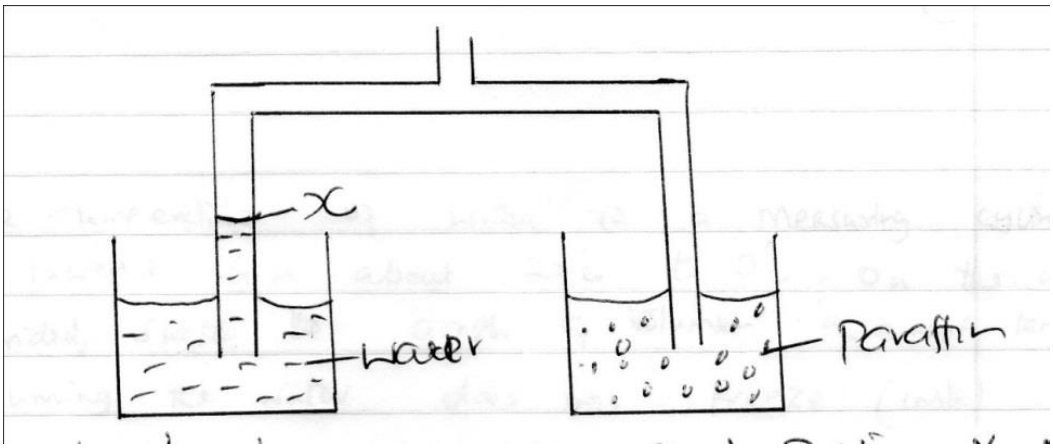
8. A vacuum pump was used to pump out air from the glass immersed in liquids as shown below

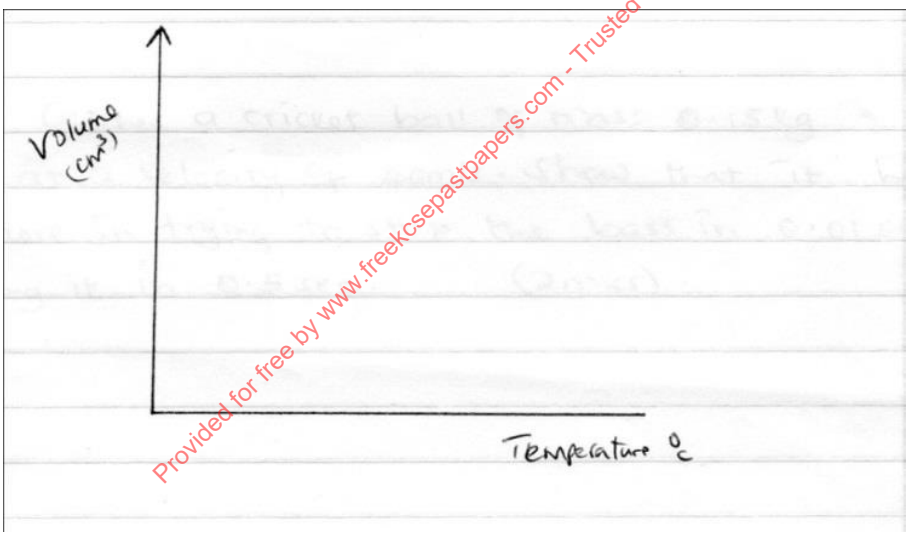


After sometime the level of water rose to position X. Mark Y the corresponding position for the paraffin level. Give a reason for your answer. (2mks)

9. When a liquid is heated in a glass flask, it is observed that the level at first goes and then rises. Explain the observation. (2mks)

10. a) Give two ways of increasing sensitivity of a clinical thermometer. (2mks)

b) The temperature of water in a measuring cylinder is lowered from about 20^0c to 0^0. On the axes provided sketch the graph of volume against temperature assuming the water does not freeze. (1mk)

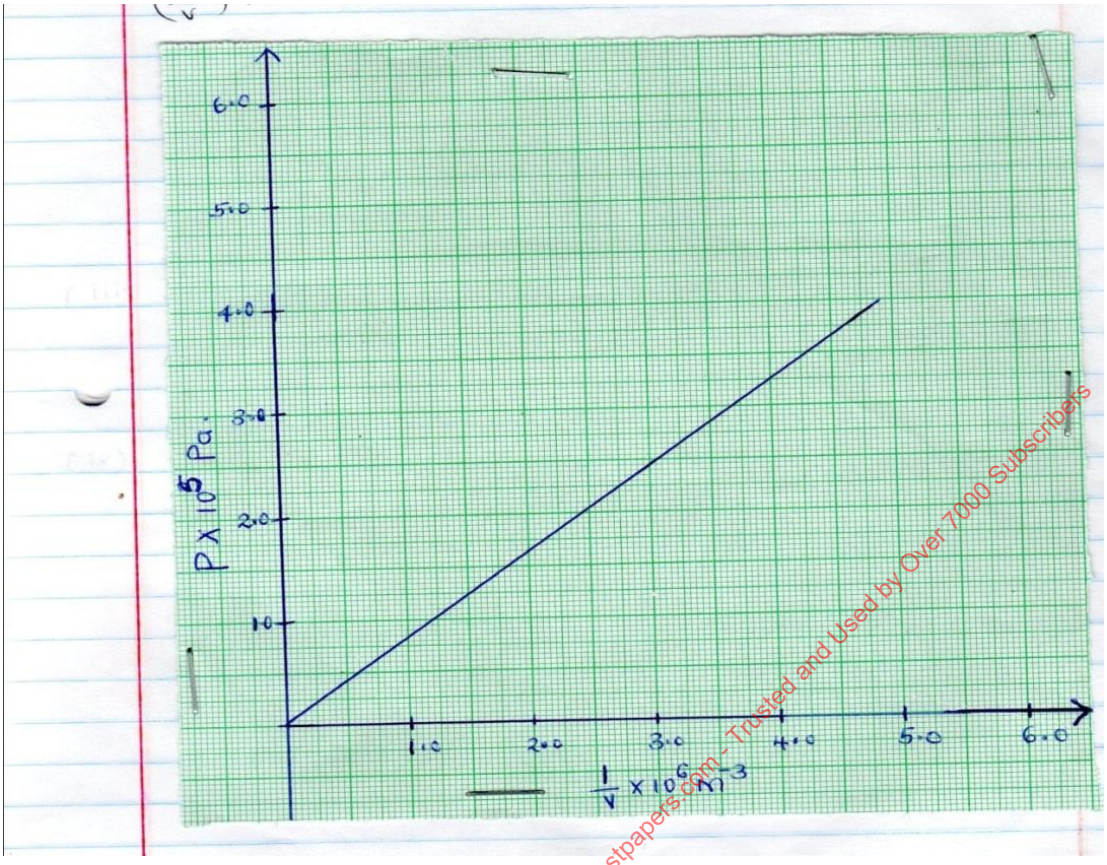


11. State one way in which the centripetal force on a body of mass (m) can be increased. (1mk)

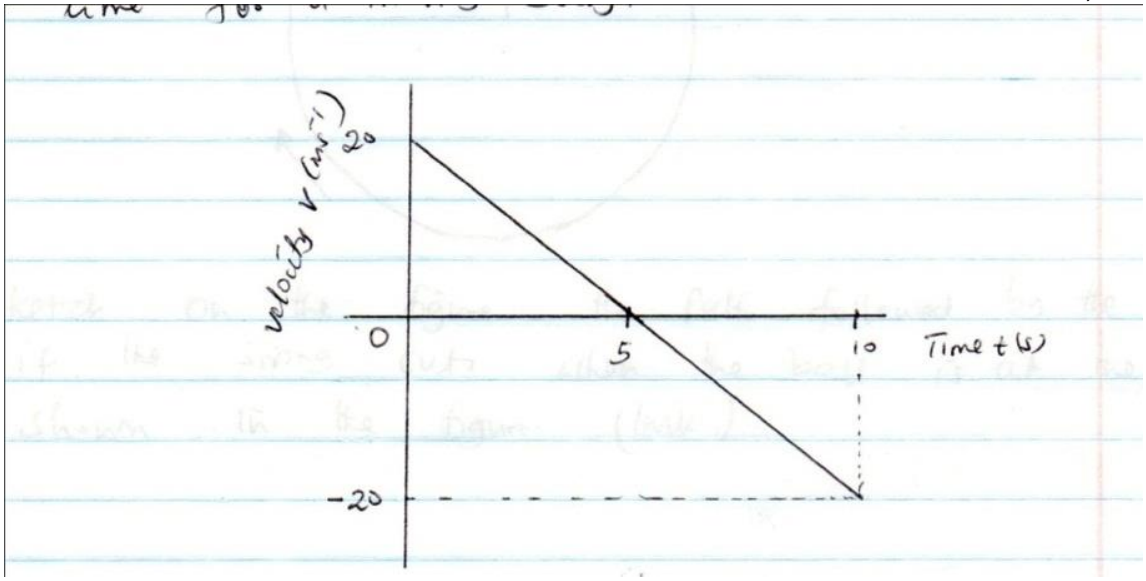
12. A boy catches a cricket's ball of mass 0.15kg moving at a velocity of 40m/s. Show that it hurts the boy more in trying to stop the bass in 0.01sec than stopping it in 0.5 sec. (2mks)

SECTION B (55MARKS)

13. a) State what is meant by an ideal gas. (1mk)
    b) The pressure acting on a gas in a container was changed steadily while the temperature of the gas was maintained constant. The value of volume (v) of gas was measured for various value of pressure (p). The graph in the figure below shows the relationship between the pressure (p) and the reciprocal of volume (v).



    i) Suggest how the temperature of the gas could be kept constant. (1mk)
    ii) Given that the relationship between pressure (p) and volume (v) of the gas is given by pv= k whereby k is a constant, use the graph to determine the value of k. (3mks)
    iii) What physical quantity does k represent? (1mk)
    iv) State one precaution you would take when performing such an experiment. (1mk)
    c) A gas occupies a volume of 4000 litres at a temperature of 37^0c and normal atmospheric pressure. Determine the new volume of the gas if it is heated at a constant pressure to a temperature of 67^0c. (Normal atmospheric pressure = 1.01 x105pa) (4mks)
14. a) State the principle of conservation of linear momentum. (1mk)
    b) Distinguish between elastic and inelastic collision. (1mk)
    c) A sticker kicks a ball of mass 200 g initially at rest with a force of 78N. Given that the foot was in contact with the ball for 0.30s, determine the take – off velocity of the ball. (3mks)
    d) A high jumper usually lands on a thick soft mattress. Explain how the mattress helps in reducing the force of impact. (2mks)
    e) A ball is throne horizontally from the top of a vertical tower of height 75m and strikes the ground at a point of 80m from the bottom of the tower.
    Determine the:
    i) Time taken by the ball to hit the ground (acceleration due to gravity= 10m/s)
    ii) Initial horizontal velocity of the ball. (2mks)
15. a) Show that V2 = u+2as (3mks
    b) The figure below shows a graph of velocity against time for a moving body.

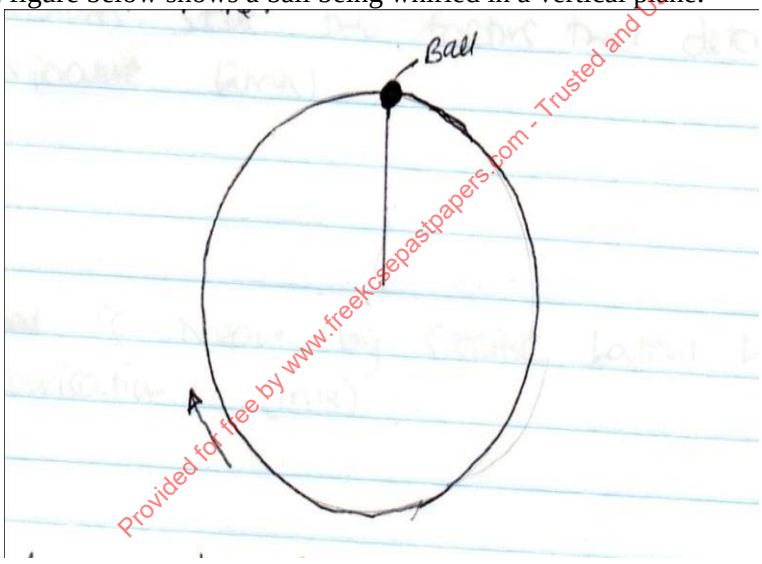


Describe the motion of the body during the 10 seconds. (2mks)

c) i) Explain why a pail of water can be swing in a vertical circle without the water pouring out. (2mks)

ii) A body of mass 5.0kg is attached to the end of a string of length 50cm and whirled in a horizontal circle. If the tension of the string is 81N, determine the velocity of the body. (3mks)

iii) The figure below shows a ball being whirled in a vertical plane.



Sketch on the figure the path followed by the ball if the string cut when the ball is at the position shown in the figure. (1mk)

16. A liquid at 80^0C in a cup was allowed to cool for 20 minutes. State two factors that determine the final temperature. (2mks)

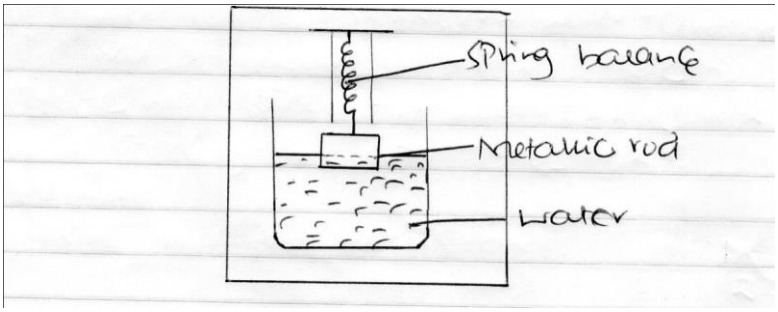
b) What is meant by specific latent heat if vaporization. (1mk)

c) In an experiment to determine the specific latent heat of vaporization of water, steam at 100^0c was passed into water contained in a well logged copper calorimeter. The following measurements were made:
Mass of calorimeter=80g
Initial mass of water = 70g
Initial temperature of water =5^0c
Final mass of calorimeter + water + condensed steam=156g.
Final temperature of mixture = 30^0c.
Specific heat capacity of water = 4200j/kg/k and specific heat capacity for copper = 390j/kg/k.

Determine:

a) Mass of condensed steam. (2mks)
b) Heat gained by the calorimeter and water. (2mks)
c) Given heat L is the specific latent heat of vaporization of steam.
   i) Write an expression for the heat given out by steam. (2mks)
   ii) Determine the value of L. (2mks)

17. The figure below shows a metallic red rod length 10cm and uniform cross-sectional area 4 cm^2 suspended from a spring balance with 7.5cm of its length immersed in water. (The density of the material is 1.5g/cm^3 while density of water 1.05/cm^3).



Determine:

i) The mass of the rod. (2mks)
ii) The up thrust acting on the rod. (2mks)
iii) The reading of the spring balance. (2mks)
iv) The reading of the spring balance when the rod is wholly immersed in water. (3mks)
v) Explain why ice cubs float on water and solid benzene sinks in liquid benzene. (2mks)

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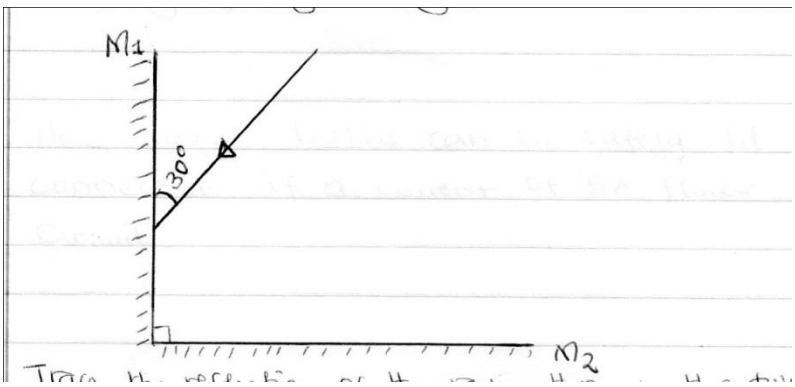
PHYSICS
PAPER 2

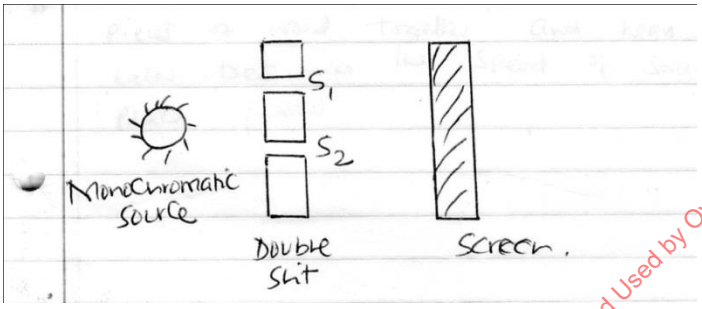
SECTION A (25MARKS)

1. The figure below shows two mirrors M1 and M2 are inclined at right angles to each other.

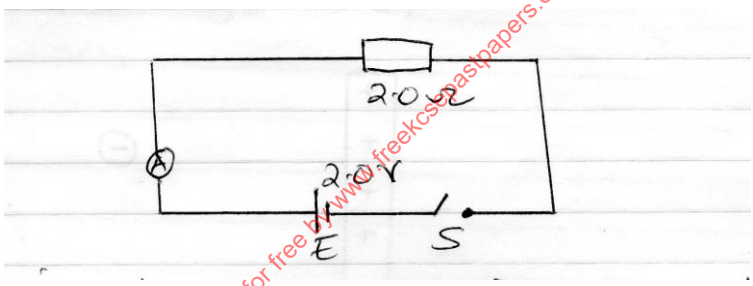


Trace the reflection of the ray through the two mirrors and find the angle between the incident ray and reflected ray of mirror M_2. (2mks)

2. State the reasons why a convex mirror is preferred over a plane mirror for use as a driving mirror. (1mk)
3. A current of 0.5A flows in a circuit. Determine the quantity of charge that crosses a point in 4 minutes through the circuit. (2mks)
4. State the reasons why the magnetic field strength is greatest at the poles. (1mk)
5. It is observed that when a ultra violet radiation falls on a zinc plate placed on the negatively charged electroscope the leaf falls. Explain this observation. (1mk)
6. a) An electrical bulb is rated 24V,100W. Explain the meaning of the rating. (1mk)
   b) How many bulbs can be safely lit in the above connection if a current of 5A flows through the circuit? (1mk)
7. A radio station broadcasts on a wavelength of 150m at a frequency of 200 kHz. Calculate the velocity of the radio waves. (2mks)
8. Voltage in mains supply is always in alternate current. Explain. (1mk)
9. A microscope is focused on a mark on a horizontal surface. A rectangular glass block 30mm truck is placed on the mark. The microscope is then adjusted 10mm upwards to bring the mark back to focus .Determine the refractive index n of the glass. (3mks)
10. State two properties of cathode rays. (2mks)
11. In an experiment to observe interference of light waves, a double slit placed close to the source.



   i) State the function of the double slit. (1mk)
   ii) State what is observed on the screen when the slit separation S_1 S_2 is reduced. (1mk)
12. The internal resistance of the cell in the figure below is 0.5 Ω.

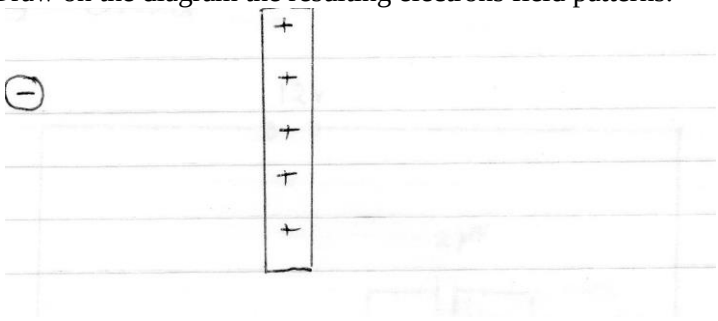


   Determine the ammeter reading when the switch S is closed. (2mks)
13. State two sources of background radiation. (2mks)
14. A man standing 600 away from a wall bangs two pieces of wood together and hears an echo 2.5 seconds later. Determine the speed of sound in air at that place. (2mks)

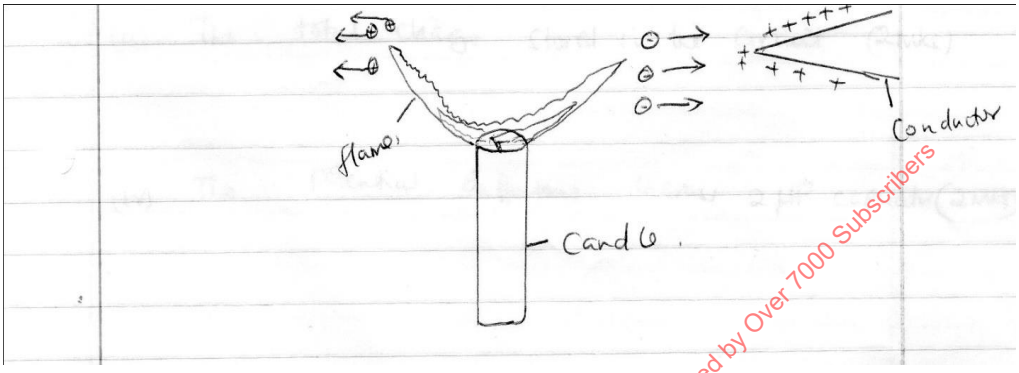
SECTION B(55MARKS)

15. a) What is meant by the term capacitance. (1mk)
    b) The figure below shows a point placed near a positively charged rod.

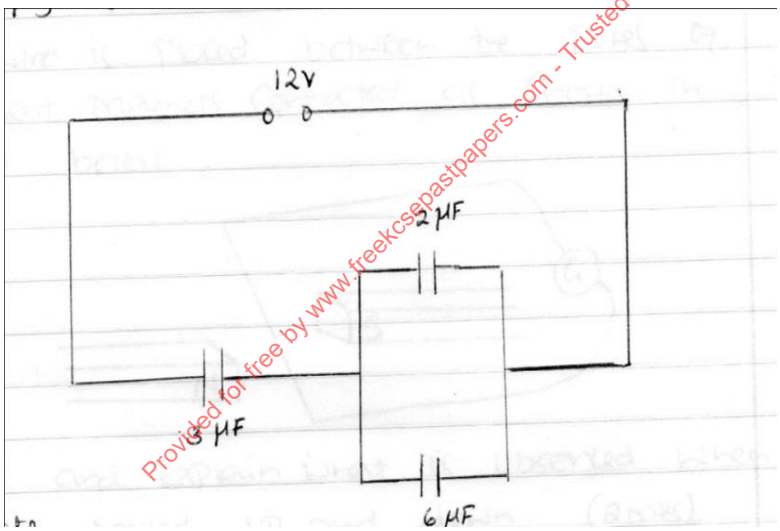
Draw on the diagram the resulting electrons field patterns. (1mk)



c) When a positively charged conductor is brought close to a candle, the flame is diverted as shown in the figure below. Explain thus observation. (2mks)



d) The figure below shows three capacitors of capacitance 34µf, 2µf, and 6µf. Connected to a 12v supply circuit.

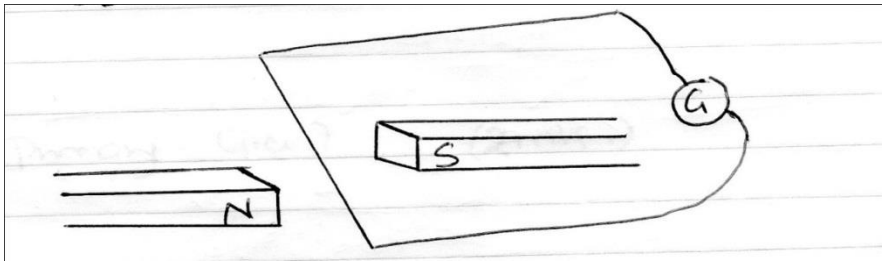


Calculate:

i) The total capacitance of the circuit. (2mks)
ii) The total change stored in the circuit. (2mks)
iii) The potential differences across 2µf capacitor. (2mks)

16. State Lenz's law of electromagnetic induction. (1mk)

b) A wire is placed between the poles of two permanent magnets connected as shown in the diagram below.



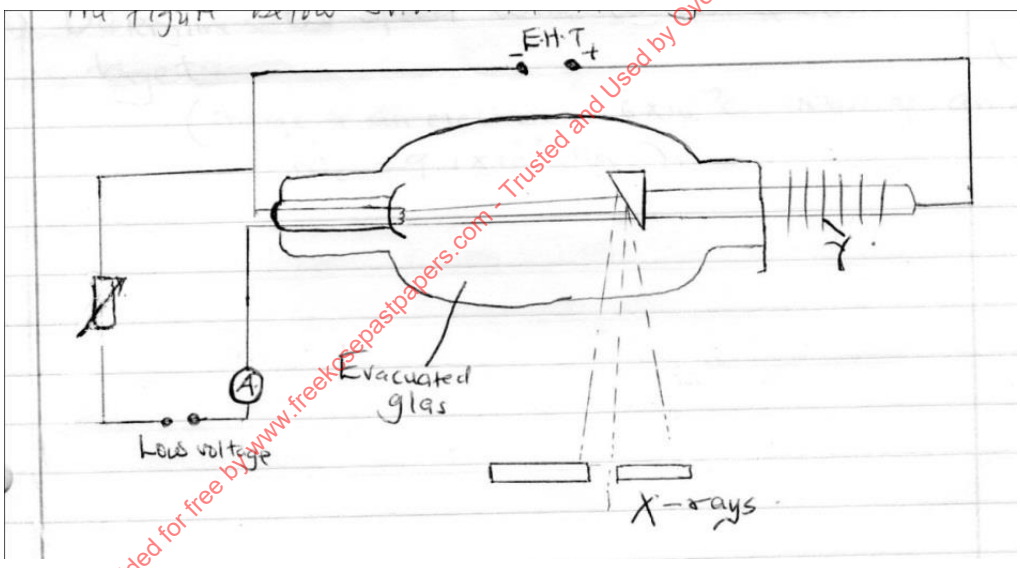
i) State and explain what is observed when the wire is moved up and down. (2mks)
ii) Suggest two ways of altering the magnitude of the effect stated in(i) above (2mks)

c) Explain why the core of a transformer is:
i) Laminated (1mk)
ii) Made of soft iron (1mk)

d) An ideal transformer has 2000 turns in the primary circuits and 200 turns in the secondary circuit. When the primary circuit is connected to a 400V a.c source, the power delivered to a resister is found to be 800W. Determine the current in:
i) The secondary circuit. (4mks)

e) The primary circuit. (2mks)

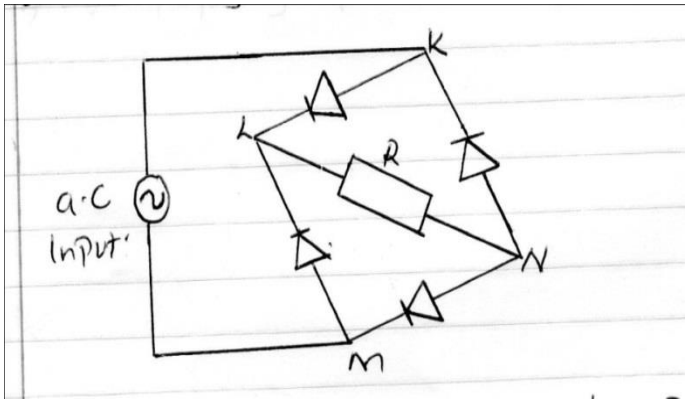
17. The figure below shows an x-ray tube.



a) Name the part labeled Y. (1mk)
b) How would one increase:
i) The intensity of the x-rays. (1mk)
ii) Penetrating powers of x-rays. (1mk)
c) Explain why the tube is highly evaluated. (2mks)
d) An x- ray tube is operating with an anode of potential of 10 kV and current of 15mA.
i) Calculate the number of electrons hitting the target per second (3mks)
ii) Determine the speed with which electrons hit the target (3mks)
Given are the:
Charge of an electron $=1.6\times10^{-19}$c,
Mass of an electron $=9.1\times 10^{-31}$kg

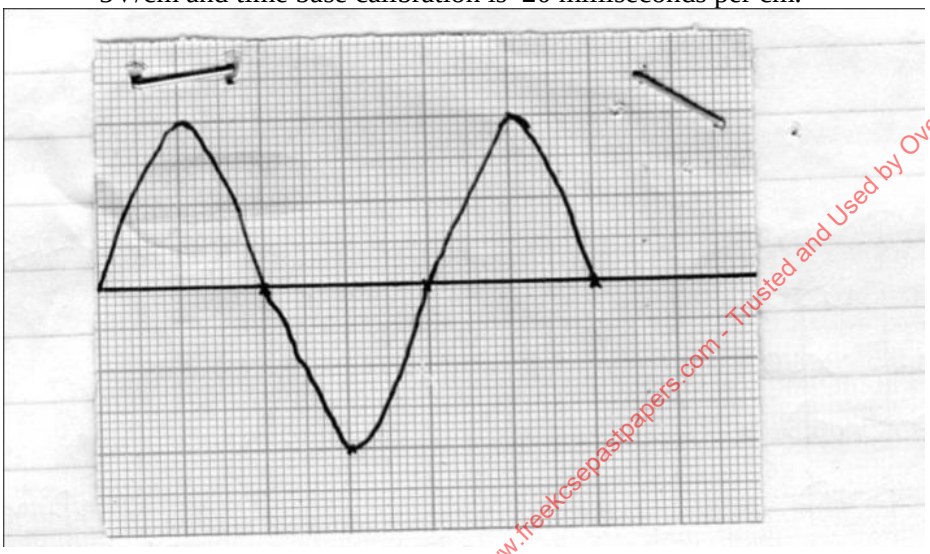
18. Extrinsic semiconductors are made through the process known as doping.
i) Define doping. (1mk)
ii) Describe how doping produces an n-type conductor. (3mks)

b) The diagram below shows a rectifier circuit for an alternating current (AC) input.



Sketch a graph to show how the p.d across R varies with time. (2mks)

c) In a CRO, a waveform given below was displayed on the screen when the Y-gain of the CRO was set at 5V/cm and time base calibration is 20 milliseconds per cm.

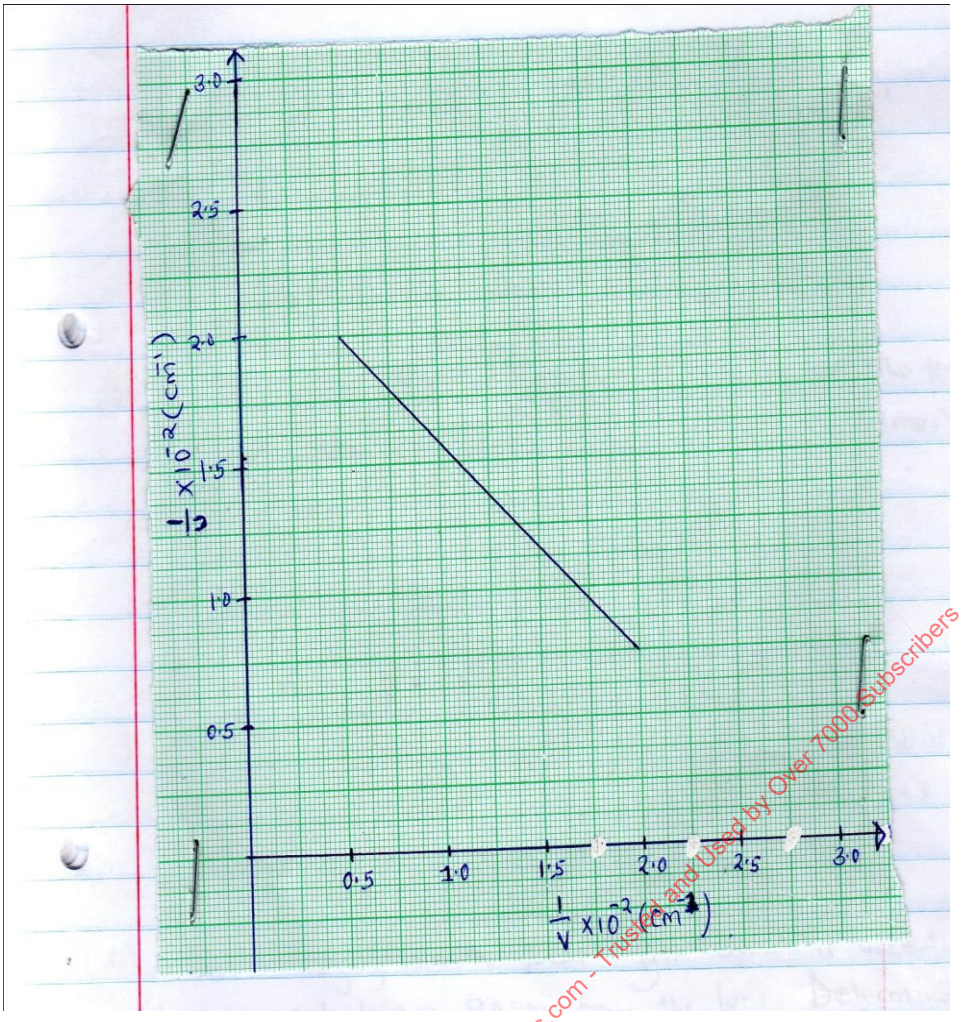


Determine:

i) The peak voltage. (2mks)

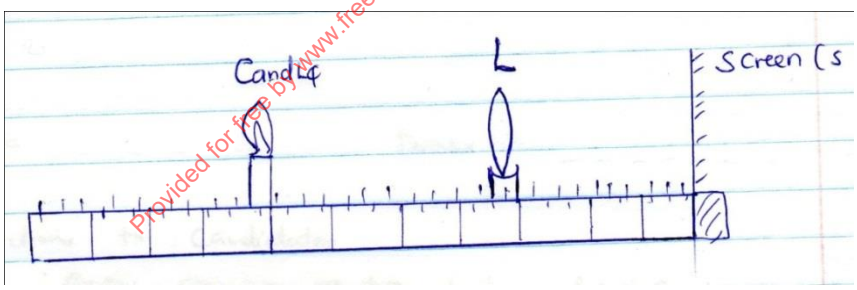
ii) The frequency of the voltage. (2mks)

19. The graph in the figure below shows the relationship between 1/u and 1/u for a converging lens where u and v are the object and image distances respectively



a) From the graph determine the focal length f of the lens. (3mks)

b) Figure below shows an experimental set up consisting of a counted lens L a screen, a meter rule and a candle.



i) Describe how the set up may be used to determine the focal length f, of the lens. (3mks)

ii) State why the set up would not worse if the lens was replaced with a diverging lens. (1mk)

c) A thin converging lens of focal length 30cm is used to form a real image 90 cm from the lens. Determine :

i) The objects distance from the lens. (2mks)

ii) The magnification of the lens. (2mks)

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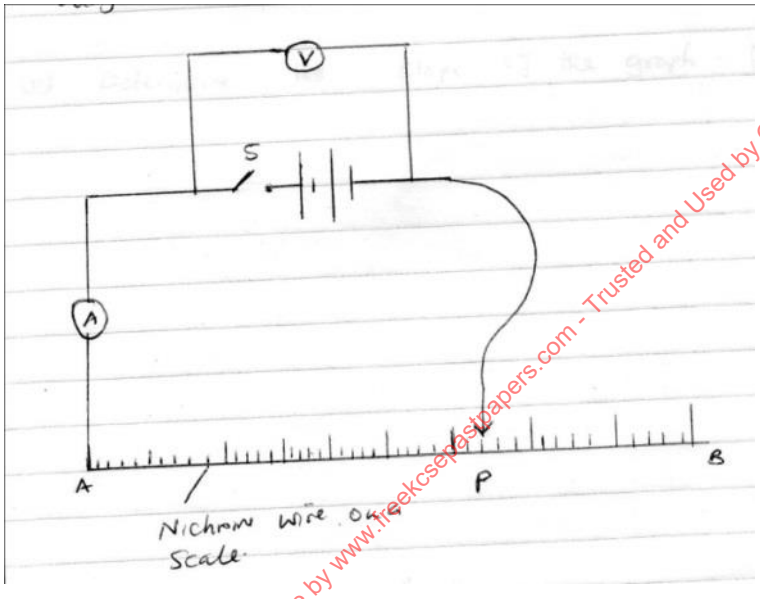
PHYSICS
PAPER 3

1. a) You are provided with:
   - One voltmeter with a scale of 0 - 5V.
   - One ammeter (0 - 2.5A)
   - Six connecting wires(three with crocodiles clips at one end)
   - Two dry cells.
   - Cell holder.
   - Nichrome wire mounted on a scale.
   - A micrometer screw gauge.
   - Switch.

Proceed as follows.

a) Measure the thickness of the wire using the micrometer screw gauge provided.
d= …….. m (1mk)

b) i) Set up the apparatus as shown in the circuit diagram below. (AB is the nichrome wire).



ii) Adjust length AP of the nichrome wire to 80cm using the crocodile clip at P. Now connect the crocodile clip next to the switch and record the voltage and ammeter reading in the table below.

Length AP (cm)	80	70	60	50	40
P.D(V)					
Current (A)					

iii) Repeat b(ii) for lengths 70cm, 60cm, 50cm and 40cm and enter the reading in the table above. (5mks)

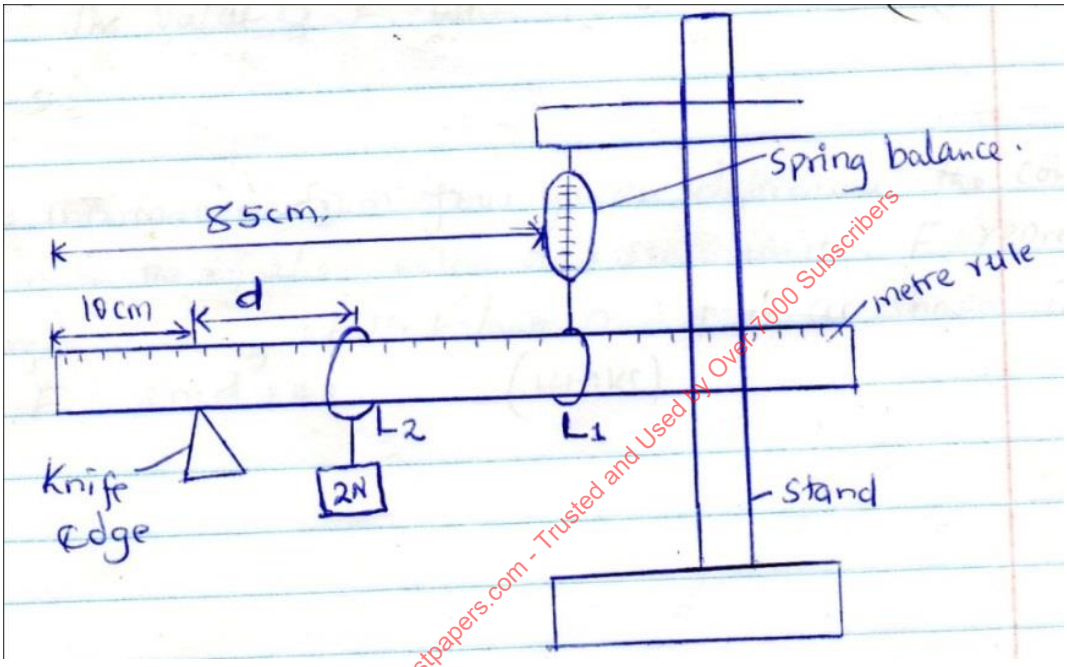
i) Plot a graph of p.d against current. (5mks)
ii) Determine the slope of the graph. (3mks)

2. a) You are provided with the following:
   - A metre rule
   - A spring balance
   - A weight of 2N with a hook or (two 100g masses)
   - Stand
   - Knife edge support.

- Two light strings about 10cm long.

Proceed as follows:

i) Using the string provided make two loops to be used as hooks L1 and L2 in the diagram.
ii) Suspended the spring balance from a clamp and using one loop to support the rule from the spring so that the loop L2 is on 85cm mark.
iii) Support the other end of the rule with a knife edge at the 10cm mark so that the rule is horizontal.
iv) Using loop 1 suspended the 2N weight at a distance d=10cm from the knife edge as shown and take the reading of the spring balance, record the results in the table.
v) Adjust the distance d to 20cm,30cme.t.c and each time recording the reading of the balance to complete the table. (5mks)



RESULTS

Distance (d)	10.0	20.0	30.0	40.0	50.0	60.0	70.0
Force (N)							

i) Plot a graph of force F against distance d(cm) (5 mks)
ii) From your graph determine:
(a) The slope (2mks)
(b) The value of F when d=0 (2mks)
iii) Using the information from your graph, determine the constant k and m in the equation below and state units, f represents the reading of he balance and d is as shown in the above. **F=2md +40k.** (4mks)

b) You are provided with the following

- A candle
- A lens and a lens holder
- A screen
- A metre rule

a) Set up apparatus as shown in the figure below ensure that the candle flame and the lens are approximately the same height above the bench.

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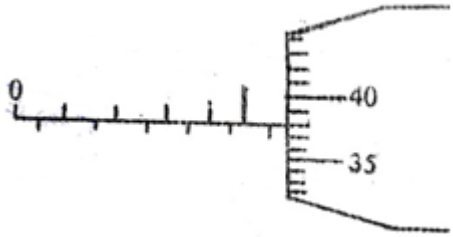
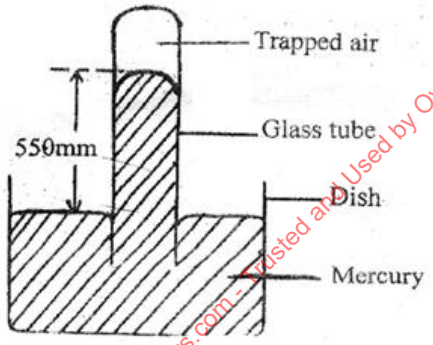
FORM IV
2 HOURS

1. The diagram below shows a section of a micrometer screw gauge used to measure the diameter of a thin rod. If it has a zero error of – 0.02mm/ determine the diameter of the rod measured (2mks)

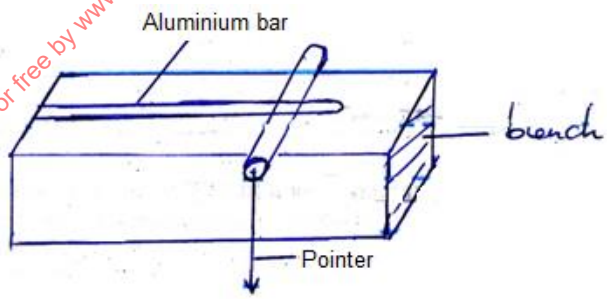


2. State two forces other than upthrust that will act on on insect floating on water (2mks)
3. The figure below shows some air trapped in a glass tube, the tube is inverted in a dish containing mercury.



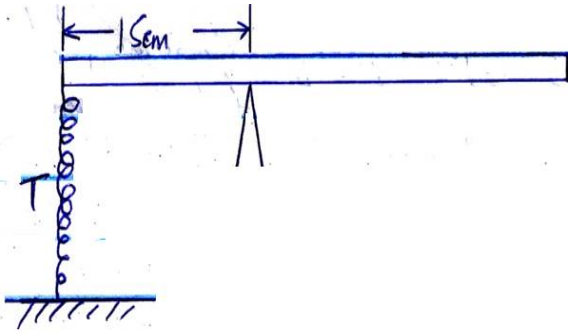
Given that the atmospheric pressure is 760 mmHg and the height of mercury column in the glass is 550 mm determine the pressure of the air trapped in the tube in mm H g. (2mks)

4. State the reason why gases are easily compressible while liquids and solids are not (1mks)
5. The diagram below shares an aluminum bar fixed at one end and resting on a roller that has a pointer fixed at one end

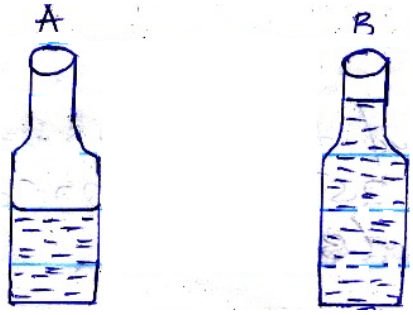


State and explain the direction in which the pointer turns when the bar is cooled below room temperature (2mks)

6. In a cold day two form four students were observer. One was wearing a light fitting pullover while the other had a baggy one. The one with the light – fitting pullover was found shivering while the other one was not. Explain why. (2mks)
7. The diagram below shows a uniform half metre rule of mass 60g pivoted at the 15cm mark. A spring is attached at the zero cm mark and fixed on the ground. Find the tension T in the spring given that it is in equilibrium (3mks)

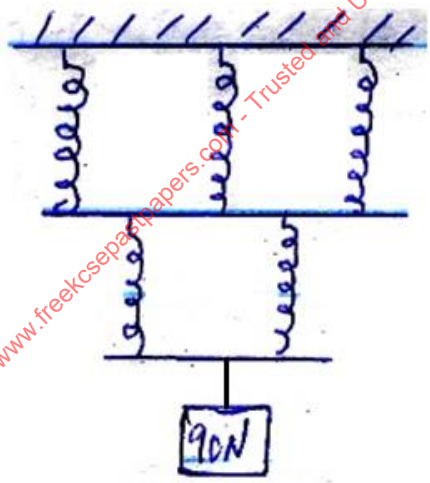


8. The diagram below shows two identical water bottles filled with water to the level shown



State with a reason which bottle was easier to topple (2mks)

9. The springs in the arrangement shown below are indicated and have negligible weight. Study the diagram and answer the question that follow



Given that the 90 N weight cause a total extension of 25cm, determine the springs constant of each spring(3mks)

10. The total cross- sectional area of all blood capillaries in a person's circulatory system is 0.5 m^2. if the blood flows at 150cm $^3/_s$, calculate the average velocity of blood in the capillaries(2mks) State a conduction which should be attained by the body moving in a fluid to attain terminal velocity (1mks)

11. An external force applied to a ball of mass 160g increases its velocity from 25cmls to 275 cm/s in 10 seconds. Calculate the force applied. (3mks)

SECTION B: (55MKS)

Answer all questions in this section

12. (a) State Newton,s second law of motion (1mk)

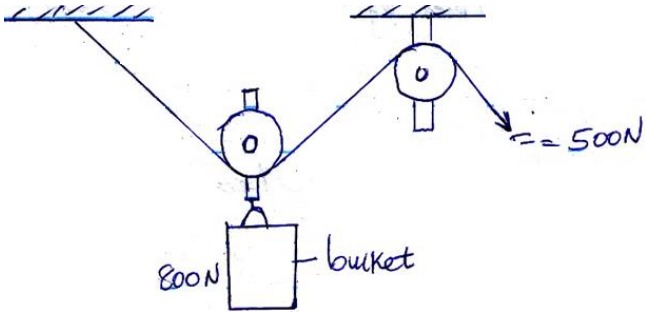
(b) A student kicked a ball vertically upwards with an initial velocity of 8mls. Determine:

i) The time taken to reach maximum height (2mks)
ii) The maximum height reached by the ball (3mks)

(c) In a hockey match, a player hit a stationary ball of mass 800g with a force of 500N using a hockey stick. Find the velocity with which the ball leaves if the stick and ball are in contact for 0.02 seconds (3mks)

13. State the law of conservation of energy (1mks)

(b) The diagram below shows a pulley system lifting a bucket full of sand – cement mixture of total weight 800N.



If the movable pulley has a mass of 50kg and force F of 500N is applied for a distance of 6m, find

I. The velocity ratio of the machine (1mks)
II. The load distance (2mks)
III. The work done on the load (2mks)
IV. The efficiency of the machine (3mks)

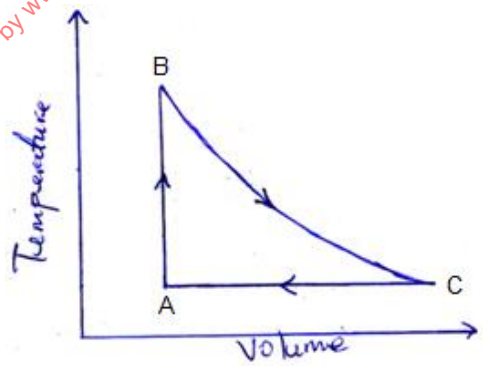
14. (a) Explain why water is a good coolant liquid in a car engine cooling system (1mks)

(b) What is meant by the term specific latent heat of vaporization (1mks)

(c) Water of mass 5000g initially at 18^0cis headed in an electric kettle rated 2.5 KW. The water is heated until it boils at 98^0c taking specific heat capacity of water to be 4,200 $JKg^{-1}k^{-1}$, heat capacity of kettle as 438 Jkg^{-1},specific latent heat of vaporization of water to be 2.28MJkg1^{-1}calculate

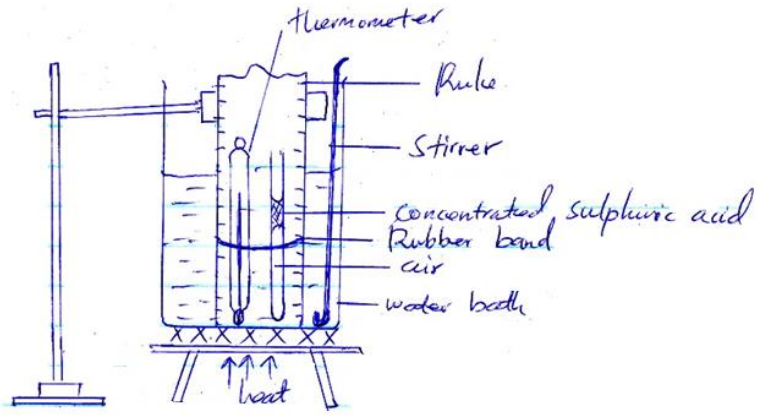
I. The heat absorbed by the water (2mks)
II. The heat absorbed by the electric kettle. (2mks)
III. The time taken for the water to boil (2mks)
IV. How much longer it will take to boil away all the water into vapour (2mks)

15. (a) A fixed amount of gas was taken through a number of process represented by AB, BC and CA as shown in the figure below



I. Which process was carried out according to Boyke's law (1mk)
II. Suggest how process AB was carried out (1mk)

b. The figure below shows a set – up to investigate one of the gas laws



I. State the gas law being investigated (1mks)
II. Give one reason for the using the concentrated Sulphuric acid index (1mks)
III. What is the purpose of the water bath (1mks)
IV. State two measurement that should be taken in this experiment (1mks)

c. A gas has a volume of $30cm^3$ at 18^0c and normal atmospheric pressure. If the gas is heated to 54^0c at the same pressure, determine the final volume of the gas (2mks)

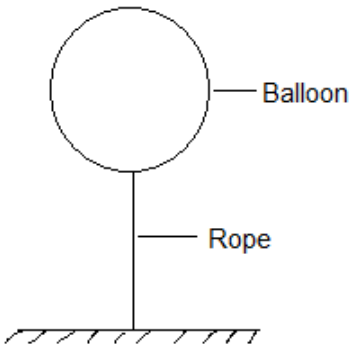
17. (a) State one factor that affects centripetal force other than mass and radius. (1mk)

(b) Explain why vehicles moving very fast have to slow down when nearing a road bend (1mk)
(c) i) Define angular velocity (1mk)
ii) A body going round in a circular path at constant speed is said to be accelerated. Explain why.(1mks)
(d) A stone of mass 200g is tied to a string 100cm long and whirled round a vertical circle at 120 revelations per minute. Find

I. The linear spend (3mks)
II. The maximum tension in the string (3mks)

18 . (a) State the law of floatation (1mks)

(b) A solid weighs 40N in air, 15N when fully immersed in water and 20N when fully immersed in another liquid, determine the relative density of the other liquid (3mks)
(c) A balloon of mass 320kg is held vertically by a rope tied to the ground. The balloon total volume is $300m^3$ and the surrounding air has a density of $1.2kg/m^3$

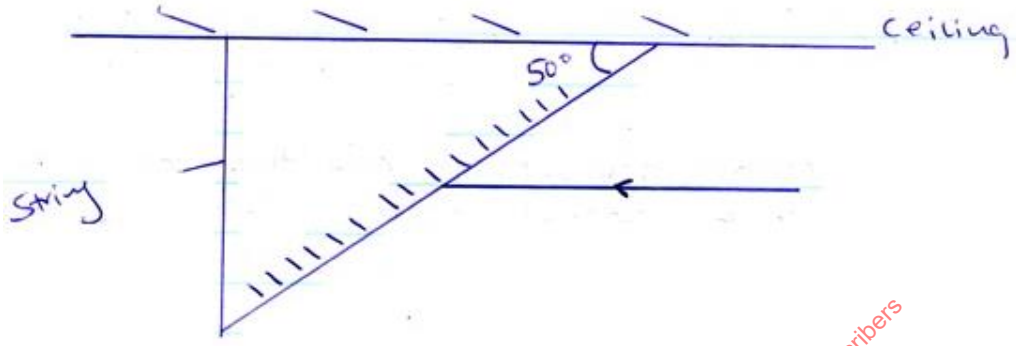


Determine

I. The up thrust acting on the balloon (3mks)
II. The tension in the rope (2mks)

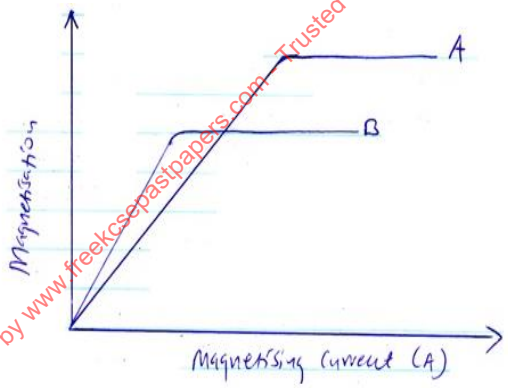
CEKENA PRE MOCK
PHYSICS
232/2
FORM IV
2 HOURS

1. Figure below shows a plane mirror suspended, using a string and makes an angle of 50^0 with the ceiling.



A ray of a light strikes the mirror horizontally as shown in the figure . Trace the path of the reflected ray showing the angles of incidence (i) and reflection (r) (2mks)

2. (a) What are ferromagnetic materials? (1mks)
   (b) The figure below shows a graph of magnification against magnetizing current for two materials A and B

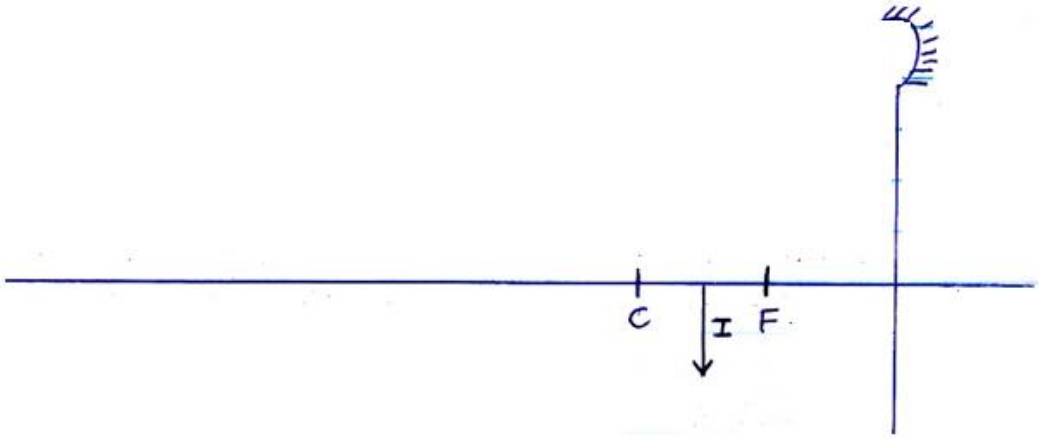


State with a reason the material which is more suitable for the use in a transformer (2mks)

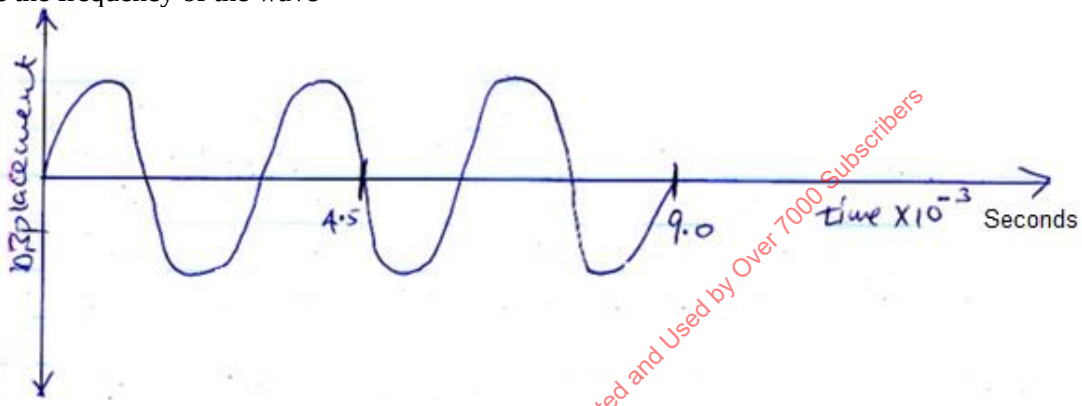
3. A girl standing 200m from the foot of a high wall claps her hands and the echo reaches her 1.16 seconds later. calculate the velocity of sound in air using this observation (2mks)
4. The table below shows part of the electromagnetic wave spectrum in order of decreasing wave length

A	B	Infrared	Visible light	C	D

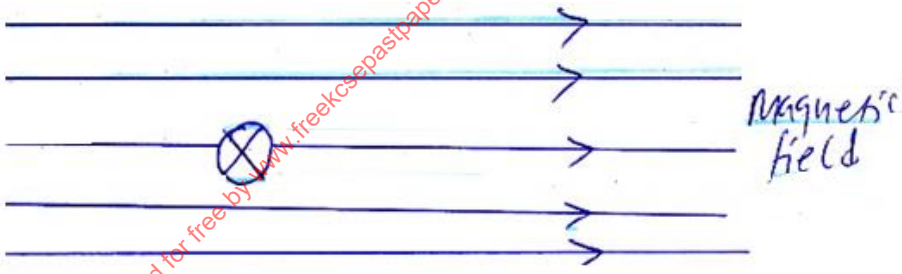
   i. State one source of wave c (1mks)
   ii. State one use of wave D (1 mks)
5. The figure below shows the image formed by a concave mirror. Using appropriate rays locate the position of the object. (3mks)



6. The figure below shows a displacement – time graph for a transverse wave traveling along the x – axis. Determine the frequency of the wave (3mks)

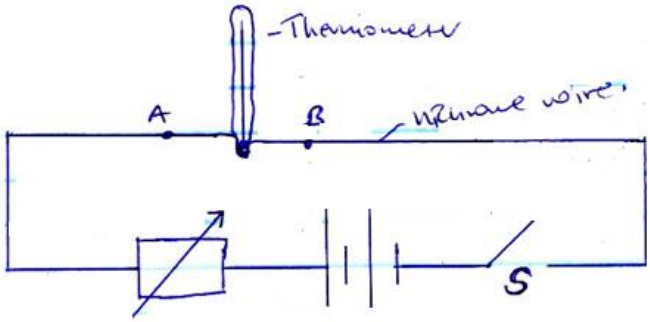


7. The figure below shows a wire in a magnetic field. A current is switched on to flow through the wire in the direction shown. (1mks)



Show the direction of motion of wire with an arrow

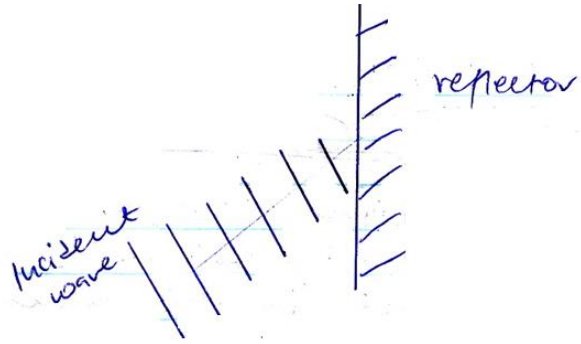
8. The figure below shows an experiment set – up in a laboratory.



A thin wire was wound on a thermometer and then connected between ends A and B.

a. State the observation made after sometime when the switch S was closed (1 mks)
b. Explain the observation made in (a) above (1mks)

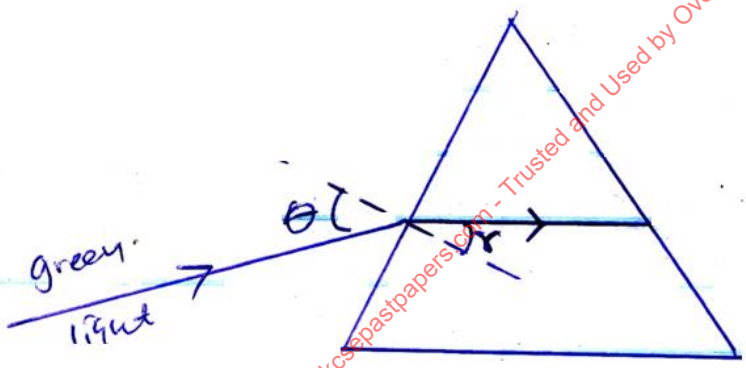
9. The figure below shows plane waves indent on a straight reflector complete the diagram to show the reflected wave (1mks)



10. An object 2cm tall was placed 20cm in front of a diverging lens of focal length 15cm. Find the image distance
11. 214 Bi has a half-life of 20 minutes .
    83
    What percentage of 214Bi remains after one hour?
    83 (2mks)
12. Explain how an N – type semi conductor is obtained (1mks)

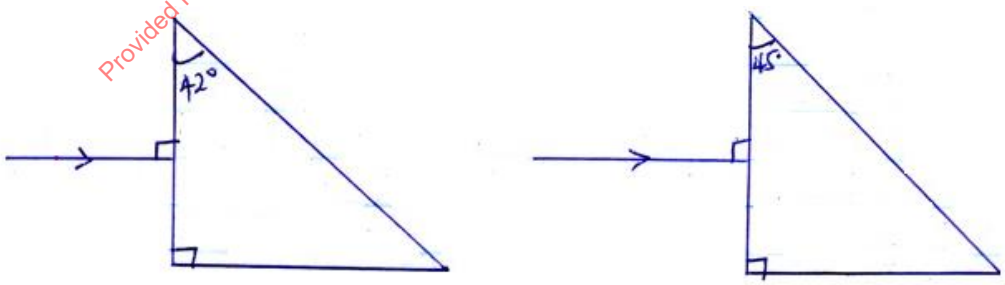
SECTION B (55 MARKS)

13. The figure below shows a ray of green light through a prism. The speed of green light in the prism is 2.0×10^8m/s



i. Determine the refractive index of the prism material(speed of light in air = 3.0×10^8m/s (3mks)
ii. Given the r ==23.2^0, determine the angle (3mks)

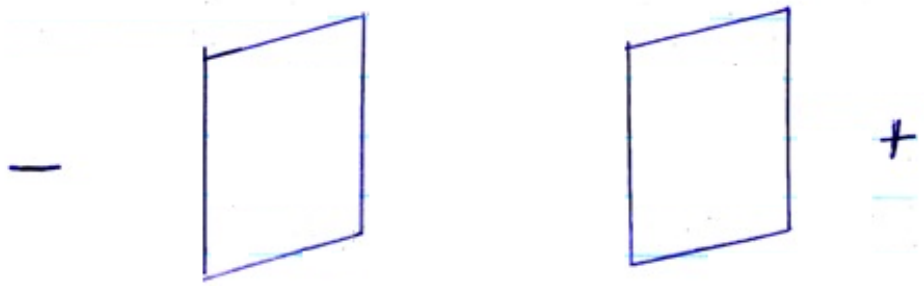
b) i) The diagram below show two prisms



Given that the critical angle of the glass in both prisms is 42^0 sketch the paths of the two rays in each prism indicating all the angles. (2mks)

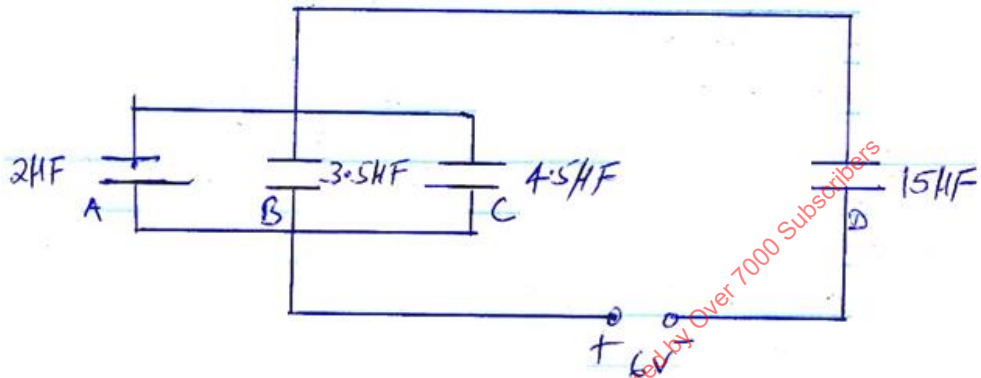
ii) Give two application of total internal reflection (2mks)

14. The figure below shows a pair of parallel plates of a capacitor placed close to one another



State one way in which the capacitance of capacitor way be increased (1 mks)

b. Four capacitors are connected in a circuit as shown in figure below.



Determine

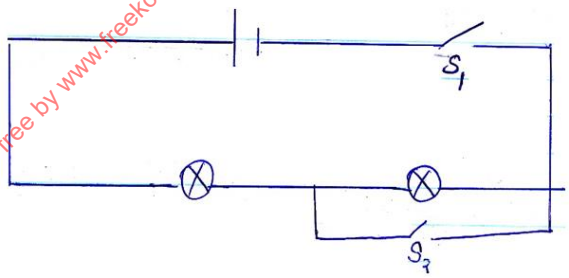
(i.) The total capacitance in the circuit (3mks)

(ii.) The charge in capacitor D (3mks)

(iii.) The potential difference across capacitor B (3mks)

15. a) Define electric current (1mks)

b. The figure below shows an electric circuit with two bulbs S_1 and S_2 which are identical.

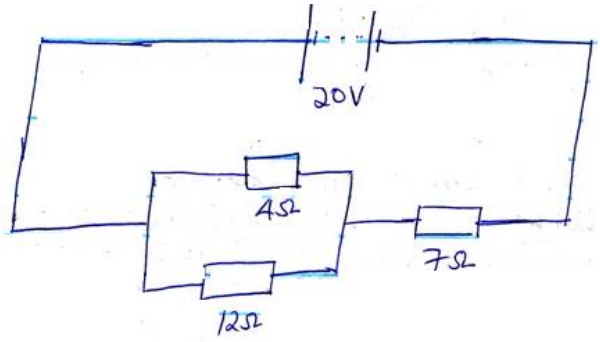


Explain what happens to the bulbs when

i. S_1 only is closed (2mks)

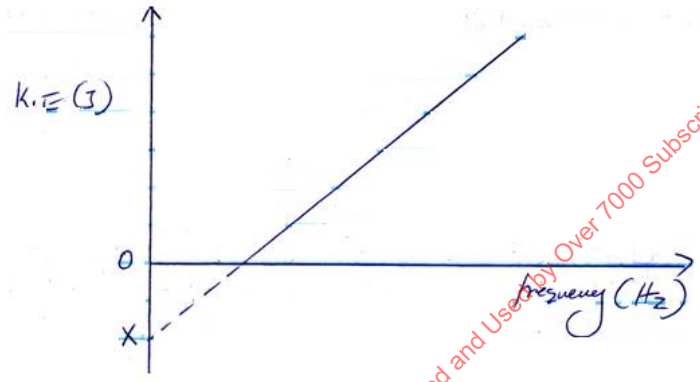
ii. S_1 and S_2 are closed (2mks)

c. The figure below shows an electric circuit. Use the circuit to determine the current supplied by the battery (3mks)



16. Define photoelectric effect (1mk)

b) A graph of K.E of photoelectronics emitted by metal surface A against the frequency of radiation used is as shown below



i. From the graph, state the relationship between K.E and frequency (1mks)
ii. What is the significance of the gradient of the graph? (1mks)
iii. What is the significance of OX (1mks)

c) The experiment was repeated with a photocell of a metal surface B which has a lower work function than metal A. Sketch on the same axes the expected graph if metal surface B photocell was used. (1mks)

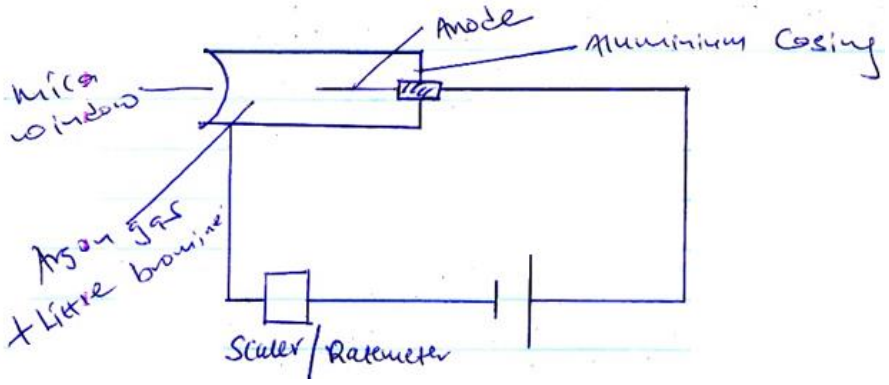
d) The minimum frequency of light which will cause photoelectric emission from a metal surface is 5.0 x 10^{14}H2. If the surface is illuminated by light of frequency 6.5 x 10^{14}HZ, Find (h= 6.6^{3}x 10^{-34}55/Me = 9.11 x 10^{-31}kg)

i. The work function of the metal surface (2mks)
ii. The maximum K.E of the electros emitted (2mks)
iii. The maximum speed of the electrons (2mks)

(take h=6.63 x 10^{-34}JS, mass of electron = 9.11x10^{-31}Kg)

17. (i.) Explain why power is transmitted at high voltage along the transmission lines (1mks)
(ii) A drier is rated 2.5KW,240V. Explain why it is not advisable to use a 10A fuse for the drier. (3mks)
b) i) What do you understand by the term mutual induction? (1mks)
ii) A transformer is used on a 240Va.c supply to deliver energy taken from the supply to an electric bell rated 120w,12V,. if 20% of the energy is dissipated in the transformer calculate the supply current (3mks)

18. a) What do you understand by the term half – life of a radioactive substance (1mks)
b) A G-M tube registers an initial count rate of 3200 counts for a certain substance and 100 counts 30 hours after. What is the half – life of this substance? (2mks)
c) The figure below shows aG.M tube



i. What is the purpose of bromine (1mks)
ii. Briefly explain how the G.M tube operate (3mks)

d) State one application of radioactivity (1mks)

PAPER 3 CONFIDENTIAL
232/3
PHYSICS
FORM 4

QUESTION 1
Each candidate to have the following apparatus:
- A wooden metre ruler (straight)
- A vernier calipers
- One 300g mass or equivalent combination
- Two knife edges (each 10cm high)
- Sewing thread (about 15cm long)

QUESTION 2
- Ammeter 90.25 A)
- A voltmeter (0 – 3v or 0 – 5v)
- Two new dry cells
- Cell holder to hold two cells
- A mounted resistance wire (SWG 28) on a 1 metre, millimeter scale labeled P on one end and Q on the other end.
- Seven connecting wires
- A switch
- A jockey or crocodile clip
- A micrometer screw gauge.

CEKENA PRE MOCK
PHYSICS
232/3
FORM IV
2 ½ HOURS

PHYSICS PAPER 3 (PRACTICAL)

Question 1

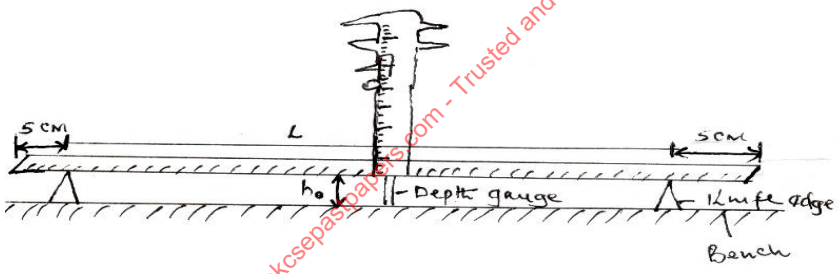
You are provided with the following

- ✓ A metre rule
- ✓ Vernier calipers
- ✓ A 300g mass or equivalent combination
- ✓ Two knife edges
- ✓ A piece of thread

Proceed as follows

a). Place the meter rule on the knife edges such that each knife is 45 cm from the 50cm mark (centre of the rule). See figure 1. Ensure that the millimeter scale of metre rule is facing upwards. The distance L between the knife edges is now 900 mm. Place the vernier calipers vertically against the metre rule at the 50 cm mark with the depth gauge lowered to touch the bench as shown in figure 1. Record the height ho, from the upper edge of the metre rule at the 50 cm mark. (see figure 1)

ho = …….. mm (1 mk)



b). Using the thread provided, tie the thread at the 50 cm mark of the metre rule and hang the 300g mass. Ensure that the mass does not touch the bench. Measure and record in table 1, the height h of the edge of the metre rule at 50 cm mark.

c). With the 300g mass still at 50 cm mark, adjust the position of the knife edges so that L is now 800 mm. (The knife edges should be equidistant from the centre of metre rule). Measure and record in table 1 the height h of the edge of the metre rule at the 50 cm mark.

d). Repeat the procedure in (c). for other values of L shown in table and complete the table

Length L (mm)	900	800	700	600	500
Height h (mm)					
Depression d (h_0 - h)mm					
Log L					
Log d					

Table 1 (7 mks)

e). Plot a graph of Log L (y axis) against log d (5 mks)

f) i). Determine the slope, s of the graph (3 mks)

ii). Evaluate y = $\frac{1}{6}$ (1 mk)

iii). Determine G, the value of log L, when log d=0 (1 mk)

iv). Given that, G = $\frac{Log\ K}{y}$, determine the value of K (2 mks)

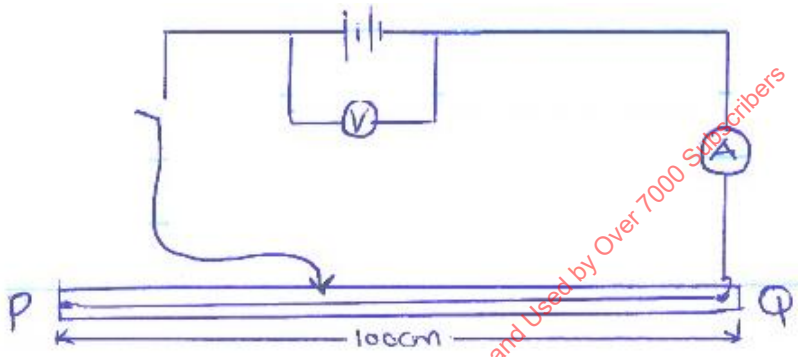
Question 2

You are provided with the following apparatus

- ✓ An ammeter (0 – 2.5A)
- ✓ A voltmeter (0 – 3v or 3 -5v)
- ✓ Two dry cells
- ✓ A mounted resistance wire on a metre rule
- ✓ Seven connecting wires
- ✓ A switch
- ✓ A jockey or crocodile clip
- ✓ A micrometer screw gauge

Procedure

a). i). Connect apparatus provided as shown in the circuit diagram below



ii). With the crocodile clip at P take the voltmeter reading and ammeter reading and record the values in the table below.

- Repeat the readings for L=80cm, 60cm, 40cm, 20cm and 0cm respectively
- Complete the table below (6 mks)

Length L(cm)	100	80	60	40	20	0
Voltage V(v)						
Current I (A)						

iv) Plot a graph of the ammeter reading (y-axis) against voltmeter reading (5 mks)

v). Determine the slope of your graph (3 mks)

vi). What physical quantity is represented by the slope of the graph (1 mk)

b). i). Given the apparatus in part a i). above, draw a circuit diagram you would use to determine the current through the resistance wire and potential difference across it (1 mk)

ii). Set up the circuit you have drawn. Record the ammeter reading I and voltmeter reading V, when L=100cm.

V = _____V (½mk)

I = _____ A (½mk)

iii). Using a micrometer screw gauge, measure the diameter d, of the wire

d = _____ m (1 mk)

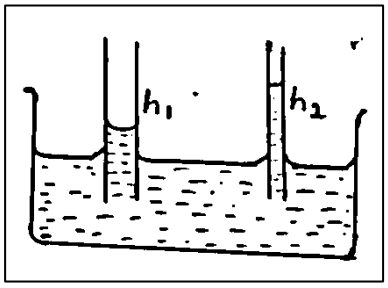
iv). Calculate the quantity

p = 0.785 x $\frac{V}{I}$ x $\frac{d^2}{L}$ and give its unit where L is one metre (2 mks)

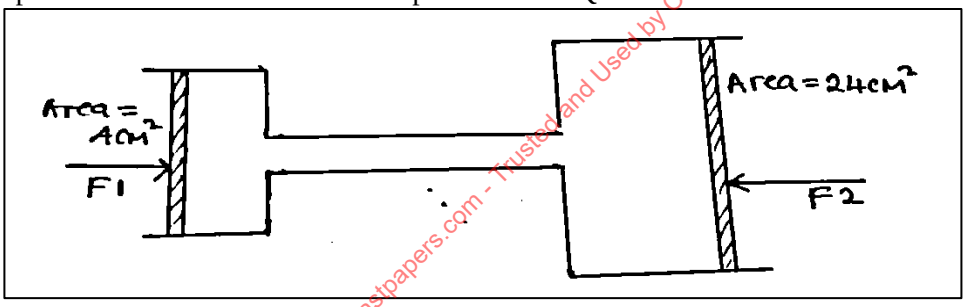
3GR JOINT EXAMINATION 232/1
PHYSICS THEORY
PAPER 1

SECTION A: 25 MARKS

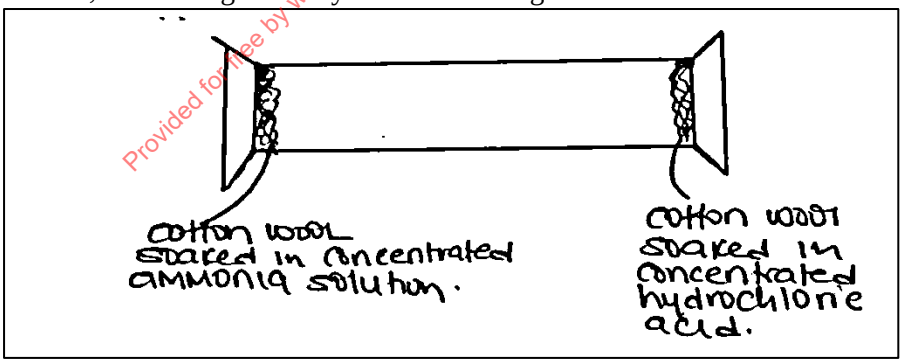
1. In an experiment to estimate the size of an oil molecule of olive oil, a drop of radius 0.35mm was placed on a clean water surface. The oil spread into a patch of area $6.0 \times 10^4 mm^2$. Estimate the size of a molecule of the olive oil. (3mks) .
2. The figure below shows two glass tubes of different diameter dipped in water.



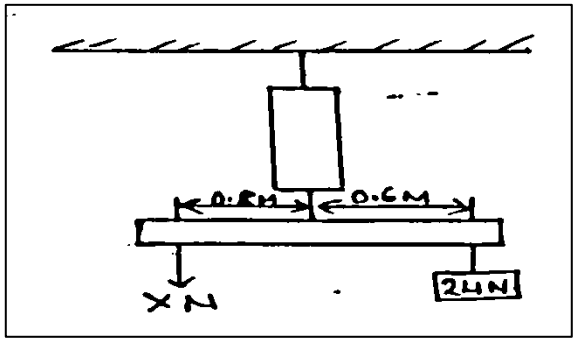
   Explain why h_2 is greater than h_1. (1mk).
3. A metal pin was observed to float on the surface of pure water. However the pin sank when a few drops of soap solution were added to the water. Explain this observation (1mk).
4. The figure below shows two cylinders of different cross-section areas connected with a tube. The cylinders contain an incompressible fluid and are fitted with pistons P and Q as shown.



   Opposing forces F_1 and F_2 are applied to the pistons until they do not move. If the pressure on the smaller piston is $54Ncm^{-2}$. Determine the force F_2 (2mks)
5. Tracks which carry heavy loads have many wheels. Explain why (1mk).
6. In the figure below, ammonia gas and hydrochloric acid gas diffuse and react



   State and explain the observation made after sometime. (2mks)
7. A student went to a hotel put some sugar in a cup and then added tea to the cup until it was full to the brim. He stirred carefully without pouring any but he noted that the volume of the content in the cup reduced. Explain the observation. (1mk)
8. State one ways of increasing the sensitivity of a liquid in glass thermometer. (1mks)
9. The figure below shows a uniform bar of mass 0.8kg supported by a spring balance at its Centre and the bar is at equilibrium.

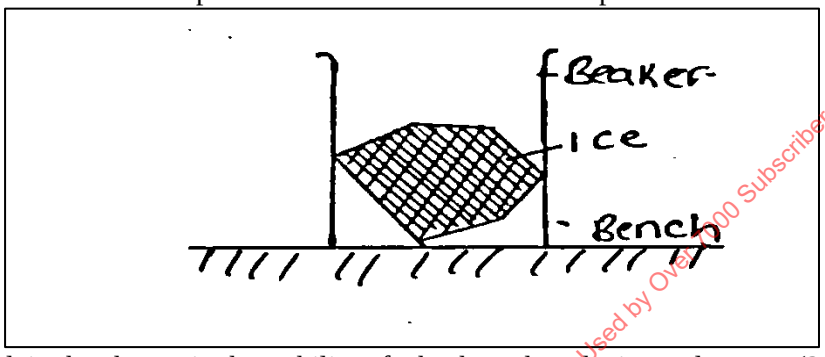


Determine

i. Value of X. (3mks)

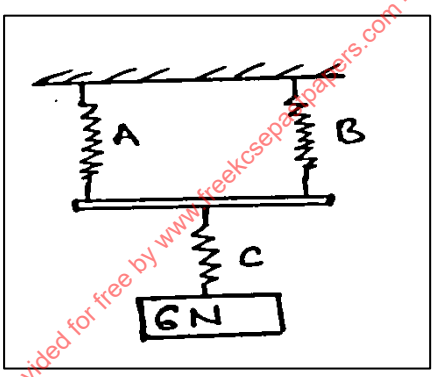
ii. Reading of the spring balance. (1mk)

10. The figure below shows a beaker placed on a bench. Block of ice is placed in a beaker as shown below.



State and explain the change in the stability of a beaker when the ice melts. (2mks)

11. Three identical springs A,B and C of the spring constant $2Ncm^{-2}$ and negligible weight are arranged as shown in the figure below



Calculate the total extension of the system. (3mks)

12. Explain why a car travelling at high speed appears lighter. (1mk)

13. Water flows through a pipe with different cross-section areas at rate of $7.7 \times 10^{-2}m^3/s$. If the pipe has a diameter of 7mm, determine the velocity of water through the pipe at a particular section. (3 mks)

SECTION B: 55 MARKS

14. (a). State the law of energy conservation. (1mk)

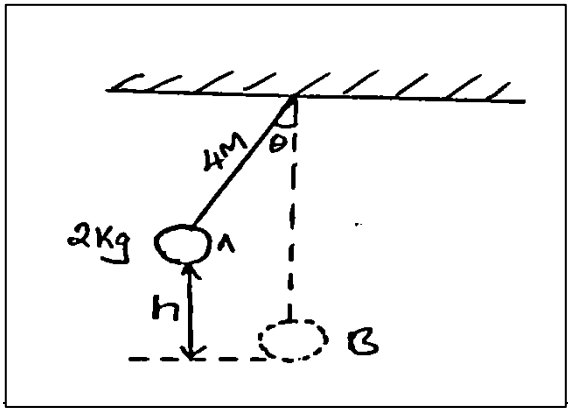
(b) A crane lifts a load of 200kg through a vertical distance of 3.0m in 6.0 seconds. Determine the;

(i) Work done (2mks)

(ii) Power developed by the crane. (2mks)

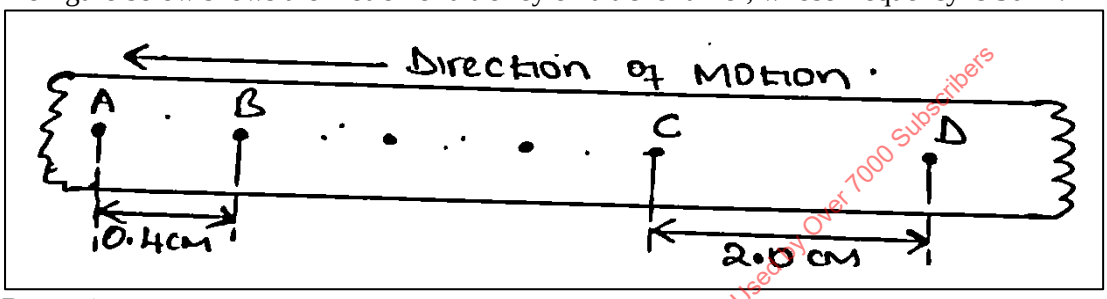
(iii) Efficiency of the crane given that it is operated by an electric motor rated 1.25KW. (2 mks)

(c) A metal ball suspended vertically with a wire is displaced through an angle Ø as shown in the diagram below. The ball is released from A and swing back to B



Given that the maximum velocity at lowest point B is 2.5m/s. Find the height h from which the ball is released. (3mks)

15. (a) The figure below shows the motion of a trolley on a ticker timer, whose frequency is 50Hz.



Determine;

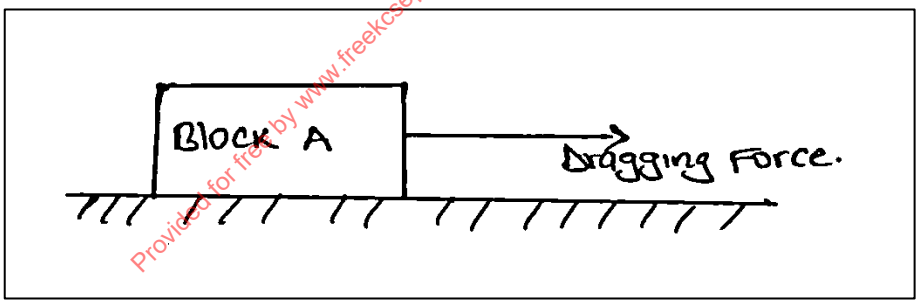
(i) The velocity between A and B. (3mks)

(ii) The velocity between C and D. (2mks)

(iii) The acceleration of the trolley during the motion. (3mks)

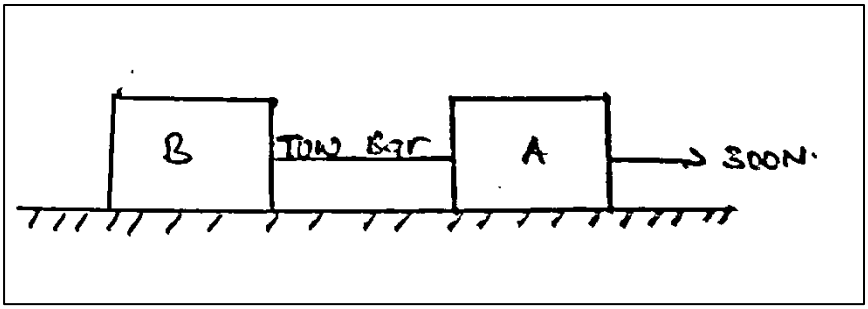
16. (a) State the law of conservation of linear momentum. (1mk)

(b) Metal block A of mass 50kg requires a horizontal force of 100N to drag it with uniform velocity along horizontal surface as shown in the figure below.



(i) Calculate the coefficient of friction. (2mks)

(ii) Another block B of mass 60kg requires a force of 120N to drag it along the same surface. The two blocks A and B are now connected together with a tow bar and a force of 300N applied to pull them along the same surface as shown below.



Determine

(i) The acceleration of the system. (3mks)
(ii) The tension of the tow-bar (2mks)

(c) A fisherman in Sori beach wanted to jump out of his boat towards the offshore. Unfortunately he landed in water. Explain why he landed in water. (1mk)

17. (a) What is meant by the term specific latent heat of fusion of a substance (1mk)
(b) Water of mass 250g at a temperature of 65^0C is put in a well lagged copper calorimeter of mass 80g. A piece of ice at 0^0C and mass 10g is placed in the calorimeter and the mixture stirred gently until the ice melts. The final temperature, T, of the mixture is then measured. (Take specific latent heat of fusion of ice = 334000J/kg)
Determine
(i) The heat absorbed by the melting ice at 0^0C. (2mks)
(ii) The heat absorbed by the melted ice to rise to temperature T. (Give answer in terms T). (2 mks)
(iii) The heat lost by the warm water and the calorimeter. (Give answer in terms of T) (2 mks)
(iv) The final temperature, T of the mixture (Take specific latent heat of fusion of ice = 334000J/kg, specific heat capacity of water = 4200J/kg, specific heat capacity of copper = 900J/kg). (2 mks)

18. (a) State the pressure law of gases. (1mk)
(b) Using the kinetic theory of gases, explain how rise in temperature of gas causes a rise in pressure of a gas if the volume is kept constant. (2mks)
(c) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure 160KPa and the temperature of 16^0C. Determine its volume when temperature is 0^0C at a pressure of 160KPa. (4mks)

19. (a) (i) What is the importance of banking a road in corners. (1mk)
(ii) Explain why wet clothes put in drum which has holes at the bottom get dried faster when the drum of the drying machine is rotated at a high speed. (2mks)
(b) A turntable of a record player makes 60 revolutions per minute. Calculate
(i) Angular velocity in rads per second. (2mks)
(ii) The linear acceleration at a point 0.18m from the Centre. (2mks)

20. (a) State Archimedes principle. (1mk)
(b) A sphere of radius 3cm is floating between liquid A and B such that half is at A and half at B. If densities of liquid A and B are $0.8kg/m^3$ and $1kg/m^3$ respectively determine mass of the sphere. (4 mks)

3GR 2019 JOINT EXAMINATION
232/3
PHYSICS
PAPER 3 (PRACTICAL)

PART A

1. a) You are provided with the following apparatus.
- Ammeter (0 – 2.5A)
- A voltmeter (0 – 3.0)
- Two dry cells
- A cell holder
- A switch
- A wire mounted on a millimeter scale
- Six connecting wires, two with crocodile clips at one end.

Proceed as follows:-

(a) Connect the circuit as shown in figure 1 below:

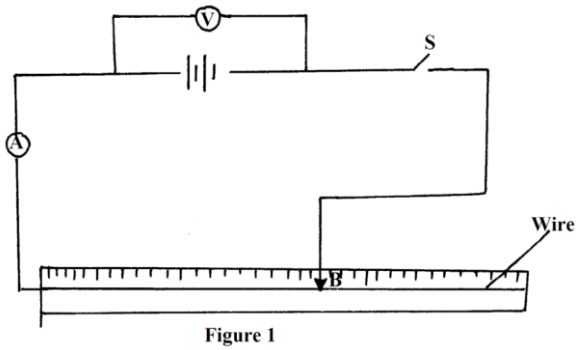


Figure 1

(b) Adjust the contact B so that the reading on the voltmeter is 2.6V. Read and record the current in table 1 below. Adjust further the contact B to have voltmeter reading of 2.5V, 2.4V, 2.3V, 2.2V and 2.1V. Each time read and record the ammeter reading.

Complete the table below. (5mks)

P.d(V)	2.6	2.5	2.4	2.3	2.2	2.1
I(A)						

(c) Plot a graph of voltage against current. (5mks)

(d) From the graph, determine the e.m.f, **E** and internal resistance **r** of the battery given that $E=V+Ir$

I. E= (1mk)

II. r = (3mks)

PART B

You are provided with the following.

- A metre rule
- A knife edge
- One 50g mass and a 100g
- Some thread
- Some water in a beaker.

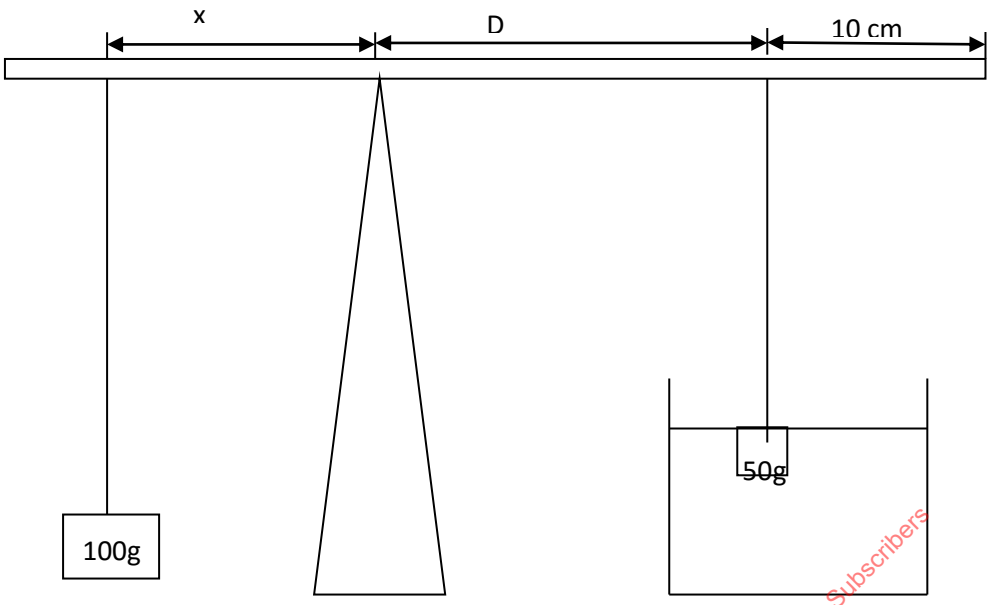
Proceed as follows:

a) Balance the meter rule on the knife edge and record the reading at this point.

Balance point = _____cm (1mk)

For the rest of this experiment the knife edge must be placed at this position.

b) Set up the apparatus as shown in the figure below. Use the thread provided to hang the masses such that the positions of the support can be adjusted.



The balance is attained by adjusting the position of the 100g mass. Note that the distance **x** and **D** are measured form the knife edge and the 50g mass is fully immersed in water. Record the values of **x** and **D**

X = _____cm (1mk)

D = _____cm (1mk)

Apply the principle of moments to determine the weight W_1 of the 50g mass in the water and hence determine the Upthrust **UW** in water.

W_1= (2mks)

UW= (1mk)

2. You are provided with the following apparatus.
   - One convex lens
   - A lens holder
   - One screen with a hole and cross wires
   - One white screen
   - A candle
   - A metre rule

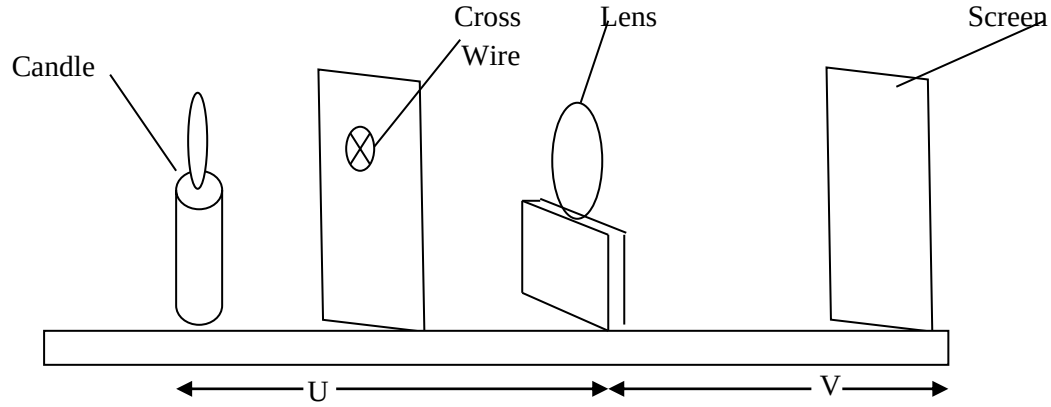
   Proceed as follows

a) Using the lens provided, focus a distant objecton the screen. Measure and record the distance **D** between the screen and the lens

D= _____cm (1mk)

b) Arrange the apparatus as shown in the figure below. Fixing U=20cm, vary the position of the screen until a sharp image is formed on the screen. Read and record the value of V.

V= _____cm (1mk)



c) Repeat the above for other values of U as indicated in the table. Complete the table (9 mks)

U (cm)	V(cm)	UV(cm^2)	U+V (cm)
20			
25			
30			
35			
40			
45			
50			
55			

d) (i) Plot a graph of UV(cm^2) (y-axis) against U+V (cm) (5mks)

e) Given that n(U+V) = UV where n is a constant, use your graph to find the value of n. (3mks)

f) What does this constant represent? (1mk)

3GR JOINT EXAMINATION
232/1
PHYSICS THEORY
PAPER 1

Marking scheme

1. Volume=$\frac{4}{3}\pi r^3$
   $=\frac{4}{3}\times\frac{22}{7}\times(0.35)^2$
   $=0.1797cm^3$
   $0.1797=6\times 10^4\times t$
   $t=\frac{0.1797}{6\times10^4}$ $t=2.994\times 10^{-6}mm$

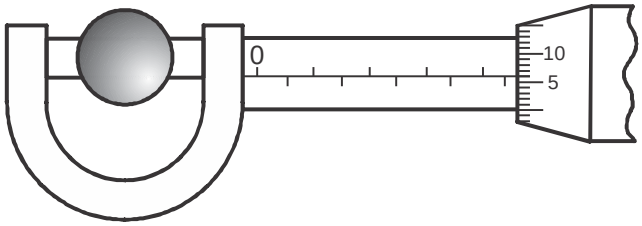
2. Adhesive force in narrow tube is greater than adhesive force in wider tube OR
   Volume of water in both tubes is same hence the column of water in narrow tube is greater.
3. Soap solution is an impurity. When added to water, it lowers the surface tension of water making the needle to sink.
4. $P_1=p_2$

COMPLIANT I
232/1
Paper 1 (Theory)

SECTION A : (25 MARKS)
Answer all the questions in this section.

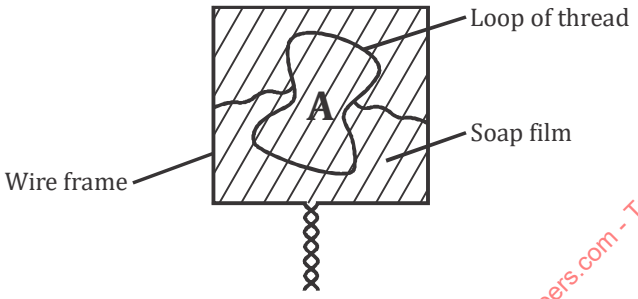
1. A stopwatch started 0.36s after the start button was pressed. The time recorded using a stopwatch for an athlete running from point A to B was 12.86s. Determine the actual time taken by the athlete. (2 marks)

2. Fig 1.0 shows a spherical ball held between the anvil and the spindle of a micrometer screw gauge.



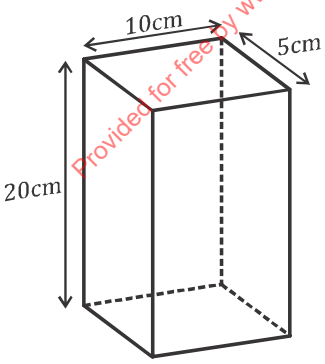
Determine the radius of the spherical ball. Give your answer in SI units. (2 marks)

3. Figure 2.0 shows a loop of cotton thread tied onto a wire frame. The figure is dipped into a soap solution and withdrawn.



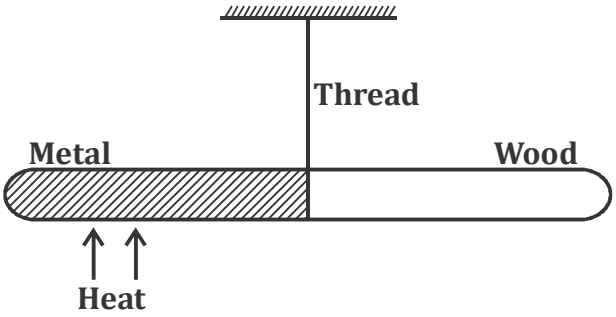
Illustrate and explain what happens to the shape of the loop of thread when part A is broken by touching it with a hot needle. (2 marks)

4. Figure 3.0 shows a brick of mass 8.0kg standing upright on the ground as shown.



What is the pressure it exerts on the ground ? ($g = 10Nkg^{-1}$) (3 marks)

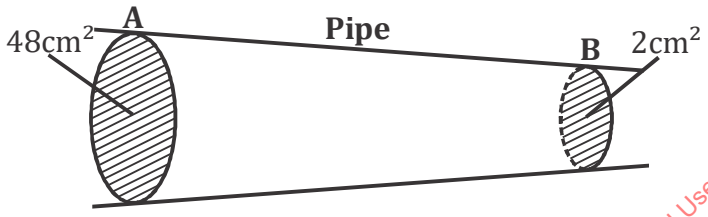
5. The figure 4.0 shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



The side made of metal is heated with a bunsen burner flame. State with a reason, the side to which the rod is likely to tilt. (2 marks)

6. State the relationship between Physics and Mathematics. (1 mark)

7. The diagram in fig 5.0 shows a section of a pipe with different cross-sectional area.



If water flows with a velocity of 10m/s in section A, what would be the velocity of water in section B ?(3 marks)

8. Determine the spring constant of a spiral spring whose length changes from 10cm to 18cm when a load of 10.0N is suspended from its lower end. (3 marks)

9. Figure 6.0 below shows a wooden sphere with a nail hammered into it as shown.

Fig. 6.0

The sphere is rolled on a horizontal ground and comes the rest after sometime at point Y. Draw the sphere after it comes to rest at point Y. (1 mark)

10. 7.0 When the temperature of an enclosed gas at constant pressure is raised, the volume of the gas increases. Explain how the molecules of the gas causes the increase in volume. (2 marks)

11. It is easier to stop a saloon car than a bus when both are moving with the same velocity. Explain.(2 marks)

12. Figure (a) shows a displacement-time graph. Sketch a velocity-time graph on fig. 7.0(b)

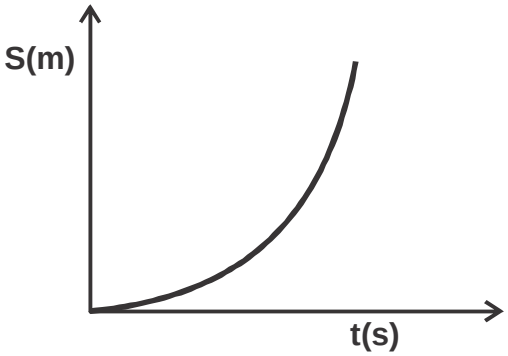


Figure 7.0(a)

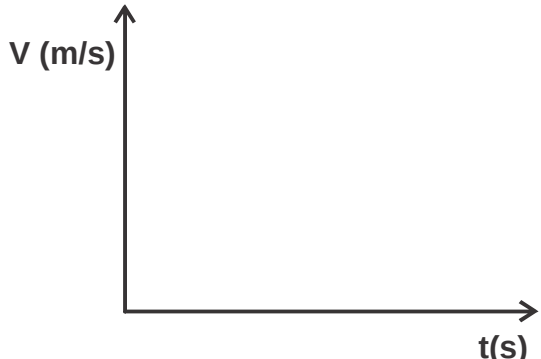


Figure 7.0(b)

State the law of conservation of energy. (1 mark)

SECTION : (55 MARKS)

Answer all the questions in this section.

13. **a)** Explain why it is advisable to use a pressure cooker at high altitude. (2 marks)

b) Water of mass 3.0kg initially at 20^0C is heated in an electric kettle rated 3.0kW. The water is heated until it boils at 100^oC (take specific heat capacity of water = 4200Jkg^{-1}k^{-1}, heat capacity of the kettle = 450Jkg^{-1} and specific latent heat of vaporization of water = 2.3MJkg^{-1}j.

Determine:

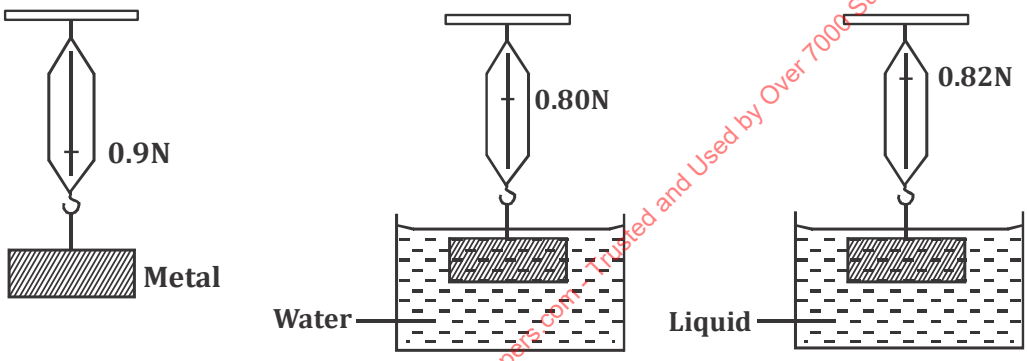
i) The heat absorbed by the water. (2 marks)

ii) The heat absorbed by the electric kettle. (2 marks)

iii) The time taken for the water to boil. (2 marks)

iv) How much longer it will take to boil all the water. (3 marks)

14. Figure 8.0 shows the same block weighted in air, water and liquid. Given that the reading of the level of water becomes 150cm^3 when the metal is fully immersed. (density of water = 1000kgm^{-3})



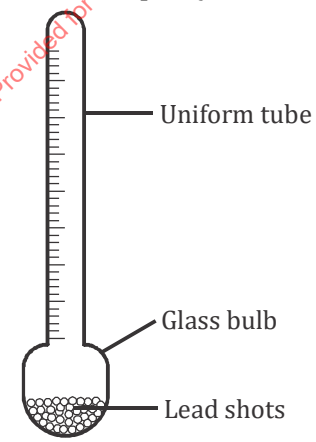
a) Determine the,

i) density of the metal (3 marks)

ii) How would you determine the water level before the solid was immersed. (2 marks)

iii) Explain why the spring balance gives different reading in fig8(ii) and 8(iii) with the same metal block. (2 marks)

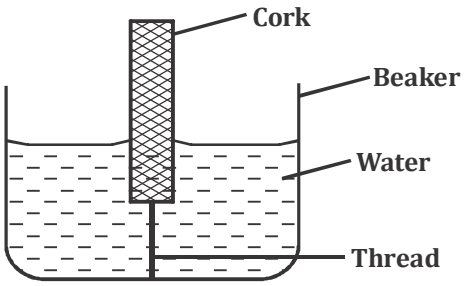
b) Figure 9.0 below shows a simple hydrometer.



i) State the purpose of the lead shots in the glass bulb. (1 mark)

ii) How would the hydrometer be made more sensitive. (1 mark)

c) Figure 10.0 shows a cork floating on water and held to the bottom of the beaker by a thin thread.



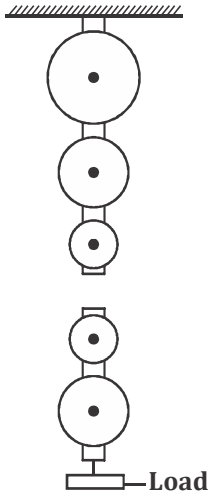
Name the forces acting on the cork. (3 marks)

15. **a)** A bicycle has a driving cog wheel of radius 10cm and 24 teeth. The driven rear cog wheel has a radius of 4cm and 8 teeth. Determine :

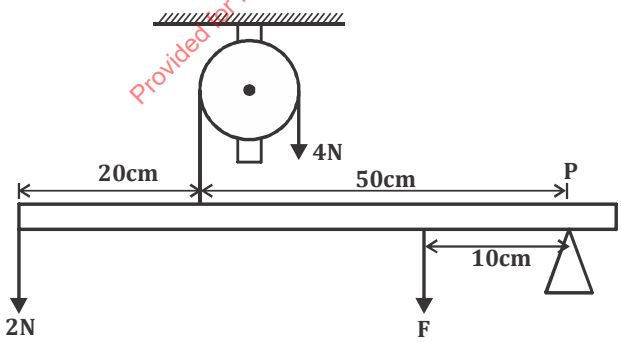
i) the velocity ratio (2 marks)

ii) the efficiency (2 marks)

iii) Draw the string over the block and tackle pulley system below and indicate the direction of the effort(E) (2 marks)



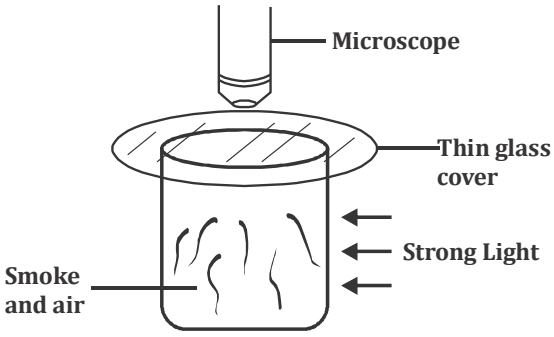
b) i)A wooden plant of negligible weight and 80cm long is supported by a knife edge at P. Weights of 2N, 4N and F act as shown.



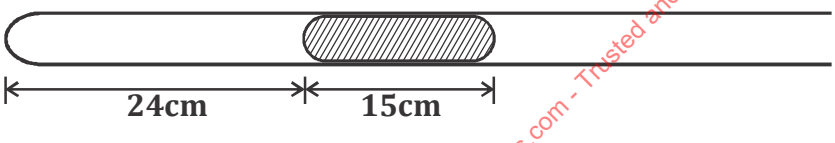
i) Calculate the value of F (3 marks)

ii) The moment of the weight of a vertical door does not significantly affect the moment of the force required to open the door. Give a reason for this. (1 mark)

16. Brownian motion of smoke particles can be studied by using the apparatus shown in figure 11.0.
To observe the motion, some smoke is closed in the smoke cell and then observe through the microscope.



a. Explain the role of the smoke particles and microscope in the experiment.
   i) Smoke cell (1 mark)
   ii) Microscope (1 mark)
b. Why are smoke particles suitable for use in this experiment? (1 mark)
c. State and explain the nature of the observed motion of the smoke particles. (2 marks)
d. What will be observed about the motion of the smoke particles if the temperature surrounding the smoke cell is lowered slightly. (1 mark)
e. A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is horizontal,the length of the enclosed air column 24cm as shown.



   i) What is the length of the enclosed air column when tube is vertical with the open end uppermost if the atmospheric pressure is 750mmHg ? (3 marks)
   ii) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface.(1 mark)

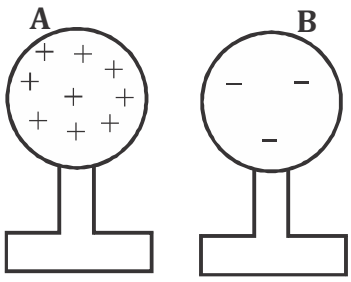
18. a) A boy throws a tennis ball vertically upwards from a truck moving at a constant velocity. Give the reason why the ball lands back exactly the same point where it was projected. (1 mark)
b) Define impulse in terms of momentum. (1 mark)
c) A trailer of mass 30 tonnes travelling at a velocity of 72km/h rams onto a stationary bus of mass 10 tonnes. The impact takes 0.5 seconds before the two vehicles move off together at a constant velocity for 15 seconds. Determine:
   i) the common velocity (3 marks)
   ii) The distance moved after the impact (2 marks)
   iii) the impulsive force on the trailer on impact (3 marks)
d) Give reasons why a safety seat belt used in a vehicle:
   i) Should have a wide surface area (1 mark)
   ii) Should be slightly extensible (1 mark)

COMPLIANT I
232/2
PHYSICS
Paper 2 (Theory)

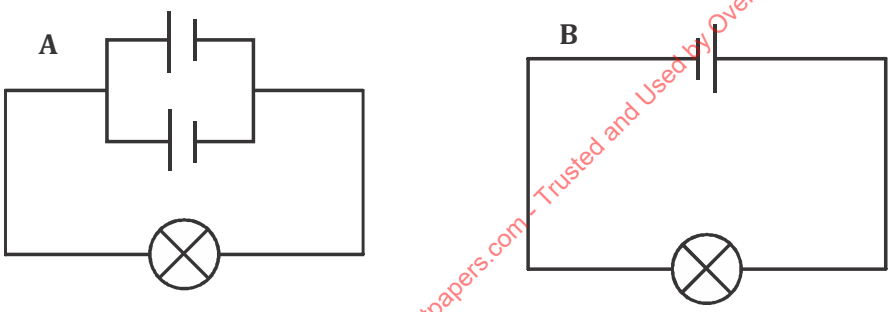
1. State the property of light associated with formation of shadows. (1 mark)

2. Figure 1.0 below shows two charged spheres A and B. If the two spheres are brought in contact and then separated, complete the diagram showing charge distribution on the two spheres after separation.

(2 marks)



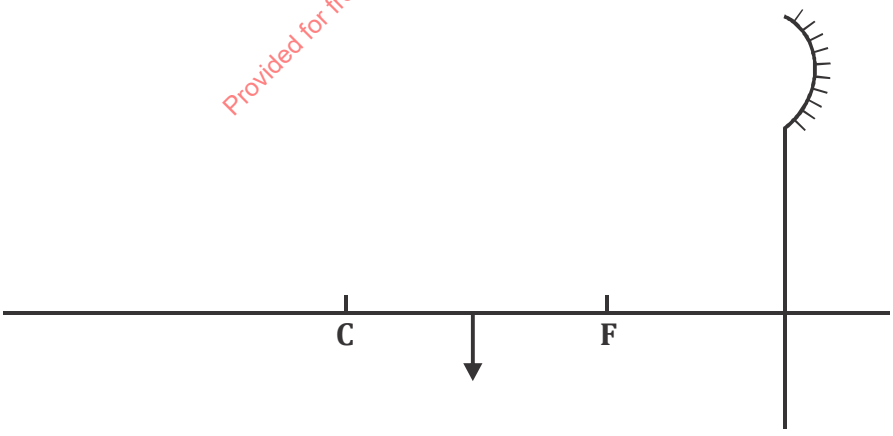
3. In the circuit diagram shown in figure 2.0 the lamps are identical and cells are also identical.



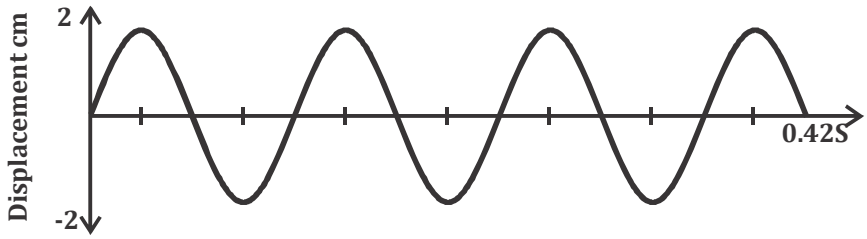
State with a reason, in which circuit the lamp will be lit for a longer period. (2 marks)

4. Explain in terms of domain theory, what happens when a bar magnet is placed in a solenoid in which an alternating current flows. (2 marks)

5. Use appropriate rays to complete the ray diagram in figure 2.0 and state the nature of the image formed.(3 marks)



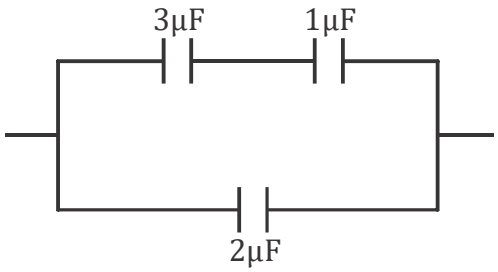
6. Figure 4.0 shows a transverse wave.



a) Calculate the frequency of the wave. (2 marks)

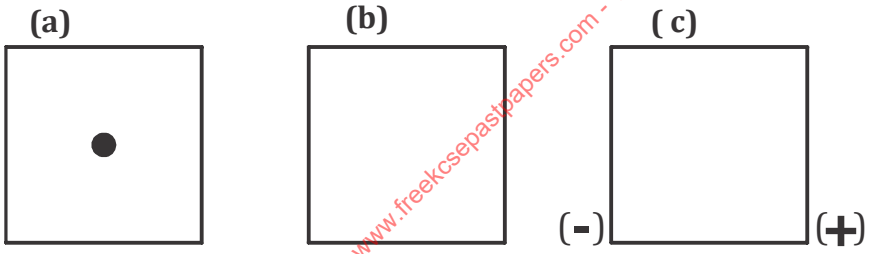
b) Sketch another wave on the same diagram that has double the frequency and half the amplitude and label it as M. (1 mark)

7. The figure 5.0 below shows a network of capacitors.

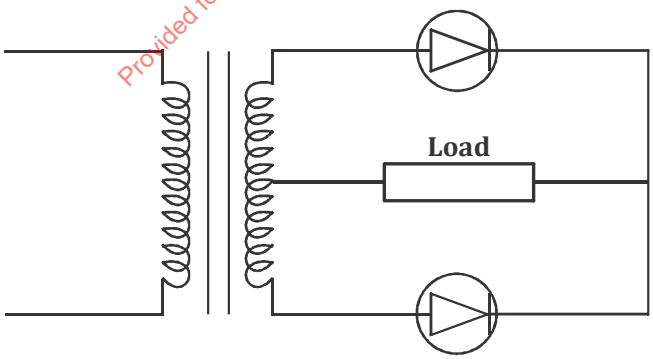


Determine the combined capacitance of the network. (2 marks)

8. Figure 6.0 below shows the position of the bright spot on the screen of a C.R.O when there is no signal on both Y and X plate. Indicate on the diagram (b) when the Y plate is connected t o a.c signal and for (c) the X-plate is connected to d.c signal i.e. the display on the screen. (2 marks)



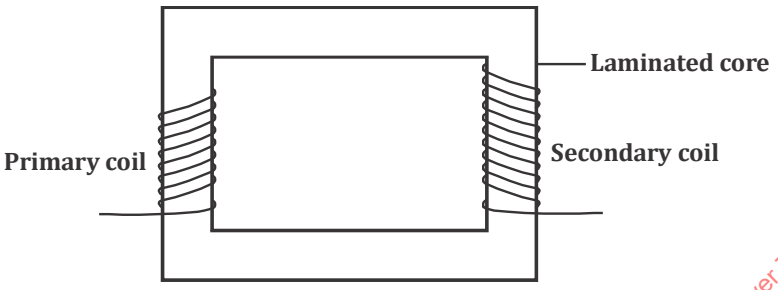
9. Fig. 7.0 shows a circuit diagram used for full wave rectification of an a.c signal. (1 mark)



a) What is rectification ? (1 mark)

b) On the axes shown below, sketch output waveform displayed on the C.R.O screen. (1 mark)

10. Figure 8.0 below shows a simple transformer. Study it and answer the questions that follow.

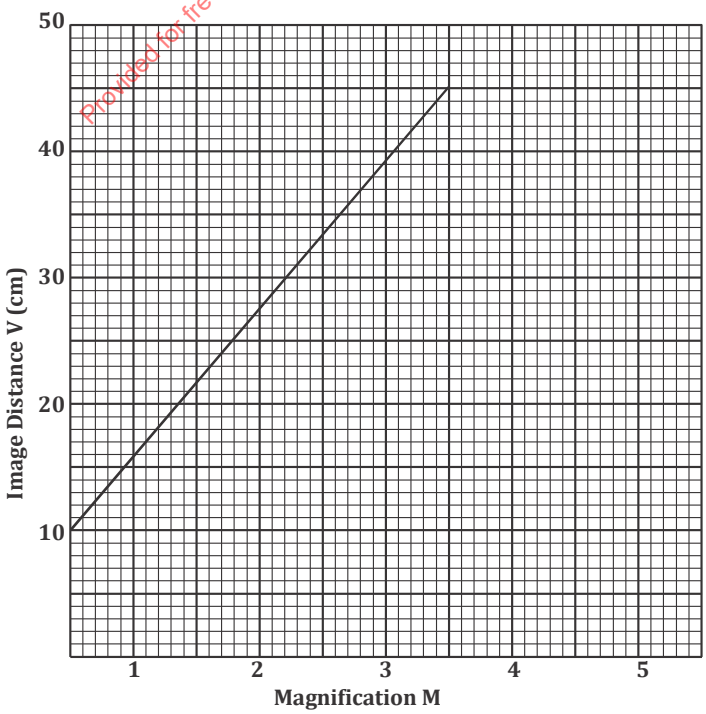


i) Give a reason as to why the core is laminated. (1 mark)
ii) State and explain which coils are thicker. (2 marks)

11. Define the **kilowatt-hour**. (1 mark)
12. Two people stand facing each other 200m apart on one side of a high wall and at the same perpendicular distance from it. When one fires a pistol, the other hears a report 0.6 seconds after the flash and a second sound 0.25 seconds later. Explain. (1 mark)

SECTION B: (55 MARKS)
Answer all the questions in this section.

13. **a)** What is magnification ? (1 mark)
b) The following graph shows the variation of image distance, v, with magnification, m, for a converging lens.



Using the graph and the equation $\underline{v} = m + 1$ to determine f

i) the object position when the image position is 45cm (3 marks)
ii) the focal length of the lens (2 marks)
iii) the power of the lens (2 marks)

14. **a)** The work function of a certain material is 3.2eV. Determine the threshold frequency for the material (1 electron volt eV = 1.6×10^{-19}J) and planks constant = 6.62×10^{-34}Js) (3 marks)

b) An X-ray tube is operating with an anode potential of 50kV. Calculate the maximum speed of an electron (charge of an electron is 1.6×10^{-19}C, mass of an electron is 9.1×10^{-31}kg) (3 marks)

ii) A faulty X-ray tube generates X-ray of higher intensity than required. State what adjustment should be made to correct the defect. (1 mark)

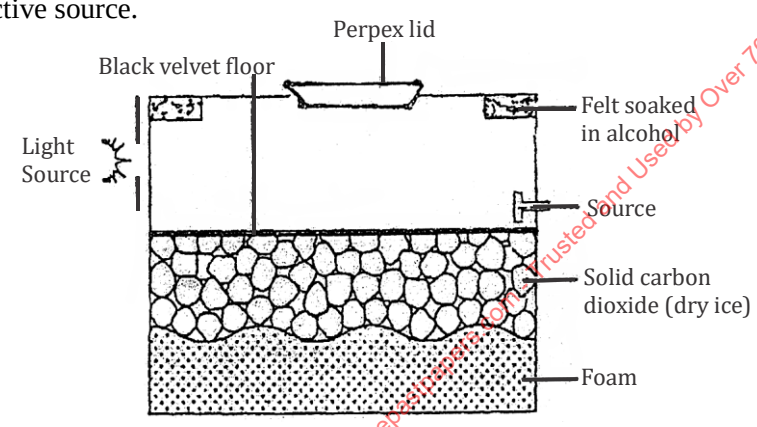
iii) Distinguish between hard and soft X-rays. (2 marks)

iv) Explain the effect of exposing a patient to X-rays for too long. (1 mark)

15. **a)** i)Explain why carbon $^{14}_{6}(C)$ is radioactive while carbon $^{12}_{6}(C)$ is not. (1 mark)

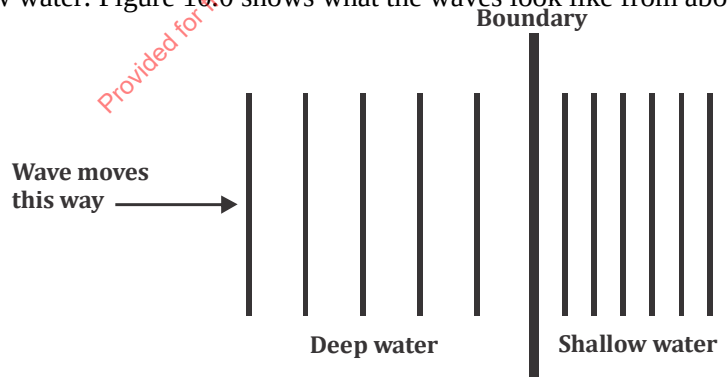
ii) A radioactive isotope showed a count rate of 82 counts per second initially. After a time of 210 seconds, the count rate dropped to 19 counts per second. The average background count remained constant at 10 counts per second. What is the half life of the material ? (2 marks)

b) Figure 9.0below shows features of a diffusion cloud chamber used for detecting radiations from a radioactive source.



i) Explain how the chamber works when a radioactive particle is introduced at the source. (2 marks)
ii) What is the purpose of solid carbon (IV) oxide. (1 mark)

c) Some plane water waves were produced in a ripple tank. They pass from a region of deep water intoa region of shallow water. Figure 10.0 shows what the waves look like from above.



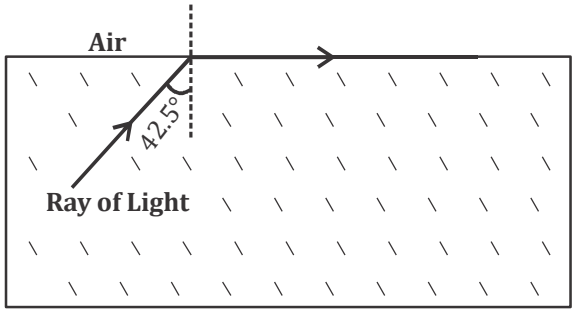
State what happens at the boundary to

i) the frequency of the waves (1 mark)
ii) the speed of the waves (1 mark)
iii) the wavelength of the waves (1 mark)

d) Arrange the following electromagnetic waves in order of their increasing wavelength :
X-rays, gamma rays, ultra violet, visible light, microwaves, infra-red. (2 marks

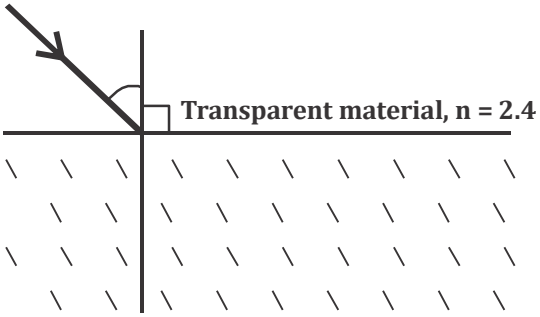
16. **a)** Give the conditions necessary for total internal reflection to occur. (2 marks)

b) i) Figure 11.0 below shows the path of a ray of light passing through a rectangular block of perspex in air.



Calculate the refractive index of perspex. (3 marks)

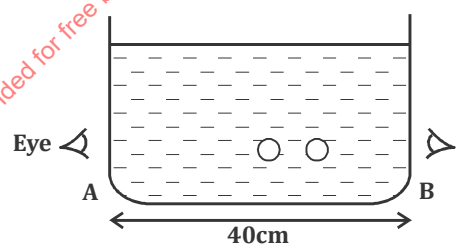
ii) A ray of light now travels from a transparent medium into the perspex as shown in figure 12.0 below.



Calculate the critical angle c. (2 marks)

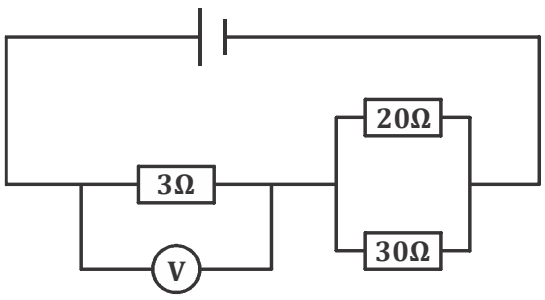
c) Give one use of an optical fibre. (1 mark)

d) In a transparent liquid container, an air bubble appears to be 18cm when viewed from end A and 12cm when viewed from end B as shown in figure 13.0 below. Where exactly is the air bubble.
If the length of the tank is 40cm ? (3 marks)



17. **a)** State Ohm's law. (1 mark)

b) The cell is figure 14.0 has an e.m.f of 1.8V and negligible internal resistance.

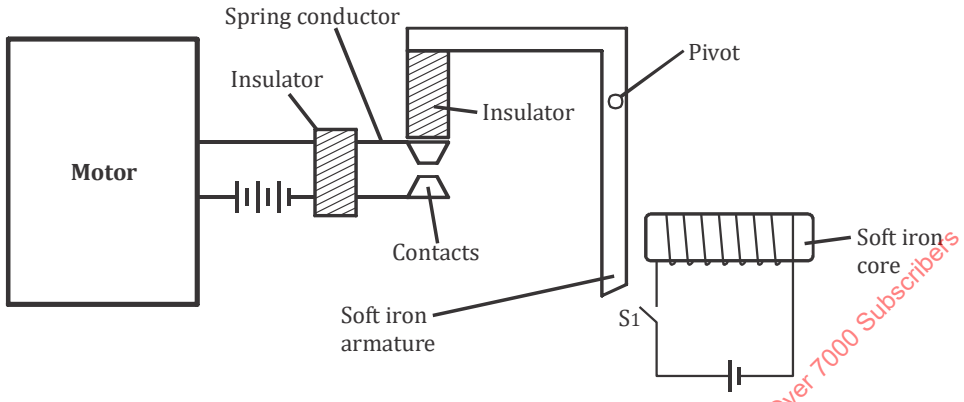


Determine :

i) Total resistance in the circuit. (2 marks)
ii) The current in the circuit (1 mark)
iii) Reading of the voltmeter (2 marks)

c) Five identical cells each of e.m.f 1.5V and internal resistance 0.5 are connected in series. Determine :
i) their overall e.m.f (1 mark)
ii) their total internal resistance (1 mark)

18. **a)** Figure 15.0 shows a motor connected to a magnetic switch called a relay operated by an ordinary S switch S_1. Use the information in the figure to answer questions that follow.



i) Explain how the relay switches on the motor when S_1 is closed. (3 marks)
ii) State with a reason the effect on the motor if the iron core is replaced with a steel core and switch S_1 is put on and then off. (2 marks)

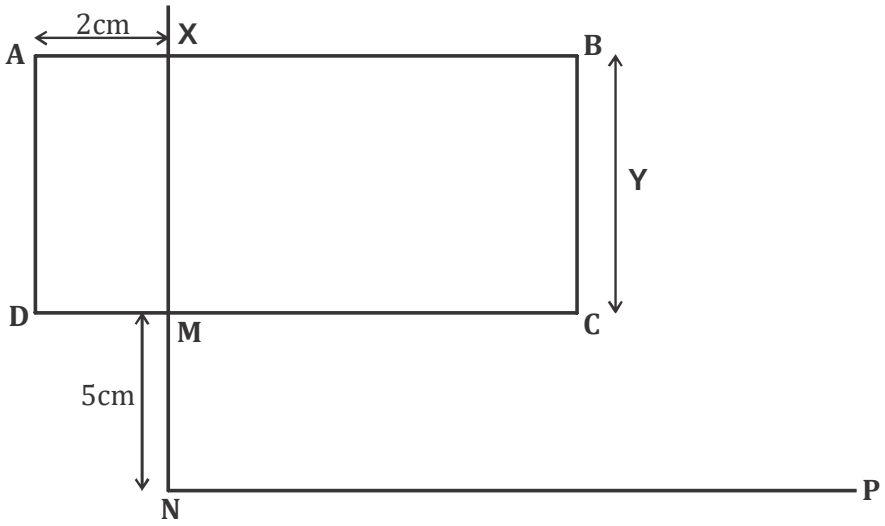
b) Draw the electric field around the charges shown below. (2 marks)

COMPLIANT I
232/3
PHYSICS
Paper 3
(Practical)

1. You are provided with the following :
A glass block
Soft board
A plane paper
Four optical pins
Four paper pins (office pins)
A protractor
A 30cm plastic ruler

a) Fix the plane paper on a soft board using the four paper pins
b) Place the glass block on the plane paper. Let the glass block rest on the paper from the broader face.
c) Trace the glass block using a pencil

d) Remove the glass block



Mark a point X on one of the longer side of the traced glass block as shown in the figure 1.0 below. Point X should be 2cm from edge A.

e) Construct a normal at X to emerge through line DC. Let this normal meet line DC at point M.(1 mark)

f) Mark point N along the emergent normal 5cm from M

g) Construct the line NP to meet the normal at N at 90^o. Line NP can be about 10cm. (1 mark)

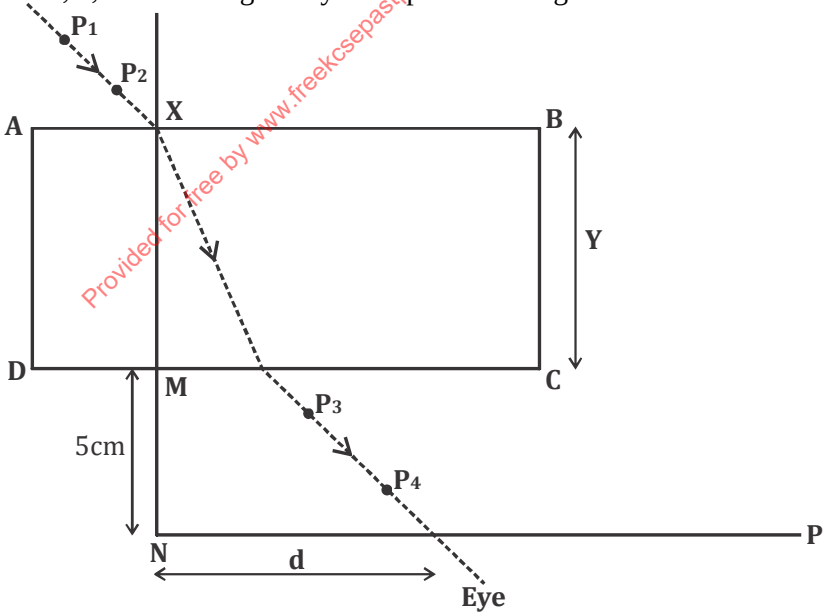
h) Using a protractor, construct an incident ray RX at an angle of incidence = 10^o. Fix two optical pins P_1 and P_2 along RX.

i) Replace the glass block to traced figure.

j) View the path of the incident ray RX through the glass block using the two pins P_3 and P_4. This can be done by ensuring that the images of P_1 and P_2 are in a straight line with the pins P_3 and P_4

k) Remove the glass block and draw the emergent ray through P_3 and P_4 (see Fig. 2)

l) Measure the distance, d, of the emergent ray from point N along line NP as shown in the figure 2 below.



m) Record the corresponding values of d in the table 1 below.

angle of incidence *i*	10°	20°	30°	40°	50°
Distance, d, (cm)					
sin *i*					
$\sin^2 i$					

n) Repeat the procedure for other values of i. (10 marks)
o) Plot a graph of $\sin^2 i$ (y-axis) against d on the grid provided. (5 marks)
p) Calculate the gradient of the graph. (3 marks)

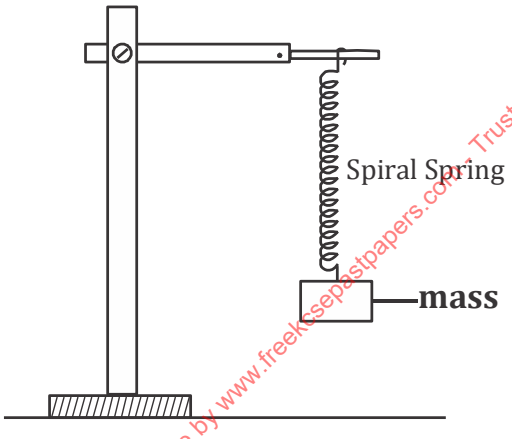
2. PART A

You are provided with the following

- a retort stand, clamp and a boss
- spiral spring
- stop watch
- three 100g masses

Proceed as follows

a) Suspend a 100g mass at the end of the spring as shown in figure 3.0



Now give the mass a small vertical displacement and release so that it performs vertical oscillations. Time ten oscillations and determine period T. Enter your results in table 1.

b) Repeat the experiment for the other values of mass and complete the table

Table 2

Mass m (g)	100	200	300
Time for 10 oscillations (s)			
Periodic time T(s)			

(3 marks)

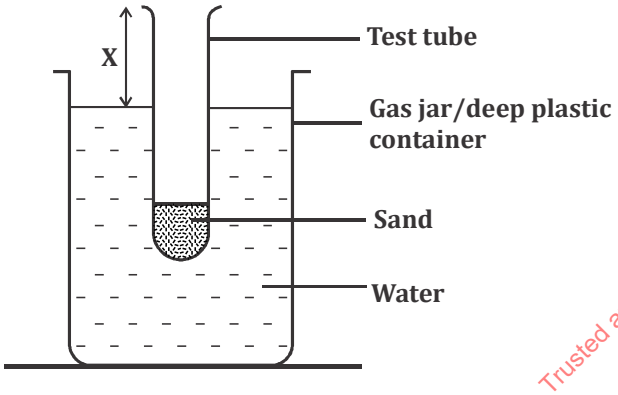
c) Given the $T = \pi\sqrt{\left(\frac{m}{k}\right)}$ where k is the spring constant. Find the average value k for the spring. (2 marks)

PART B

You are provided with the following :
- test tube
- gas jar or transparent plastic bottle (1 litre)
- sand / fine gravel / lead shots in a small beaker
- vernier callipers (to be shared)
- a weighing balance (to be shared)
- metre rule / half metre rule / 30cm rule / 15cm rule
- spatula and water

Proceed as follows :

a) Set up the apparatus as shown in figure 3 by adding lead shots / sand / fine gravel into the test tube until the test tube just floats upright.



b) Measure the length X
X = ... cm (1 mark)

c) Measure the whole length of test tube y.
y = ... cm (1 mark)

d) Determine the external diameter of the test tube using the vernier calliper.
External diameter ..... cm (1 mark)
External radius ..... cm (1 mark)

e) Measure the mass of the test tube and its contents.
mass m = ...g (1 mark)

f) Determine the density of water given that $P = \frac{7m}{22r^2(y-x)}$ (2 marks)

PART C

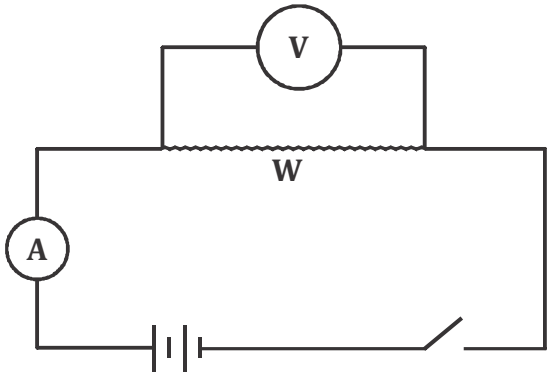
You are provided with the following apparatus :
- voltmeter
- an ammeter
- a resistance wire labelled W
- a wire mounted on a mm scale and labelled T
- a micrometer screw gauge (to be shared)
- six connecting wires with crocodile clips
- 2 new dry cells (size D)

Proceed as follows :

a) Using the micrometer screw gauge provided measure the diameter of the wire labelled T
d = ...mm (1 mark)
Determine the radius r of the wire. (1 mark)

r = ... mm

b) Set up the apparatus as shown below.



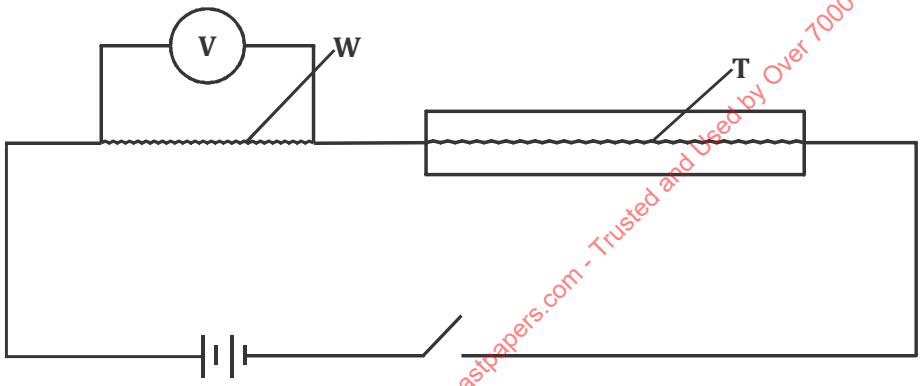
i) Record the voltmeter (V) and ammeter I (A) readings.

V = ...V (1 mark)

I = ... A (1 mark)

ii) Determine the resistance R_w of the wire W. (1 mark)

c) Set up your apparatus as shown below.



i) Use the voltmeter provided to measure the p.d V_w across W and V_T across T when the switch is closed.

V_w = ... V (½ mark)

V_T = ... V (½ mark)

Open the switch.

ii) Use the value of R_w calculated in b(ii) and the value of V_w to calculate the current I flowing through W when switch was closed.

I = ... (1 mark)

iii) Determine the constant k and its units given that

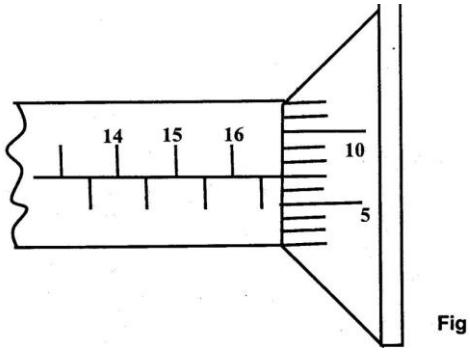
$$K = \frac{R_w T}{V_T}$$ (1 mark)

KANDARA MOCKS
END OF TERM 2 EXAMINATION 2019
PHYSICSPAPER ONE (232 / 1);

Take g = 10 N / kg, density of mercury = 13600 kg / m^3 and density of water = 1000 kg / m^3

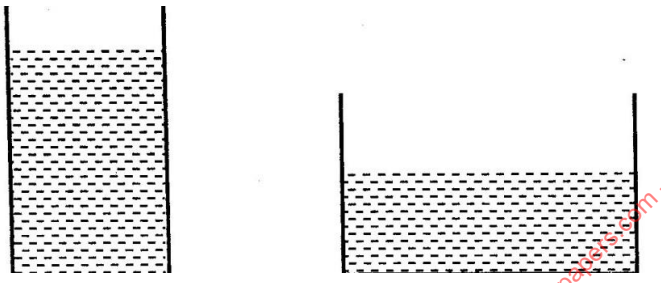
ANSWER ALL QUESTIONS

1. The instrument shown in the fig. below has a Zero error of -0.02mm.It was however used to measure the diameter of a marble as shown. Determine the correct diameter of the marble. (2 mks



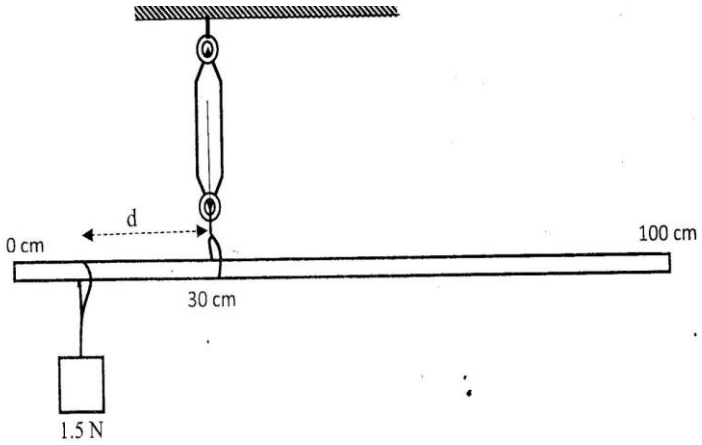
Fig

2. Equal volumes of water was poured into a narrow beaker and a wide beaker .The two beakers were then exposed to the same heat for some time as shown in the fig. below.



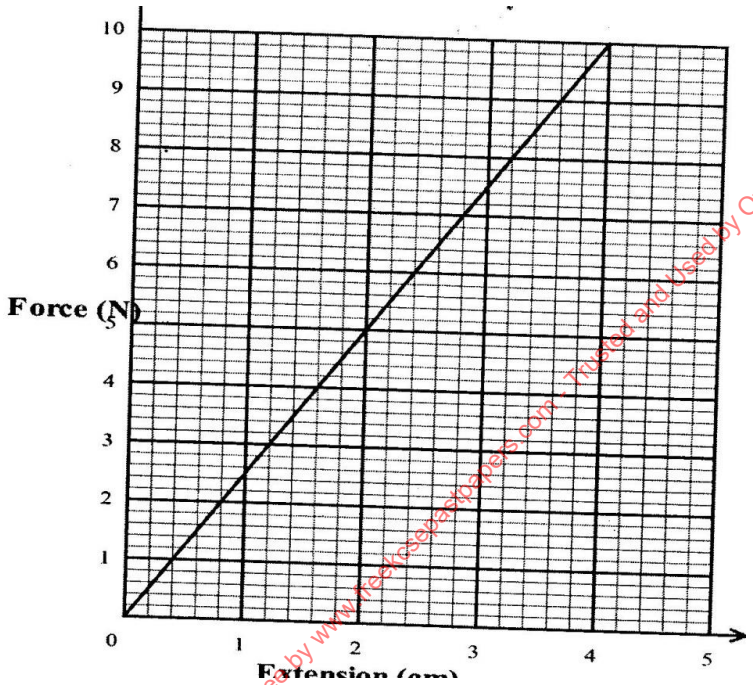
State with reason the difference in volume of water in the two beakers after some time. (2 mks)

3. A mother mixes 2 kg of hot water at 40 0c and 3 kg of cold water at 25 0c to enable john have a warm bath and leave for school. Determine the temperature of the water john used to take a bath. (2 mks)
4. A small drop of volatile liquid such as Freon placed on your skin feels colder than a drop of water of the same volume. Explain this observation. (I mk)
5. Oxygen gas of volume 1.2 m3 is prepared at standard atmospheric pressure (76 cm Hg) and at a temperature of 25 oc. The gas is then compressed into a cylinder of volume 0.24 m3 and stored at a temperature of 20 oc. Determine the pressure of the stored gas. (2 mks)
6. In an experiment to determine the size of an oil molecule, an oil drop of volune 0.12 mm3 is placed on clean water surface. The oil drop spreads into a circular film of diameter 0.2m. Use the information to estimate the size of the oil molecule (Give your answer to 2 decimal places) (2 mks).
7. A uniform plank of length 100 cm and mass 200g is supported by a spring balance at the 30 cm mark. The plank is balanced horizontally by a 1.6 N weight suspended at a distance (d) from the pivot as shown in the fig. below.



Determine the distance (d). (3 mks).

8. The fig. below shows a graph of stretching force F (N) Against extension e (cm) of an elastic material.



Determine the work done to stretch the material by 4 cm. (2 mks)

9. State any two advantages of mercury over alcohol as thermometric liquids. (2 mks
10. Similar lift pumps were supplied to two sets of farmers. Those at high altitude and others at low altitude. The pumps were to be used to draw water from drilled wells. The pumps could not draw water for one set of farmers. State with a reason the likely set of farmers whose pumps could not draw the water . (2 mks)
11. Give a reason why smoke particles in a smoke cell are observed to be in a continuous random motion when viewed under a microscope. (1 mk)
12. An object dropped from a height (h) attains a velocity of 6 m / s just before hitting the ground. Find the value of h. (2 mks)
13. The height of mercury in a barometer at a place is 62 cm. What would be the height of a column of paraffin in the barometer at the same place ?
(Density of paraffin = 8.0 x10^2 kg/m^3, density of mercury = 13600 kg/m^3). (2mks)

SECTION 2 (55 MARKS)

14. a) State Archimedes principle. (1mk)

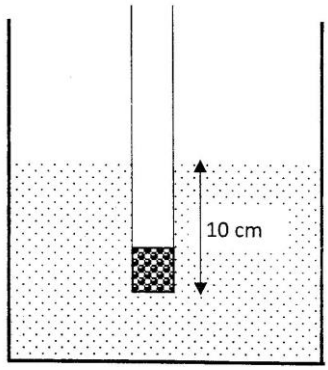
b) A balloon of volume 3m3 is filled with hydrogen of density 0.09 kg /m 3. The weight of the balloon fabric is 10 N . (Density of air is 1.31 kg / m3). Determine the ;

i) Weight of air displaced. (2 mks)

ii) Weight of hydrogen gas in the balloon. (2 mks)

iii) Maximum load the balloon can lift. (2 mks)

c) A uniform test tube of diameter 2.8 cm is placed on water in a beaker and some sand added till it just floats upright. The length of the test tube in water is measured to be 10 cm as shown in the fig. below.



(Density of water is 1000 kg / m3)

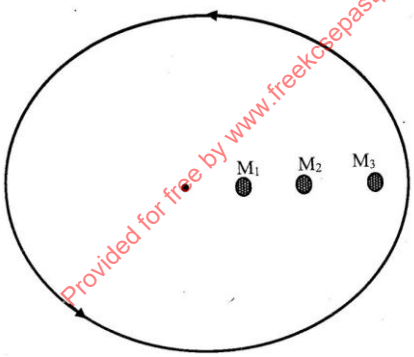
i) Determine the (I) Volume of water displaced. (2 mks)

ii) Upthrust on the test tube. (3 mks)

iii) When placed in another liquid , the length of test tube in the liquid is 15 cm. Determine the density of the liquid. (2 mks)

15. a) Define angular velocity. (1 mk)

b) Similar 1 kg masses m_1, m_2 and m_3 are placed 20 cm, 30 cm and 40 cm respectively from the center of a turn table of uniform surface as shown in the fig. below;



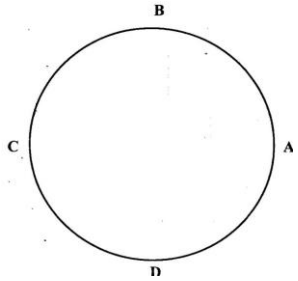
The masses m_1, m_2 and m_3 fly off the table tangentially at different angular velocities v_1, v_2 and v_3 respectively.

i) If m1 flies off when v1 = 10 rad / sec, determine the centripetal force. (2 mks)

ii) Arrange v_1, v_2 and v_3 in order from the highest to the smallest. (1 mk)

c) A 2 kg mass is attached to an inelastic string and whirled in a horizontal circle at an angular velocity of 14 rad / sec. Determine the tension in the string. (2 mks)

d) If the mass in (c) above is whirled in a vertical circle at the same angular velocity, Determine the tension at the bottom (lowest point) D of the vertical circle shown in the fig. below. (2 mks)



e) State the position A, B , C and D of the mass where the string is least likely to break. (1 mk)

16. a) Define specific heat capacity. (2mks)

b) In an experiment to determine specific latent heat of water , steam at 100^0c was passed into water contained in a well lagged copper calorimeter. The following measurements were made.

Mass of calorimeter = 60g
Initial mass of water = 80g
Initial room temperature of water = 15^0c
Final temperature of the mixture = 45^0c
Final mass of water+ calorimeter + condensed water = 160g
Specific heat capacity of water = 4200 j/kg k
Specific heat capacity of copper = 3900 j/kg k

Calculate;

(i) mass of condensed steam. (1mk)
(ii) Heat gained by the calorimeter and water. (3mks)
(iii) Given that L is the specific latent heat of vaporization of steam,
a) Write an expression for the latent heat of vaporization of steam. (1mk)
b) Determine the value of L (3mks)

17. a) Use the table below to answer the questions that follow;

Mass m (g)	0.0	50	100	150	200	250	300
Force F (N)	0.0	0.5					
Length (cm)	34.2	35.8	37.8	38.9	40.5	42.0	43.6
Extension e (cm)							

(i) Complete the table by filling in the missing values. (2mks)
(ii) Plot a graph of force (x-axis) against extension. (4mks)
(iii) From the graph, determine the spring constant. (2mks)
(iv) Why will the graph not be linear if a large mass is hung ? (1mks)

b) A spring with a spring constant of 25 N/cm extends by 5 cm when a certain force acts on it. Determine the work done by the force. (2mks)

6. The figure 2 below shows a displacement-time graph for a wave motion

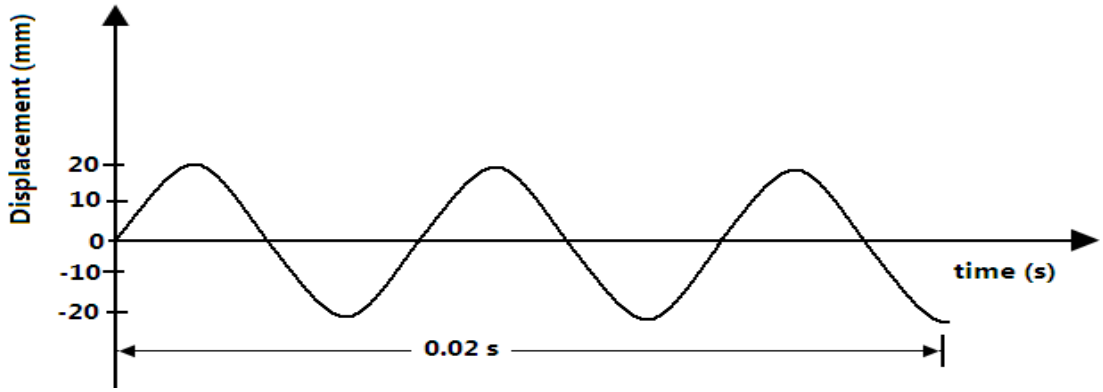
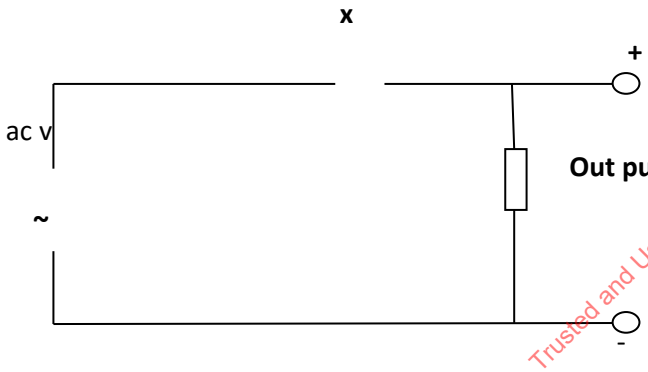


Figure 2

What is the frequency of the wave? (2 marks)

7. Figure 3 below shows an incomplete circuit diagram for a half-wave rectification of an AC voltage.

Figure 3



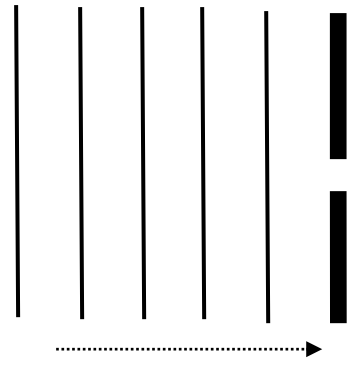
a) Complete diagram by inserting a diode at X so that the output terminals are positive and negative as shown (1mark)

b) On the axes provided below sketch a graph showing how the output voltage varies with time (1mark)

Figure 4

8. The figure 5 below shows a series of wave fronts one wavelength apart approaching a gap between barriers in ripple tank.

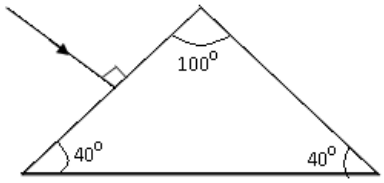
Figure 5



On the same diagram, show what happens when the waves pass through the gap. (1 mark)

9. In figure 6 shown below (not to scale), sketch the path of a ray till it emerges from the prism. (1mk)

Figure 6



10. Explain briefly how free electrons are produced in an X-ray tube. (1 mark)
11. A bulb is rated 100W, 240V. Calculate the amount of current passing through the bulb filament. (3 marks)
12. (a). One method of producing a weak magnet is to hold a steel rod in the North South direction and then hammer it continuously for some time. Using the domain theory of magnetism explain how this method works. (2 marks)
13. Figure 7 shows a motor connected to a magnetic switch called a relay operated by an ordinary switch S_1. Use the information in the figure to answer questions that follows:

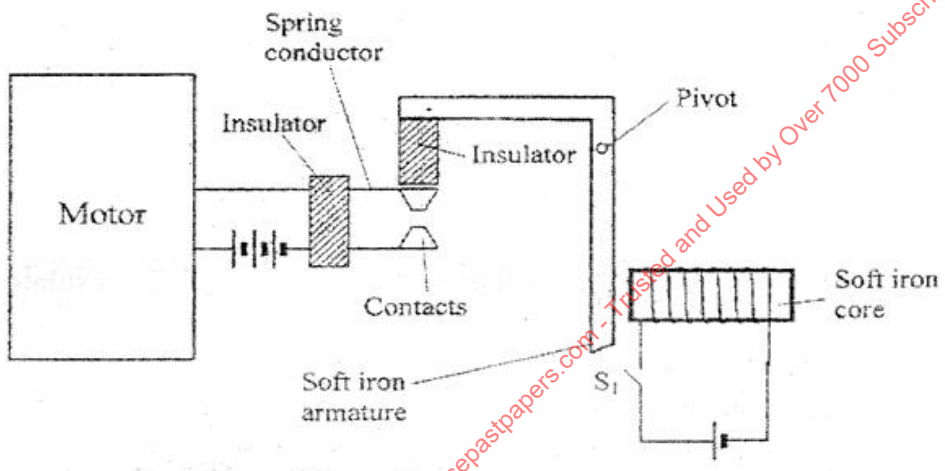


Figure 7

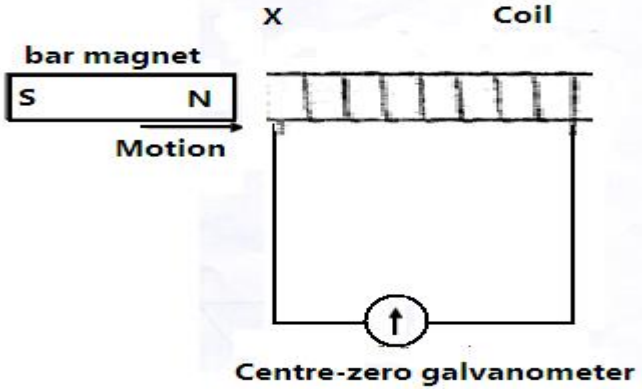
i. Explain how the relay switches on the motor when S_1 is closed (3 marks)
ii. State with a reason the effect on the motor if the iron core is replaced with a steel core and switch S_1 is put on and then off. (2 marks)

SECTION B (55MARKS)

Answer ALL the questions in this section.

14. a) State Lenz's law of electromagnetic induction. (1mark)
    b) In the figure 9 below the bar magnet is moved into the coil.

figure 9



State and explain what is observed in the galvanometer. (2 marks)

c) State any two ways in which power is lost from the transformer and explain how each loss is minimized. (2 marks)

d) A transformer is used to provide a potential difference of 100KV to an X-ray tube from 250V a.c mains supply. A current of 100mA flows in the X-ray tube and the transformer is 100% efficient.

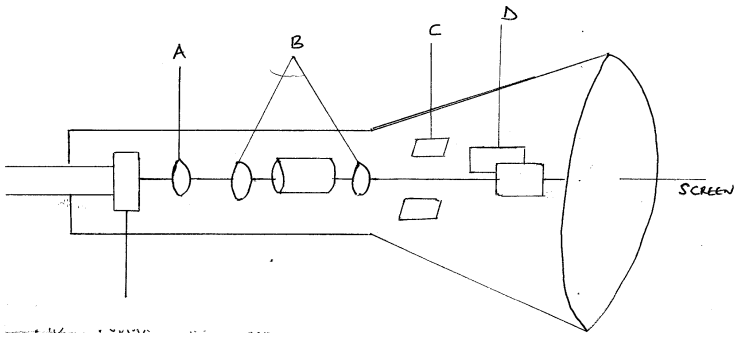
Calculate;

i. The ratio of the number of turns of the secondary coil to the number of turns in the primary coil. (3 marks)

ii. The current in the primary coil (2 marks)

iii. State giving reasons which of the coils of the transformer is thinner. (2 marks)

15. a) The figure 1 below represent a cathode ray oscilloscope. (C.R.O)



i) Name the parts labeled A and B (2 Marks)

ii) What are the functions of parts labeled C and D (2 Marks)

iii) Explain how electrons are produced. (1 Mark)

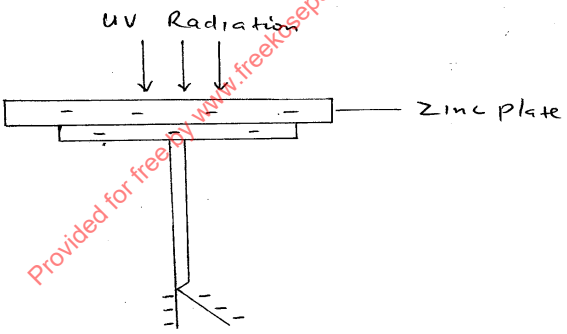
iv) Give a reason why the tube is evacuated (1Mark)

b) The potential between the anode and the cathode of an x- ray tube is 80kV. Calculate;

i) the energy of an electron accelerated in the tube (electronic charge e=1.6 x 10^{-19}C) (3Marks)

ii) the velocity of electrons in the tube (mass of an electron= 9.11 x 10^{-31}kg) (3Marks)

16. a) The figure below shows ultra-violet light striking a polished zinc plate on a negatively charged gold leaf electroscope.



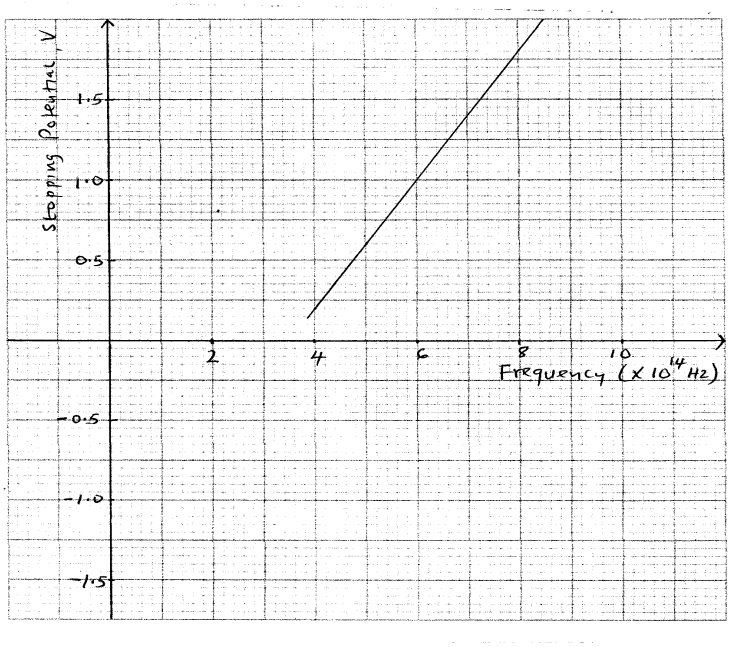
Explain the following observation;

The leaf of the electroscope falls. (2 Marks)

b) A radioactive nuclide $^{228}_{90}X$ decays by emitting an alpha particle to become a nuclide $^{a}_{b}M$. Write a decay equation for the process giving the actual values of a and b. (2 Marks)

c) State one factor which determines the speed of photoelectrons emitted by a metal surface. (1Mark)

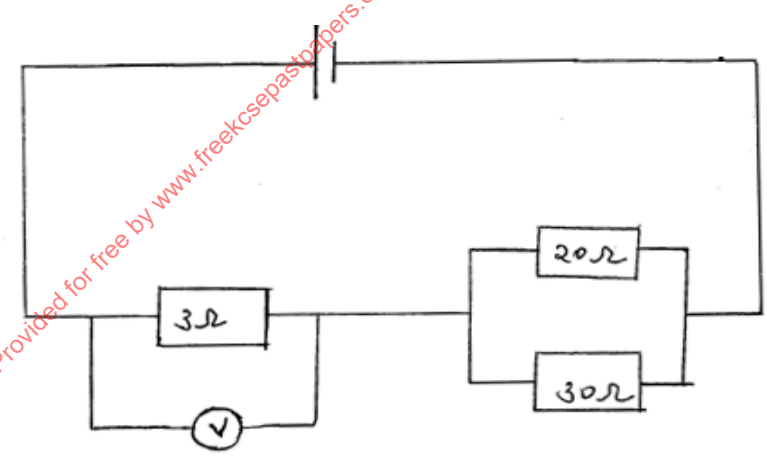
d) The graph below shows the plotting of stopping potential against frequency for a radiation directed on a clean metal surface.



From the graph, determine;

i) Threshold frequency of the metal (2Marks)
ii) Planck's constant (use charge of an electron, e = 1.6 x 10^{-19} C) (3Marks)
iii) Work function of the metal in electron-volt. (2Marks)

17. a) Define the term 'Ohms law' (1Mark)
b) Three resistors 1 Ω, 3Ω and 5Ω are connected together in a circuit. Draw a circuit diagram to show an arrangement that would give minimum resistance and determine that resistance. (3Marks)
c) The cell in the figure below has an e.m.f of 1.8V and negligible internal resistance

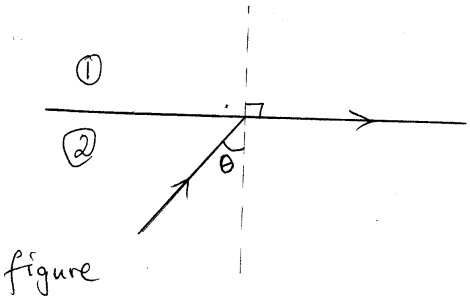


Determine ;

i) Total resistance in the circuit (2 Marks)
ii) The current in the circuit. (1 Mark)
iii) Reading of the voltmeter. (2 Marks)

d) Five identical cells each of e.m.f 1.5v and internal resistance 0.2Ω are connected in series. Determine;
i) Their overall e.m.f (1 Mark)
ii) Their total internal resistance. (1 Mark)

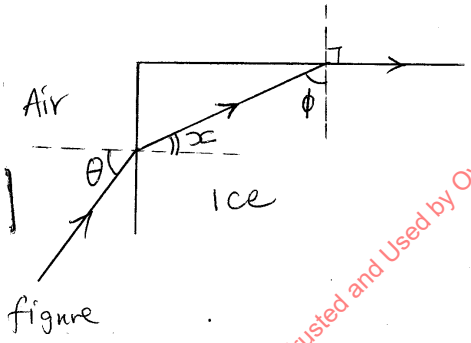
18. a) State the conditions necessary for total internal reflection to occur. (2 Marks)
b) Figure below shows a ray of light incident on the boundary between two media 1 and 2 at an angle ɵ



figure

Show that the refractive index for a ray of light travelling from medium 1 and medium 2 is given by $\eta = \frac{1}{sin\ \theta}$

c) Figure shows a ray of light incidence on one face of a block of ice of refractive index 1.31 and totally reflected at the adjacent face.



figure

Determine;

i) Angle ɵ (2 Marks)
ii) Angle x (1 Mark)
iii) Angle ɵ, the greatest angle for which the total internal reflection is possible. (2 Marks)

KANDARA MOCKS
CONFIDENTIAL FORM 4
232/3
PHYSICS PRACTICAL
PAPER 3

Question 1
Each candidate is required to have the following

- Two dry cells (1.5V size D Eveready)
- An ammeter (0-1A)
- A voltmeter (0-5v)
- A cell holder
- Six connecting wires, two with crocodile clips
- A jockey
- A nichrome wire (SWG 28) mounted on a mm scale and labeled PQ
- A Switch

Question 2

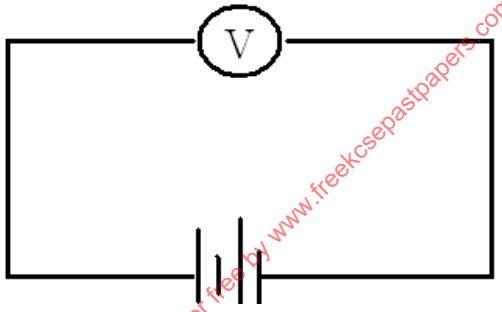
- Candle
- A lens holder
- A convex lens focal length 10 cm.
- A white screen
- A meter rule
- A knife edge about 7 cm high
- One 50 g mass and 100 g mass
- Two pieces of thread about 20 cm
- Some water in a beaker
- Liquid L in a beaker (Liquid L is Kerosene)
- A piece of tissue paper

KANDARA
232/3
PHYSICS
PRACTICAL
Paper 3

1. ***You are provided with:***
   - A resistance wire mounted on millimeter scale
   - Two dry cells in a cell holder
   - A voltmeter
   - A switch
   - Six connecting wires, two with a crocodile clip at one end

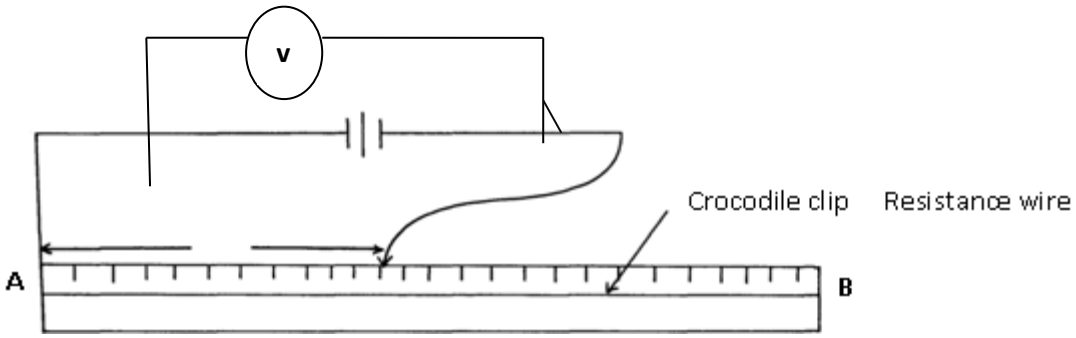
   Proceed as follows:-

   (a) Set up the circuit as in the figure below and determine the total electromotive force E, of the cells.



Electromotive force E, of thecells……..……..…..Volts. (1 mark)

(b) Set up the circuit shown in the figure below, connect the wire with clip on the mounted wire at a length (L) of 10cm from the end marked A. Record the voltmeter reading in the table provided in part (c) below:



(c) Repeat the procedure in (b) above for the following values of L

L(cm)	V(volts)	E-V(volts)	$\frac{V}{}$
10			
20			
30			
40			
50			
60			

(d) Plot a graph of $\frac{V}{E-V}$ against L (cm) (5marks)

(e) Determine the slope of the graph. (3marks)

(f) Given the equation $\frac{V}{E-V} = K_1L_1 + K_2$

Determine the values of K_1 and K_2 (2marks)

(g) Given that $4K_2r = 10$ where r is the internal resistance of the cells. Determine the value of r. (2marks)

Question 2

PART A

2. ***You are provided with the following apparatus***:

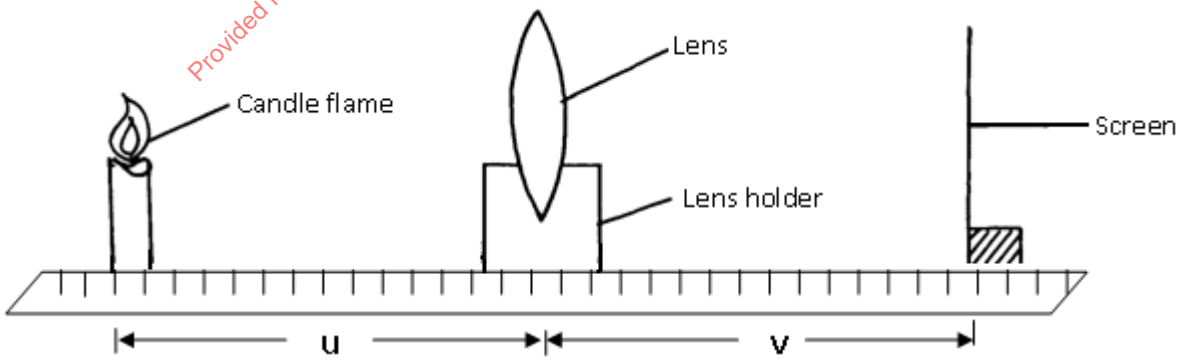
- A candle
- A lens holder
- A convex lens
- A screen
- A metre rule
- An object

Proceed as follows:

Using an object infinity outside the room, focus its image on the screen provided. The image should be as sharp as possible and inverted. Measure the distance from the lens to the screen h cm.

h……..cm (1 mark)

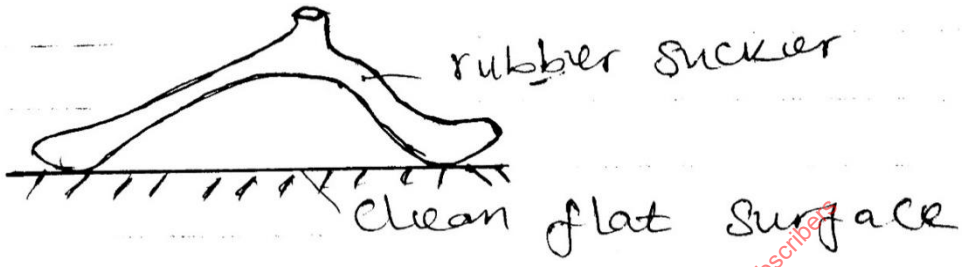
Arrange the candle flame, the lens, and the screen as shown in the diagram below:



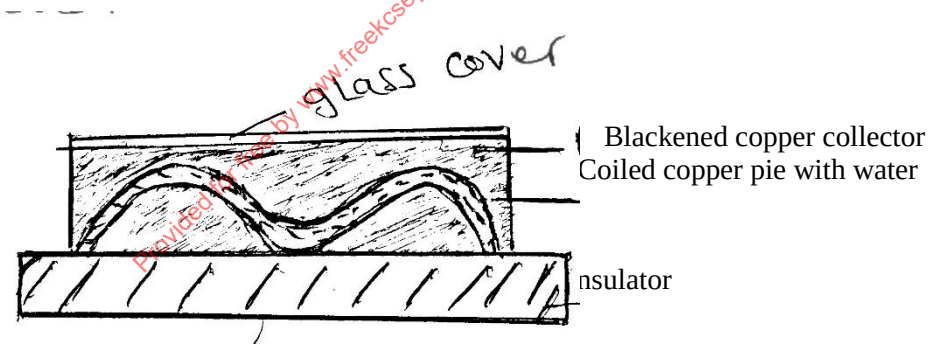
KAPSABET BOYS
232/1 PHYSICS (Theory)
PAPER ONE

SECTION A (35 Marks)
(Answer all questions in this section)

1. A micrometer screw gauge has a zero error of -0.03mm. It is used to measure the diameter of a wire. If the actual diameter of the wire is 0.30mm, draw the micrometer screw gauge showing the measured diameter of the wire. (3 marks)
2. The figure (1) below shows a rubber sucker, explain why the sucker sticks on a clean flat Surface. (1 mark)



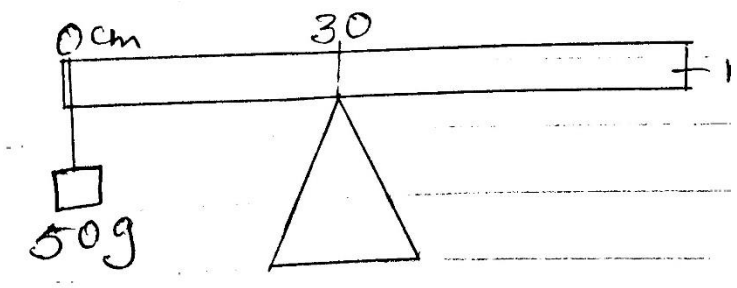
3. You are provided with a test – tube, thread and a meter ruler. Outline the steps you would use to measure the circumference and hence the diameter of the test – tube. (4marks)
4. A car weighs 12 000N.
   a. What is the force acting on one tyre if the weight is evenly distributed amongst the tyres? (1 mark)
   b. If the area of contact of tyre is 80cm^2.Calculate the pressure of the air in the tyre. (3 marks)
5. Why are gases easily compressible while liquids and solids are almost incompressible? (1 mark)
6. Name three properties of a clinical thermometer that make it suitable for measuring body temperature
7. How does the volume of a given mass of water change as;
   i) The water is cooled from 10^0 C to 0^0C? (1 mark)
   ii) The water is frozen to ice at 0^0C? (1mark)
8. The figure (2) below shows a section of a solar heater



Explain;

   i) Why the pipeline is fixed to a dark coloured collector plate (1 mark)
   ii) Why is pipe coloured several times (1 mark)
   iii) Why is pipe made of copper (1 mark)
   iv) Why is the collector plate fixed to an insulator? (1 mark)
   v) Why the panel front covered with glass (1 mark)
9. (a) Define moments of a force (1 mark)

(b) The figure (3) below shows a uniform meter rule balanced at the 20 cm mark when a mass of 50g is hanging from its zero cm mark



Meter rule

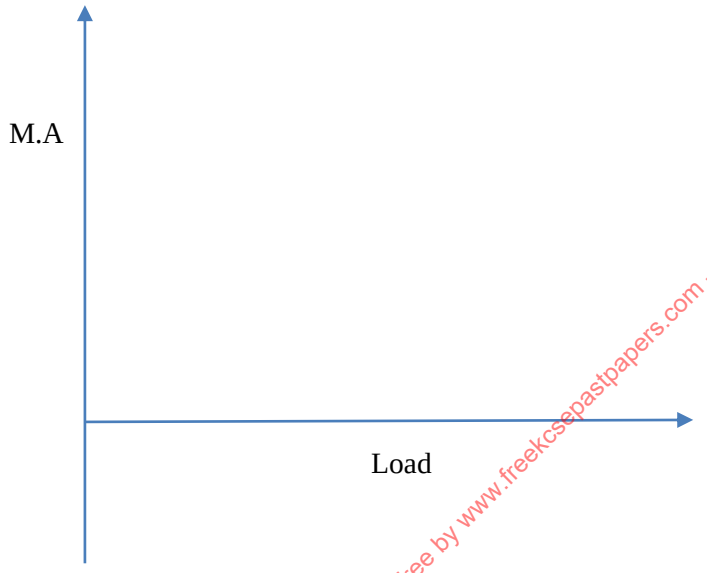
Calculate the weight of the rule (3 marks)

10. State two practical applications of stability (2 marks)

11. Explain how loose clothing may affect safety in the laboratory (2 marks)

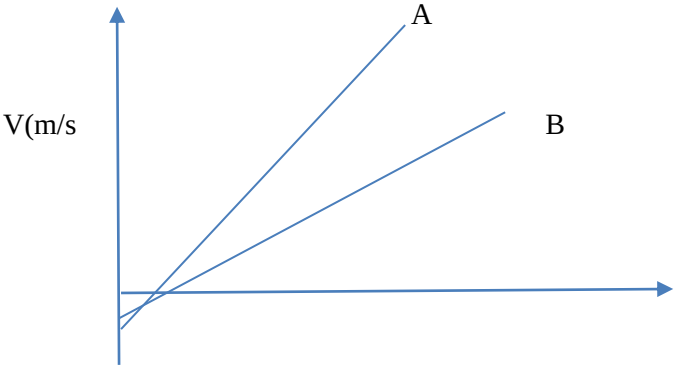
12. Water flows steadily along a horizontal pipe at a volume rate of $8.0\times10^{-3}m^3/s$.If the cross-section area of the pipe is $20cm^2$.Calculate the velocity of the fluid. (3 marks)

13. On the axis provided sketch a graph of mechanical advantage (MA) against load for a pulley system (1 mk)



SECTION B :(45 marks)
(Answer all the questions in this section)

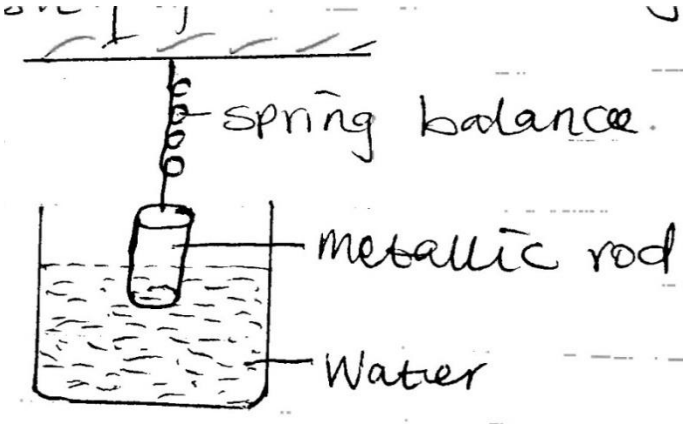
14. The figure below shows velocity-time graphs of two objects A and B drawn on same axes



The two objects are of equal masses. The same size of force is applied against each object. State with a reason which of the two objects stops in a shorter distance. (2 marks)

(b) An object moving at 30 m/s starts to accelerate at 5m/s^2 so that its velocity becomes 50 m/s.
   i) Find the distance moved during this acceleration (3 marks)
   ii) The object is now braked so that it comes to rest in a time of 5 seconds. Find the braking force if its mass was 2700g. (3 marks)

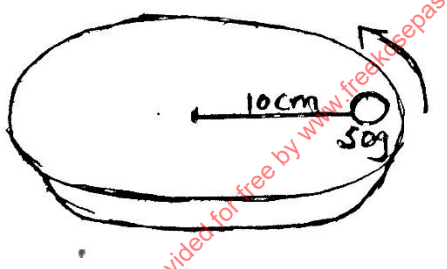
15. a) State the law of floatation (1 mark)
(b) The figure (5) below shows a metallic rod of length 10cm and uniform cross-sectional area 4cm^2 suspended from spring balance with 7.5 cm of its length immersed in water. The density of the material is 1.5g/cm^3.The density of water is 1 g/cm^3.



Determine:

   i) The mass of the rod (3marks)
   ii) The upthrust acting on the rod (3marks)
   iii) The reading 0f the spring balance (2marks)
   iv) The reading of the spring balance when the rod is wholly immersed in water (3marks)

16. (a)State what provides centripetal force for an electron moving round the nucleus (1mark)
(b) The figure (6) below shows a turntable on which a mass of 50g is placed 10cm from the centre



Frictional force between the 50g mass and the turntable is 0.4 N.When the turntable is made to rotate with angular velocity of W rad/sec, the mass starts to slide off.

i) Determine the:
   a. Angular velocity W (3marks)
   b. Time taken to make one complete revolution (3marks)
   ii) On the figure, draw a path that would be taken by the 50g mass if the turntable suddenly came to stop (1 mark)

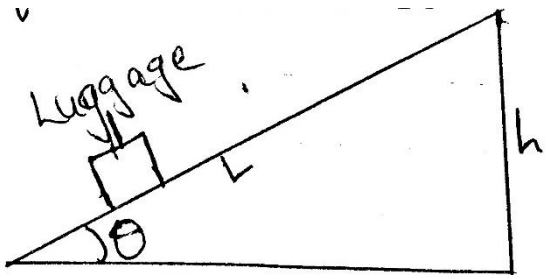
17. (a) An object of the mass 150kg moving at 20m/s collides with a stationary object of mass 90kg.They couple after collision .Determine the :
   (i) Total momentum before collision (2 marks)
   (ii) Total momentum after collision (1 mark)
   (iii) Their common velocity after collision (2 marks)
(b) A piece of wire of length 12m is stretched through 2.5cm by a mass of 5 kg. assuming that the wire obeys the Hookes law, what force will stretch it through 4.0 cm. (2marks)

18. (a)Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface (2 mks)

(b) An immersion heater rated 2.5Kw is immersed into a plastic jug containing 21kg of water and switched on for four minutes .Determine:

i) The quantity of heat gained by water (2 marks)
ii) The temperature change for water.(specific heat capacity of water=$4.2\times10^{3}Jkg^{-1}k^{-1}$ (3 marks)

(c) The figure (7) below shows an inclined plane used to load heavy luggage's onto a lorry. The length of the plane is L metres and the height is h metres



Show that the velocity ratio is given by $\frac{1}{\sin\theta}$

KAPSABET BOYS
232/2 PHYSICS (Theory)
PAPER TWO

SECTION A (25 MARKS)
ANSWER ALL THE QUESTIONS IN THE SPACES PROVIDED

1. Figure 1 below shows two plane mirrors inclined at an angle x from each other. A viewer counts a total of seven images by looking directly from the object O. Determine value of angel x. (2mks)

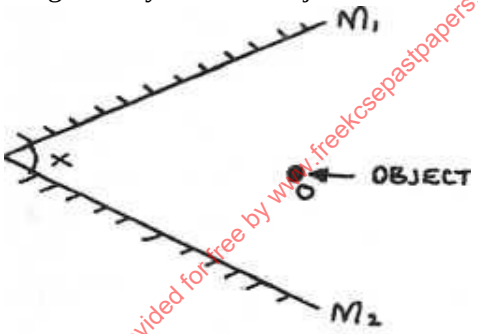
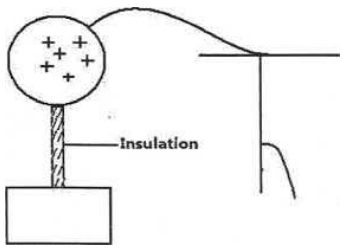
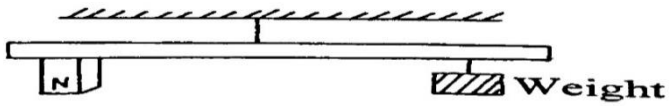


Figure 1

2. A charged metal sphere is connected to an uncharged electroscope as shown in the figure 2 below. State and explain the observations made. (2mks)



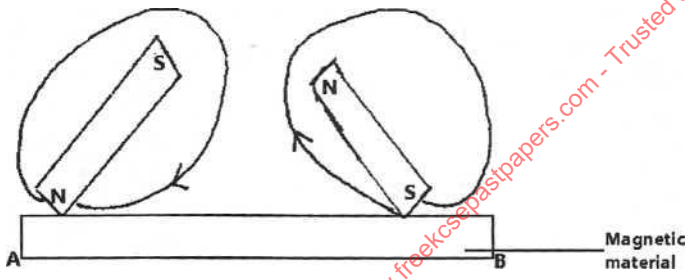
3. A metre rule is suspended by a thread such that it in equilibrium balanced by a permanent magnet attached to the metre rule and some weight as shown in figure 3 below.



If the soft iron is fixed to the bench, state and explain the effect on the metre rule when the switch is close. (2mks)

4. a) Explain why convex mirrors are preferred to plane mirrors as vehicle side mirrors. (1mk)

   b) A part from images being formed behind the mirror, state any other two similarities of images formed by a plane mirror and a convex mirror. (2mks)
5. i) Differentiate between polarization and local action in a simple cell (2mks)
   ii) State the use of manganese IV oxide in a dry cell (1mk)
6. Other than progressive waves travelling in opposite direction at the same speed, state any other two conditions necessary for the formation of stationary (2mks)
7. A gun is fired and an echo heard at the same place 0.6s later. How far is the barrier, which reflected the sound from the gun? (Speed of sound in air=330ms^{-1} (3mks)
8. In an attempt to make a magnet, a student used the double stroke method as figure 4 shown below. (2mks)



State the polarities at the ends A and B

9. a) The figure 5 below shows an electromagnetic relay.

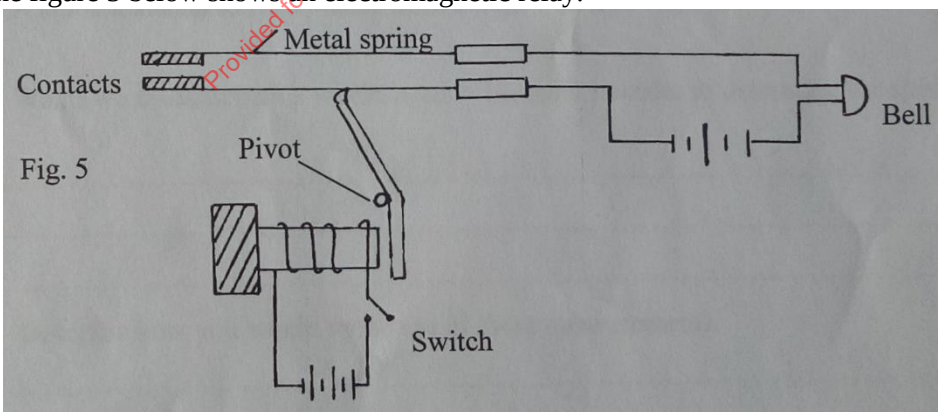


Fig. 5

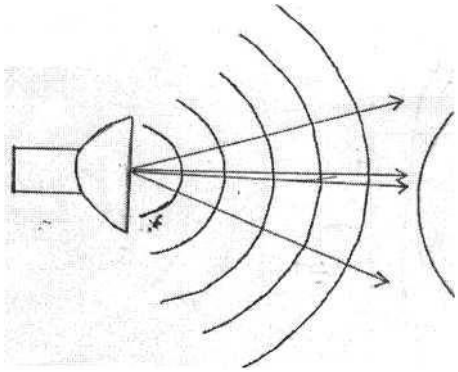
Explain what happens when the switch is closed. (2mks)

10. A current of 12A flows through a circuit for 2.5 minutes. How much charge passes through the circuit. (2mks)
11. a) Define term light (1mk)
    b) Other than the image being real, state any other characteristics of the images formed by pin-hole camera (1mk)

SECTION B(55MARKS)
ANSWER ALL THE QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED

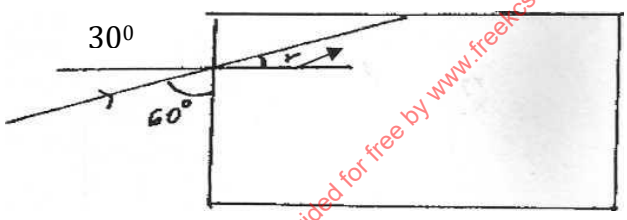
12. a) A student stands some distance from a high wall and claps his hands
    i) What two measurements would need to be made in order to determine the speed of sound? (2mks)
    ii) Describe how you would make use of these measurements (2mks)
    iii) The speed of sound in air is 330m/s. How far from the wall would you stand? Choose an answer from the following distances 10m, 200m, 500m. Give reasons why you did not choose each of the other two distances. (2mks)

    b) The balloon filled with carbon dioxide can act like a lens and focus sound from a loud speaker. On to the microphone, Figure 6 show waves produced by loud speaker moving toward the balloon.



    i) Complete the diagram to show what happens to the sound waves when they have passed through the balloon and moves towards the microphone. (2mks)
    ii) The loud speaker is now moved toward the balloon. This results in less sound at the microphone. Explain why there is less sound at the microphone (1mk)
    iii) The frequency of the sound emitted by the loud speaker is 1020Hz. Calculate the wavelength of the sound wave in air where its velocity is 340m/s (2mks)

13. a) Define critical angel (1mk)
    b) Figure 7 below shows a ray of light incident on the face of a cube made of glass reflactive index 1.50



Calculate

    i) The angle r:
    ii) The critical angle for the glass air interface (2mks)

    c) The figure 8 below shows a ray of light incident on a glass prism. Given that the critical angle for the grass is 39°, sketch on the diagram the path of the ray through the prism. (2mks)

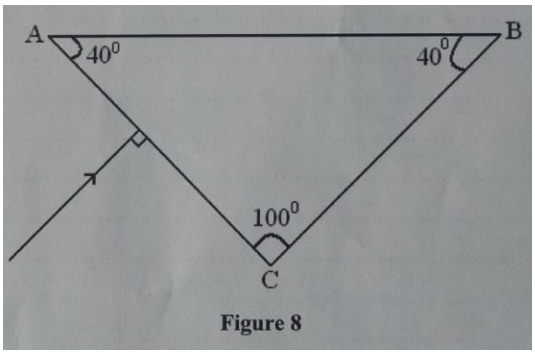


Figure 8

14. a) i) Define capacitance of a capacitor and state its S.I unit (2mks)
ii) State any two factors that affect the capacitance of a capacitor
iii) The figure 9 below shows three capacitors connected between two points A and B. (3mks)

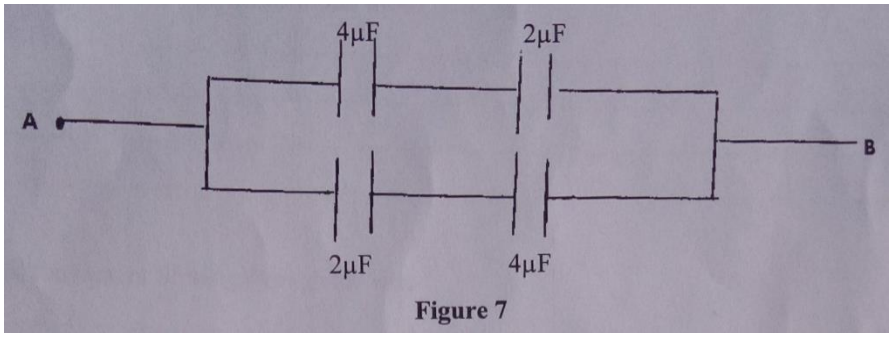
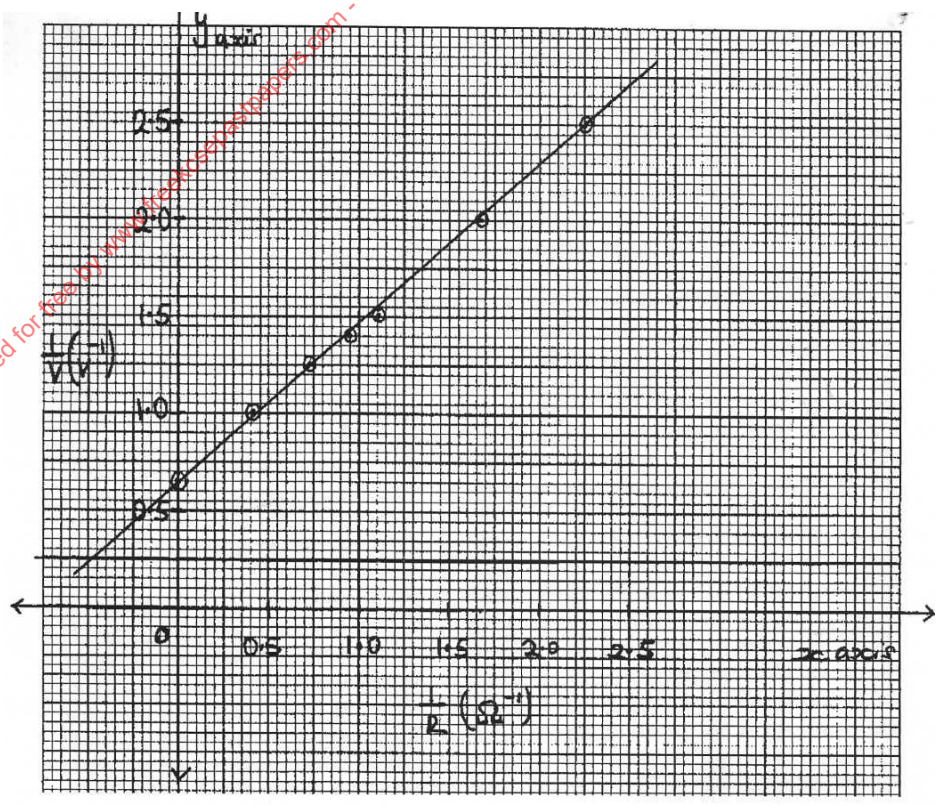


Figure 7

iv) Sketch a simple diagram that contains a capacitor, a two way switch, and a load resistor that can be used for charging and discharging a capacitor. (3mks)

15. a) State Ohm's law (1mk)
b) A wire was connected to a battery and was found that the energy converted to heat was 30J when 20C of charge flowed through the wire in 5 seconds. Calculate;
i) The p.d between the ends of the wire (2mks)
ii) The current flowing through the wire (1mk)
iii) The resistance of the wire (2mks)
iv) The average power development in the wire (2mks)
c) The graph below shows results obtained in an experiment the emf (E) and the internal resistance, r, of a cell. Given that the equation of the graph is E = r + 1

1



Use the graph to determine the values of:-
Given that the equation of the graph is $\frac{E}{V} = \frac{r}{R} + 1$
Use the graph to determine the values of:=

KAPSABET BOYS
232/3 PHYSICS (Practicals)
PAPER THREE
TIME: 2½HRS

You are provided with the following

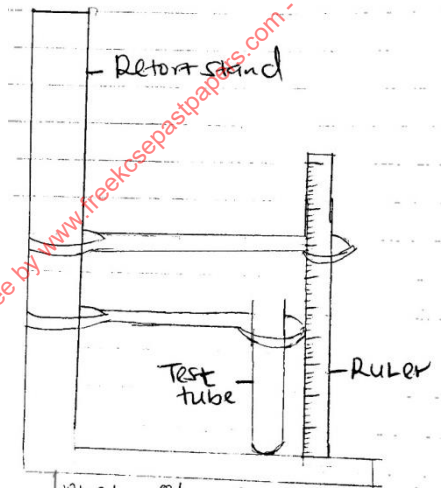
- Water in a beaker
- Complete retort stand
- Two clamps
- 100ml measuring cylinder
- Boiling tube
- Cotton thread
- Meter rule
- Beam balance(can be shared)
- Vernier calipers (can be shared
-

Proceed as follows

i) a) Using the vernier calipers, measure the internal diameter of the boiling tube
D=……. (1mk)
b) Measure the length H, of the boiling tube
H=…….cm (1mk)

ii) Measure the mass of the boiling tube using the beam balance M=…….g (1mk)

iii) Clamp the boiling tube vertically with its base resting on a flat surface as shown, Use the second clamp to clamp the meter rule beside the boiling tube.



iv) Measure 10ml of water and pour into the boiling tube. Measure the height h, of the water. Keep adding water in small amounts in the boiling tube and complete the table below

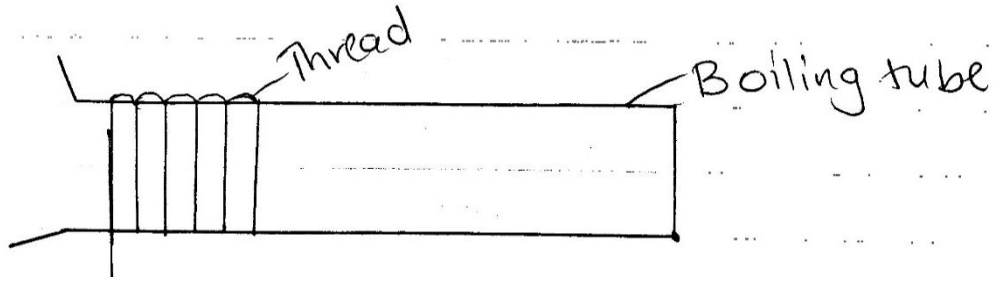
VOLUME IN CM^3/ML	**HEIGHT H(CM)**
10	
20	
35	
45	
50	
65	

(3MKS)

v) On the grid provided, plot a graph of volume V(cm^3) of water (y-axis) against height h(cm) (5mks)

vi) From the graph determine the slope, (3mks)

vii) Wind the cotton thread ten times round the boiling tube, pushing the windings very close together, the turns should not overlap on each other.



Unwind the thread and measure the length L of the thread.
L…….(cm) (1mk)

viii) Calculate the volume V,of the glass material which the boiling tube is made of, given that

$V=h\left[\frac{2L^2}{2500}-5\right]$
V= ……. (2mks)

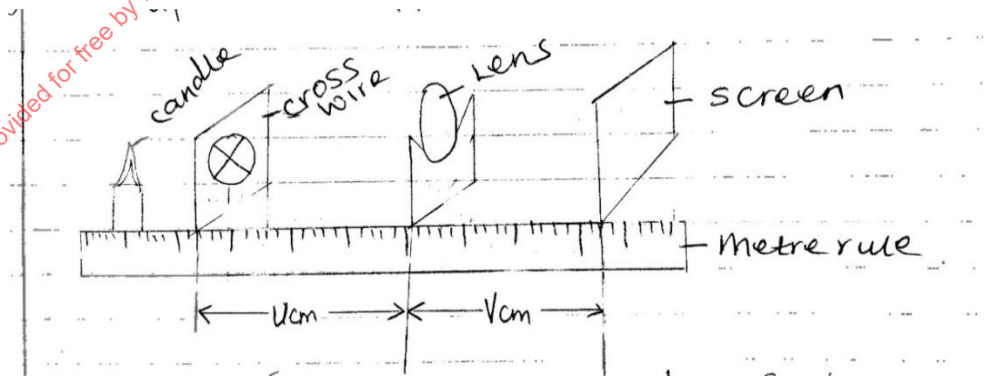
ix) Calculate the density d, of the glass material of the boiling tube d=…….....
(2mks)

QUESTION 2
PART A
You are provided with the following

- A meter rule
- Convex lens
- A candle
- Len's holder
- Cross wither mounted on a cardboard
- A white screen

Proceed as follows:-

i) Set up the apparatus as shown



ii) Starting with U=30cm vary the position of the screen S until a sharp image of the cross wire is observed on the screen. Measure and record the value of the image distance V.

iii) Repeat the experiment above for other values of U, and complete the table below

(6mks)

U(cm)	30	35	40	45	50	55
V(cm)						
M= $\frac{V}{U}$						

iv) Plot a graph of M against V (5mks)

v) Determine the slope of the graph (3mk)

vi) The equation of the graph is given by $M=\frac{v}{f}-1$. Use your graph to obtain the value of f (2mks)

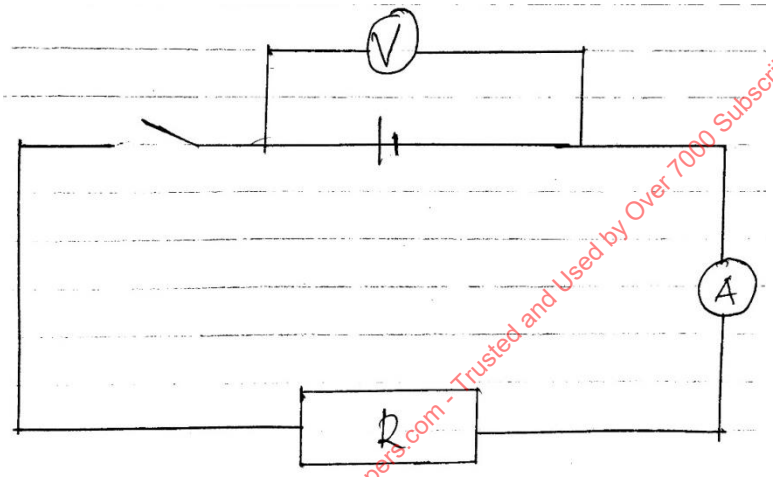
PART B

You are provided with the following apparatus:

- One cell and a cell holder
- Six connecting wires, two with crocodile clips
- A switch
- A 10 carbon resistor labledded R
- An Ammeter
- A voltmeter

Proceed as follows

i) Set up the apparatus as shown below.



Record the reading E of the voltmeter E…….. volts (1mk)

ii) Close the switch and record the reading, V, of the voltmeter and I the reading of the ammeter

V= ……..volts (1mk

I= ……amperes (1mk)

iii) Given that E = v + V + 1r, determine the value of r

r…….. volts (2mks)

K A S S U J O I N T E X A M I N A T I O N
232/1
PHYSICS
THEORY
Paper 1

SECTION A (25 MARKS)
Attempt all the questions in the spaces provided.

1. The figure (a) below shows the reading of a micrometer screw gauge when the micrometer is closed and figure (b) shows the reading on the same micrometer when used to measure the diameter of a marble.

Figure (a)

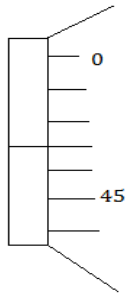
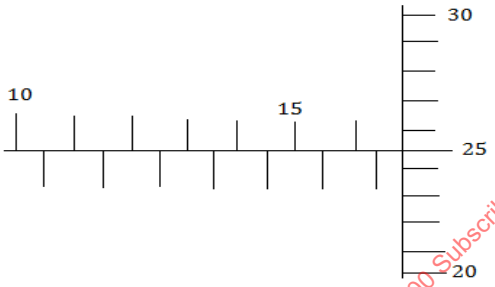


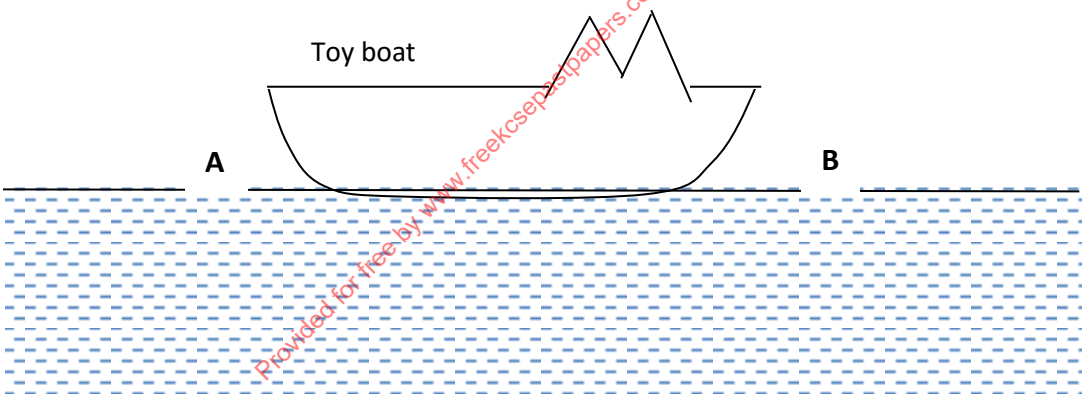
Figure (b)



Determine;

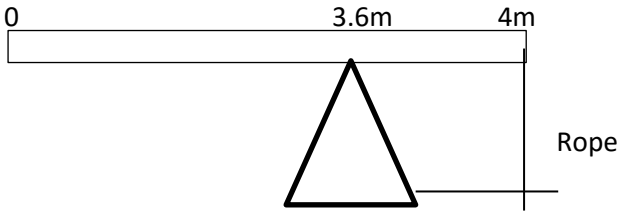
(i) the zero error of the micrometer. **(1 mark)**
(ii) the actual diameter of the marble. **(2 marks)**

2. A small toy boat is carefully placed on water surface to float as shown in the diagram.



Points **A** and **B** are near the ends of the boat. A drop of oil is placed at point **B**. State and explain what happens to the boat. **(2 marks**

3. A girl in a school in Nakuru plans to make a barometer using a liquid of density $1.25gcm^{-3}$. If the atmospheric pressure in the school is $93750Nm^{-2}$. Determine the minimum length of the tube that she will require? **(3 marks)**
4. Smoke is enclosed in smoke cell and sealed. When illuminated and viewed under a microscope, it is observed to be moving in continuous random motion. State and explain the observation when cold water is poured on the smoke cell. **(2 marks)**
5. At 27^0C the pressure of a gas is 50cmHg. At what temperature in degree Celsius would the pressure of the gas fall to 40cmHg if the volume is kept constant **(3 marks)**
6. State **two** factors that affect the spring constant of a spring. **(2 marks)**
7. Describe briefly how a fire alarm that uses a bi-metallic strip works. **(2 marks)**
8. An empty density bottle weighs 22g when empty and 65g when full of a liquid of density $800kg/m^3$. Determine the volume of the bottle. **(2 marks)**
9. The figure below shows a uniform rod of length 4m and pivoted at 3.6m mark. The rod is held horizontally with a vertical rope at 4m mark as shown.



If the tension in the rope is 160N, determine the weight of the rod. **(2 marks)**

10. Water flows through a tube of length 60cm and cross-sectional area $5cm^2$ in 0.05 minutes. Calculate the mass flow in kg/s. (density of water = $1000kg/m^3$). **(2 marks)**

11. Explain why two thin blankets are warmer than a thick one. **(1 mark)**

(i) From the graph determine the slope. **(2 marks)**

(ii) Given that $F = mrw^2$; determine m when r = 1.23m. **(2 marks)**

(iii) Determine the angular velocity attained when a force of 16N is applied. **(2 marks)**

12 Distinguish between elastic collision and inelastic collision. **(1 mark)**

SECTION B (55 MARKS)

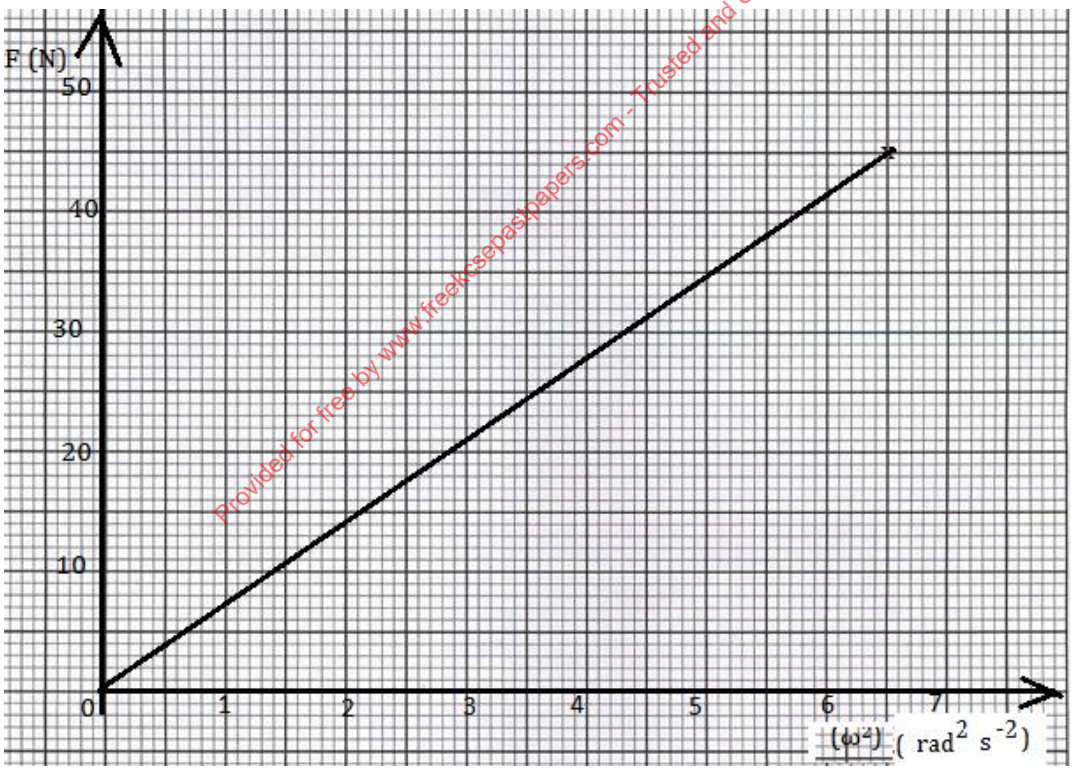
Answer ALL questions in the spaces provided.

13. (a) Define angular velocity. **(1 mark)**

(b) State the reason why a body in uniform circular motion is said to be accelerating. **(1 mark)**

(c) The graph of centripetal force against the square of angular velocity (ω^2) is plotted as shown below.

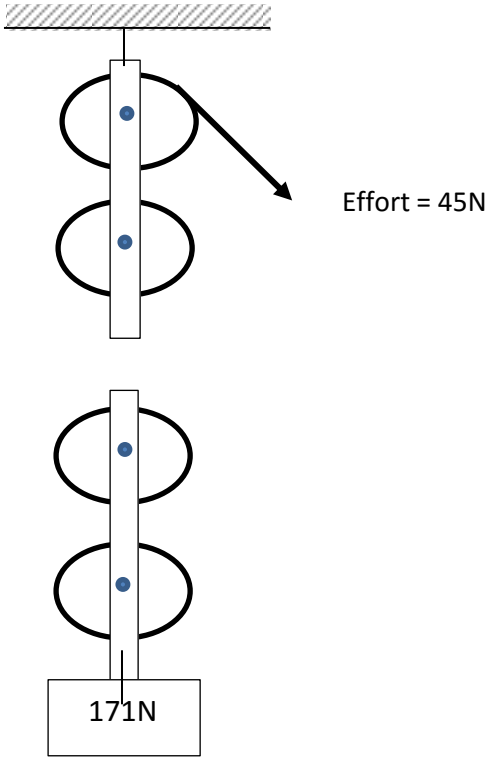
(d) An elastic spring of a spring constant 500N/m is compressed to give an extension of 10cm. A marble of mass 10g is placed on the spring and then released. Determine the velocity with which the marble will move. **(3 marks)**



e) A brick of mass 80kg is pulled along a horizontal surface with uniform velocity by a force of 60N. Determine the co-efficient of friction between the two surfaces? **(2 marks)**

14. a) State the law of conservation of energy. **(1 mark)**

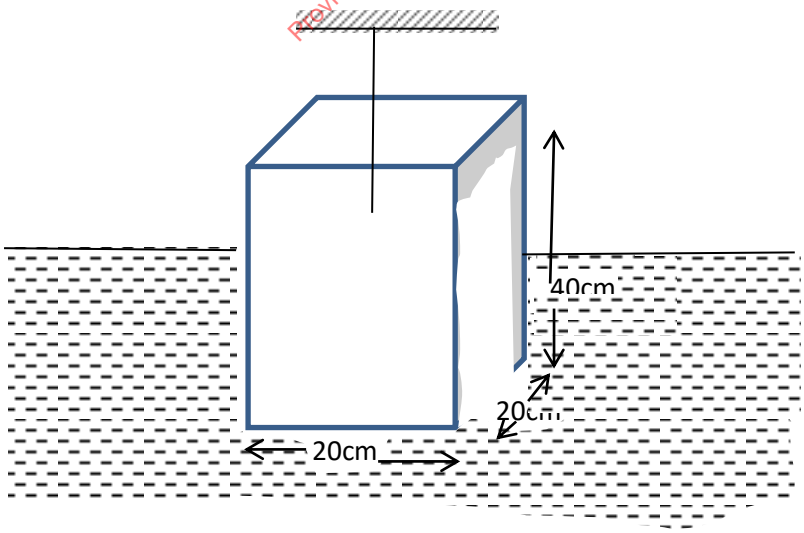
b) Complete the diagram below by showing how the string is connected for the effort of 45N to be applied to raise a load of 171N through a height of 5m. **(1 mark)**



c) From the block and tackle system shown in (b) above, determine;
(i) the velocity ratio. **(1 mark)**
(ii) the work done on the load. **(2 marks)**
(iii) the work input. **(2 mark s)**
(iv) the efficiency of the system. **(2 marks)**
(v) Why is the efficiency of the machine less than 100%? **(2 marks)**.
(vi) It is observed that the efficiency of the machine increases when it is used to lift large loads. Give a reason for this. **(1 mark)**

15. a) State Archimede's principle. **(1 mark)**

b) The following set-up shows a metal block of density 11,500 Kg/m^3 and dimensions $40cm \times 20cm \times 20cm$ suspended inside a liquid with ¾ of its volume submerged in the liquid. The block is held in position by a string attached to a point above the liquid.



(i) Determine the weight W of the block. **(2 marks)**

(ii) If the tension on the string is 1684N, determine the upthrust U of the liquid. **(1 mark)**

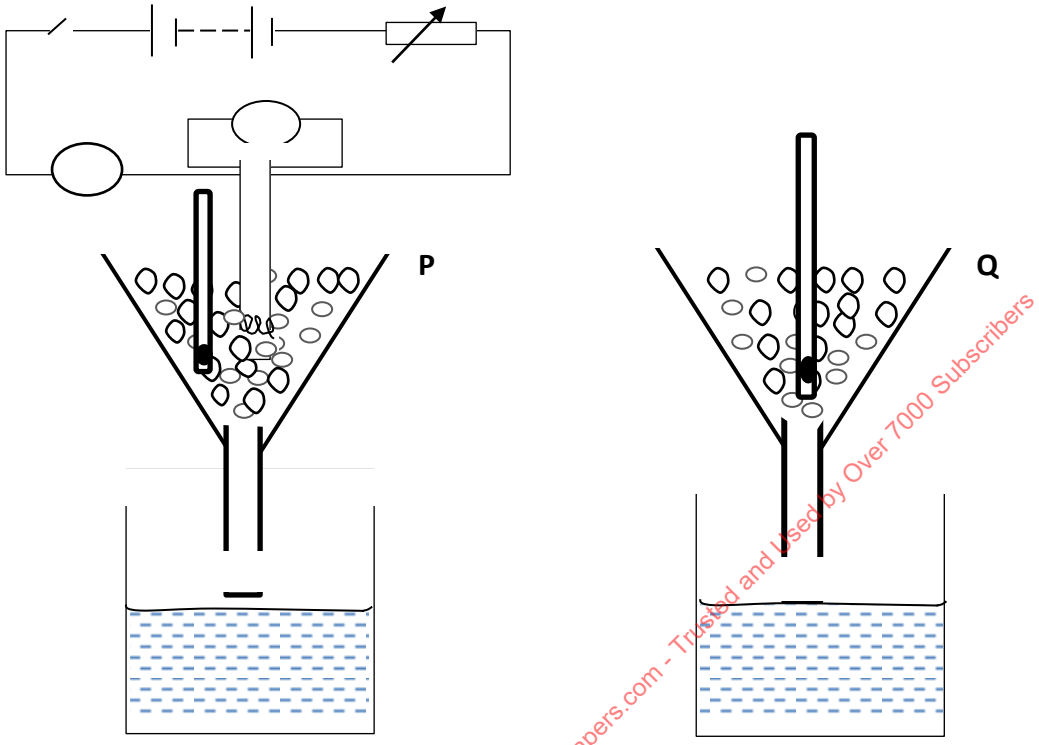
(iii) Determine the density of the liquid. **(2 marks)**

(iv) If a liquid of density 1100kg/m^3 is poured on top of the liquid until the block is jusT submerged, determine the new tension in the string. **(2 marks)**

(c) A hydrometer of mass 30g floats in oil of density 0.9g/cm^3 with 6cm of its stem above the oil. If the cross-sectional area of the stem is 0.5cm^2, calculate the total volume of the hydrometer. **(3 marks)**

16. a) Define specific heat capacity of a substance. **(1 mark)**

b) The figure below shows a circuit that was used to determine the specific latent heat of fusion of ice by electrical method.



i) Complete the circuit diagram shown above. **(1 mark)**

ii) State the measurement to be carried out during the experiment. **(2 marks)**

iii) (iii) State the purpose of experiment Q**.** **(1 mark)**

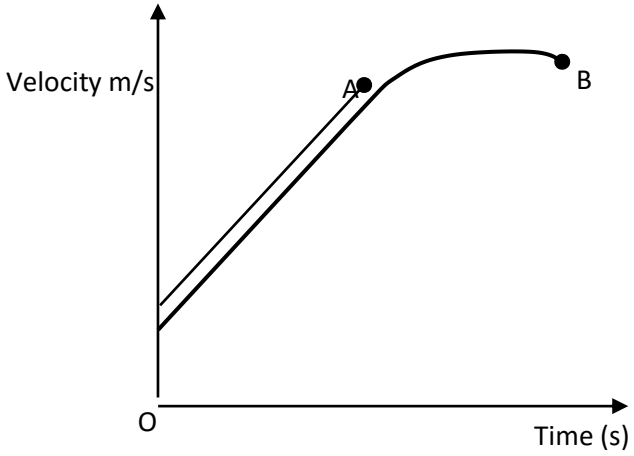
(c) Describe how the measurement taken can be used to determine the specific latent heat of fusion of ice. **(2 marks)**

(d) A heater rated 300W was used to heat water from 0^0C to 40^0C. If the heating took 5 minutes; determine;

i) the heat capacity of water. **(2 marks)**

ii) the mass of water. (specific heat capacity of water 4.2$Jg^{-1}k^{-1}$) **(1 marks)**

17. (a) The figure below shows a velocity – time graph of a body.



Describe the motion of the body between;

(i) OA **(1 mark)**

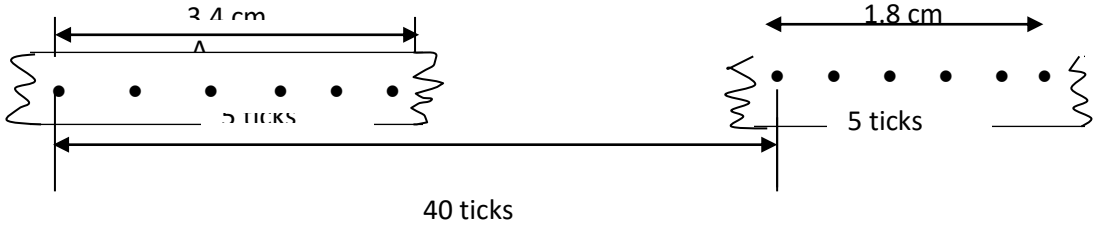
(ii) AB **(1 mark)**

(b) A simple pendulum is set swinging and the string is cut when the bob is at the centre of its oscillation and 8cm above the ground. If the velocity of the bob is then 2m/s;

(i) how long does the bob take to reach the ground? **(2 marks)**

(ii) how far does the bob travel horizontally. (Assume g = 10m/s) **(2 marks)**

(iii) A and B represents parts of the ticker tape of a trolley run. Each successive tick represents a time interval of $\frac{1}{50} th$ second.



i. Find the initial velocity in region A. **(1 mark)**

ii. Find the final velocity in region B. **(1 mark)**

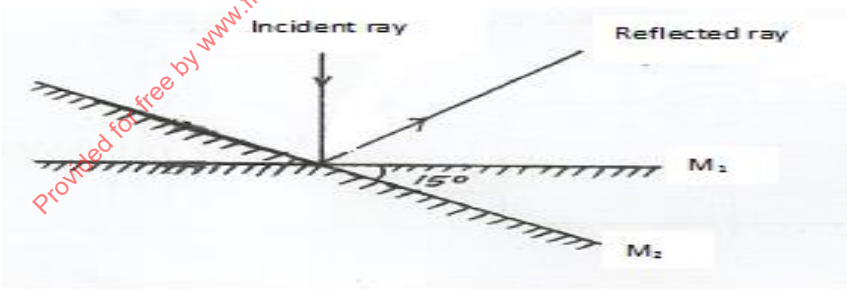
iii. Hence find the average acceleration of the trolley. **(1 mark)**

K A S S U J. E .T. E XAM I N A T I ON 2019
232/2
PHYSICS
Paper 2
2 Hours

SECTION A (25 Marks)

Answer all questions in the spaces provided

1. The figure below shows a ray of light incident along the normal. The mirror is rotated at an angle of 15° in a clockwise direction without changing the position of the incident ray,



Determine the angle through which the reflected ray is rotated. (2 marks)

2. Describe how to charge a gold leaf electroscope positively by induction method using a polythene rod and a silk cloth (2 marks)

i. An observer moves along line PQ. State and explain the observation. (2 marks)

ii. If the frequency of sound from the generator is increased, what effect does this have on the interval at which the observer hears the soft sound? (1 mark)

8. The figures below show the profiles of a transverse wave.

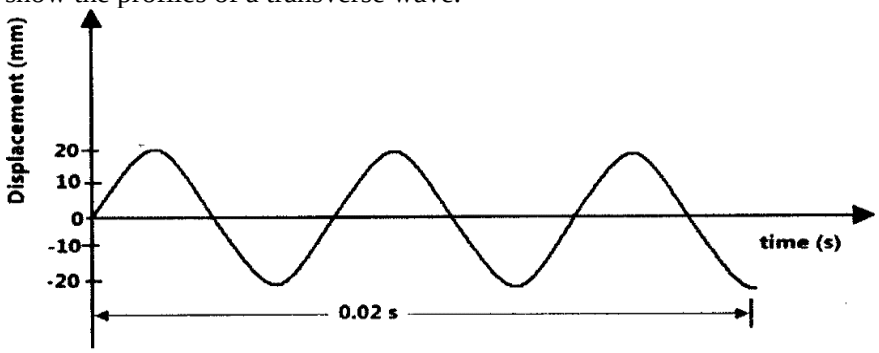
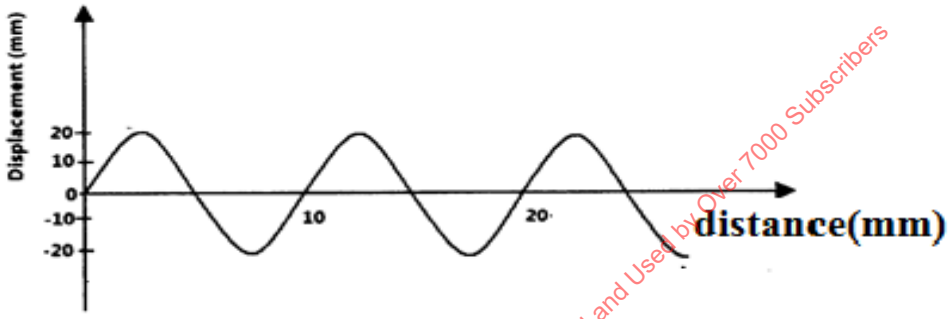


Figure 4

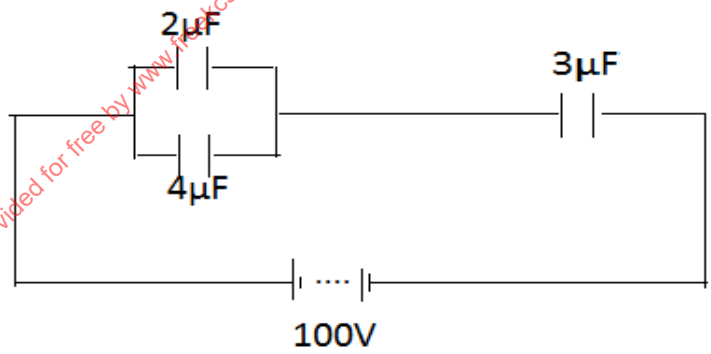


Determine for the wave the:

(i) Wavelength (1mark)

(ii) Velocity (2 marks)

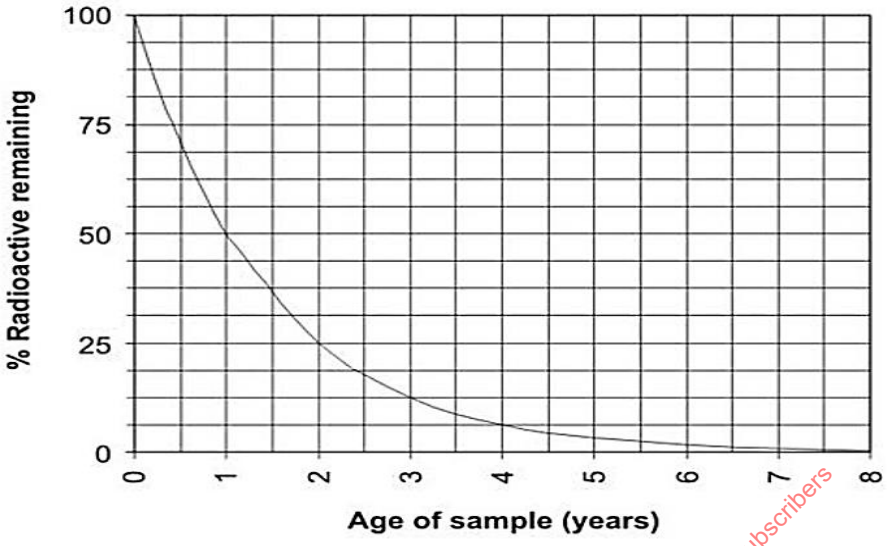
9. The diagram below shows a capacitor network connected to a 100V supply.



Calculate the total charge in the circuit. (3 marks)

10. Define the term doping as applied in electronics (1 mark)

11. The graph below shows the variation of percentage mass remaining against age in years of a certain radioactive substance



Determine the half-life of the source (1 mark)

12. State one difference between the Cathode ray tube of a television and that of a Cathode ray Oscilloscope. (1mark)

SECTION B (55 marks)

Answer all questions in the spaces provided

13. (a) State the Ohm's law (1mark)

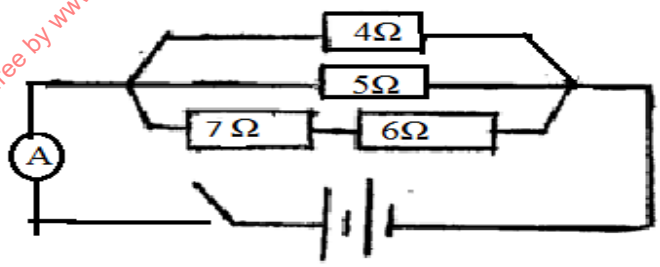
(b) You are provided with the following apparatus; a coil of nichrome wire, two dry cells, ammeter, voltmeter, connecting wires, switch and rheostat.

(i) Draw a circuit diagram that can be used to verify Ohm's law (1mark)

(ii) State the measurements to be taken (2marks)

(i) Describe how these measurements obtained can be used to verify Ohm's law (3marks)

(c) Study the figure below and answer the questions that follow



3V

Determine:

(i) The combined resistance (3 marks)

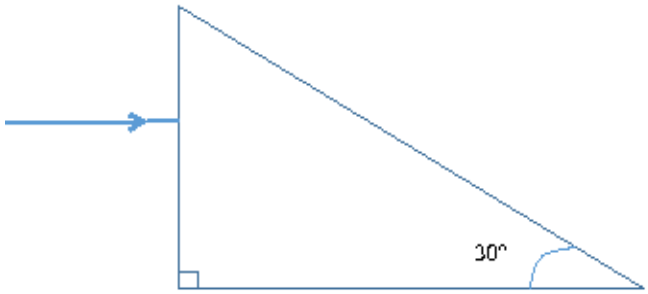
(ii) The total current flowing through the 6Ω resistor (2 marks)

(iii) Voltage across the 7Ω resistor (2marks)

14. a) Define critical angle (1 mark)

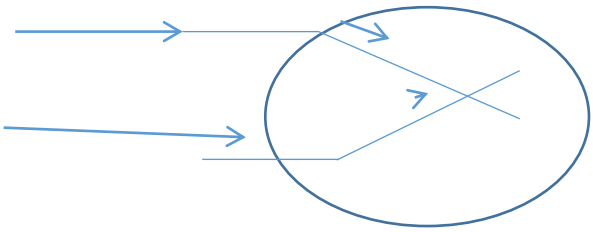
b) Crown has a refractive index of 1.55. Determine its critical angle. (3 marks)

c) A ray of light strikes the crown prism in (b) above as shown below.



Trace the path of the ray till it emerges (show your working above) (3 marks)

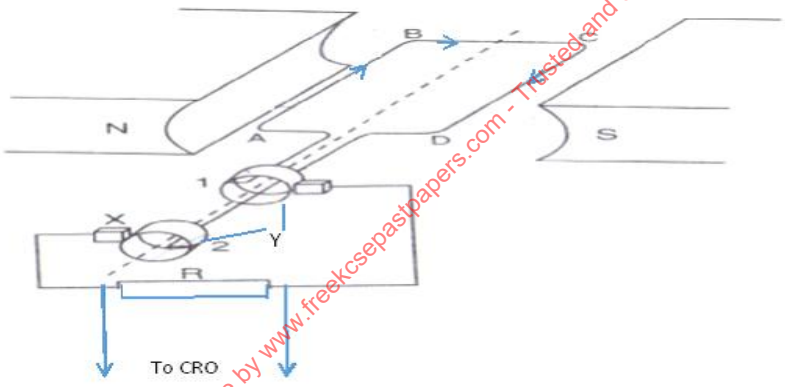
15. Using a well labeled diagram, show how you would use a converging lens as a simple microscope (3 marks)
16. The figure below shows an eye defect.



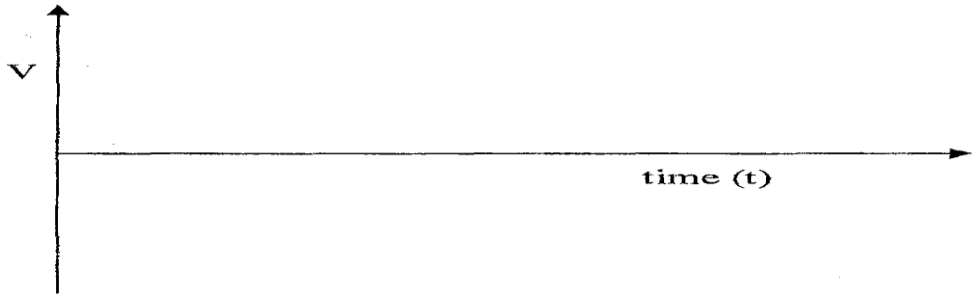
(i) Name the defect shown above (1 mark)
(ii) On the same diagram show how you can correct the above defect (2 marks)

17. a) State the Lenz's Law (1 mark)

(b) The diagram below shows a simple generator



(i) Name the parts labeled: (I) X …… (1 mark)
(II) Y…… (1 mark)
(ii) On the diagram, show the direction of rotation, such that the current flows in the direction indicated by the arrows (1mark)
(iii) State two ways of making the generator produce more current (2 marks)
(iv) On the axes below, sketch the graph of the output voltage for two complete cycles if the C.R.O is connected as shown (1 mark)



(v) Explain how you would modify the generator above to produce d.c. voltage (1 mark)

(c) A power line supplies electrical energy to a transformer in a factory. The input voltage to the transformer is 11000V. The transformer changes voltage to 415V for use in a factory. The power input to the transformer is 40KW. Calculate the current in the secondary coil of the transformer if the transformer is 90 percent efficient. (3 marks)

(d) A Form four student spent the April holiday at home and used the following electrical appliances per day:-
8KW cooker for 1 hour,
40W study bulb for 12 hours

i) Find the total monthly bill for the above household if the power company charges ksh. 2.50 per unit if in addition to the energy consumed, the power company charges each consumer.

I A standing charge of Ksh.200.

II Fuel cost levy at 70 cents per unit. (3 marks)

16. a) Apart from the intensity of light, state two other factors which affect photoelectric effect. (2 marks)

b) A material has a work function of 2.9eV. The wavelength of an incident radiation on its surface is 2.9 X 10^{-7} m. (Given that; C = 3.0 x 10^{8} m/s, h = 6.63 x 10^{-34} Js, 1eV = 1.6 x 10^{-19} and mass of an electron = 9.11 × 10^{-31}kg).

(i) Determine frequency of incident radiation (2 marks)
(ii) Determine the stopping potential. (3 marks)
(iii) Determine the speed of the emitted electrons (3 marks)

(c) (i) State how you can increase the strength of X- rays (1 mark)
(ii) Give one application of X- rays in industry. (1 mark)
(iii) Give reason why the X- ray tube is evacuated. (1 mark)
(iv) State why the anode is made of copper (1 mark)

PHYSICS PAPER 3 CONFIDENTIAL
QUESTION ONE

- A pendulum bob
- A thread 110 cm long
- A report stand, clamp and boss
- Two pieces of wood
- A Metre rule
- A stop watch

QUESTION TWO

- A lens and a lens holder (f = 15cm)
- A screen with cross wires
- A Candle
- A micrometer screw gauge (to be shared)
- A Centre zero galvanometer
- A Switch
- Connecting wires (at least five with a crocodile clip on one end)
- A resistance wire mounted on a millimeter scale labeled **AB(G32)**
- A resistance wire labeled **P(G32)**
- A resistance wire labeled **P(G28)**
- A Metre rule or half metre rule
- two dry cells and a cell holder

KASSU 2019 JOINT EXAMINATIONS
PHYSICS PRACTICAL
PAPER 3

QUESTION ONE

You are provided with the following

- A pendulum bob.
- A thread 110cm long
- A retort stand, clamp and boss.
- Two pieces of wood.
- A metre rule.
- A stop watch.

Proceed as follows:

(a) Tie the pendulum bob with the thread provided as shown in **Figure 1**. Clamp the end of the thread between the two pieces of wood, so that the length L of the pendulum is 100cm

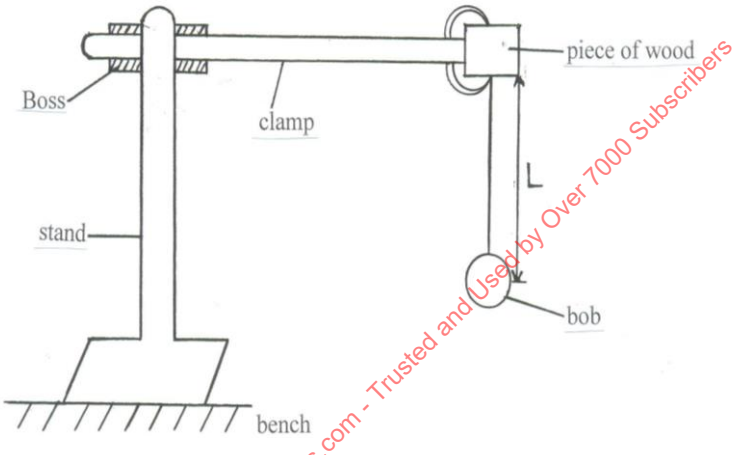


Figure 1

(b) (i) Give the bob a slight displacement and release it. Record time 20 oscillations when the length of the pendulum is 100cm.

time = ……. s. (1mark)

(ii) Repeat b (i) above for values of L of 90cm, 80cm, 70cm, 60cm, 50cm, 40cm and 30cm and complete the table below.

Length L (m)	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3
Time t for 20 oscillations (s)								
Periodic time T (s)								
T^2 (S^2)								
Log T^2								
Log L	0	-0.05			-0.22			

7marks)

(c) (i) Plot a graph of log L against log T^2 (5marks)
(ii) Determine the slope of the graph (3marks)
(iii) Given that the relationship between L and T^2 is given by $\text{Log } L = \text{Log } T^2 - \text{Log}\left(\frac{39.44}{g}\right)$

where g is a constant. Use the graph to determine the value of g.

(4marks)

QUESTION TWO

Part A

You are provided with the following:

- A lens and a lens holder.
- A screen with cross wires
- A candle
- A metre rule.

Proceed as follows:

a) Arrange the lightened candle, the lens and the screen as shown in **figure 2**. Adjust the position of the screen until a sharp inverted image of the candle is formed on the screen.

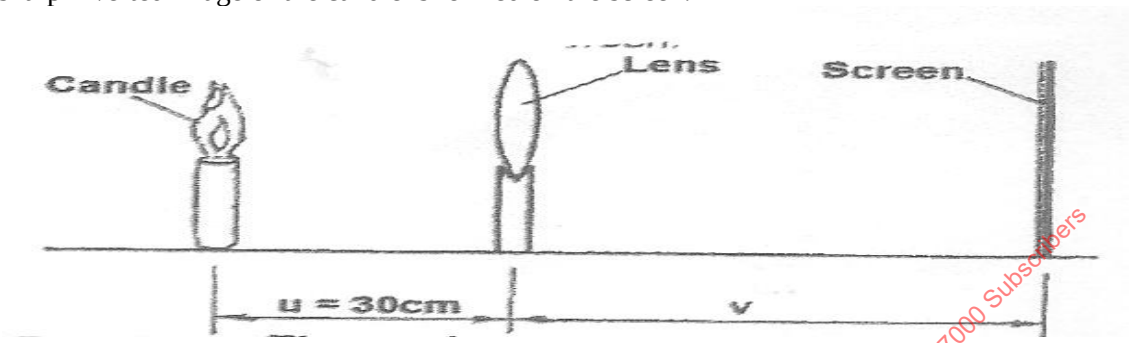


Figure 2

i) Measure the image distance.
v = …… cm (1mark)

ii) Determine the focal length of the lens using the formula $f = \frac{uv}{u+v}$ (2marks)

b) Now arrange the lighted candle, the screen with cross wires and the lens as shown in **figure 3**. *Ensure that the centre of the lens, the cross-wires, and the candle flame lie on the same horizontal line*. The candle flames should be placed close to the cross-wires for better illumination.

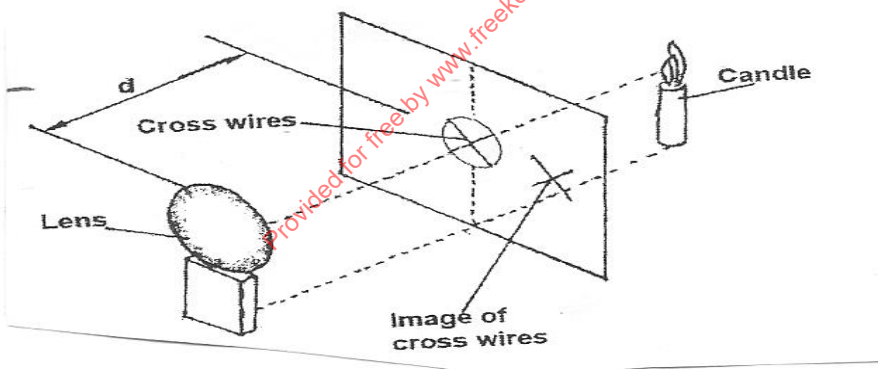


Figure 3

i) Adjust the position of the lens until a sharp image of the cross-wire is formed on the screen next to the cross wires. (*Hint: You have to rotate the lens slightly about a vertical axis so that the image of the cross-wires falls on the screen next to the cross-wires and not on the cross-wires.)*
Measure the distance d, between the lens and the screen.
d = ---------- cm (1mark)

ii) Determine the values of L and X

a) $L = \frac{df}{f-d}$ (2marks)

b) $X = \frac{L}{2f} + 1$ (2marks)

Part B

You are provided with the following

- Amicrometer screw gauge (to be shared)
- A centre zero galvanometer
- A switch
- Connecting wires (at least five with a crocodile clip on one end)
- A resistance wire mounted on a millimeter scale labelled **AB**
- A resistance wire labelled **P**
- A resistance wire labelled **G**
- a metre rule or half metre rule
- two dry cells and a cell holder

Proceed as follows:

c) Using the micrometer screw gauge provided, measure the diameter

i) D of wire P
D = ...mm (1mark)

ii) d of wire Q
d = ...mm (1mark)

d) Determine $\mathbf{C_1}$, the value of the ratio $\frac{D}{d}$

$\mathbf{C_1}$ = ... (2marks)

e) Set up the circuit as shown in **Figure 4**. (*Ensure that each of the wires **P** and **Q** is 50cm long.)*

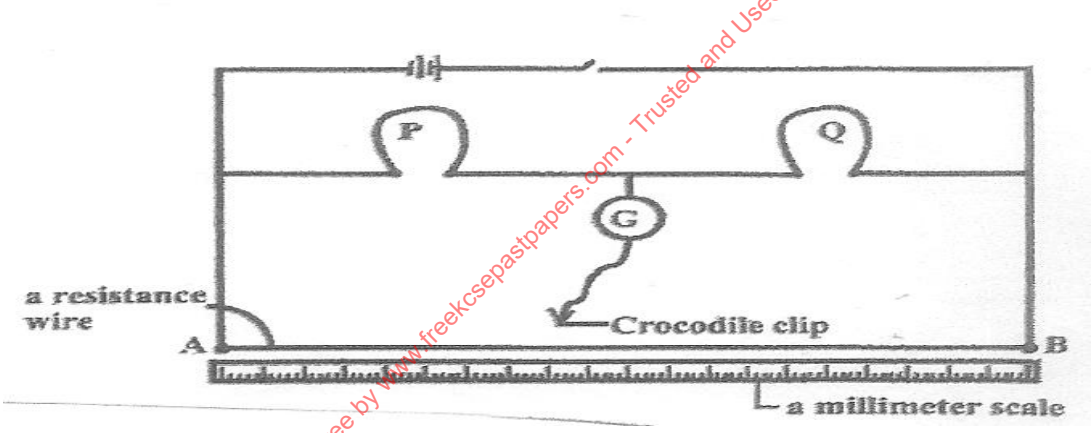


Figure 4

Close the switch. Using the clip at the free end of the wire from the Galvanometer, tap wire **AB** near end **A** and observe the deflection in the galvanometer.

ii) Then tap the wire near end **B** and again observe the deflection in the galvanometer

iii) Now tap the wire **AB** at various points between **A** and **B** to obtain a point K where there is no deflection in the galvanometer

I. Determine the length L_1, the distance from **A** to **K**
$\mathbf{L_1}$ = ...cm (1mark)

II. Determine the length L_2, the distance from **B** to **K**
$\mathbf{L_2}$ =..... cm (1mark)

f i) Given that the resistance $\mathbf{R_Q}$ of **Q** is 9.0 Ohms, determine the resistance $\mathbf{R_p}$ of **P** using the expression: (2marks)

$$\frac{R_p}{R_Q} = \frac{L_1}{L_2}$$

ii) Determine the value of $\mathbf{C_2}$, given that, (2marks)

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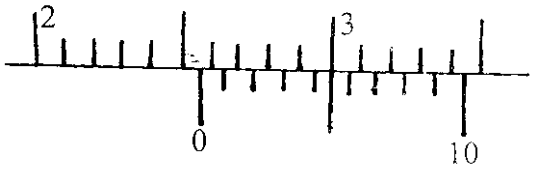
PHYSICS
PAPER 1

SECTION A (25 MARKS)
(Answer ALL the questions in the spaces provided)

1. The vernier calipers in the figure below has a zero error of -0.05 cm. It is used to measure the diameter of an object and the reading was shown.

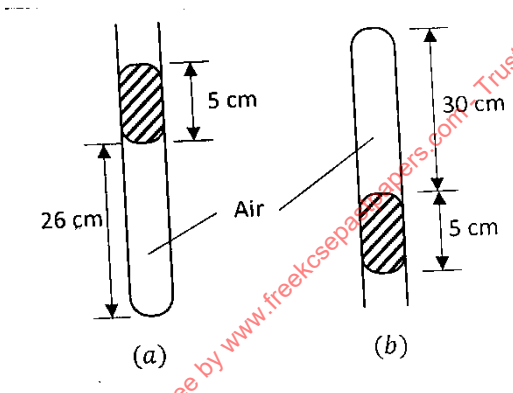


Determine the actual diameter of the object. (2 marks)

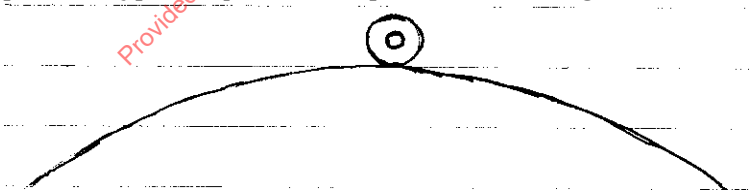
2. Equal masses of water and ice at 0^0C are added separately into two identical beakers containing equal amount of water at the same temperatures. State the reason why ice may cause a greater change of temperature. (2 marks)

3. The Jupiter's gravitational field strength is 26 N/Kg. What would be the weight of an object that weighs 30N on earth on Jupiter's . (2 marks)
(Take g = 10 N/Kg)

4. A column of air 26 cm long is trapped by mercury thread 5.0 cm long as shown in the figure (a) below. When the tube is inverted as in figure (b) the air column becomes 30 cm long . What is the value of atmospheric pressure ? (2 marks)

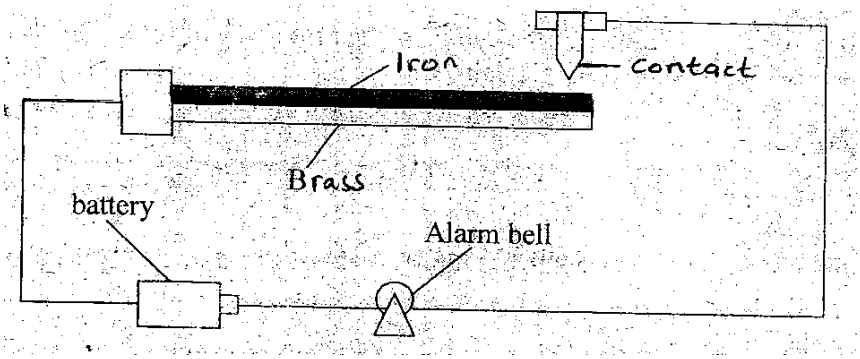


5. State and explain the type of equilibrium represented in the figure below . (2 marks)



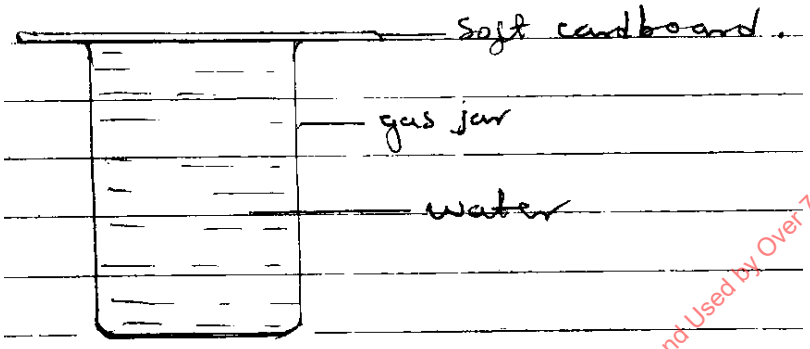
6. A spring of length 6 cm is stretched to a length of 8.5 cm by a force of 5 N. Calculate the energy stored by the spring. (2 marks)

7. The diagram below shows a model of fire alarm which was made by a form one student. The compound bar is made of brass and iron.



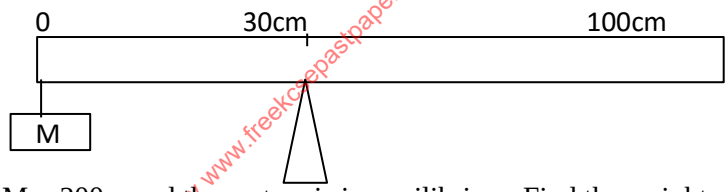
When the bar is heated with a candle flame the bell rings. Explain. (2 marks)

8. The figure below is of a gas jar completely filled with water and covered with a soft cardboard.



State and explain the observation made when the set – up is suddenly inverted. (2 marks)

9. The figure below shows a uniform metre rule pivoted at its 30 cm mark.



Given M = 200g and the system is in equilibrium. Find the weight of the rule. (2 marks)

10. In a vacuum flask the walls enclosing the vacuum are silvered on the inside.
State the reason for this. (1 mks)

11. The rate of flow of water in a tube is $0.001m^3/s$. If the cross section area of the tube is 5 cm^2, determine the speed of flow of the water. (2 marks)

12. The mass of a density bottle when empty is 25g, 75g when filled with water and 65g when filled with alcohol. Calculate the density of alcohol. (2 marks)

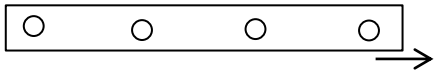
13. An oil drop has a volume of 0.01 mm^3 when placed on the surface of water , It spreads out to form a circular patch of area 500 cm^2. Determine the thickness of the oil film. (2 marks)

SECTION B (55 M ARKS)

Answer all questions

14. (a). (i) Define the term velocity and state its SI unit. (2 marks)

(ii) The figure below show a tape obtained from a ticker timer operated at a frequency of 100 Hz.



Determine the time taken to move from one dot to the successive dot. (1 mk)

b) A student from Favour high school threw a stone horizontally at a velocity of 25 m/s from a top of a tree 45 m high. Calculate ;

(i) the time taken by the stone to hit the ground.
(take g = 10 m/s^2) (2 marks)

(ii) the distance covered by the stone horizontally from the base of the tree. (2 marks)

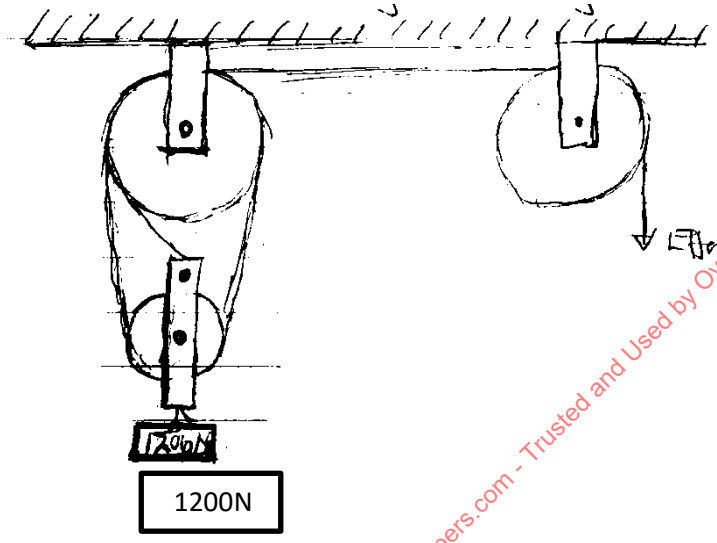
c) A car started from rest and accelerated uniformly at 2 m/s^2 for 5 seconds. It then travelled for 3 seconds with attained velocity before accelerating again at 2.5 m/s^2 for 2 seconds. The car was brought to rest within 2 seconds.

(i) Sketch a velocity - time graph for the car's motion. (2 marks)

(ii) Calculate the total distance covered by the car from the graph in (i) above. (3 marks)

15. (a) Define the term Mechanical Advantage in relation to machines. (1 mk)

(b) The figure below shows a pulley system. The minimum efforts needed to lift a load of 1200N is 500N . The load is raised through a height of 1.5 m.



Determine ;

(i) Velocity ratio of the pulley system. (1 mk)

(ii) The distance covered by the effort. (2 marks)

(iii) The efficiency of the pulley. (3 mks)

c) State the reason why efficiency in b (iii) above is not 100%. (1 mk)

d) Water of mass 200g at a temperature of 60^{0}C is put in a well logged calorimeter of mass 80g. A piece of ice at 0^{0}C of mass 20g is placed in the calorimeter and the mixture stirred until a final temperature T is reached. (Take specific latent heat of fusion of ice as 3.34 x 10^5 J/Kg)

i. State the equation relating the above information. (1 mk)

ii. Determine the heat absorbed by ice at 0^{0}C. (3 mks)

16. (a) i) State the Newton's second law of motion. (1 mk)

ii) Show that f = ma from the Newton's second law of motion in part (i) above. (2 marks)

b) A bullet of mass 20g is shot from a gun of mass 20 kg fired by a stationary soldier at a velocity of 200 m/s . Determine .

(i) the recoil velocity of the gun. (3 marks)

(ii) explain your answer in b (i) above. (1 mk)

c) A box of mass 20 kg is opposed by a frictional force whose co-efficient is 0.8 .
Calculate,

(i) Frictional force on the box. (2 marks)

(ii) State two methods of minimizing frictional force. (2 mks)

17. (a) When a bus goes around a bend on a flat road , it experiences centripetal force. State what provides the centripetal force. (1 mk)

b) State one disadvantage of flat road on the bus as compared to the banked road. (1 mk)

c) A student whirls a stone of mass of 0.2 kg using a string of 0.4 m long in a vertical plane at a constant speed of 2 revolution per second.

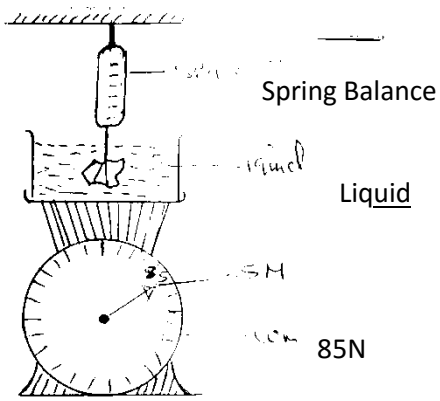
(i) State two forces acting on the stone when it is at the lowest point. (2 mks)

(ii) Determine the,

I) angular velocity of the stone. (3 mks)

II) tension of the string when the stone is at the lowest point. (3 mks)

18. A stone of mass 4 kg is immersed in a liquid as shown on the figure below. The beaker is placed on a compression balance and its reading is 85 N . The density of the stone is 3000 kg/m^3 while the density of the liquid is 800 kg/m^3.



Compression Balance

Determine the ,

a. volume of the liquid displaced. (2 marks)
b. up thrust on the stone. (3 marks)
c. reading of the spring. (3 marks)
d. reading of the compression balance when the stone was removed from the liquid. (2 marks)

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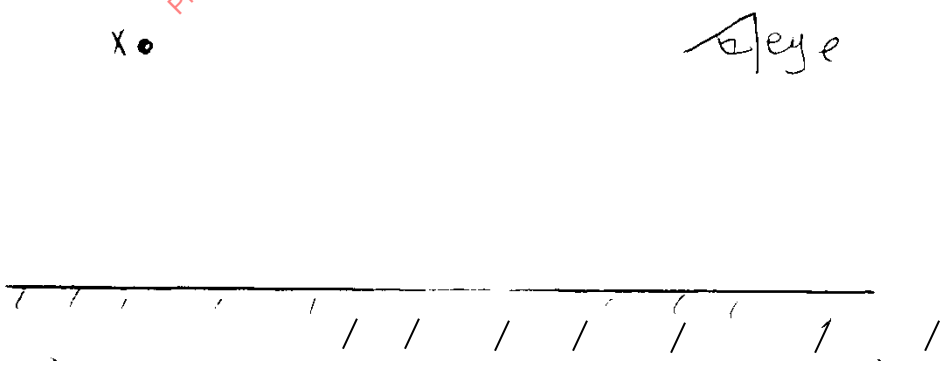
PHYSICS
Paper 2

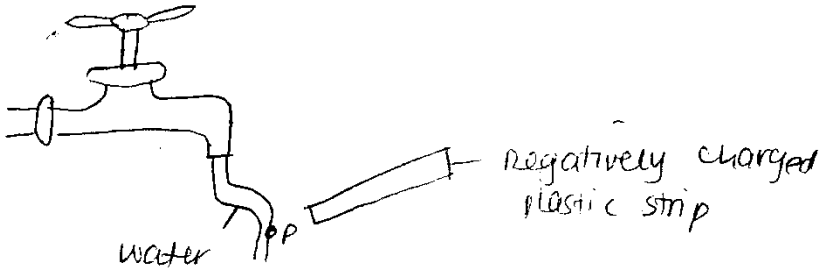
SECTION A (25 MKS)

1. The figure below shows a point object x above a horizontal plane mirror.



By drawing suitable rays, locate the image position for the object x. (2 marks)

2. Water is flowing in a very narrow stream from a water tap. A negatively charged plastic strip is held close to the stream of water as shown below.



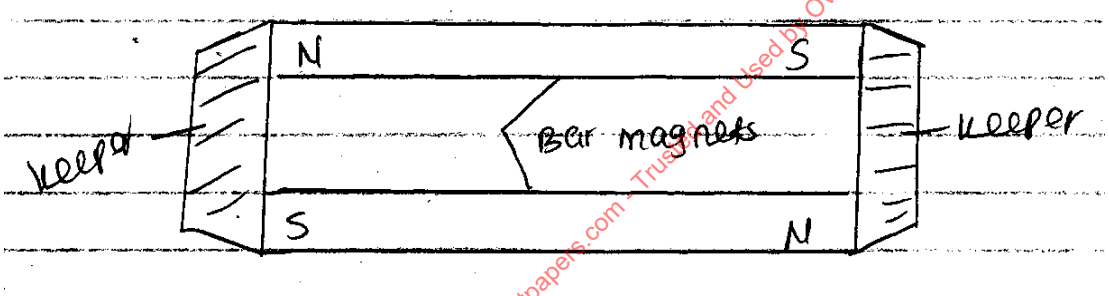
The stream of water moves towards the plastic strip in terms of the water at the point labeled P, suggest why this happens. (1 mk)

3. The chart below shows the arrangement of different parts of the electromagnetic spectrum.

Gamma rays	A	Ultra-voilet	Visible light	B	Micro waves	Radio waves

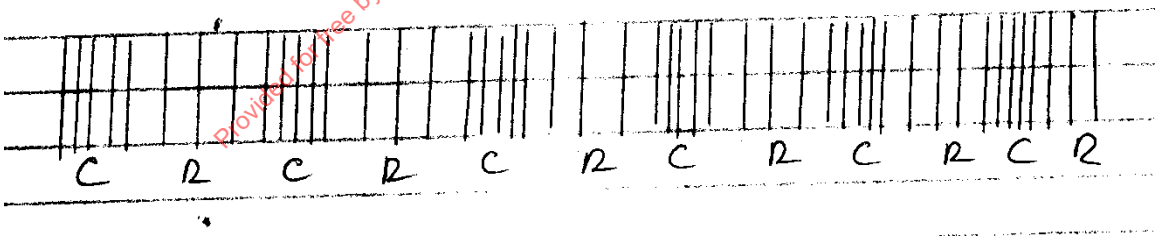
a) Name the radiation represented by A. (1 mk)
b) Name a device that can be used to detect radiation B. (1 mk)

4. The figure below shows how magnets are stored in pairs with keepers at the ends.



Explain how this method of storing helps in retaining magnetism longer. (2 marks)

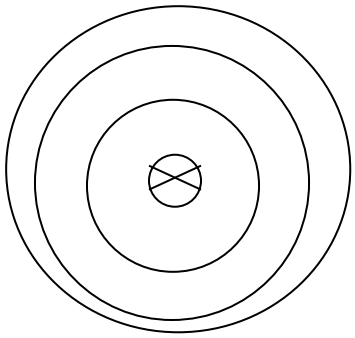
5. The diagram below shows the positions of layers of air, at one moment as a sound wave of constant frequency passes through the air. Compressions are labeled c, rarefactions are labelled R.



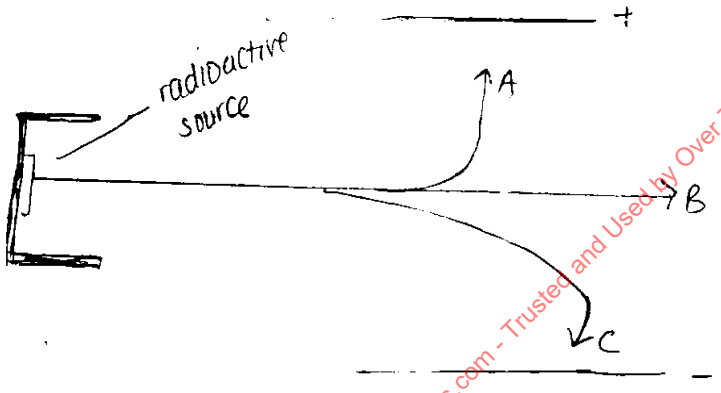
a) State how the figure would change if,
(i) the sound had a higher frequency. (1 mk)
(ii) the sound was louder. (1 mk)

b) On the same diagram , draw a line marked with arrows at each end to show the wavelength of the sound. (1 mk)

6. Show the direction of the magnetic field in the conductor carrying current shown below. (1mk)

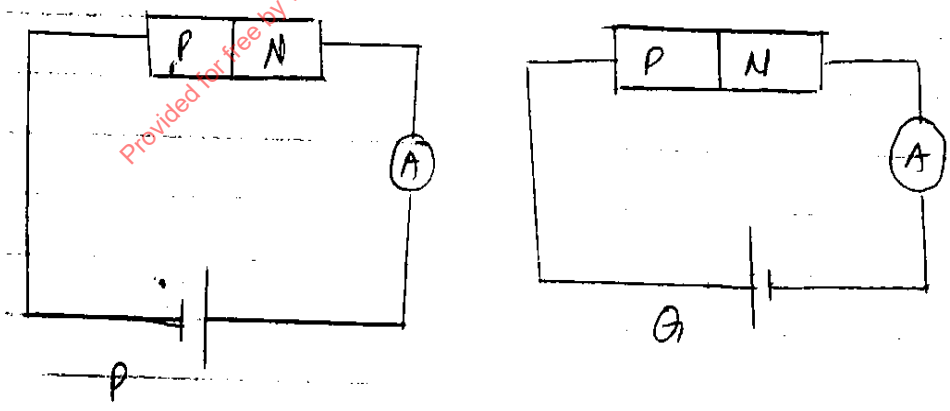


7. An electric bulb is rated 240 V, 100 W. Find the amount of current through its filament. (2 marks)
8. State two reasons why power transmission is cheaper if the voltage across the cables is very high. (2 marks)
9. Name two defects suffered by a simple cell. (2 marks)
10. The figure below shows the path taken by three radiations A, B and C from a radioactive source through the electric field.



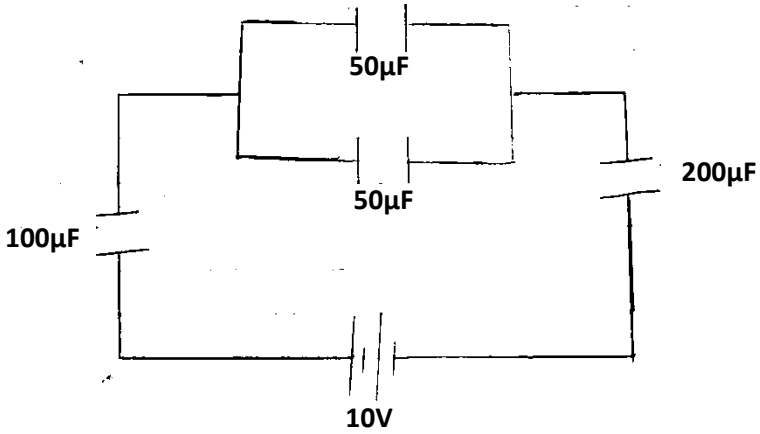
(a) Identify the radiation A, B and C . (3 mks)
(b) Give a reason for the two differences in deviation shown by A and C. (1 mk)

11. The figure below shows two ways of biasing a P-N junction.



In which circuit will the current flow? Explain the observation. (2 marks)

12. The figure below shows a combination of capacitors across a power supply.

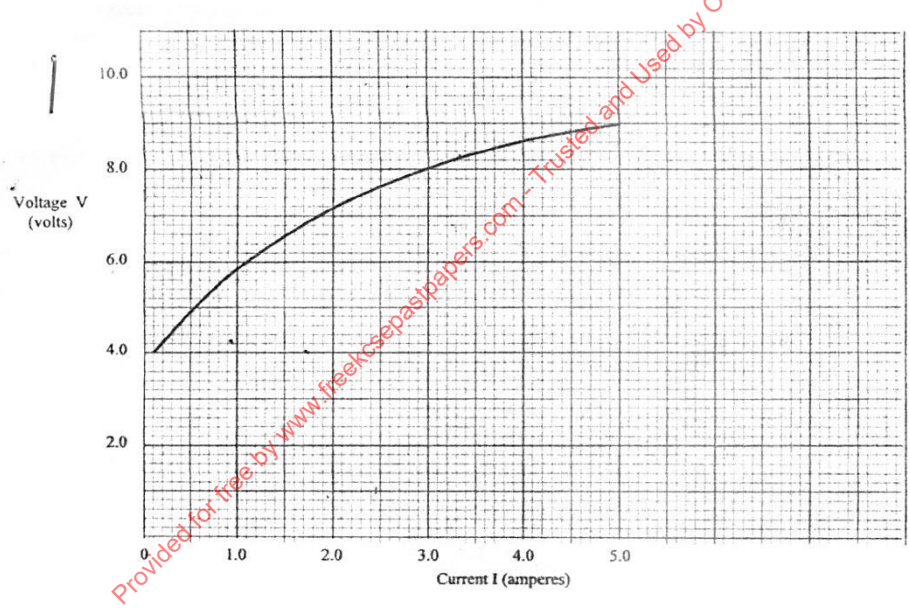


Determine the total capacitance of the system. (2 marks)

Section B (55 MKS)

13. a) State Ohms' law. (1mk)

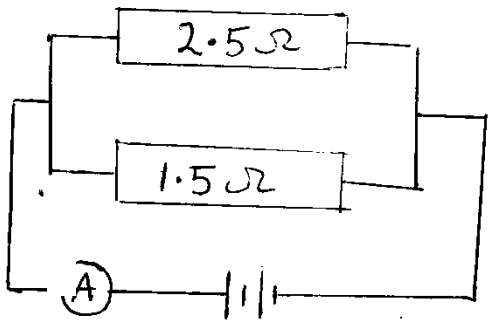
b) Figure shows a graph of the relationship between potential differences, V (V) and current, I (A) for a certain electrical device.



(i) State with a reason whether the device is ohmic or non – ohmic. (1 mk)

(ii) Determine the voltage when the current is 2.5 A (2 mks)

c) Figure – shows two resistors connected to a power supply.



Determine,

(i) The effective resistance. (2 marks)

(ii) The ammeter reading if the voltage across the source is 3.75 V. (2 marks)

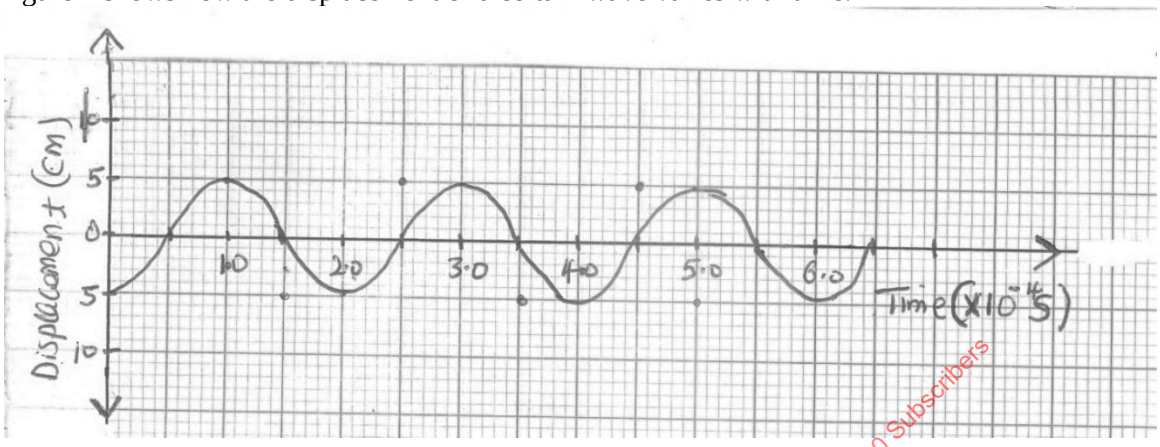
d) State the reason for the following.

(i) In a filament bulb, air is removed and the bulb is filled with an inactive gas. (1 mk)

(ii) A fuse is made of a material with low melting point. (1 mk)

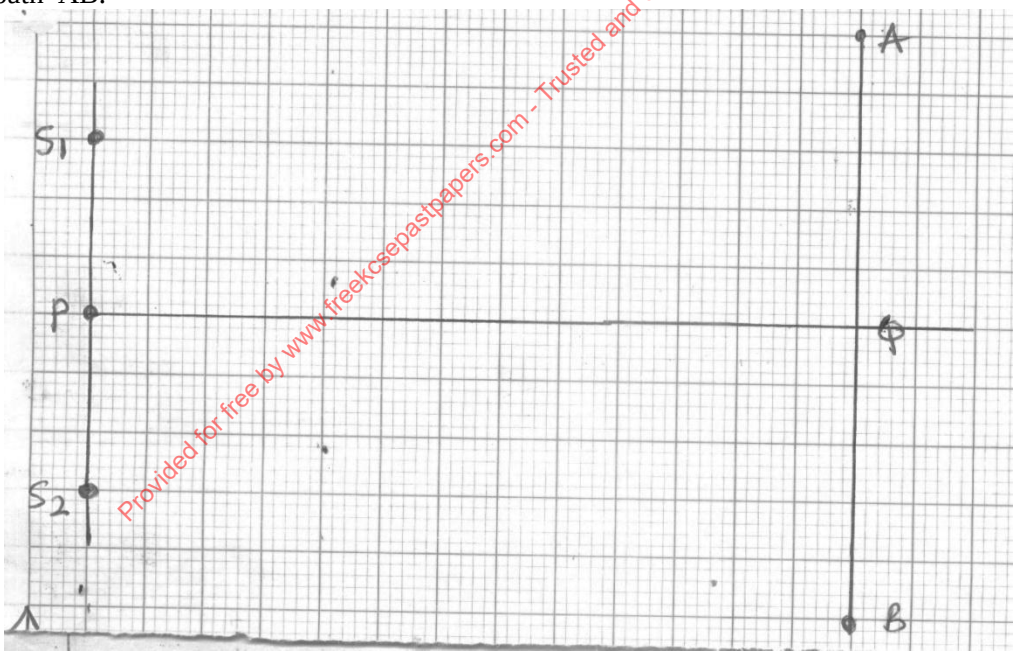
14. a) State one example of longitudinal wave. (1 mk)

b) Figure – shows how the displacement of a certain wave varies with time.



Determine the frequency of the wave. (2 marks)

c) Figure – shows two identical loud speakers L_1 and L_2 producing some sound and placed at an equal distance from a path AB.

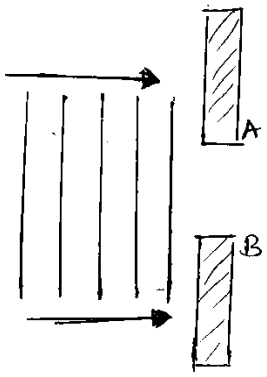


(i) A passerby walks along path A B and hears alternating loud and soft sounds.
State the reason for loud sound. (1 mk)

State the observation made when one of the loud speaker is replaced with another speaker producing sound at a higher frequency. (1 mk)

d) State one condition for the formation of a stationary wave. (1 mk)

e) Figure – shows water wave fronts incident on an opening AB



(i) On the same diagram sketch the wave fronts obtained after the waves passes the opening AB . (1 mk)

(ii) State one difference that would be observed on the wave if the opening AB was reduced to a narrow opening. (1 mk)

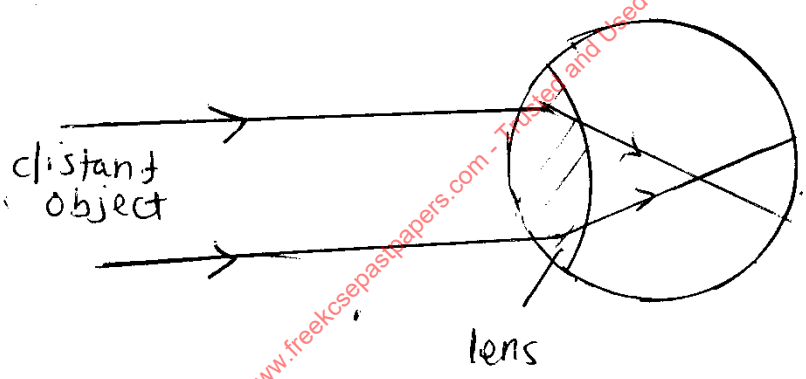
15. a) State one way in which the human eye as an optical instrument is similar to a camera. (1 mk)

b) A thin lens may be used as a simple microscope. (magnifying glass)

(i) Name the type of lens used in this way . (1 mk)

(ii) At what position must the object be placed for the type of lens in b (i) to produce virtual magnified image. (1 mk)

c) Figure below shows a defect of the eye . The eye focuses distant objects in front of the retina.

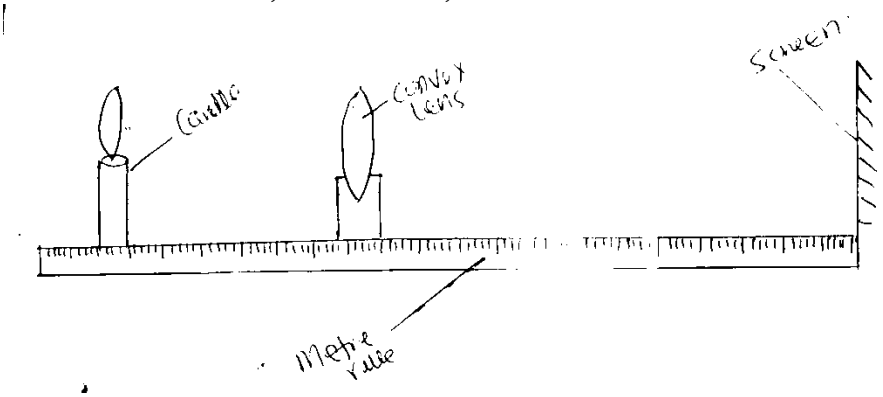


(i) Name the defect. (1 mk)

(ii) State two possible reasons for the defect. (1 mk)

(iii) On the same diagram show how the defect can be corrected. (1 mk)

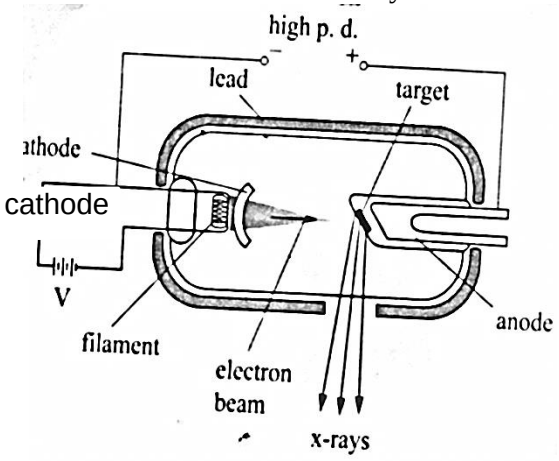
d) Figure below shows a set up used in an experiment to determine the focal length of a lens.
The set up consists of a lit candle, a convex lens, a metre ruler and a screen.



(i) State **two** measurements that should be taken. (2 marks)

(ii) Explain how the measurements in (i) above can be used to determine the focal length of the lens. (2 marks)

16. a) Figure – shows the main features in X-ray tube.



i) State reasons for the following
   I. The X-ray tube is highly evacuated. (1mk)
   II. The target is made of tungsten metal. (1mk)
   III. A high potential difference is applied between the cathode and the anode. (1mk)

ii) The X-ray produced are found to have very high penetrating power. State one adjustment that should be made in the tube in order to produce X-rays with lower penetrating power. (1mk)

iii) State one industrial application of X-rays. (1mk)

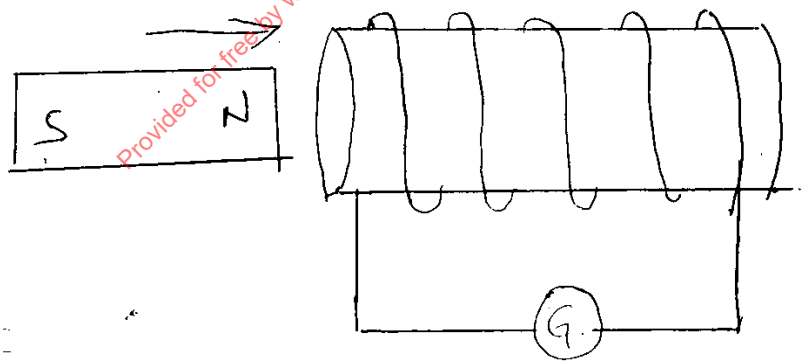
b) i) What is the meaning of the term Photo-electric effect. (1mk)

ii) The minimum frequency of light which will cause Photoelectric emission from a metal surface is 5.6 x 10^{14} Hz. If the metal surfaces irradiated with electromagnetic waves source of frequency is (6.8 x 10^{-14}Hz). Determine. (1mk)

   a. The work function of the metal surface (h = 6.63 x 10^{-34} JS) (1mk)
   b. The energy of the source radiation. (2mks)
   c. The maximum kinetic energy of the Photoelectrons produced in joules. (1mk)

17. a) State Lenz's law of electromagnetic induction. (1mk)

b) Figure shows a bar magnet being moved in to a coil connected to a galvanometer in the direction indicated.



i) State the observation made on the galvanometer. (1mk)

ii) State the observation made if
   I – The magnet is held stationary inside the coil. (1mk)
   II – The magnet is held stationary inside the coil and the coil moved towards the right hand side. (1mk)

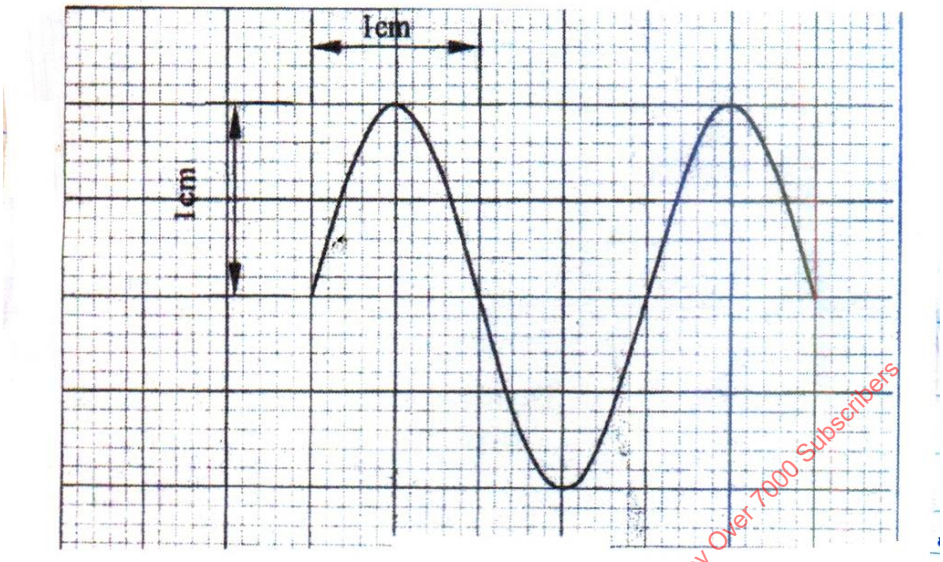
c) How is a transformer designed to minimize energy losses through flux leakage? (1mk)

d) The primary coils of a transformer has 2000 turns and is connected to a 240V AC supply. The secondary coil has 400 turns.

i) State with a reason the type of the transformer. (1mk)
ii) Determine the voltage in the secondary coils. (2mks)
iii) If the current flowing in the primary coils is 0.5A and in the secondary coils is 2.0A, determine the efficiency of the transformer. (2mks)

18. a) When an electron beam passes in a magnetic field, the beam is deflected.
What property of the electrons is shown by their behavior? (1mk)

b) Figure shows a wave form of voltage displayed on the screen of a C.R.O.



If the Y- Gain calibration is 7.5V per cm and the time base is 2.0 ms per cm.

i) Determine
I The peak to peak voltage of the input signal. (2 mks)
II The frequency of the signal. (2 mks)

ii) Sketch on the same figure the appearance of the waveform after the input signal frequency is Doubled. (1 mk)

KIRINYAGA CLUSTER
SCHOOL BASED FORM 4 EXAMINATION 2019
232/3 PHYSICS
Paper 3 Practical
Confidential

- A rectangular glass block.
- Soft board.
- Plain paper.
- Four optical pins.
- Four thumb pins.
- A protractor.
- A ruler.
- A concave mirror (of focal length 20cm).
- A cross wire mounted on the screen.
- A metre rule.
- A mirror holder.
- A candle.
- Two dry cells and a cell holder.
- A bulb (2.5V) and bulb holder.
- A voltmeter (0 - 3V or 0 – 5V).
- An ammeter (0 – 2.5A).

- A mounted nichrome wire on a millimeter scale (0.36mm)/Gauge 27.
- A switch.
- Seven connecting wires at least two with crocodile clips.
- A micrometer screw gauge.

KIRINYAGA CLUSTER
232/3
PHYSICS
PRACTICAL
PAPER 3

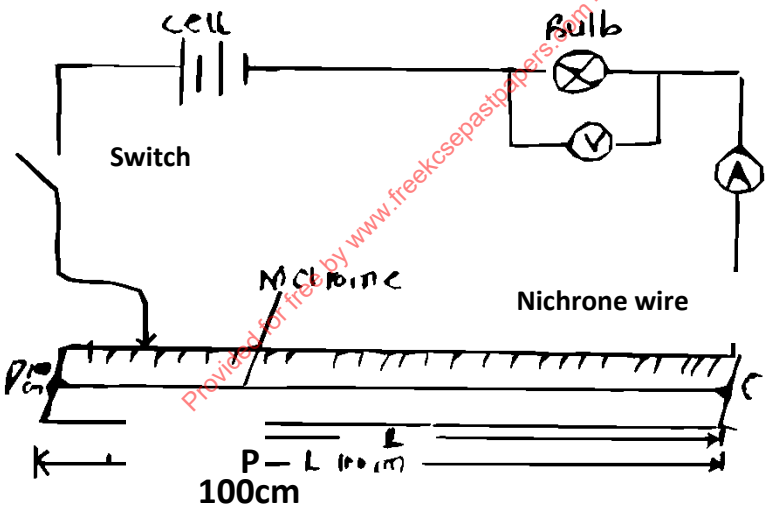
Question 1

1. You are provided with the following apparatus:
   - Two dry cells and a cell holder.
   - A bulb (2.5V).
   - A voltmeter (0-3V) or (0-5V)
   - An ammeter (0 - 2.5A)
   - A mounted nichrome wire on a millimeter scale.
   - A switch.
   - Seven connecting wires at least two with crocodile clips.
   - A micrometer screw gauge.

   Proceed as follows:

a) i) Set up the circuit as shown in figure I below.

Figure 1



ii) With the crocodile clip at P take the voltme [L = 100cm] nd the ammeter reading, I when L is 100cm. Record V and I. Repeat the proced[ure] [fo]s for L = 80, 60, 40, 20 and 0cm respectively to complete the table I below. (4mks)

Table I

Length L(cm)	100	80	60	40	20	10
Voltage V (V)						
Current I (A)						

iii) What changes do you observe on the bulb as L decreases from P? (1 mk)

iv) On the grid provided below, plot a graph of the ammeter reading (y – axis) against voltmeter reading. (5mks)

v) Determine the slope of your graph. (2mks)

vi) What physical quantity is represented by the slope of the graph at any given point? (1mk)

b) i) Given the apparatus in (a)(i) above, draw a diagram of the circuit you would use to determine the current through the resistance wire and the potential difference across it. (2mks)

ii) Set up the circuit you have drawn. Record the ammeter reading, I and the voltmeter reading, V when L = 100cm.

V = _____ V

I = _____ A (2 mks)

iii) Using a micrometer screw gauge measure the diameter, d of the wire. (1mk)

d = _____ m

iv) Calculate the quantity, $P = 0.785 (^{V}/_{I}) (^{d^2}/_{L})$

Where L is one metre. (2mks)

Question 2

Part A

You are provided with the following apparatus

- A glass block (rectangular)
- Soft board
- Plain paper
- Four optical pins
- Four thumb pins
- A protractor
- A rule

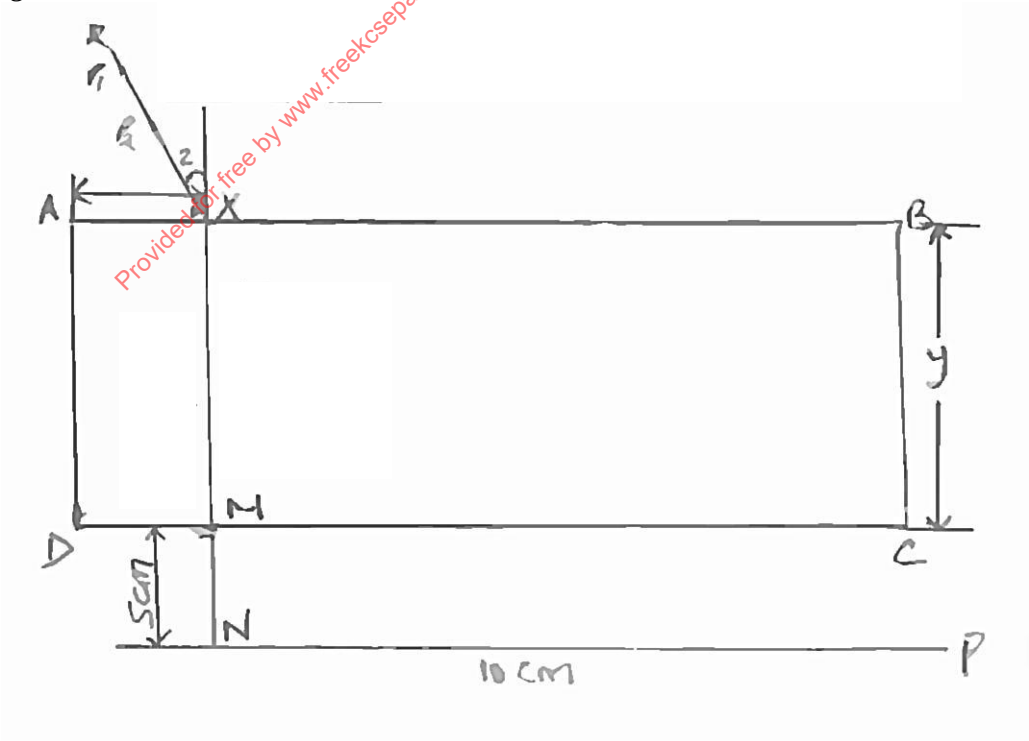
a) Fix the plain paper on the soft board using the four thumb pins.

b) Place the glass block on the plain paper (that is fixed on the soft board) let the glass block rest on the paper from the broader face.

c) Trace the glass block using a pencil.

d) Remove the glass block.

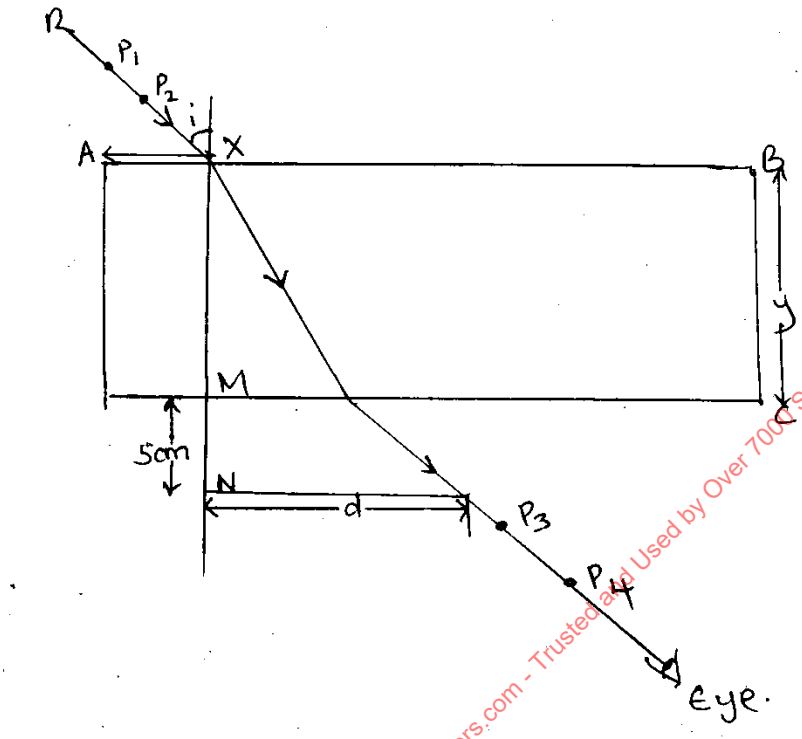
Mark point X on one of the longer side of the traced glass block as shown below. Point X should be x cm from edge A.



e) Construct a normal at X to emerge through line DC. Let this normal meet line DC at point M.

f) Mark point N along the emergent normal, 5cm from M.

g) Construct line NP to meet the normal at 90^0. Line NP can be about 10cm.
h) Using a protractor, construct an incident ray RX at an angle of incidence. i = 10^0. Fix two pins P_1 and P_2 along RX.
i) Replace the glass block to the traced outline.
j) View the path of the incident ray RX though the glass block using the other two pins P_3 and P_4. This can be done by ensuring that the images of pins P_1 and P_2 (as seen from the glass block) are in line with P_3 and P_4.
k) Remove the glass block and draw the emergent ray through P_3 and P_4.
l) Measure the distanced of the emergent ray from point N along line NP as shown below.



m) Record the corresponding values of d in the table below.
n) Repeat the procedure for other values of ***i***

Angle of incidence i^0	10	20	30	40	50	60
Distanced (cm)						
Sin ***i***						
$Sin^2 i$						

(5 mks)

o) I. Plot the graph of $Sin^2 i$ (vertical axis against d. (5 mks)

II. Calculate the gradient of the graph. (3mks)

PART B

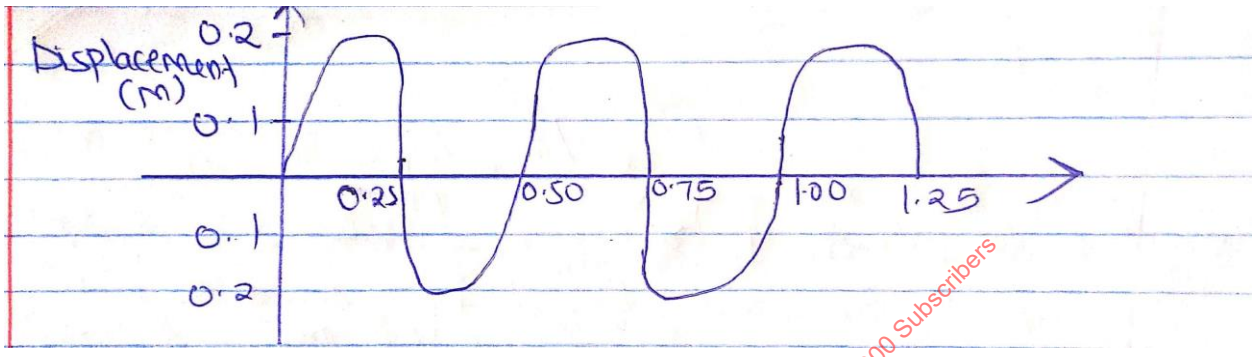
You are provided with the following

- A Concave mirror
- A cross wire mounted on the screen
- A metre rule
- A mirror holder.
- A candle

i) Set the apparatus as shown on the figure.

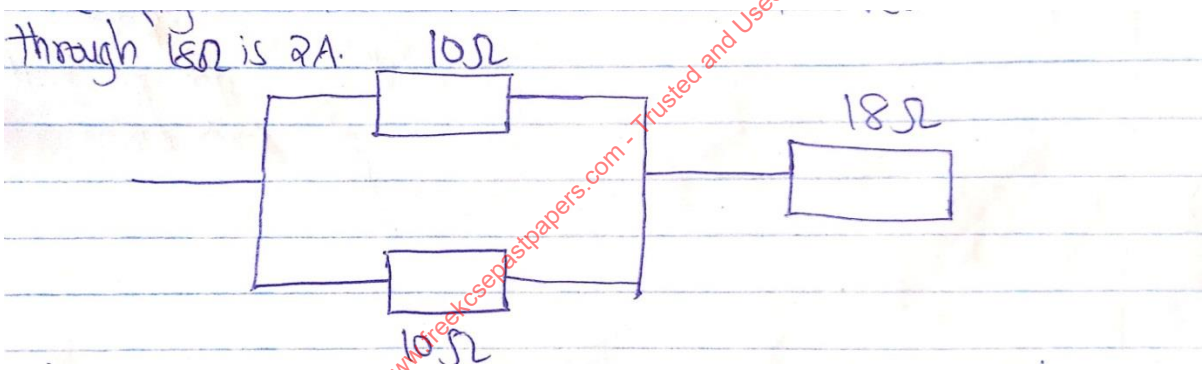
MALIET
Kenya Certificate of Secondary Education
FROM 4 PHYSICS
232/2
SECTION A

1. State the number of images formed when an object is placed between two plane mirror placed in parallel. (1mk)
2. An un-magnetized steel rod is clamped facing North-south direction and then hammered repeatedly for sometime. When tested, it is found to be magnetized. Explain this observation. (2mks
3. The figure below shows how the displacement varies with time for a certain wave.



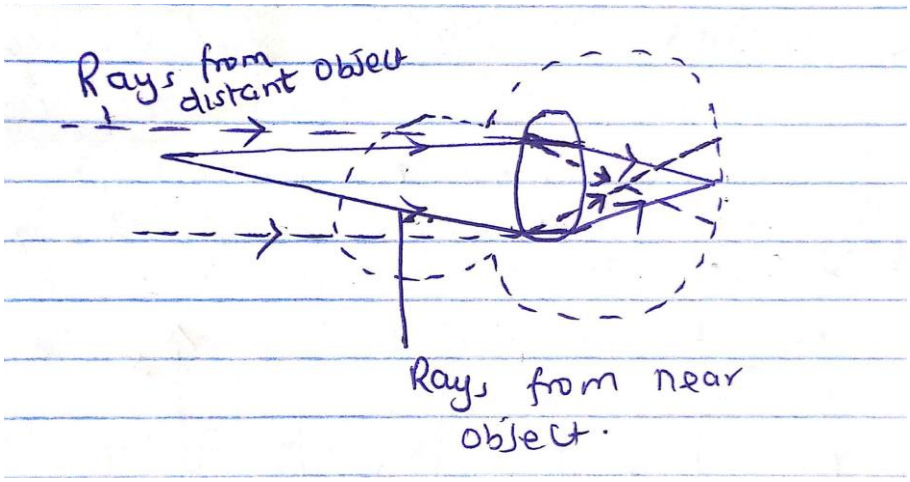
Determine the frequency of the wave. (3mks)

4. The figure below shows an electric circuit. The current through 18Ω is 2A.



State the value of the current through each of the 10Ω resistors. (1mk)

5. A heating coil is rated 100W, 240v. At what rate would it dissipate energy if it is connected to a 220V supply? (3mks)
6. The figure below shows how rays from a distant and a near object are focused inside a human eye with a certain defect.



Name the defect and state the cause of this defect.

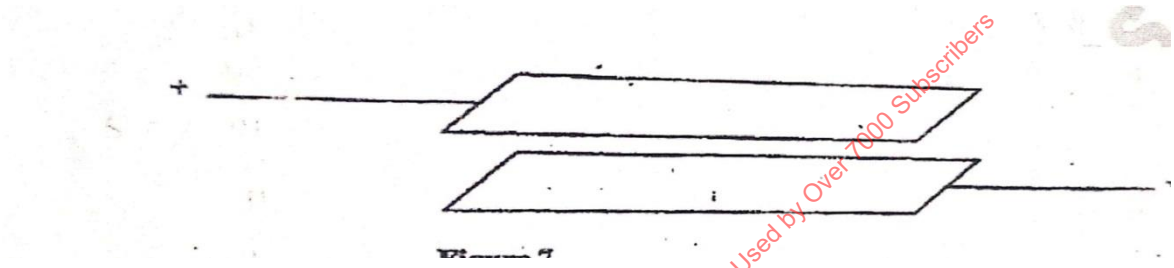
(i) Defect (1mk)
(ii) Cause of defect. (1mk)

7. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5s. he then moves 17 metres further away from the cliff and blows the whistle again. He now hears the echo after 0.6s. Determine the speed of sound. (3mks)
8. The distance between an object and its real image produced by a concave mirror is 20cm when the object is placed 10cm from the pole of the mirror. Determine the:
   (a) Linear magnification of the image. (2mks)
   (b) The focal length of the mirror. (2mks)
9. Determine the speed of light in water given that the speed of light in air is 3.0×10^8 m/s and the refractive index of water is 1.33. (3mks)
10. Give a reason why it is necessary to leave the caps of the cells opened while charging an accumulator. (1mk)

SECTION B (55 MARKS)

Answer all the questions in this section in the spaces provided.

11. (a) Figure 7 shows a pair of parallel plates of a capacitor connected to a batter the upper plates is displaced to the left.



State with reason the effect of this movement of the capacitance. (2mks)

b) Figure 8 shows an electric circuit with three capacitors A, B and C of capacitance 4.0μF, 5.0μF and 3.0μF respectively connected to a 12V battery. Determine:

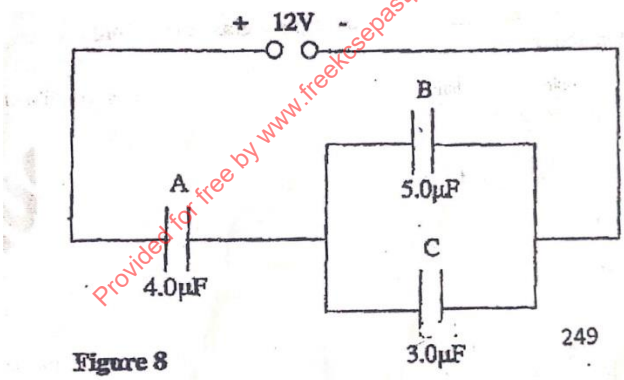


Figure 8

a. The combined capacitance of the three capacitors. (3mks)
b. The charge of the capacitor A (2mks)
c. The potential difference across the capacitors B. (2mks)

12. A bullet of mass 24g travelling in a horizontal path with a velocity of $450ms^{-1}$ strikes a wooden block of wood of mass 976g resting on a rough horizontal surface. After impact, the bullet and the block move together for a distance of 7.5m before coming to rest.
   (a) Name the type of collision which takes place above. (1mk)
   (b) What's the velocity of the two bodies when they start sliding. (2mks)
   (c) Calculate the force which brings the two bodies to rest. (3mks)
   (d) Determine the coefficient of friction between the block and the surface during this motion. (2mks)
13. A stone is projected vertically upwards with a velocity of 30m/s from the ground. Calculate:
   (a) The time it takes to reach the maximum height. (2mks)

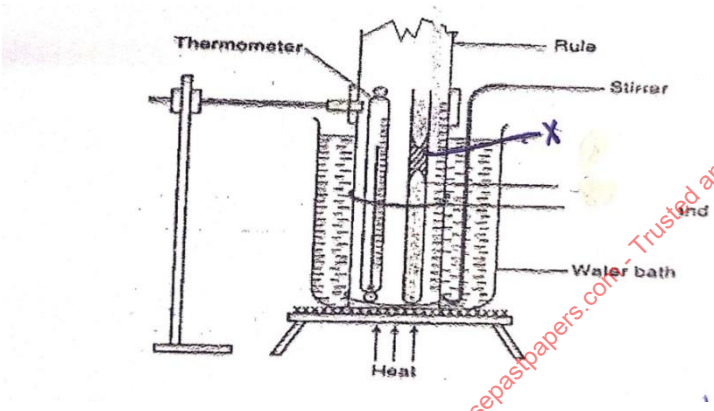
(b) The time of flight. (2mks)
(c) The maximum height reached. (2mks)
(d) The velocity with which it lands on the ground (take g=10m/s^2) (3mks)

14. In an experiment to determine the refractive index of a transparent material in form of a rectangular block, the following results were obtained.

Angle of incidence (i)	Angle of refraction (r)	Sin i	Sin r
100^o	5.0^o		
20^o	9.8^o		
30^o	14.5^o		
40^o	18.7^o		
50^o	22.5^o		
60^o	25.7^o		

(a) Complete the table. (4mks)
(b) Plot a graph of sin r (y-axis) against sin i and calculate the refractive index of the material from the graph. (7mks)
(c) Determine from the graph the angle of refraction for which the angle of incidence is 36^o. (2mks)
(d) Calculate the angle beyond which total internal refraction will occur for light travelling from the material to another one of refractive index 1.5 (3mks)

15. (a) State Pressure Law. (1mk)
b) The following diagram shows a set up of apparatus used to verify Charles Law.



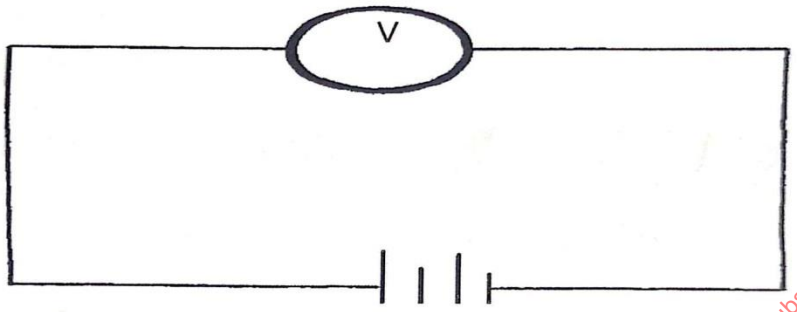
(i) Give the name of part labeled X and state Charles law. (2mks)
(ii) What is the function of the part named in (i) above? (1mk)
(iii) Briefly explain how to set up above is used to verify Charles Law. (4mks)
(c) A certain mass of hydrogen gas occupies a volume of 1.6m^3 at a pressure of 1.5x10^{5}Pa and a temperature of 12^{o}C. Determine the volume when the temperature is 0^o C at a pressure of 1.0x10^{3}Pa. (2mks)
(d) Differentiate between an ideal gas and real gas and define what absolute temperature is. (3mks)

MALIET JOINT EXAM
FORM 4 PHYSICS
232/3

1. You are provided with:
   - A resistance wire mounted on millimeter scale
   - Two dry cells in a cell holder
   - A voltmeter
   - Four connecting wires, one with a crocodile clip at one end

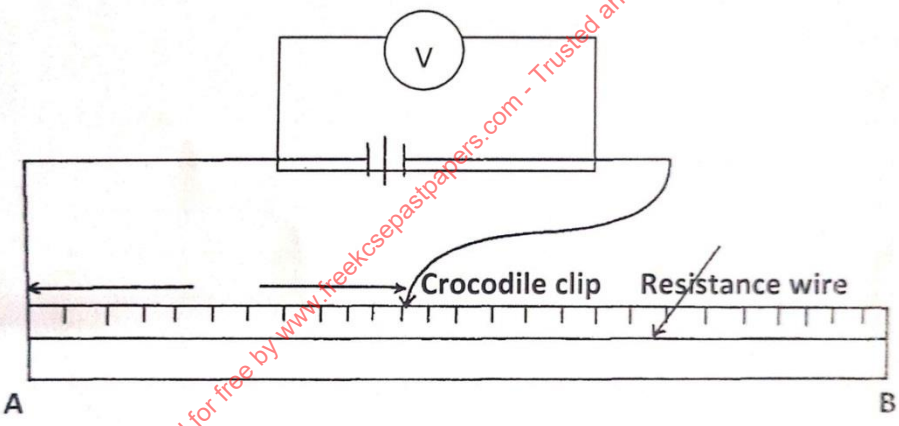
   Proceed as follows:-

   (a) Set up the circuit as in the figure below and determine the total electromotive force E, of the cells.



Electromotive force E, of the cells …….. Volts

   (b) Set up the circuit shown in the figure below, connect the wire with clip on the mounted wire at a length (L) of 10cm from the end marked A. Record the voltmeter reading in the table provided in part (c) below:



   (c) Repeat the procedure in (b) above for the following values of length L: 20cm, 30cm, 40cm, 50cm, and 60cm and complete the table below: (5mks)

L(cm)	V(volts)	E-V(volts)	$\frac{V}{E-V}$
10			
20			
30			
40			
50			
60			

   (d) Plot a graph of $\frac{V}{E-V}$ against L(cm. (5mks)

   (e) Determine the slope of the graph. (3mks)

   (f) Given the equation $\frac{V}{E-V} = K_1L_1 + K_2$. Determine the values of K_1 and K_2. (3mks)

K_1…….. K_2……..

(g) Given that $4K_2r = 10$ where r is the internal resistance of the cells. Determine the value of r. (3mks)

2. You are provided with the following apparatus.
   - A candle
   - A lens holder
   - A convex lens
   - A screen
   - A metre rule
   - An object

Proceed as follows

Using an object at infinity outside the room, focus its image on the screen provided. The image should be as sharp as possible and inverted. Measure the distance from the lens to the screen hcm. Repeat the same for three other values of H. Record your results and then calculate the average value of the three results, Hcm.

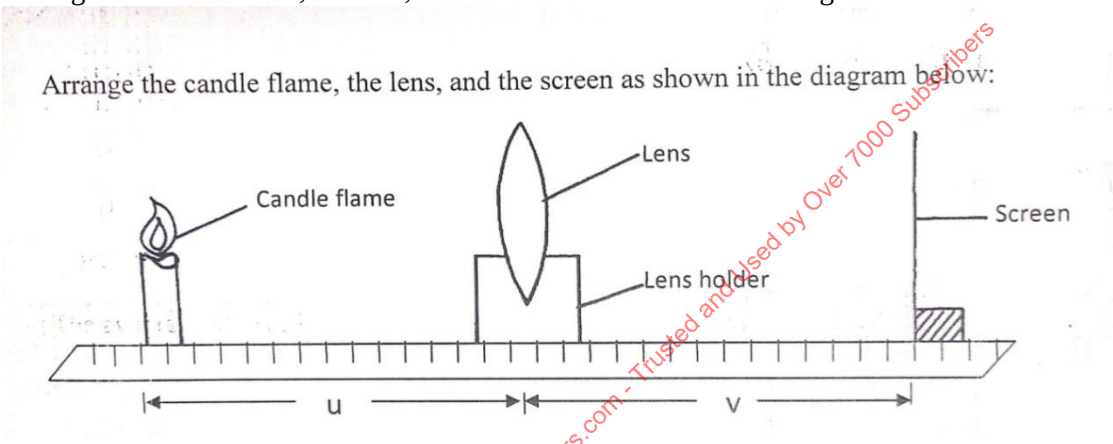
First reading of h……. (1mk)

Second reading of h …… (1mk)

Third reading of h …….. (1mk)

The average value of h(H) …….. (1mk)

Arrange the candle flame, the lens, and the screen as shown in the diagram below:



b) (i) For particular Value of u, adjust the position of the screen until a sharp image appears on the screen. Measure distance Vcm. Repeat the experiment for each of the other values of u, and enter the results in the table below: (7mks)

Distance L (cm)	Distance V (cm)	uv (cm^2)	U + v (cm)
12			
15			
18			
21			
24			
27			
30			

ii) Plot a graph of uv against u+u (5mks)

iii) From your graph, calculate the slope S. (2mks)

iv) Calculate the value of k given that kH=S. (2mks)

ii) For an incompressible fluid whose flow is steady, the flow rate (AV) is constant.

iii) $A_1V_1 = A_2V_2$

$30 \times 4 = 75 \times A_2$

$A_2 = \frac{30 \times 4}{7.5}$

$= 16cm^2$

MALIET JOINT EXAMINATIONS PHYSICS
232/2
MARKING SCHEME

1. Infinite
2. Hammering causes the domain or dipoles to vibrate when settling, some domain align themselves in the N-S-direction due to the earths magnetic field causing magnetization.
3. Period T = 0.5sec

   $F = \frac{1}{T} = \frac{1}{0.5} = 2H$
4. $\frac{2A}{2} = 1A$
5. $P = \frac{V^2}{R}$

   $100 = \frac{220^2}{204^2}$

   $R = \frac{240^2}{100}$

   E = 84J/S
6. Short sightedness / myopia
   Extended eyeball / lens has short focal length / eye ball too long
   (any two)
7. $\frac{2d}{0.5} = \frac{2d}{0.6} + 34$

   $D = \frac{17}{2} = 85m$

   $Speed = \frac{2 \times 85}{0.5}$

   $= 340$ m/s or

   $V = \frac{d}{t}$

   $\frac{17 \times 2}{0.1}$

   $= 340m/s$
8. (a) u = 10cm
   V = 30cm

   $M = \frac{v}{u} = \frac{30}{10} = 3$

   (b) $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

   $= \frac{1}{30} + \frac{1}{10}$

   $= \frac{1+3}{30} = \frac{4}{30}$

   $F = \frac{30}{4}$

   F = 7.5cm
9. $n = \frac{speed\ of\ light\ in\ air}{speed\ of\ light\ in\ media}$

MATUNGU SUB-COUNTY JOINT EVALUATION EXAMINATION – 2019
PHYSICS
PAPER 1
(THEORY)
SECTION A – 25MARKS

Answer **all** questions in this section in the spaces provided

1. Define a derived physical quantity (1mark)

2. Figure 1 below shows part of sleeve scale of a micrometer screw gauge. Insert the thimble scale, to show a reading of 14.74mm. (1mark)

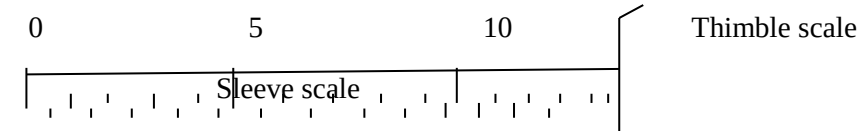


Fig 1

3. Figure 2 below shows a uniform metre rule pivoted at the 70cm mark. It is balanced by a weight of 2N suspended at the 95cm mark.

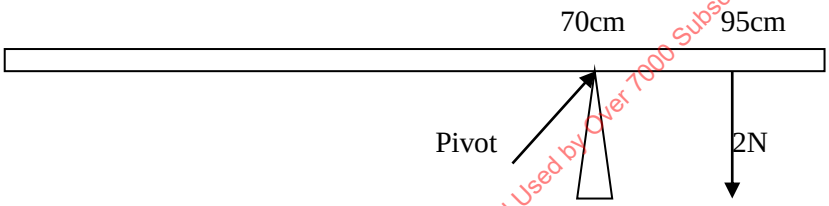
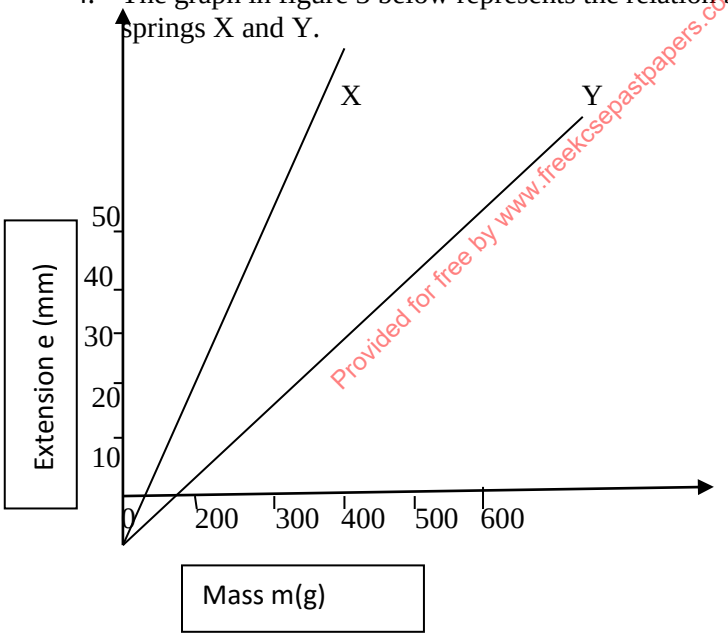


Fig 2

Determine the weight of the metre rule (2marks)

4. The graph in figure 3 below represents the relation between extension, e, and mass, m, added on two spiral springs X and Y.



Given that the two springs are made of the same material, give a reason why the graphs are different (1 mk)

5. A cart of mass 100kg is pushed along a horizontal path by a horizontal force of 15N and moves with a constant velocity. The force is then increased to 23N. Determine the acceleration of the cart (3marks)
6. The total weight of a car with passengers is 2500N. The area of contact of each of the FOUR tyres with the ground is 0.025m^2. Determine the minimum car tyre pressure (1mark)
7. A parachute falling through the air attains terminal velocity after a short-time. State the reason why it attains terminal velocity (1mark)

8. Study the figure below and answer the questions that follow. The balloons A and B are identical

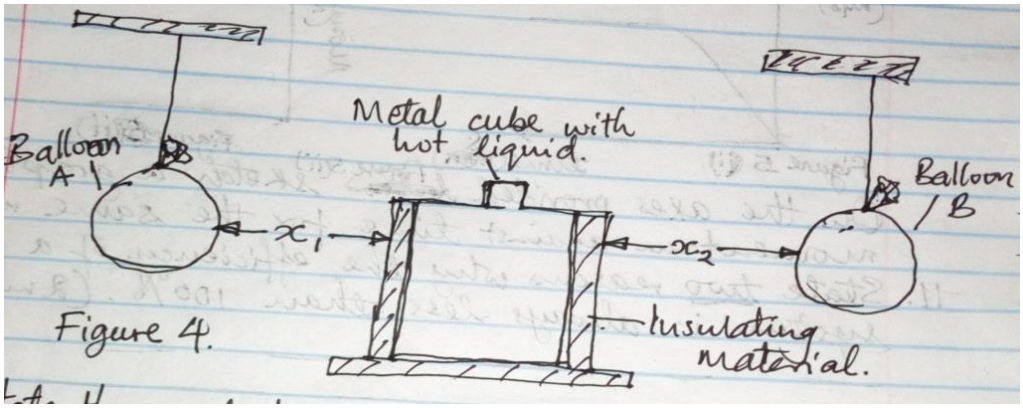


Figure 4.

i) State the mode by which heat travels from the cube to the balloons (1mark)

9. The face of the cube towards balloon A is bright and shiny and the face B is dull black. State with reason the adjustments that should be made on the distance X_1 and X_2 so that the rate of change of temperature in both balloons is the same (2marks)

10. The figure 5(i) below shows a velocity-time graph for a small metal sphere falling through a viscous fluid

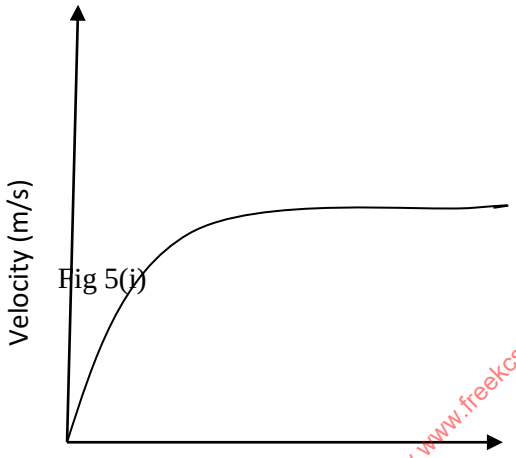


Fig 5(i)

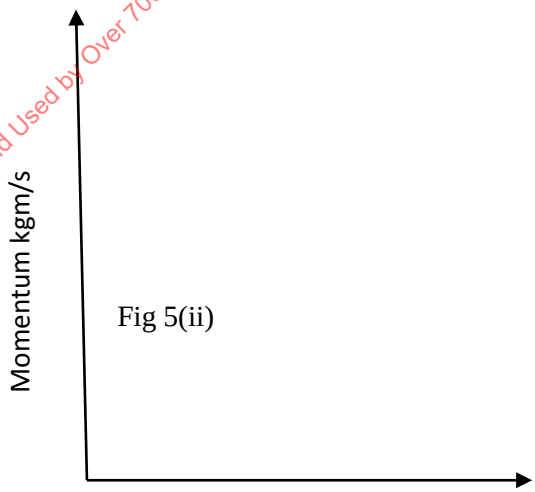


Fig 5(ii)

On the axes provided (figure 5ii) sketch a graph of momentum against time for the same mass (1mark)

11. State two reasons why the efficiency of a pulley system is always less than 100% (2marks)
12. A ball of mass 200g is thrown vertically upwards through air of resistance of 0.4N. Determine the acceleration of the ball (3marks)
13. A gas of volume $20cm^3$ exerts pressure of 7600mmHg at 25^0C. Determine the temperature of the gas when the pressure increases to 9000mmHg and the volume is reduced to $15cm^3$ (3marks)

SECTION B – 55 MARKS

Answers all the questions in this section

14. A student whirls a stone of mass 0.2kg tied to a string of length 0.4m in a vertical plane at a constant speed of 2 revolutions per second. (Take acceleration due to gravity g as $10m/s^2$)

Determine:-

i) Angular velocity of the stone (3marks)

ii) Tension in the string when the stone is at the highest point (3marks)

b) Figure 6 below shows a graph of tension, T against angular velocity squared, w^2 for an object whirled at a constant radius of 30cm

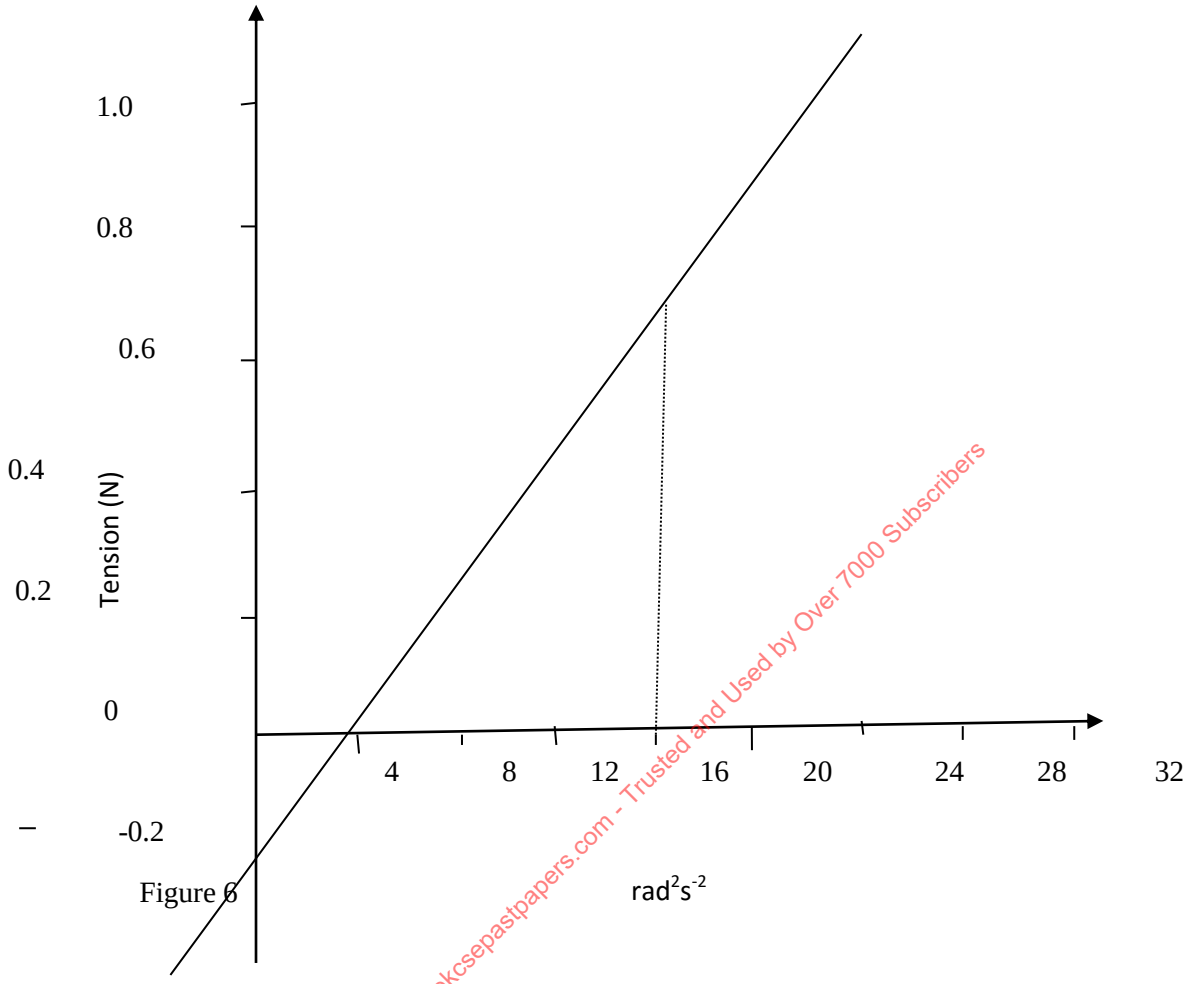


Figure 6

i) From the graph, determine the mass m, of the body given that $T=mrw^2 - c$, where c is a constant (4 mks)

ii) Determine the constant c (1mark)

c) State the purpose of banking roads at bends (1mark)

15. (a) State the two forces acting on a body immersed in a liquid. (2 mks)

(b) Figure 7 shows a block of wood of mass 5kg submerged in water in a pond and held in position by a thin rope fixed to the bottom of the pond

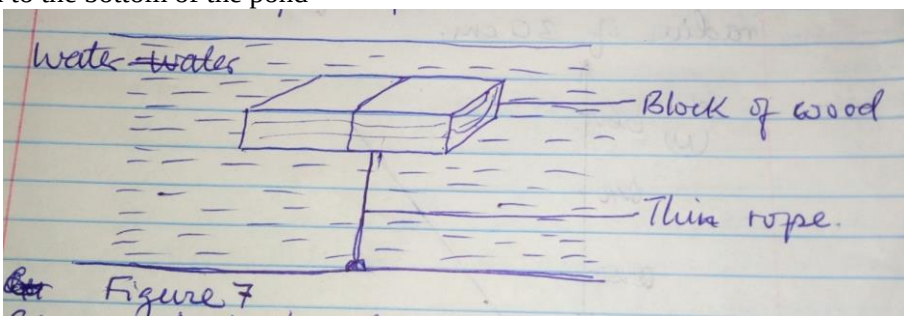


Figure 7

Given that the density of water is $1000kgm^{-3}$ and that of wood is $800kgm^{-3}$, determine

i) The volume of the wooden block (2marks)

ii) The upthrust on the wooden block (2marks)

iii) The tension in the rope (2marks)

16. V_1, V_2, V_3 and V_4 represent speeds of water as it flows steadily through the sections of the tube. Arrange the speeds in decreasing order starting with the highest (1mark)

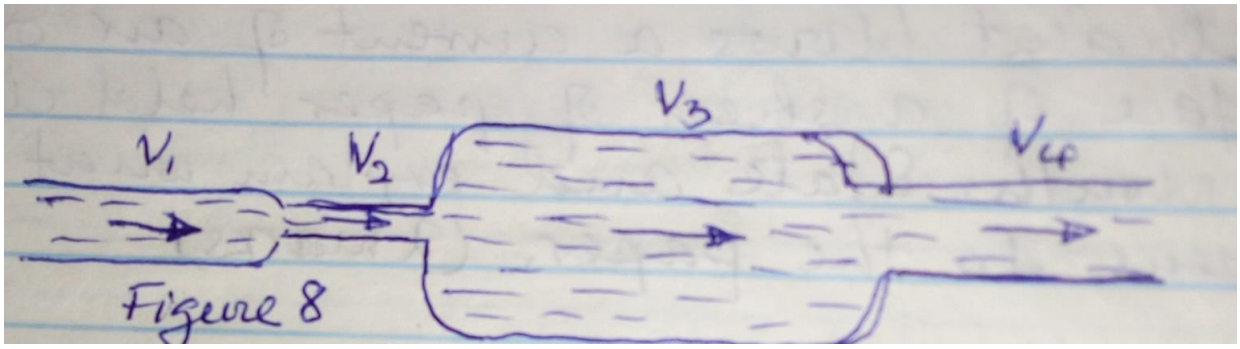


Figure 8

ii) State two assumptions made when deriving the equation of continuity (2marks).

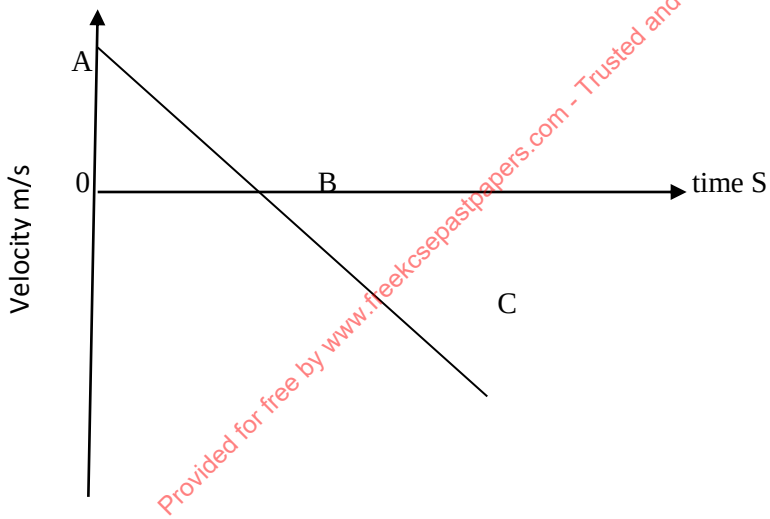
b) A lawn sprinkler has 40 holes each of cross sectional area 0.02cm^2. It is connected to a hose pipe of area 1.6cm^2. If the speed of water in the hose pipe is 1.2m/s, calculate

i) The flow rate in the hose pipe (2marks)

ii) The speed at which the water emerges from the holes (3marks)

c) A student blows a current of air over the surface of a sheet of paper held close to the mouth. State and explain what happens to the paper (2marks)

17. Figure 9 below shows a graph of velocity – time below for a moving body.



a) Describe the motion of the body in the stated sections

AB (2marks)

Point B (1mark)

BC (2marks)

b) In an experiment to determine the acceleration due to gravity, g, a student made the following measurements

- Period, T = 1.66s
- Length of pendulum = 70.5cm

Given that $T = 2\pi\sqrt{\frac{l}{g}}$, determine the value of g correct to two significant figure (3marks)

c) A car moving initially at 10m/s decelerates at 2.5m/s^2

Determine:

i) Its velocity after 1.5s (2marks)

ii) The distance travelled in 1.5s (2marks)

iii) The time taken for the car to stop (2marks)

18. State two factors on which turning effect of a force depends. (2marks)

b) Describe briefly how you can experimentally determine the centre of gravity of an irregularly shaped lamina object (4marks).

ii) State the reason why a steel sphere resting on a horizontal surface is said to be in a neutral equilibrium (1mark)

c) Two painters P and Q carried a uniform ladder 3.6m long weighing 1200N. P held the ladder from one end while Q supported the ladder at a point 0.4m from the other end. Calculate the load supported by each painter (3marks)

MATUNGU SUB-COUNTY JOINT EVALUATION EXAMINATION – 2019
232/2
PHYSICS
PAPER 2
(THEORY)
2HOURS
SECTION A – 25 MARKS

1. Figure 1 shows a ray of light incident on a mirror making an angle of 45° with the mirror. Another mirror is placed at an angle of 45° to the first one as shown.

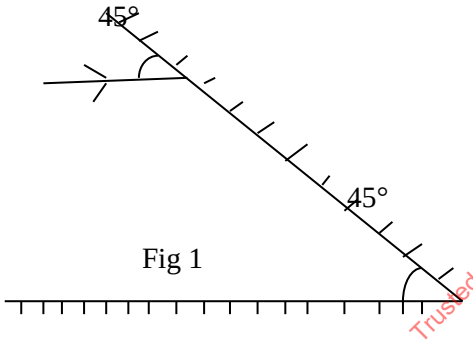


Fig 1

Sketch the path of the ray until it emerges (2marks)

2. You are provided with a charged electroscope, an insulator and a conductor. Describe how you would identify a conductor from an insulator given that the properties of the material given initially were unknown. (2 marks)
3. When alternating current is passed over a magnet facing east-west direction, it (magnet) loses its magnetic strength. Explain (2marks)
4. An electromagnet is made by winding insulated copper wire on an iron core. State two changes that could be made to increase the strength of the electromagnet (2marks)
5. (a) State the purpose of manganese (IV) oxide in a dry cell (1mark)
   (b) Name two indicators/measurements that will inform your decision whether or not your lead acid accumulator is due for recharging (2marks)
6. Figure 2 below shows an object, O in front of a concave mirror and its image, I formed after reflection

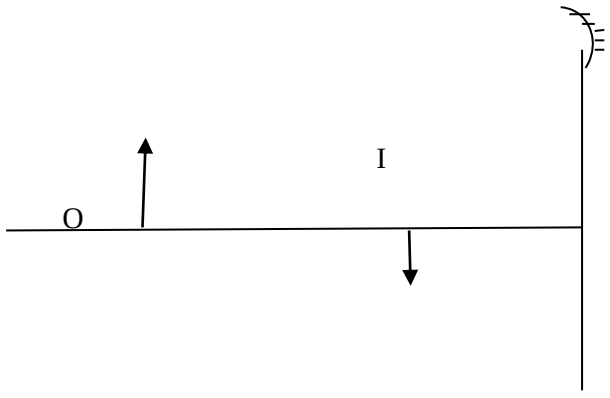


Fig 2

a) On the same diagram draw appropriate ray(s) to locate the principal focus, F, of the mirror (2 marks)
b) Determine the focal length of the mirror (scale 1:5) (1mark)

7. The figure 3 below shows a wave profile for a wave whose frequency is 20Hz

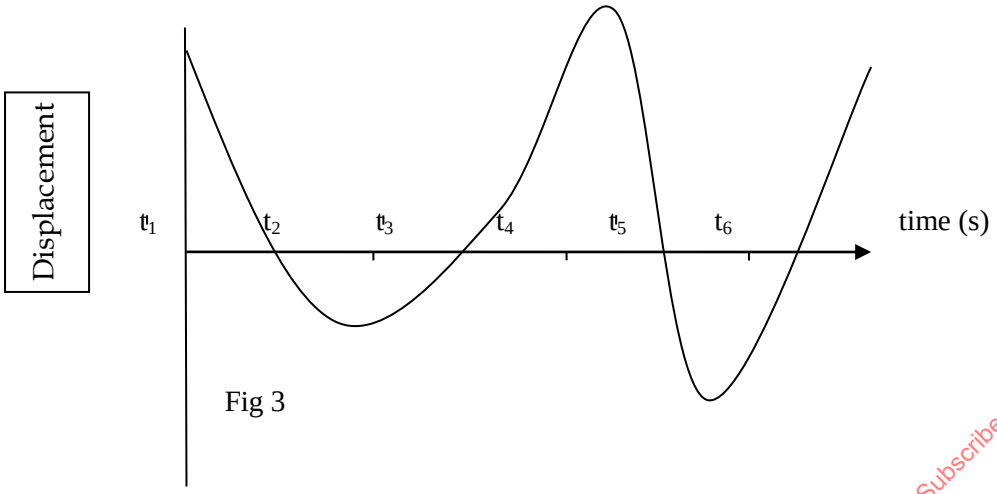


Fig 3

Determine the value of t_3 (s) (2marks)

8. Determine the maximum number of 75W bulbs which can be used to run on a 240V source with a SA fuse (3marks)
9. A boy standing in front of a cliff blows a whistle and hears the echo after 0.5seconds. He then moves 34metres further away from the cliff and blows the whistle again. He now hears the echo after 0.7seconds. determine the speed of sound (3marks)
10. The figure below shows part of the electromagnetic spectrum starting from the part with least frequency

Radio	Infra Red	Visible	A	B	C

a. Identify radiation represented by A (1mark)
b. Give one use of radiation represented by C (1mark)

11. State why sound waves are easily diffracted unlike light waves (1mark)

SECTION B – 55MARKS

12. (a) State Ohm's law (1mark)
b) Three resistors of resistance 2Ω, 4Ω and 6Ω are connected together in a circuit. Draw a circuit diagram to show the arrangement of the resistor which gives minimum resistance (1mark)
(c) Figure 4 shows a cell in series with a 3Ω resistor and a switch. A voltmeter is connected across the cell.

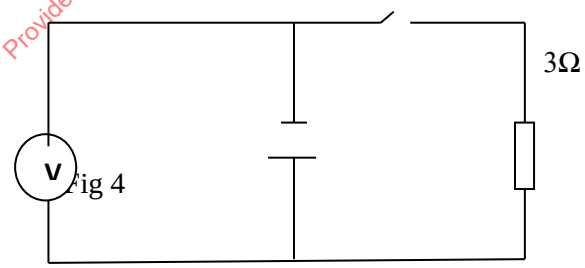


Fig 4

The voltmeter reads 1.5V with the switch open and 1.2V with the switch closed.

i) State the electromotive force of the cell (1mark)
ii) Determine the current through the 3Ω resistor when the switch is closed (2marks)
iii) Determine the internal resistance of the cell (2marks)
(d) A circuit consists of a battery, a metal wire, an ammeter and a switch connected in series. The switch is closed and the ammeter reading noted. The metal wire is now heated. State the observation made on the ammeter reading and give a reason for your answer (2marks)

13. (a) Define capacitance and state its SI unit (2marks)

b) A form 3 girl burned a candle just above the cap of a negatively charged electroscope. State and explain the observation she made on the electroscope (2marks).

c) Figure 5 shows three capacitors connected to a 10V battery

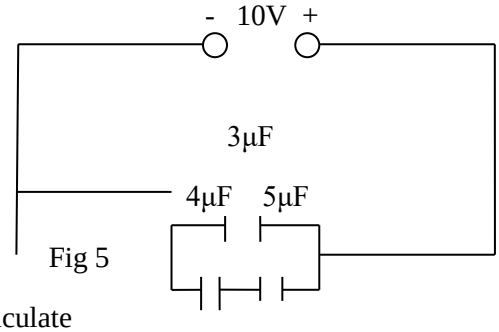


Fig 5

Calculate

i) The combined capacitance of the three capacitors (3marks)

ii) The charge on the 5μF capacitor (3marks)

d) State any one use of a capacitor (1mark)

14. a) Define principal focus as used in refraction on a convex lens (1mark)

b) A vertical object is placed 20cm in front of a convex lens of a focal length 5cm. Determine

i) The image distance (3marks)

ii) State two characteristics of the image (2marks)

c) Name any defect of the eye and state the type of lens used to correct it (2marks)

d) Give one similarity and one difference between human eye and a camera (2marks)

15. (a) State Faraday's law of electromagnetic induction (1mark)

b) Figure 6 shows a current carrying coil in a magnetic field

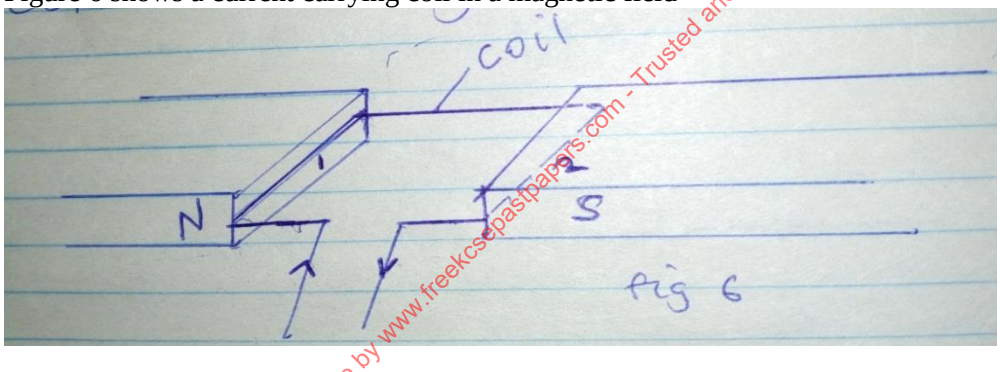


Fig 4

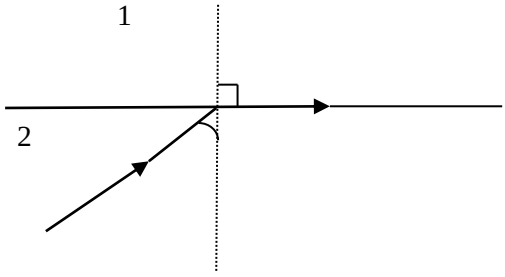
i) Indicate on the diagram the direction of the forces acting on the sides of the coil labeled 1 and 2 (2marks)

ii) State two ways of increasing the force on the coil (2marks)

c) List any one application of an electromagnet (1mark)

16. (a) State Snell's law (1mark)

b) Figure 7 shows a ray of light on the boundary between two media 1 and 2 at an angle θ.

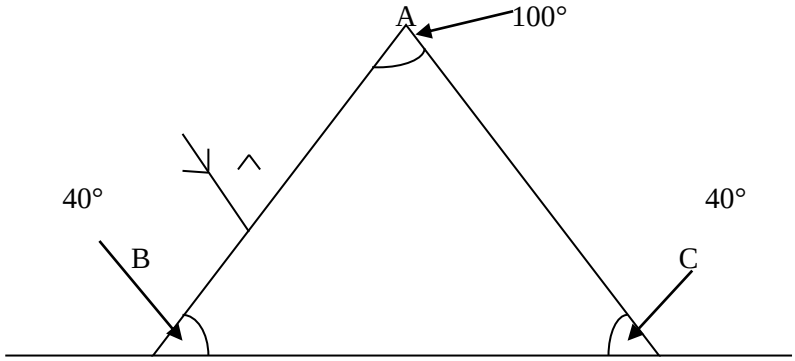


Show that the refractive index of medium 2 is given by $_1n_2 = \frac{1}{Sin\ \theta}$ (2marks)

c) A coin is placed at the bottom of a tall glass jar. When the jar is filled with paraffin to a depth of 32.4cm, the coin is apparently seen displaced 9.9cm from the bottom. What is the refractive index of paraffin (3 marks)

d) One of the conditions for total internal reflection to occur is that light must come/travel from a denser medium to a rare medium. State the other condition (1mark)

e) Figure 8 shows a ray of light incident on a glass prism.

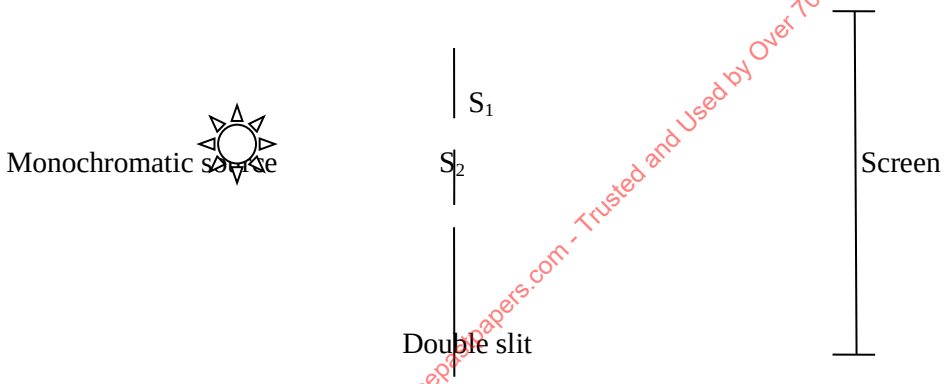


If the critical angle of the glass is 39° sketch on the same diagram the path of the ray until it emerges from the prism (3marks)

17. a) What is a progressive wave? (1mark)

b) State any 2 conditions necessary for the formation of a standing/stationary wave. (2marks)

c) In an experiment to observe interference of light waves, a double slit is placed close to the source



i) State the function of the double slit (1mark)

ii) Describe what is observed on the screen (2marks)

iii) State what is observed on the screen when:-

I) The slit separation S_1S_2 is reduced (1mark)

II) White light source is used in place of monochromatic source (1mark)

d) State any one factor that affects the speed of sound in air (1mark)

MATUNGU SUB- COUNTY JOINT EXAM- MAY/JUNE 2019
PHYSICS PRACTICAL CONFIDENTIAL
QUESTION 1

- Each candidate will require
- Centre zero galvanometer
- One new size D dry cell & cell holder
- A switch
- Eight connecting wires each with crocodile clip at one end.
- A piece of nichrome wire swg 28 (diameter 0.32 mm) of length 30cm. To be mounted on a piece of wood and label it Y.
- A resistance wire labeled AB 100cm long mounted on a millimeter scale
- Six 10 Ω carbon resistors.
- A jockey (a crocodile clip may be used)
- A micrometer screw gauge (Can be shared)

QUESTION 2

- A boiling tube
- Some dry sand
- A half metre rule
- Tissue paper
- A 250 ml measuring cylinder, containing water of volume 200ml.
- A glass block.
- 4 optical pins
- A plain paper fixed on a soft board.
- A vernier calliper (to be shared)
- Electronic balance (to be shared)
- A protractor

MATUNGU SUB-COUNTY JOINT EVALUATION TEST – 2019
232/3
PHYSICS
PAPER 3
(PRACTICAL)

1. You are provided with the following;

- a galvanometer
- a dry cell and a cell holder
- a switch
- A wire labelled Y mounted on a piece of wood.
- Eight connecting wires each with a crocodile clip at one end.
- A resistance wire labelled AB mounted on a millimeter scale.
- Six 10 ohm carbon resistors
- a jockey or crocodile clip
- micrometer screw gauge (to be shared)

Proceed as follows:

(a) Set up the circuit as shown in figure 1. Z is one of the 10 ohms carbon resistors.

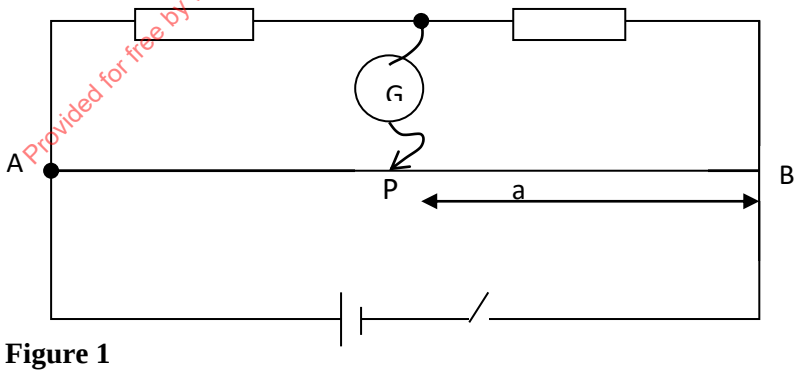


Figure 1

(b) Close the switch. Tap the jockey at various points on the wire AB and locate point P at which the galvanometer shows zero deflection, measure and record in table 1 the length a, where a = PB.

(c) Repeat the procedure in (b) using two 10Ω resistors in parallel, three resistors in parallel four resistors in parallel, five resistors in parallel and six resistors in parallel. Record your readings in table 1. Complete the table. X is the effective resistance for the parallel combination i.e. $X = \frac{10}{n}$ where n is the number of resistors in parallel. **(6 marks)**

Number of 10Ω Carbon resistor	One	Two	Three	Four	Five	Six
X (Ω)						
a (cm)						
$\frac{1}{X}(\Omega^{-1})$						
$\frac{1}{a}(cm^{-1})$						

(d) Plot a graph of $\frac{1}{a}$ (y-axis) against $\frac{1}{X}$ **(5 marks)**

(e) Determine the slope m of the graph. **(2 marks)**

(f) Given that $\frac{1}{a} = \frac{R}{K}.\frac{1}{X} + \frac{1}{K}$ where K = 100cm. Use the graph to determine R. **(2 marks)**

(g) Measure the diameter d and the length L of wire Y and hence determine its cross-sectional area A. **(2 marks)**

L = ……m

d = …… m

A =……

…… m^2

(h) Determine the resistivity of the wire Y given that its

Resistance, $R = \rho \frac{L}{A}$ where ρ is the resistivity of wire Y.

L - the length of the wire Y
R – resistance of wire Y
A – cross sectional area of wire Y **(3 marks)**

Question 2

PART A:

You are provided with the following:

- A boiling tube
- Some dry sand
- A liquid in a measuring cylinder labelled L.
- A half metre rule
- Electronic balance
- Tissue paper
- A measuring cylinder
- A Vernier caliper

Proceed as follows:

(a) Measure the length of the boiling tube.

h = ……cm (1mrk)

h = ……m (1mrk)

MOMALICHE 2 CYCLE 6
232/1
Physics Paper 1 (Theory)
2 Hours

SECTION A (25MKS)

1. Figure 1 shows a micrometer with a negative error of 0.02 mm, used to measure the diameter of a ball bearing.

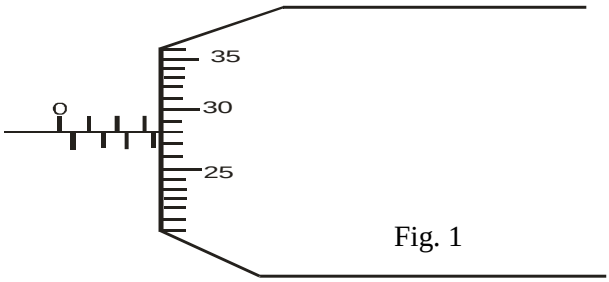


Fig. 1

Record the diameter of the ball. (2 marks)

2. Explain the washing effects of detergents of soap and why detergents in warm water wash greasy clothes even better. (2 marks)
3. State the reasons why concrete beam reinforced with steel does not crack when subjected to changes in temperature. (1mark)
4. A uniform metallic bar of length 100cm and mass 40kg is supported horizontally by two vertical spring balances A and B as shown below.

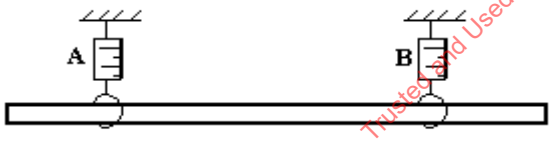


Fig. 2

Balance A is 20cm from one end while balance B is 30cm from the other end. Find the reading of each individual balance AB. (3 marks)

5. The figure 3 below shows a fire alarm circuit. Explain how the alarm functions. (2 marks)

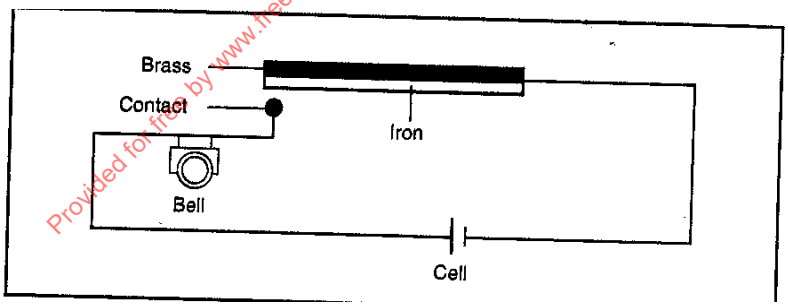


Fig. 3

6. The mass M was suspended from a tight copper wire using a rider as shown in figure 4.
The copper wire was then heated.

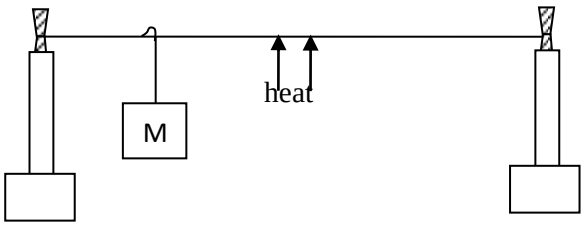


Fig. 4

State and explain what was observed on the position of M as the wire was heated for some time. (2 marks)

7. A car of mass 1600kg traveling at 56km/h is brought to rest over a distance of 50m. Find
   (i) The acceleration. (2 marks)
   (ii) The breaking force in newtons. (1 mark)
8. A carbon dioxide cylinder contains 6600cm^3 of gas at a pressure of 2.40x10^5 Pa. Atmosphere pressure is 1.0Ox10^5 Pa. Calculate the volume of the gas at atmospheric pressure. (2 marks)
9. Why are wire shelves used rather than solid shelves in the center of a refrigerator? (1mark)
10. When a Bunsen burner is lit below a wire gauze, it is noted that the flame initially burns below the gauze as shown in the figure below. After sometime the flame burns below as well as above the gauze.

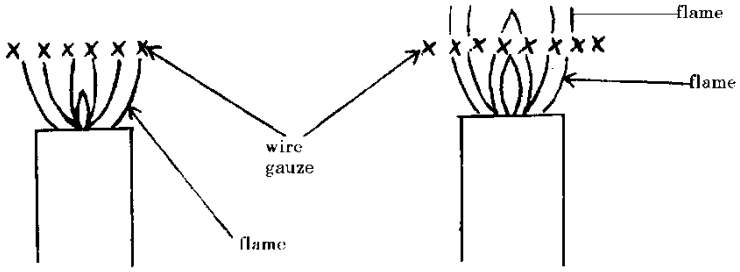


Fig. 5

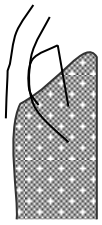
Explain this observation. (2 marks)

11. A clinical thermometer has a constriction in the bore just above the bulb. State the use of this constriction and the thin walled bulb. (2 marks)

Fig. 6

12. State Hooke's law. (1 mark)
13. The figure below shows a burning candle standing on a bench. State and explain how the stability of the candle will be affected. (2 marks)

Fig. 7



SECTION B (55 MARKS)

Answer all questions in this section

14. (a) An object is released to fall vertically from height of 98m. At the same time another object is projected vertically upward with velocity of 42m/s.
   (i) Calculate the time taken before the objects meet. (3 marks)
   (ii) At what height do the objects meet? (2 marks
   (b) A stone is projected horizontally at a speed of 35m/s from a cliff 160m high. After how long will it strike the ground? (2marks)

(c) You are going to investigate the motion of an object down a slope. A length of track s = 1.20 m has been marked out for you.

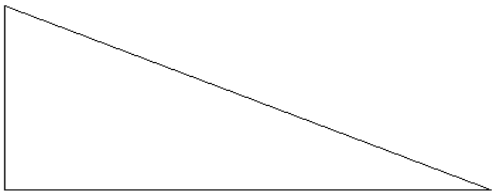


Fig .8

If the ball starts from rest (u = 0) it can be shown that the acceleration, a, is given by: where t is the time taken for the marble to roll a distance s.

$$a \equiv \frac{2s}{t^2}$$

(i) Setting the height h to 0.10m and if the time t taken for the marble to roll down the slope is 1.70s. [2 marks]

(ii) Use the above equation to calculate the acceleration, a, of the marble. [2 marks]

By resolving forces acting on the ball a student suggests that $ma = mg\sin$ and hence that $a = g\sin\varphi$

Use your solution to (i) to find a value for the acceleration due to gravity, g. [2 marks]

15. (a) i) Define Archimedes' Principle. (1 mark)

ii) An object weighs 1.04N in air, 0.64N when fully immersed in water and 0.72N when fully immersed in a liquid. If the density of water is 1000 kg m^{-3}, find :

I. The density of the liquid. (3 marks)

II. Calculate the density of the metal block. (2 marks)

(iii) Calculate the up thrust on the metal and the apparent weight of the metal when completely submerged in salt solution of density 1.2g/cm^3. (3 marks)

b) A block of metal of volume 80cm^3 weighs 3.80N in air. Determine its weight when fully sub merged in a liquid of density 1200kgm^{-3}. (3 marks)

16. a) Define Pressure Law (1 mark)

b) State **one** basic assumption of the kinetic theory of gases. (1 marks)

c) Figure **8** shows a set up that may be used to verify Pressure law.

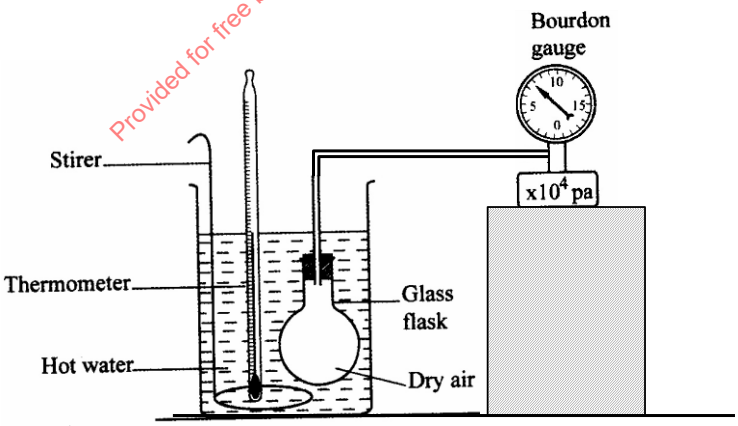


Fig. 8

i) State the measurements that may be taken in the experiment. (2 marks)

ii) Explain how the measurement in (i) above may be used to verify Pressure law (4 marks

iii) A car tyre is at an air pressure of 4.0 x 10^5 Pa. at a temperature of 27 ^{0}C. While it is running, the temperature rises to 75 ^{0}C. What is the new pressure in the tyre?
(Assume the tyre does not expand) (3 marks)

MOMALICHE
232/3
PHYSICS PRACTICAL
PAPER 3

Question 1

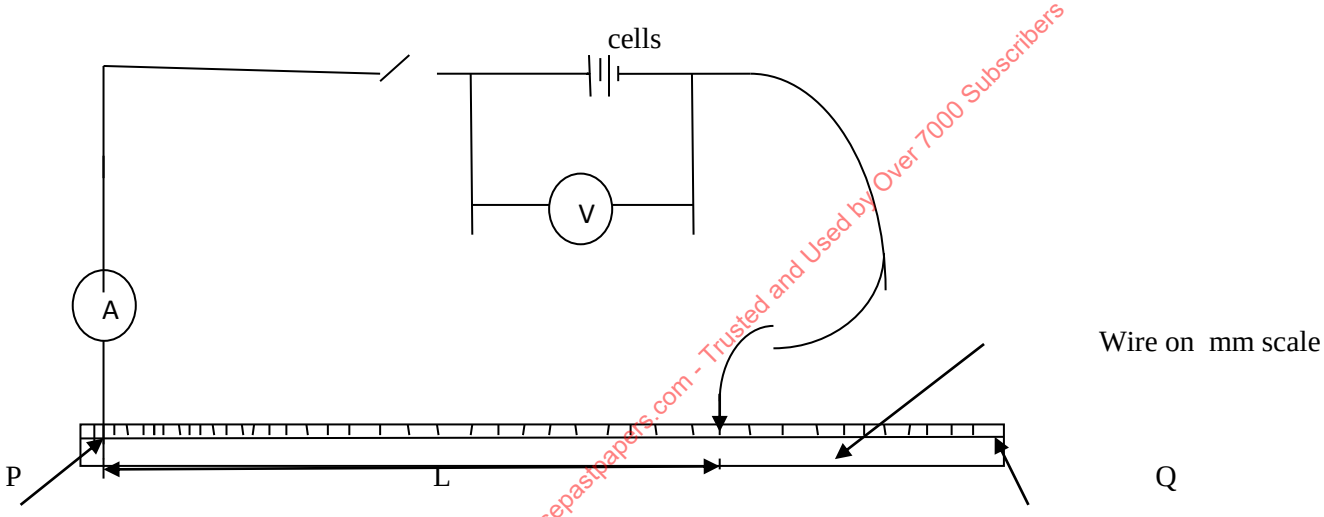
PART A

You are provided with the following.

- A resistance wire PQ mounted on a mm scale
- An ammeter
- A voltmeter
- A switch
- Two new dry cells and cell holder
- Seven connecting wires at least two with crocodile clips

Proceed as follows:

(a) Set up the circuit as shown in figure 1 below.



(b) Open the switch and record the voltmeter readings
E=.....volts (1mk)

(c) (i) Starting with L =70cm, read and record the readings of voltmeter in table 1 provided.

Table 1

Length L (cm)	70	50	40	30	20	10
Current I(A)						
P.d V(volts)						

(ii) Repeat step c (i) above for other values of L given in the table 1 above (5marks)

(d) Plot a graph of p.d (y-axis) against I (5marks)

(e) Given that the graph is govern by the equation E=V+Ir,determine

(i) The e.m.f of the two cells in series (2marks)

(ii) The internal resistance of the two cells (2marks)

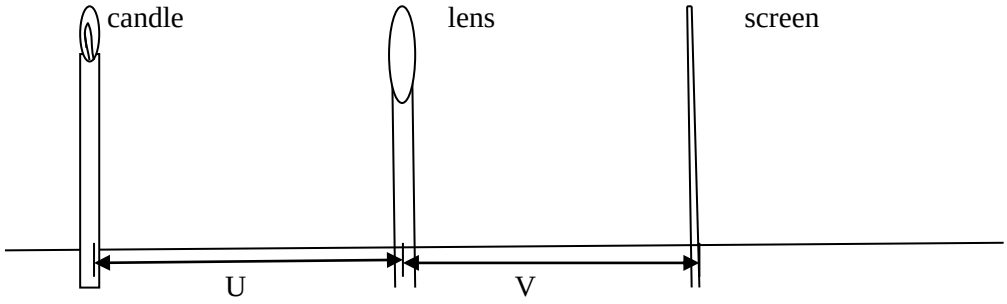
PART B

You are provided with the following

- A lens and lens holder
- A candle
- A screen
- A metre rule

Proceed as follows:

Set up the apparatus as shown in figure 2



(f) Starting with U =30cm,adjust the position of the screen to obtain a sharp image of the candle. Record the value of V in table 2

(g) Repeat the procedure in (f) for U=40cm.Complete the table. (2marks)

U(cm)	V(cm)	m=$\frac{V}{U}$
30		
40		

Table 2 tfbvg

(h) Given that the focal length of the lens satisfies the equation f= $\frac{V}{1+m}$ determine the average value of focal length f. (3marks)

Question 2

PART A

You are provided with the following :

- A metre rule
- A knife edge
- One 50g mass and a 100g mass
- Some thread
- Liquid L in a beaker
- Tissue paper

Proceed as follows:

(a) Balance the metre rule on the knife edge and record the reading at this point
Balance point.....cm (1mk)
For the rest of this experiment the knife edge must be placed at this position

(b) Set up the apparatus as shown in the figure 1. Use the thread provided to hang the masses such that the positions of the support can be adjusted.

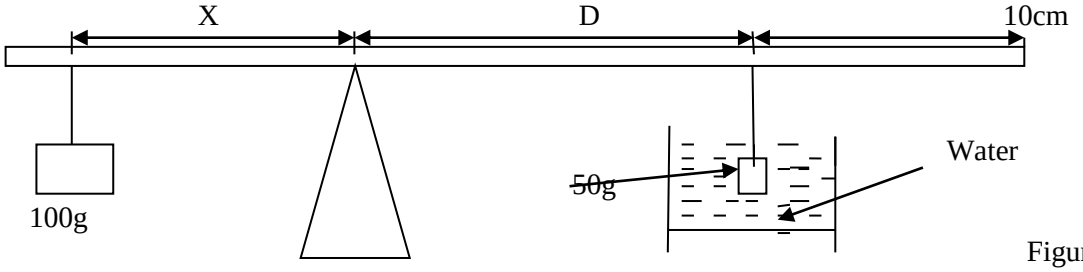


Figure 1

The balance is attained by adjusting the position of the 100g mass. Note that the distance X and D are measured from the knife edge and the 50g mass is fully immersed in water. Record the values of X and D

X=.....cm (1mark)
D=.....cm (1mark)

Apply the principle of moments to determine the weight W_1 of the 50g mass in water and hence determine the uphrust U_w in water

W_1 =..... (2marks)

U_w=..... (1mark)

Remove the 50g mass from water and dry it using tissue paper.

(c) (i) now balance the metre rule when the 50g mass is fully immersed in the liquid L. Record the value of distance X

X=..... (1mark)

(ii) Apply the principle of moments to determine the weight W_2 of the 50g mass in the liquid L and hence determine the uphrust U_L in the liquid.

W_2=..... (1mark)

U_L=..... (1mark)

(d) Determine the relative density R.D of the liquid L given that:

$$R.D = \frac{U_L}{U_L}$$ (1mark)

(e) Find the density of liquid X in kg/m^3.(given that density of water is 1000kg/m^3) (1mark)

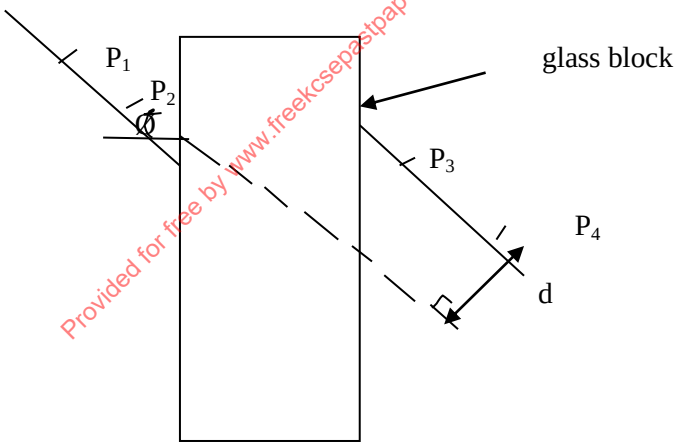
PART B

You are provided with the following

- A rectangular glass block
- Four optical pins
- A piece of soft board
- A plain sheet of paper
- 4 thumb pins

Proceed as follows

(f) Place the plain sheet of paper on the soft board and fix it using the thumb pins provided . Place the glass block at the centre of the sheet, draw its outline. Remove the glass block .



(g) Draw a normal at a point 2cm from the end of the longer side of the block outline. This normal line will be used for the rest of the experiment. Draw a line at an angle of angle Ø=25^0 from the normal .Stick two pins p_1 and p_2 vertically on this line.

(h) By viewing through the glass from the opposite side, stick two other pins p_3 and p_4 vertically such that they are in line with the images of the first two pins. Draw a line through the marks made by p_3 and p_4 to touch the outline. Extend the line p_1p_2 through the outline (dotted line) .Measure and record in the table the perpendicular distance d between the extended line and the line p_3 and p_4 Record this value in the table.

(i) Repeat the procedure in (g) and (h) for other values of Θ shown in the table.

Θ (deg)	25	35	40	45	55	60	65
d(cm)							

(3marks)

(j) (i) plot a graph of d against Θ (5mark)

ii) Use the graph to estimate the value of d when Θ =0 (1mark)

MOMALICHE JOIN EXAM
CONFIDENTIAL

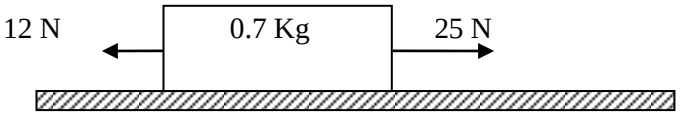
Question 1.

- 2 dry cells
- Voltmeter
- Switch
- Ammeter
- Resistance wire(S.W.G 28) mounted on a mm scale
- Six connecting wires
- Convex lens (f=10cm) and lens holder
- A candle
- White screen
- A metre rule

Question 2

- Metre rule
- Knife edge
- One 50g mass and a 100g mass
- Three pieces of thread about 50cm
- Some water in 100ml beaker
- Paraffin(liquid L) in 100ml beaker
- Tissue paper
- Rectangular glass block(n=1.5)
- Four optical pins
- A piece of soft board
- A plain sheet of paper
- 4 thumb pins

6. Two parallel forces are acting on a body of mass 0.7 kg as shown in the figure below.



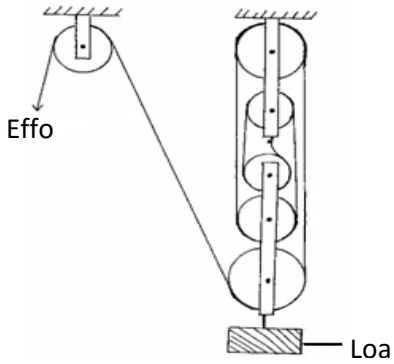
Calculate the acceleration of the 0.7Kg mass (3mks)

7. (a) State pressure law. (1mk)

a) Air is compressed at a constant temperature until its pressure rises from 82cmHg to 140cmHg. If the initial volume of air is $85cm^3$, find the final volume of air. (3mks)

8. Explain the cause of random motion of particles as observed in Brownian motion in a smoke cell experiment. (1mk)

9. The figure **below** shows a machine being used to raise a load. Use the information given in the figure to answer questions **below**.



b) (a)Determine the velocity ratio (V.R) of the machine. (1 mark)

b) If a load of 800N is raised by applying an effort of 272N, determine the efficiency of the machine. (3 mark)

10. Figure below shows a liquid in a long cylindrical tube closed at one end with a cork. The cork is tight fitting but movable.

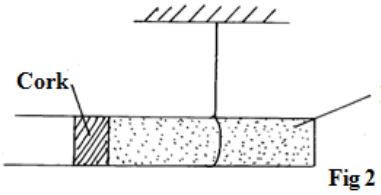


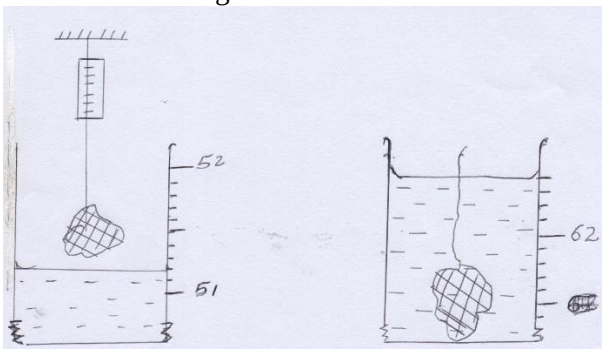
Fig 2

State and explain the observation that would be made when the tube is heated uniformly. (2mks)

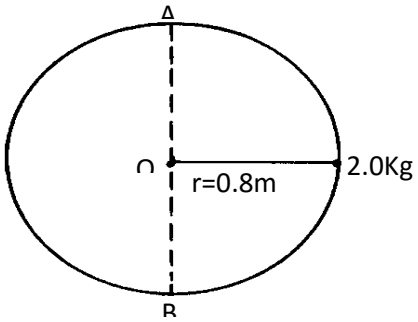
SECTION B (55 MARKS)

11. A) State Archimedes principle. (1mk)

b) Figure below shows an experiment used to determine the density of an irregular piece of metal. The mass of metal in air is 200g.



b) The diagram below shows an object of mass 2.0kg whirled in a vertical circle of radius 0.8m at a uniform speed of $50ms^{-1}$.



Determine;

i) The centripetal force on the object. (3mks)
ii) The tension in the string when the object is at **A.** (2mks)
iii) The tension in the string when the object is at **B**. (2mks)

c) The speed of rotation is gradually increased until the string snaps. At what point is the string likely to snap? Explain. (2mks)

14. a) State the principle of parallel forces. (1mk)

b) A uniform plank of wood weighing 50N and of length 5m is suspended by two ropes A and B, 1.5m a part A is 2m from end and B is 1.5m from the other end, as shown in fig. 1 below. A concrete block of weight 100N is suspended from the center of the plank.

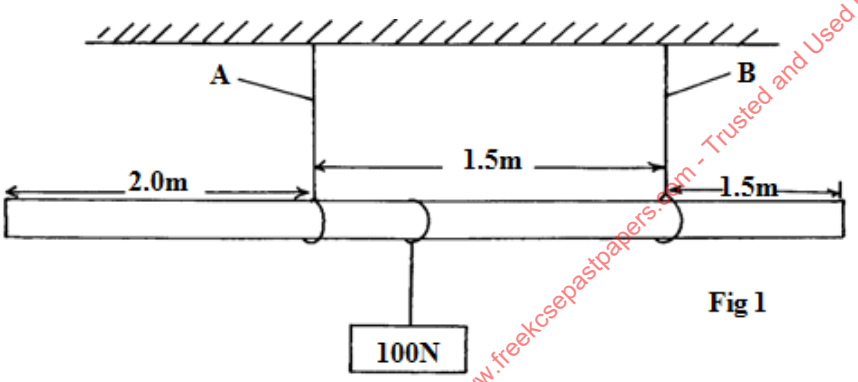
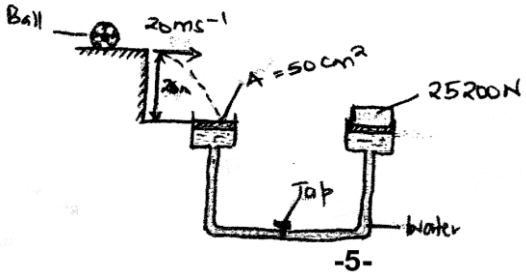


Fig 1

Calculate the tension, $\mathbf{T_A}$ on the string **A** (3mks)

c) I) state two ways in which the stability of a body can be increased. (2mks
II) State one way in which vehicle assembling companies enhances stability in vehicles. (1mks

15. The figure below shows a ball of mass 50kg being thrown from a top of wall 20m high with a horizontal velocity of 20m/s. It stuck the piston A of hydraulic lift and no water splashed out. The other piston B had a weight of 25200N placed on it. Assuming the tap was opened at the time the ball stuck the piston A.



-5-

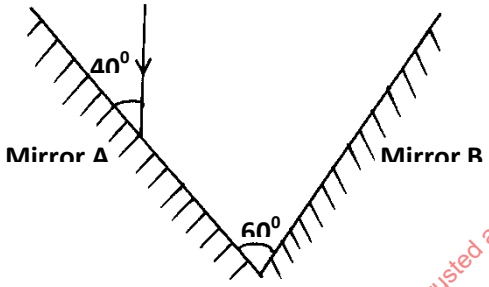
Determine;

(i) The time taken by the ball to strike the surface of piston A. (3 mks)
(ii) The distance from the foot of the wall to where it hit piston A. (2 mks)
(iii) The vertical velocity with which the ball struck piston A. (2 mks)
(iv) The force with which the ball struck piston A. (2 mks)
(v) The area of piston B if the load on the piston B did not move and that the two pistons were initially at the same level. (3 mks)

MERU SOUTH
232/2
PHYSICS FORM 4
PAPER 2
Constants
i) Density of water = $1g/cm^3$ or $1000kg/m^3$.
ii) Gravitational acceleration = $10m/s^2$.

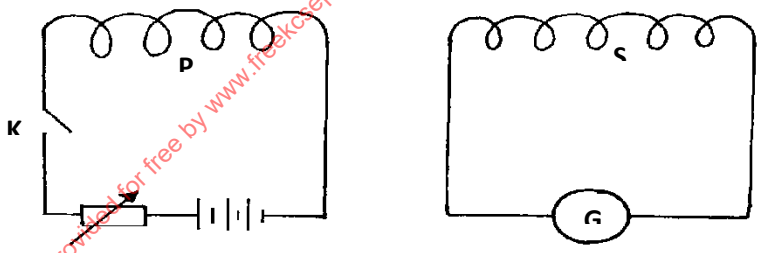
SECTION A (25 MARKS)

1. A ray is incident on two mirrors inclined at 60^0 as shown in the diagram below. (3mks)



Determine the angle of reflection on mirror **A**, hence trace the path of the ray as it leaves mirror **B.**

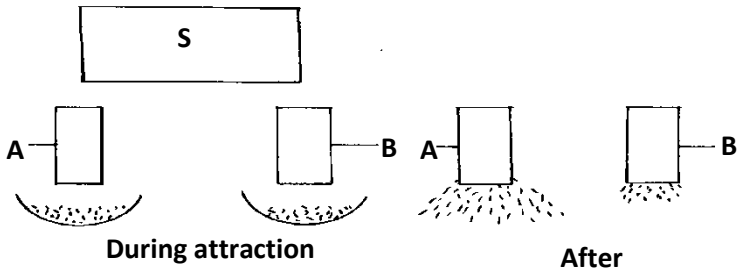
2. a) The coils **P** and **S** are connected as shown below. **P** is connected to a battery, rheostat and a switch **K**. **S** is connected to a galvanometer **G**.



State the behavior of the pointer on **G** in the following cases;
i) When **K** is switched on (closed) (1mk)
ii) When **K** is opened. (1mk)

b) A transformer has 200 turns in the primary coil and 1000 turns in the secondary coil. If the transformer is 100% efficient and the current in the secondary coil is 0.15A, determine the current in the primary coil. (3mks)

3. Figure below shows a simple experiment using a permanent magnet and two metal bars **A** and **B**
Put close to the iron filings.



SECTION B (55 MARKS)

11. (a) Students set up a mass attached to a spring such that when it oscillates it taps on water surface in a wide shallow tank as in figure 11 below.

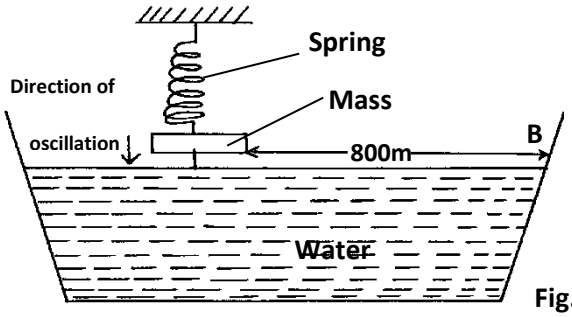


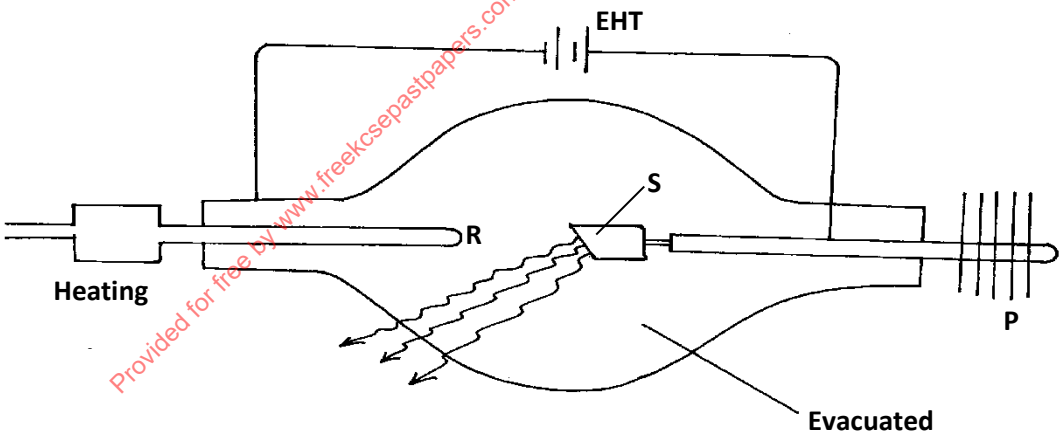
Fig. 11

The students measured time for 20 oscillations and found that the mass takes 36 seconds.

Determine:
(i) The periodic time of the mass (2mks
(ii) The frequency of the waves produced on the water surface (2mk)
(iii) The speed of the waves if the students counted four ripples between the mass and end **B** of the tank (3mks)

(b) State any **two** factors that would increase the speed of sound in air (2mks)
(c) An echo sounder of a ship received the reflected waves from a sea bed after 0.20s.
(i) Determine the depth of the sea bed if the velocity of sound in water is 1450m/s (2mks)
(ii) When the ship above passes over a sunken reef, the echo sounder receives an echo after 0.16s. Determine the height of the sunken reef (2mks)

12. (a) The diagram below shows an X-ray tube drawn by a student. Use it to answer the questions which follow.



(i) State with reason the material used for the part labeled **R**. (2mks
(ii) Why is the tube evacuated (1mk)
(iii) How can the wavelength of the X-rays emitted from this tube be reduced (1mk)

b) X-rays are emitted when a tube operates at 3×10^2 V and a current of 0.01 A is passing through it (take e = 1.6×10^{-19}C, Me = 9×10^{-31}kg). Calculate;
(i) The velocity of the electron on hitting the target. (3mks)
(ii) The minimum wavelength of the X-rays emitted (3mks)

c) (i) State **one** properties of X-rays (1mk)
(ii) State **one** uses of X-rays (1mk)

- Cotton thread at least 120cm long
- Stand and a clamp
- Pendulum bob
- Metre rule

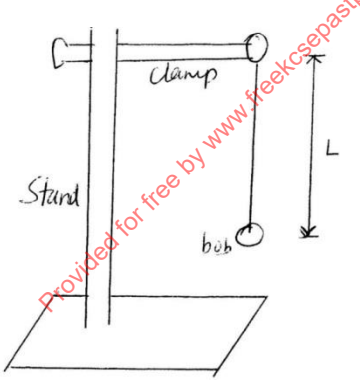
Question 2

- Convex lens
- A candle
- White screen
- Lens holder
- Metre rule
- 2 New dry cells
- An ammeter
- A mounted wire labelled AB
- A cell holder
- A switch
- Connecting wires

M SOUTH
232/3
PHYSICS FORM 4
PAPER 3

1. You are provided with the following;
   - A stopwatch
   - Cotton thread at least 120cm long
   - Stand and a clamp
   - Pendulum bob
   - Metre rule

   Arrange your apparatus as shown



Proceed as follows;

i) Adjust the length of the pendulum to 1meter.
ii) Displace the bob side ways to an angle of about 45^{o} (estimate) and let the pendulum switching for 10 oscillations and record the time, t, take for the ten oscillations.

iii) Repeat the same for other values of L as shown in the table below and fill in the columns of the table as indicated. (8 Marks)

Length L(in m)	Time for 10 oscillations (in sec)	Periodic time (T)	(Periodic Time)^2 T^2 (in 2 d.p.)
1.0			
0.8			
0.7			
0.6			
0.5			
0.4			
0.3			

iv) Plot a graph of T^2 against L. (5 Marks)

v) Determine the gradient (3 Marks)

vi) Given that period (T) of a pendulum and the length (L) are related by the equation

$$T = 2\pi\sqrt{\frac{l}{g}},$$

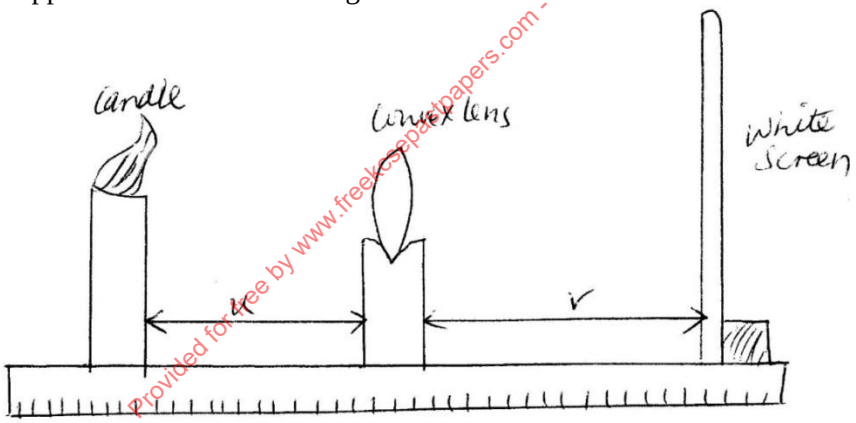
Where g is the gravitational pull, use your graph to determine the value of g. (4 Marks)

2. PART A

You are provided with the following apparatus.

- A Convex lens
- A candle
- White screen
- Lens holder
- Metre rule

a) Set up the apparatus as shown in the figure below.



b) Place a lighted candle at object distance, U = 20cm. Move the screen, towards or away the lens until a sharp image of the candle flame is obtained on the screen. Measure the distance V and record the results in the table below.

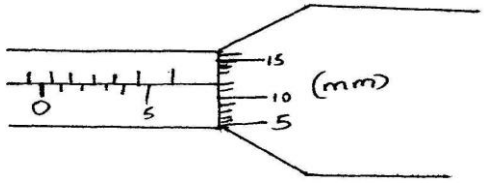
c) Repeat the same for other values of U as shown in the table and fill their respective values of V. (5mks)

Object distance U (in cm)	Image distance V(in cm)	U + V (cm)	UV (cm^2)
20			
30			
45			
60			
75			
90			

d) Plot a graph of UV (cm^2) against (U + V) (cm). (5 Marks)

MUMIAS WEST JOINT EXAMINATION*Kenya Certificate of Secondary Education*
PHYSICS
PAPER 1
(THEORY)
2 HOURS

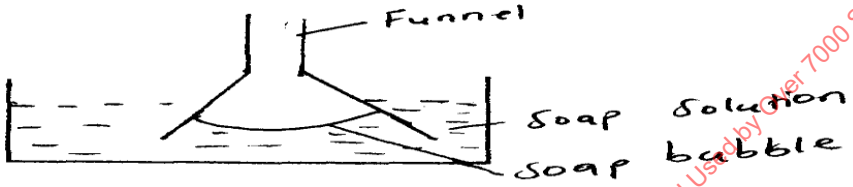
1. The diagram below shows a portion of a micrometer screw gauge used to measure the diameter of a metal pipe. The reading on the gauge when the jaws were fully closed without the pipe was 0.012cm.



What is the diameter of the pipe? (2mks)

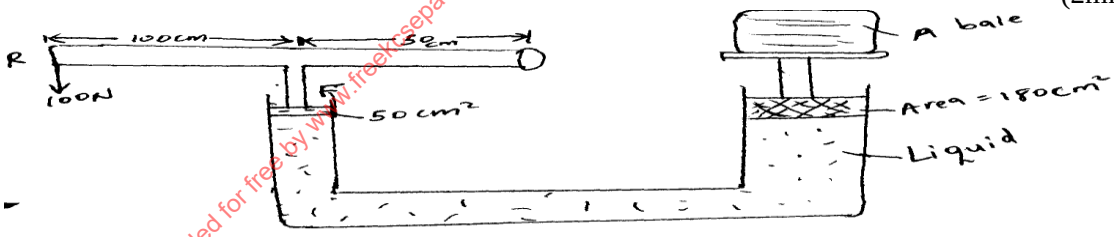
2. Given that the length of pipe is 1.40cm, find the volume. (2mks)
3. a) what is surface tension?

b) Figure 2 shows a funnel dipped into soap solution. Figure 2

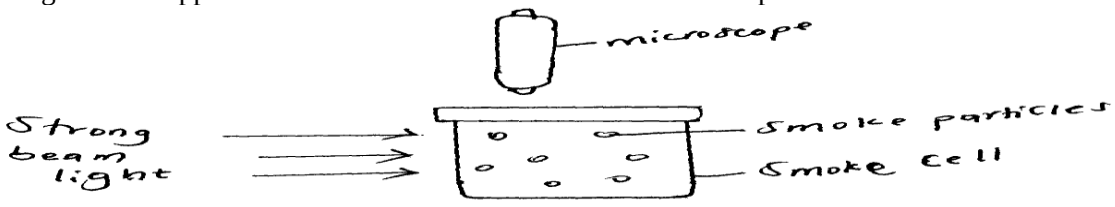


Explain what happens to the soap bubble when the funnel is removed (1mk)

4. Fig3 shows a hydraulic press system using a lever of negligible mass on the side of small piston pivoted at point P. A force of 100N is applied at R 2
Use this information to answer question 4 and 5 4. Calculate the force F exerted by small piston on the liquid. (2mks)



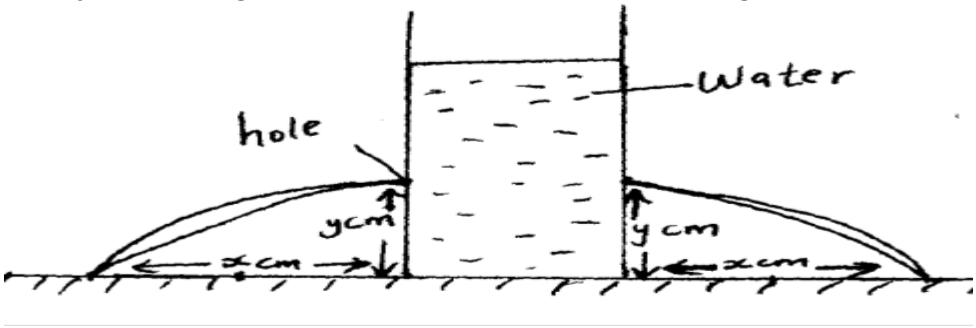
5. Find the weight of the Bale supported by the piston on the liquid. (2mks)
6. The fig 3 shows apparatus used to observe the behaviour of smoke particles in smoke cell.



a) Explain what is observed. (1mk)
b) Explain what happens if the temperature was raised (1mk)

7. Explain why a glass container with thick glass walls is more likely to crack than one with a thin wall when a very hot liquid is poured into them. (2mks)
8. Explain two facts which shows that heat from the sun does not reach the earth surface by convection (2mks)

9. Water jets out through small holes in a tall can on the same height as shown in the fig 4 below. Fig,4. 3



a) State one conclusion that can be made from this observation. (1 mk)
b) Explain two adjustments that can be made to increase the distance x without changing the type of liquid or the position of the can. (2mks)

10. The figure 5a below shows spherical balls placed at different positions on a surface.

Fig,5a.
Describe the state of equilibrium of the ball in each position. (3mks)

11. Write down the relationship between mechanical advantage M.A, velocity ratio V.R and efficiency E of a machine. (lmk)

b) A machine of efficiency 80% is used to lift a load of 480N with an effort of 60N
Calculate the velocity ratio of this machine. (2mks)

SECTION B (55MKS)

12. a) Differentiate between speed and velocity. (1 mk)
b) A body of mass 200g is tied to a string and whirled in a vertical circle of radius 1m with a speed of 4m/s.
Calculate:
i) Angular velocity. (2mks)
ii) The tension in the string at the highest and lowest position of the body. (3mks)
c) A block of wood of mass 4kg is suspended from a tree by a long light string. A bullet of mass l0g is fired with a velocity of l00m/s and embeds itself in the target
i) At what velocity does the target begin to move after the impact? (2mks)
ii) How high does the target move? (2mks)
iii) State the energy change on impact up to the highest point. (2mks)

13. a) Define specific latent heat of vaporization. (1 mk)
b. In an experiment to determine the specific latent heat of vaporization of a liquid using an electrical method, the amount of heat ,Q ,required to vaporize a given mass of, M of liquid were recorded as shown in the table,

$Q(S)\times 10^3$	3.0	4.0	5.0	6.0	7.0	8.0
M(Kg)	4.0	6.4	8.8	11.2	13.6	16.0

i) On the grid provided plot a graph of Q (y-axis) against M. (5mks)
ii) From your graph, determine the specific latent heat of vaporization of the liquid. (3mks)
iii) Suggest the reason why the graph does not pass through the origin. (1 mk)
iv) Write a possible equation of this graph. (lmk)

c. Calculate the amount of heat required to melt 30g of ice at 0°c (Specific latent heat of ice is 3.34 x l05Jkg-).
Give your answer correct to two decimal places. (3mks)

14. a) State the law of floatation. (1mk)
b) A rectangular block of cross section area 0.08m2 is immersed in a liquid of density 1200kg/cm3. The top and lower surfaces are 200cm and 80cm below the surface of the liquid respectively.
i) What is the downward force on the top of the block? (2mks)
ii) Calculate the up thrust on the block. (3mks)

c) A block of glass of mass 0.25kg floats in mercury of density 1.36x 104 kg/cm3.What volume of the glass lies under the surface of Mercury? (3mks)

d) The weight of a cube in air is 0.5N when immersed in water, it weighs 0.44N and when in oil weighs 0.46N.Calculate the relative density of the oil. (3mks)

15. a) Explain why a glass exerts increased pressure when it is compressed in to a small space. (2mks)

b) State the law that relates the volume of a gas to the temperature of the gas. (2mks)

c) A balloon is filled with air to a volume of 200m1 at a temperature 293K.Determine the volume when the temperature rises to 353K at the same pressure. (3mks)

d. i) Explain why Boyles law would not hold for gases such as methane. (1 mk)

ii) Sketch the graph of pressure against volume for an ideal gas.

16. a) state the hooks law (1mrk

b) Define the term spring constant (1mrk)

c) State two factors that determine spring constant. (2mks)

d) The pointer of unloaded mass of 120g is applied to the spring and the pointer reads 38cm.A pan, in which a mass of 2l0g is placed, is now suspended from the spring and the pointer reads 48cm.Determine the mass of the pan. (4mks)

MUMIAS WEST JOINT EXAMINATION
PHYSICS
TIME: 2 HOURS

Section A (25 marks)

1. Give the difference between luminous and non-luminous sources of light. (1mk)
2. **Figure 1** shows a circuit contains a battery of cells V. a 3Afuse F, a switch Sand two identical lamps L_1 and L_2. A current of 2A flows through lamp L_2 when the switch is open.

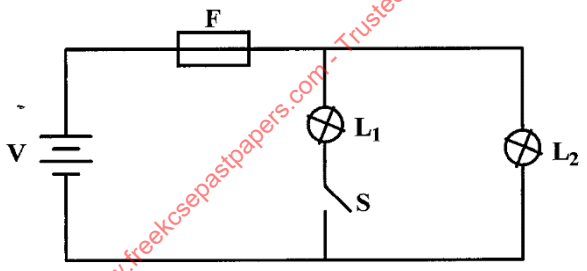


Figure 1

Explain why the fuse may blow when the switch is closed. (2mks)

3. When a negatively charged rod is brought near the cap of a leaf electroscope, the leaf rises. Explain this observation, (2mks)
4. The figure below (drawn to scale) shows the image I, formed by a convex mirror. F is the Virtual principal focus of the mirror.

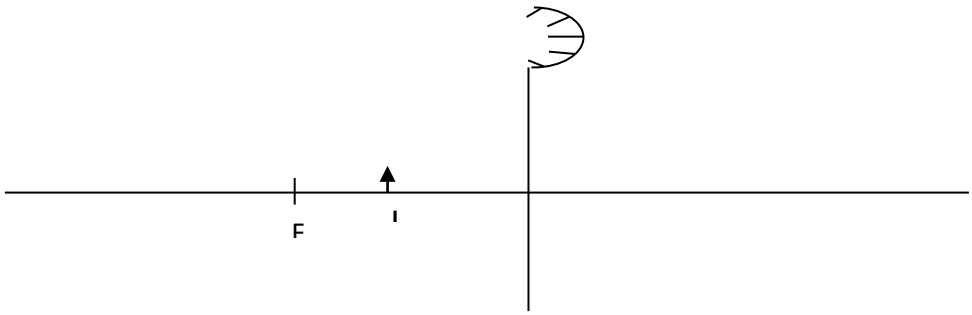


Fig 2

Using ray diagrams locate the position of the object and draw the object. (3 marks)

5. State and explain two factors affecting the strength of an electromagnet.
6. **Figure 3** represents a displacement-time graph for a wave.

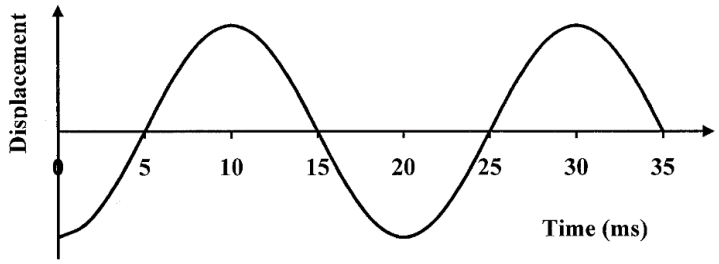


Fig 3

Determine the frequency of the wave. (2mks)

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7. **Figure 4** shows the magnetic field pattern round a current-carrying conductor. Indicate on the conductor the direction of the current. (1mk)

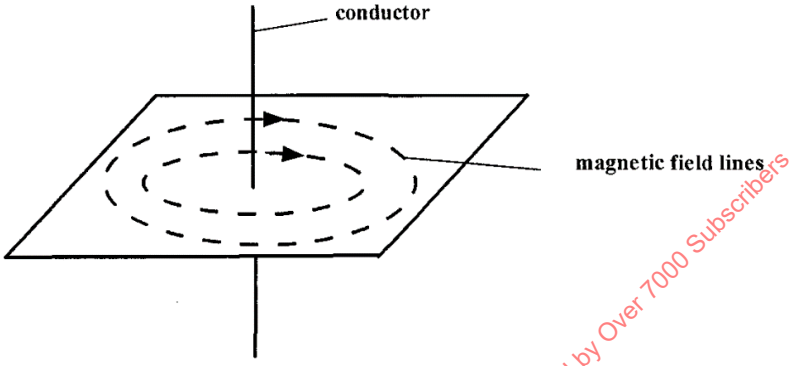
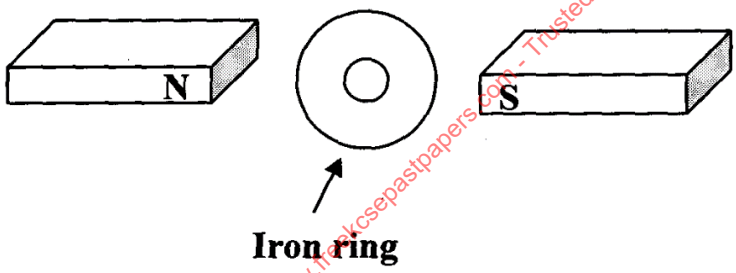


Fig 4

8. Sketch the magnetic field pattern between the two poles of the magnet shown below. (2mks)



9. (a) State the basic law of magnetism. (1 mark)

(b) The figure **below** shows how magnets are stored in pairs with keepers at the ends.

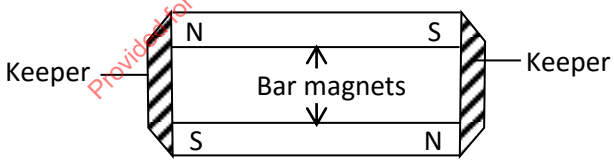


Fig 6

Explain how this method of storing helps in retaining magnetism longer. (2 marks)

10. a) State Ohm's law. (1mrk)

b) A dry cell of emf E and an internal resistance of r is used to drive a current through various resistors of resistance R and the values of $\frac{1}{I}$ and R plotted on a graph in figure 9.

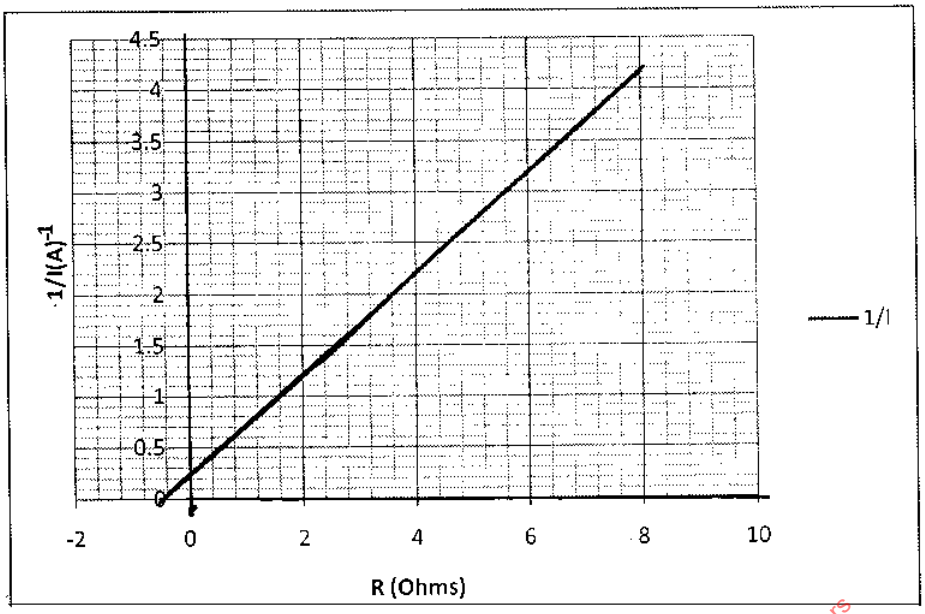


Figure 7.

The variables I and R are related by the equation $\frac{1}{I} = \frac{R}{E} + \frac{r}{E}$

(i) Using the graph in figure 9, determine the emf, E of the cell. (4mrks)

(ii) Show that the internal resistance r of the cell is given by r = -R intercept and hence determine r. (3mrks)

c) A cell supplies a current of 0.5A when connected to a 2Ω resistor and 0.25A when connected to a 5Ω resistor. Find the e.m.f and the internal resistance of the cell. (4mks)

11. (a) Students set up a mass attached to a spring such that when it oscillates it taps on water surface in a wide shallow tank as in figure 11 below.

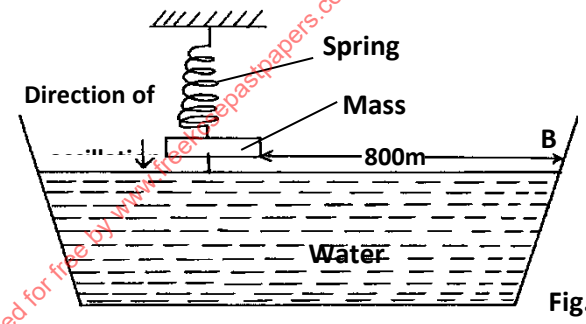


Fig. 8

The students measured time for 20 oscillations and found that the mass takes 36 seconds.
Determine:

(i) The periodic time of the mass (2mks)

(ii) The frequency of the waves produced on the water surface (1mk)

(iii) The speed of the waves if the students counted four ripples between the mass and end **B** of the tank (3mks)

(b) State any **two** factors that would increase the speed of sound in air. (2mk)

(c) An echo sounder of a ship received the reflected waves from a sea bed after 0.20s.

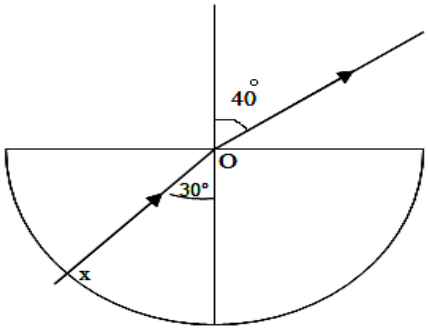
(i) Determine the depth of the sea bed if the velocity of sound in water is 1450m/s (2mks)

(ii) When the ship above passes over a sunken reef, the echo sounder receives an echo after 0.16s. Determine the height of the sunken reef. (2mks)

12. (a) State what is meant by refractive index of a material. (1 mark)

(b) Figure 9 represents a ray of light falling normally on the curved surface of a semi-circular plastic block at X, meeting the opposite face at an angle of incidence of 30^0 and emerging into the air at an angle of 40^0.

Fig 9



(i) State and explain what happens to the ray as it moves from:
I) Air to glass at X. (1marks)
II) From glass to air at O. (1marks)

(ii) Calculate refractive index of the plastic. (3marks)

(iii) Describe how the apparatus above could be used to find the critical angle experimentally. (3marks)

MUMIAS WEST JOINT EXAMINATION
232/3
PHYSICS PRACTICAL
Paper 3
CONFIDENTIAL
QUESTION 1

1. Constantan wire SWG 26 mounted on a metre rule
2. Ammeter (0 – 1) A
3. Voltmeter (0 –2.5) V
4. A jockey
5. 6 connecting wires with crocodile clips
6. A switch
7. A new dry cell and a cell holder
8. Micrometer screw gauge to be shared

QUESTION 2

1. Copper wire of length = 150cm

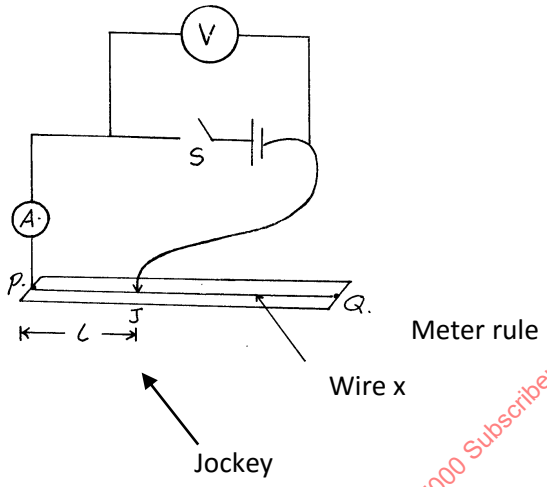
Specification
(i) Diameter = 0.7mm
(ii) Size = 22
(iii) Length = 150cm

2. 50g mass
3. A metre rule
4. Two pieces of wood
5. Test tube
6. Retort stand, boss and clamp

MUMIAS WEST JOINT EXAMS
PHYSICS PAPER 232/3

Q1. **Proceed as follows:**

i. Connect the apparatus provided as shown in the circuit below.



ii.

iii.

iv.

v.

vi. i. With the crocodile clip at L = 10 cm, close the switch S and record the ammeter and voltmeter reading.

I = _____ A

V = _____V

Repeat the procedure in (b) for other values of l = 15cm, 20cm, 25cm, 30cm, 35cm and record the readings in the table below./

Length. L. (cm)	10	15	20	25	30	35
Voltmeter reading , V (volts)						
Ammeter reading , I(A)						

(5mks

ii. Plot a graph of potential difference, V (y-axis) against the Current I . (5mks)

vii. Determine the slope of the graph (2mks)

viii. Given that V= E – I r, use your graph to determine the value of;

(i) E (1mk)

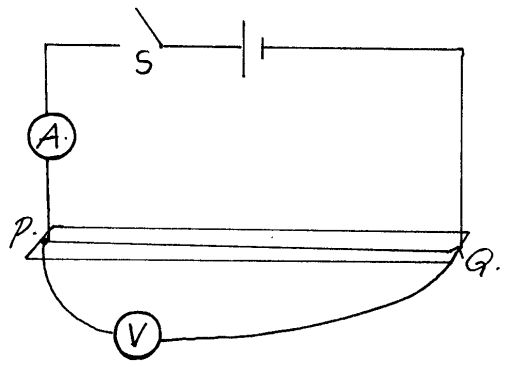
(ii) r (2mks)

ix. Measure the diameter d of the wire x using the micrometer screw gauge.

d = _____ mm

_____m (1mk)

x. Dismantle the apparatus and set up the circuit as shown below.



xi. Close the switch S and record the ammeter and the voltmeter readings

I = _____ A

V = _____ V (1mk)

Hence find R, the resistance of the wire x.

R = _____ Ω (1mk)

xii. Given that $R = \frac{4\rho}{\pi d^2}$ determine ρ (2 mks)

Question 2

Proceed as follows.

a) Measure the length, L, of the wire provided

L = _____ cm (1mk)

b) Wind the whole length of the wire tightly on the test-tube making sure that the turns are as close as possible but not overlapping. Measure the length, φ , of the coil made.

φ =_____ cm (1mk)

c) Count and record the number, N, of the complete turns on the coils.

N = _____ (1mk)

d) Remove the coil from the test-tube. Straighten the first and the last turns of coil. Bend one end to make a hook

e) Count and record in the table below, the number, n , of complete turns remaining on the coil.

f) Measure and record in the table below, the distance, h_1 between the end turns of the coil as shown on the diagram below

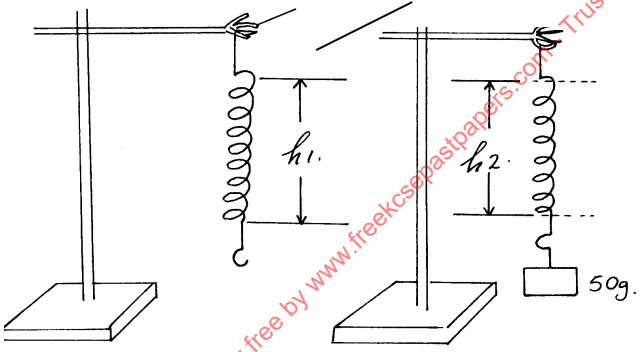


Figure 1

Figure 2

g) Load a 50 g mass on the coils as shown in figure 2 above. Measure and record in the table below, the distance,h_2 , between the end turns of the coil.

h) Remove the mass from the coil Reduce the number of turns by straightening three turns of the coil from the upper end and adjust the point of suspension of the coil as shown in figure 2.Record the number of turns, n, remaining.

i) Measure and record the new distances,h_1 in the table below.

j) Load 50g mass on the coil. Measure and record the new h_2 in the table below.

k) Repeat the procedure (i) and (j) above so as to obtain four sets of readings for, n,h_1 and h_2.

Calculate the corresponding extension and complete the table below.

Number of turns, n, remaining					
Distance, h_2 (cm)					
Distance, h_1 (cm)					
Extension, e(cm)					

(6mks)

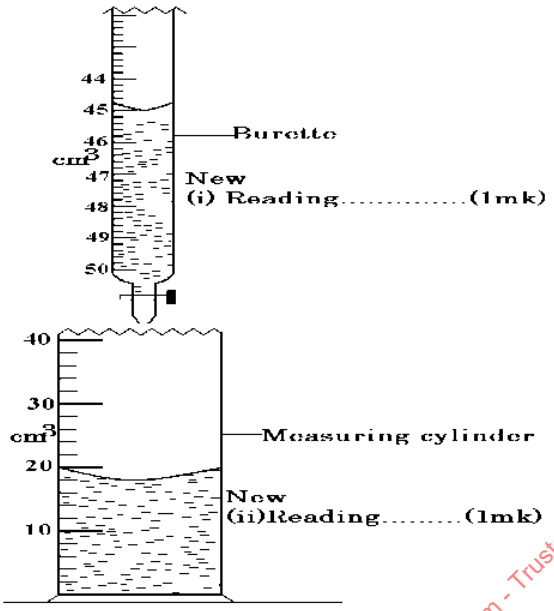
l) Plot the graph of extension, e(y-axis) against the number of turns, n, on the grid provided. (5mks)

NAMBALE
232/1
PHYSICS
PAPER 1 (Theory)

SECTION A (25 MARKS)

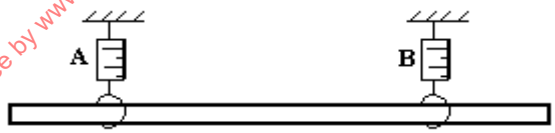
Answer questions in the spaces provided.

1. The figure below shows a measuring cylinder containing some water.



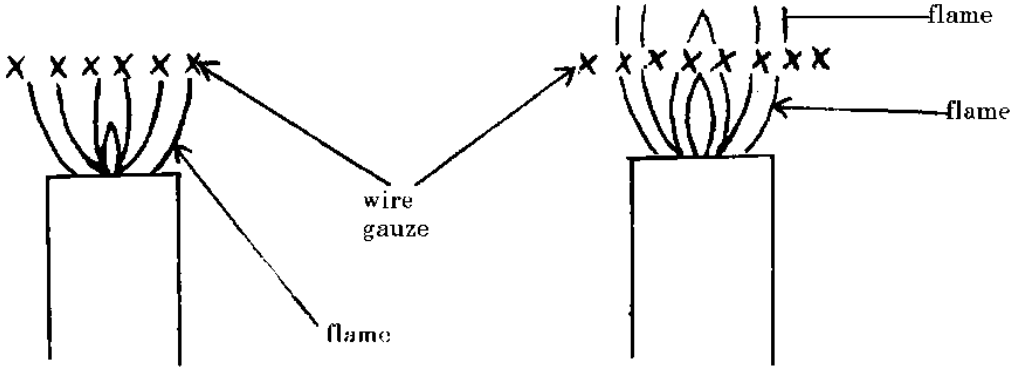
Another 3cm^3 of water was added in to the cylinder from a burette delivering volumes from 0cm^3 to 50 cm^3.
Record in the spaces provided the **new reading** indicated on each vessel. (2 marks)

2. Sketch a vernier callipers scale reading 3.41 cm. (1mark)
3. A uniform metallic bar of length 100cm and mass 40kg is supported horizontally by two vertical spring balances A and B as shown below.



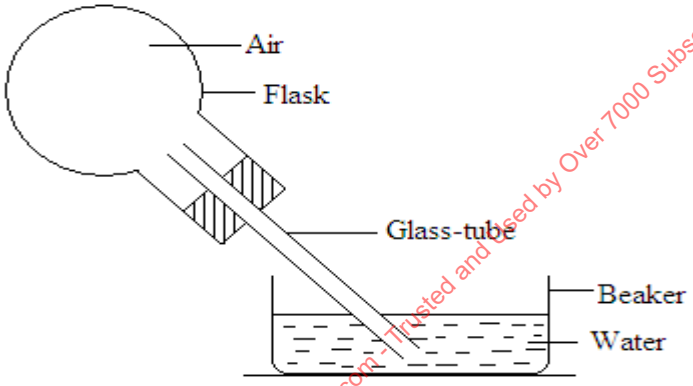
Balance A is 20cm from one end while balance B is 30cm from the other end. Find the reading of each individual balance AB. (3 marks)

4. The reading on a mercury barometer at Mombasa is 760mm. Calculate the pressure at Mombasa(density of mercury is 1.36x10^{4}Kgm^{-3}) (3 marks)
5. Explain the cause of random motion of smoke particles as observed in Brownian motion experiment using a smoke cell. (1 mark)
6. When a Bunsen burner is lit below a wire gauze, it is noted that the flame initially burns below the gauze as shown in the figure below. After sometime the flame burns below as well as above the gauze.



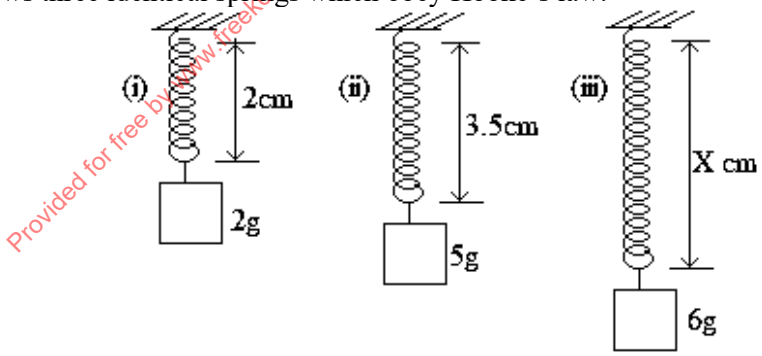
Explain this observation (2 marks)

7. The diagram below shows a flask fitted with a glass tube dipped into a beaker containing water at room temperature. The cork fixing the glass tube is tight.



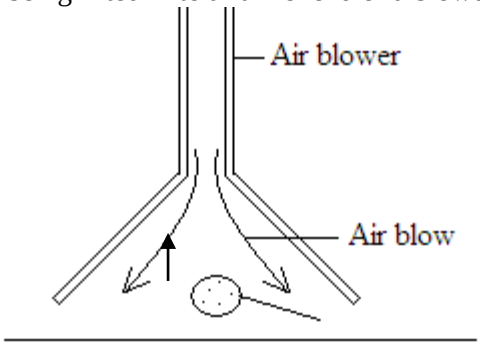
State with reason what would be observed if cold water is poured on to the flask. (2marks)

8. A resultant force F acts on a body of mass 'm' causing an acceleration of a_1 on the body. When the same force acts on a body of mass 2m, it causes an acceleration of a_2.Expressa_2 in terms of a_1. (3 marks)
9. The diagram below shows three identical springs which obey Hooke's law.



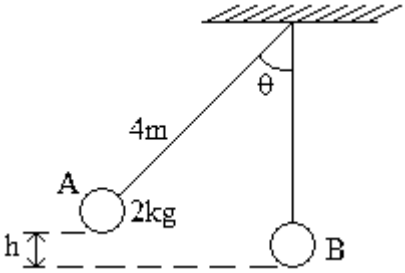
Determine the length X. (3 marks)

10. The figure below shows a pith ball being lifted in to a funnel end of a blower.



Explain this observation (2 marks)

11. A metal ball suspended vertically with a wire is displaced through an angle θ as shown in the diagram below. The body is released from A and swings back to 'B'.



Given that the maximum velocity at the lowest point B is 2.5 m/s. Find the height h from which the ball is released $\left(g = 10m/s^2\right)$ (3 marks)

SECTION B (55 MARKS)

Answer questions in the spaces provided.

12. (a) When is work done? (1mark)

(b) The table below shows energy conversion from form A to form B and the transducers in use. Complete the table (5marks)

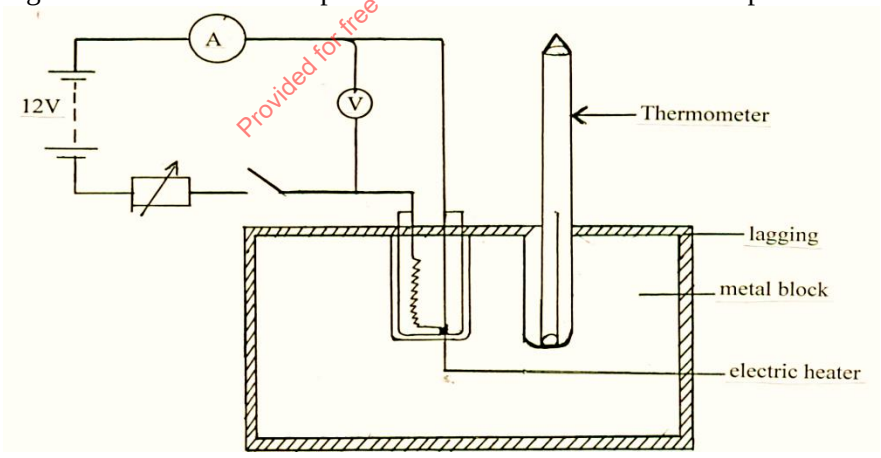
Form A	Form B	Transducer
(i) Chemical	Electrical	_____
(ii) Solar	_____	Plants
(iii) _____	Electrical	Thermocouple
(iv) Electrical	Kinetic	_____
(v) Electrical	_____	Loudspeaker

(c) When an electric pump whose efficiency is 70% raises water to a height of 15m, water is delivered at the rate of 350 litres per minute.

(i) What is the power rating of the pump? (3marks)

(ii) What is the energy lost by the pump per second. (3marks)

13. The figure below shows a set up that can be used to determine the specific heat capacity of a metal block.



(i) State the measurement that should be taken in the experiment to determine specific heat capacity of the metal block. (3marks)

(ii) Show how the measurement above can be used to determine the specific heat capacity of the metal block. (2marks)

(iii) State the function of the following in the set up

(I) Lagging (1mark)

(II) Drops of oil in the holes containing thermometer and the electric heater (1mark)

(b) A copper can together with stirrer of total heat capacity 600J/K contains 200g of water at 15^0C. Dry steam at 100^0C is passed through the water while stirring until it reaches a final temperature of 55^0C. Calculate the mass of the steam condensed. Take specific heat of capacity of water as 4200J/Kgk and specific latent heat of steam as 2,260,000J/kg (5marks)

14. (a) A car is negotiating unbanked circular track. State two factors that will determine the critical speed of the car. (2marks)

(b) Given that the car above has a mass of 1000kg and the circular path has a radius of 25m. Determine the maximum speed with which the motorist can travel so as not to skid if the frictional force between the tyres and the road is 6500N. (3marks)

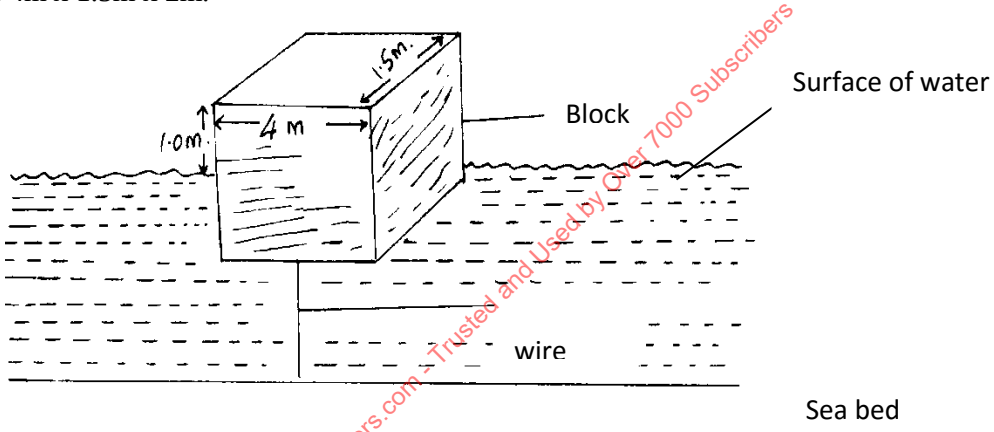
(c) A 200g mass tied to a string is being whirled in a vertical circle of radius 32cm with uniform speed, At the lowest position the tension in the string is 10.5N. Calculate:-

(i) The speed of the mass (3marks)

(ii) The tension in the string when the mass is at the uppermost position of the circular path (Take g = 10m/s^2) (3marks)

15. a) (i) State Archimedes' principle. (1 mark)

(ii) The figure below shows a rectangular object of mass 100kg tethered to the sea-bed by a wire. The dimensions are 4m x 1.5m x 2m.



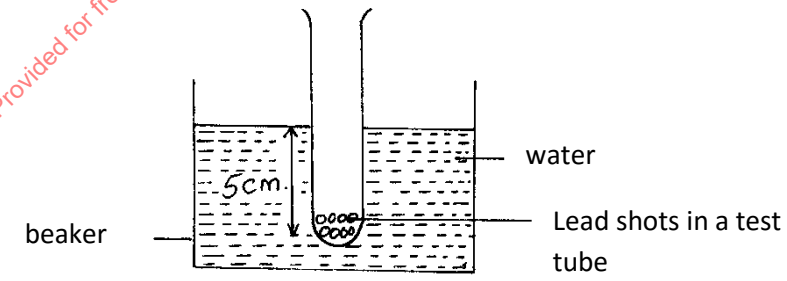
Calculate the :-

(I) Weight of sea water displaced by the buoy (density of sea water = 1100kg/m^3) (3 marks)

(II) Upward force exerted on the buoy by the water. (1mark)

(III) Tension in the wire (2 marks)

(b) A test tube of mass 10g and uniform cross-sectional area 4cm^2 is partly filled with lead shots and floats vertically in water with 5cm of its length submerged.



Find the:-

(i) Mass of the lead shots.(density of water = 1g/cm^3) (3 marks)

(ii) Length of the test tube that would be submerged in a liquid of density 0.75g/cm^3. (2 marks)

16. (a) A car sets out from rest with constant acceleration of 0.5m/s^2 for 10s. It then continues at a constant velocity for further 25s and then decelerates to rest in 5s.

(i) Draw a velocity-time graph for the whole journey. (2 marks)

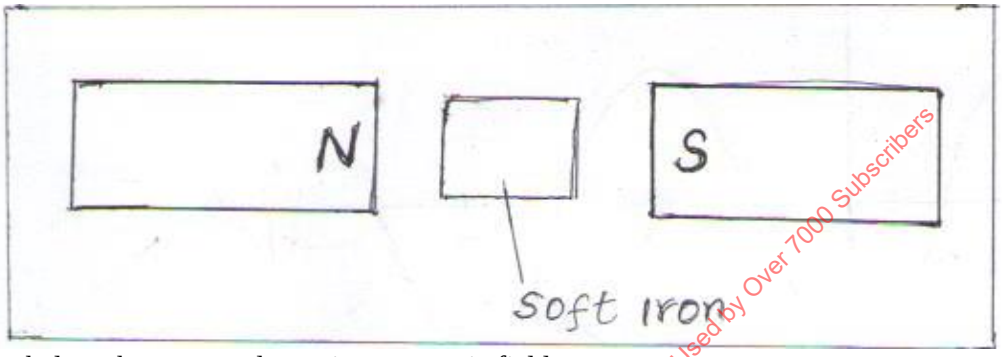
(ii) find the average speed for the whole journey. (3 marks)

(b) A body is moving eastwards at 10m/s and it decelerates at 2.0m/s^2. Determine its velocity after it has traveled 24m. (3 marks)

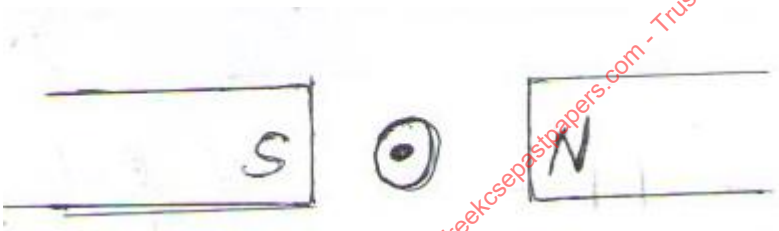
NAMBALE DIOCESE JOINT EXAMINATION
232/2
PHYSICS
PAPER 2

SECTION A (25 MARKS)

1. State two differences between images formed by a plane mirror and a pinhole camera. (2marks
2. You are provided with connecting wires, 2 dry cells, a switch and two bulbs.
   Draw a circuit diagram to show; cells in parallel, bulbs in parallel and controlled by one switch. (2 marks)
3. When an ebonite rod is rubbed using a dry clothe it acquires negative charge.
   Explain how the negative charge is acquired. (1mark)
4. The diagram below shows a soft Iron bar placed between poles of a magnet.
   Draw the magnetic field pattern produced. (2mks)

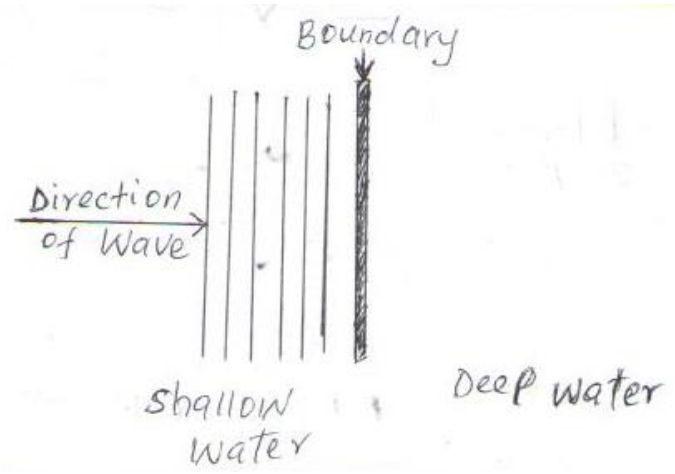


5. The diagram below shows a conductor in a magnetic field.



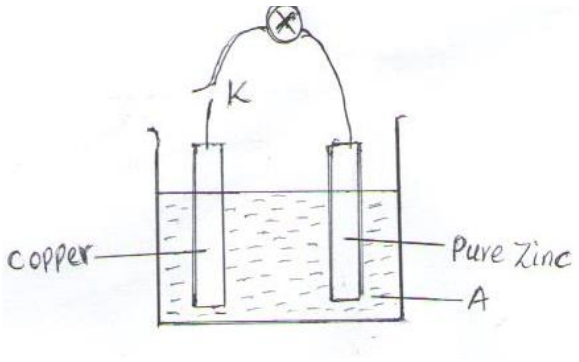
   Indicate on the diagram the direction of motion. (1mark)

6. State one application of total internal reflection. (1 mark)
7. You are provided with resistors of 2.0Ω, 4.0Ω and 9.0Ω. Draw a circuit diagram to show how the three resistors can be connected together to give an effective resistance of 6Ω. (2 marks)
8. The diagram below shows plane waves moving from shallow to deep end of a pond.



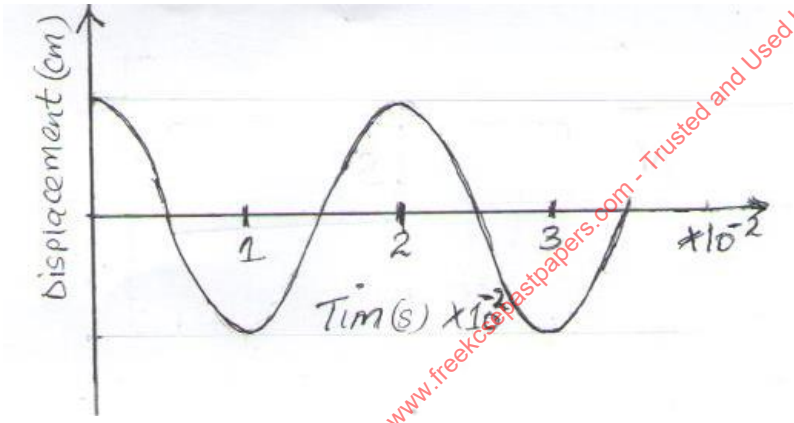
(a) Complete the diagram to show the waves on the deep end. (1 mark)
(b) State what happens at the boundary to:
(i) The frequency of the waves, (1 mark)
(ii) The speed of the waves. (1mark)

9. The figure below shows a simple cell.



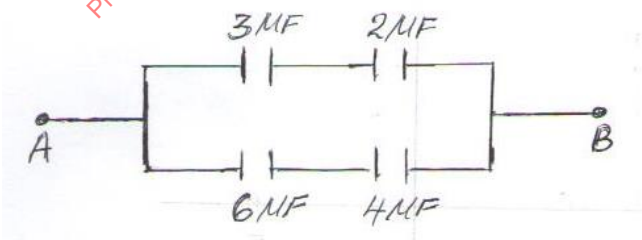
(a) Identify solution A. (1 mark)
(b) When switch K is closed, the bulb lights brightly initially, but grow dim and dimmer until it goes off;
(i) State the possible cause of this behavior. (1 mark)
(ii) State the remedy for the behavior. (1mark)

10. The diagram below shows a wave profile.



Determine the frequency of the wave. (3 marks)

11. The diagram below shows a system of capacitors.



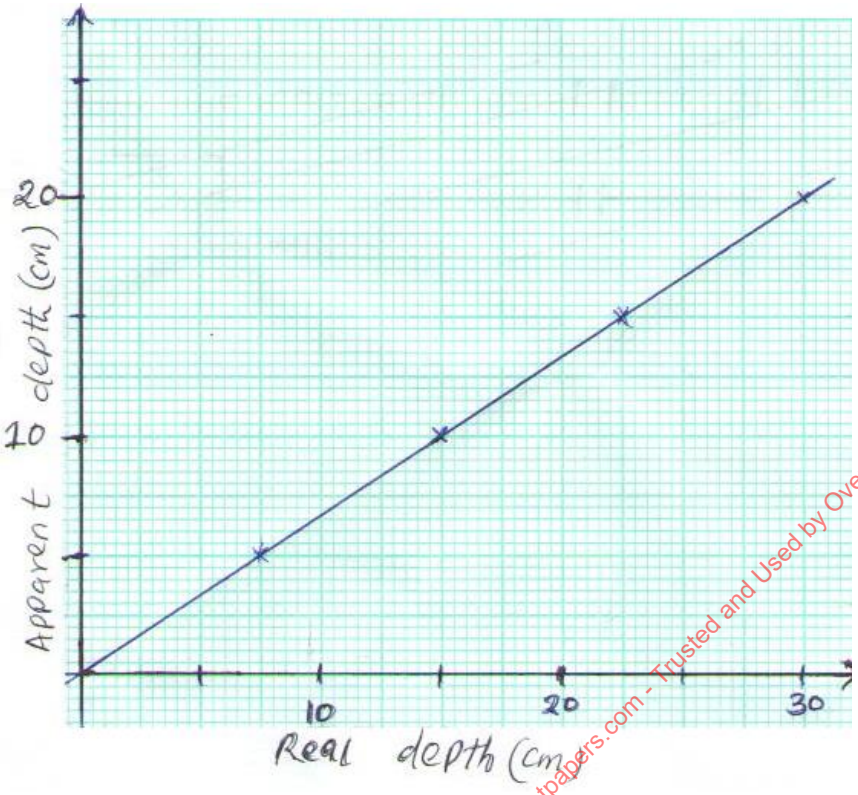
Calculate the effective capacitance between the points A and B. (3mks)

12. A driver was given two mirrors – a plane mirror and convex mirror to choose from. He chose convex mirror as his driving mirror. Give two reasons why?

SECTION B: 55 MARKS

13. (a) State Snell's law of refraction. (1mark)

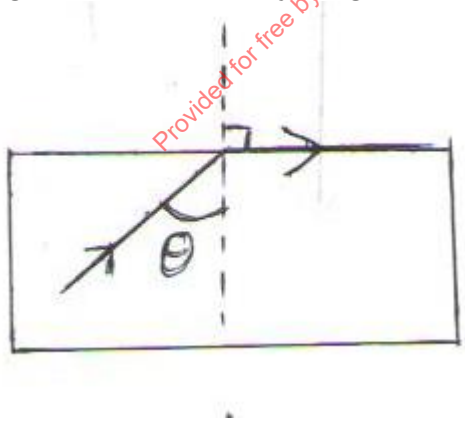
(b) In an experiment to determine the refractive index of a liquid, the liquid was poured into a measuring cylinder, a pin was placed at the bottom of the cylinder and another pin used to locate the apparent position of the first pin. The values of real and apparent depth were used to plot a graph as shown below.



(i) From the graph determine the refractive index of the liquid. (3 marks)

(ii) Given that the velocity of light in vacuum is 3.0×10^8 m/s, what would be the velocity of light in the liquid above. (2marks)

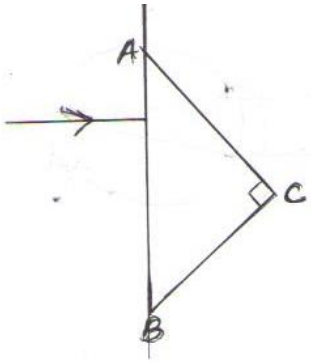
(c) The diagram below shows a ray of light incident on a glass-air interface.



Given that the refractive index of glass is 1.4, determine the value of θ (3marks)

d) State two conditions necessary for total internal reflection to occur. (2marks)

e) The diagram below shows a ray of light incident a glass prism ABC at 90^o



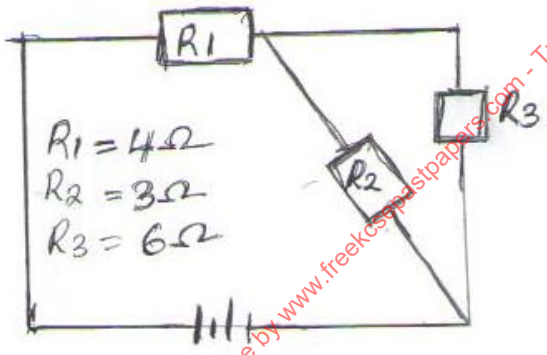
Complete the ray to show how it emerges from the prism given the critical angle of the glass is 42^o.(2marks)

14. a) State Ohm's law. (1mark)

b) You are provided with three resistors R_1, R_2, and R_3 connected in parallel. If the Pd across them is V, derive an expression for the effective resistance of the three resistors. (3marks)

c) The diagram below shows the resistors R_1, R_2 and R_3 connected in a circuit.

R1 = 4Ω
R2= 3Ω
R3=6Ω



(i) Calculate the total resistance in the circuit. (2marks)
(ii) The total current flowing in the circuit. (2marks
(iii) The pd across resistor R_1 (2 marks)
(iv) The current flowing through resistor R_2 (2marks)

(d) State two factors that affect the resistance in a conductor. (2marks)

15. (a) Explain how the following affect the velocity of sound in air. (3mks)

(i) Wind
(ii) Temperature
(iii) Humidity

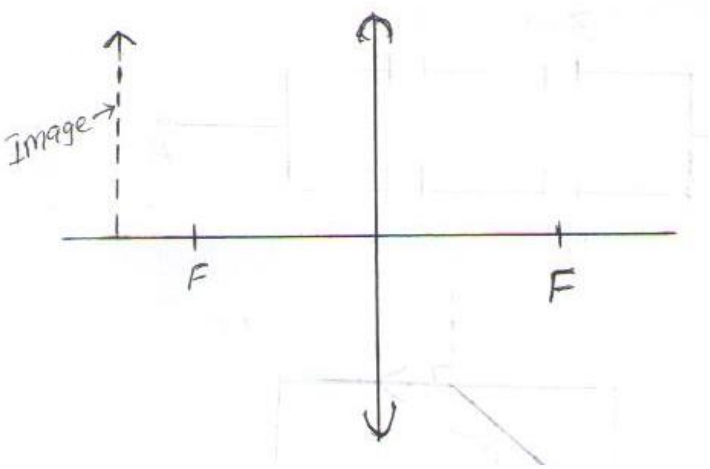
(b) A girl standing in a gorge between two cliffs claps her hands at a steady rate ad hears two echoes. The first eco comes after 2 seconds and the other after 3 seconds.
If the speed of sound is 340m/s, what is the distance between the cliffs. (3marks)

(c) The diagram below shows part of electromagnetic spectrum.

Gamma Rays	A	B	Visible light	C

(i) State which property of the electromagnetic waves decrease in the direction given. (1mk)
(ii) Name the wave marked B. (1 mark)
(iii) State any one use of A. (1mark)
(iv) State how C is detected. (1mark)

16. (a) Define Principal focus of a biconcave lens. (1mark)
(b) The diagram below shows a virtual image of an object placed in front of a biconvex lens.

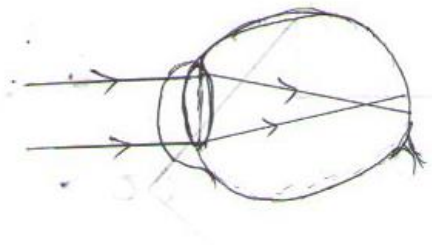


Draw appropriate rays to locate the object. (2marks)

(c) A convex lens forms a red image five times the size of the object n a screen. If the distance between the object and screen is 120cm, determine;

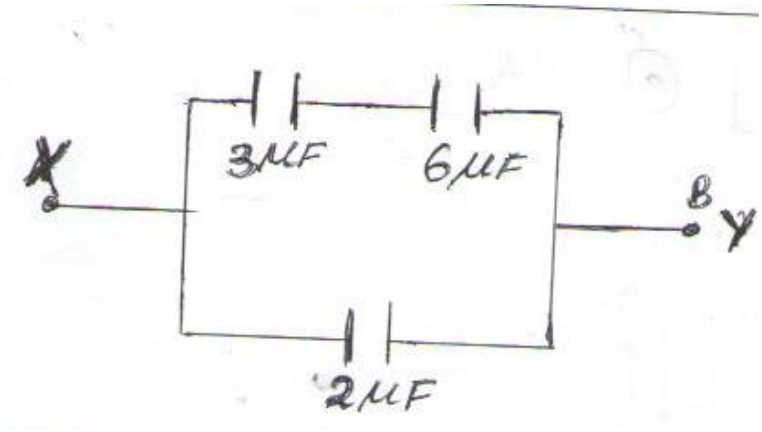
(i) Image distance (1marks)
(ii) Focal lent of the lens. (3marks)

(d) The diagram below shows a defect in human eye



(i) Name the defect. (1mark)
(ii) State two causes of the defect. (2marks)
(iii) How can the defect be corrected? (1mark)

17. a) State any two ways of increasing the capacitance of a parallel plate capacitor. (2marks)
(b) The diagram below shows a simple network of capacitors.



If the potential difference between X and Y is 12V. Calculate the total charge stored by the capacitors. (3mks)

If the potential difference between X and Y is 12v, calculate the total charge stored by the capacitors. (3marks)

(c) State any one application of capacitors. (1mark)

ACK NAMBALE DIOCESE
CONFIDENTIAL PHYSICS PRACTICAL-2019
QUESTION 1; EACH CANDIDATE SHOULD BE PROVIDED WITH;
PART A

- Two metre-rules.
- A stopwatch.
- A half metre rule.
- Two retort stands, two bosses and two clamps.
- Some sewing thread about 50cm
- A pendulum ball.

PART B

- A cylindrical container (about 20cm high and diameter 8cm or more)- used plastic containers can be used by cutting the upper section
- Some water
- A stop watch
- Ametre rule or half-metre rule
- A boiling tube
- Some sand (in 100ml beaker)
- Spatula
- A rubber band

QUESTION 2
EACH CANDIDATE SHOULD BE PROVIDED WITH THE FOLLOWING;
PART A

- A metre rule
- A log of plasticine
- Bi convex lens of focal length 20cm
- A candle
- A lens holder
- Across wire mounted on a cardboard
- A white screen

QUESTION2 : PART B

- new dry cells size D
- A cell holder.
- switch
- Voltmeter 0 - 3V.
- Ammeter 0-1A,
- 8 connecting wires (4 with at least 1 crocodile clip).
- Resistor =10Ω mounted on cardboard lebelled R

ACK NAMBALE DIOCESE JOINT EXAM 2018
232/3
PHYSICS
(PRACTICAL)
PAPER 3-2019
TIME: 2 ½ HOURS

QUESTION 1;

This question consists of two parts A and B; attempt both parts.

PART A

You are provided with the following:

- Two metre-rules.
- A stopwatch.
- A half metre rule.
- Two retort stands, two bosses and two clamps.
- Some sewing thread.
- A pendulum ball.

Proceed as follows:

(a) Clamp one metre rule horizontally on the two stands so that it is on a vertical plane. Suspend the second metre rule so that it balances on one point as shown in figure 1 below. Note the balance point as the centre of gravity of the metre rule. Let this be point A.

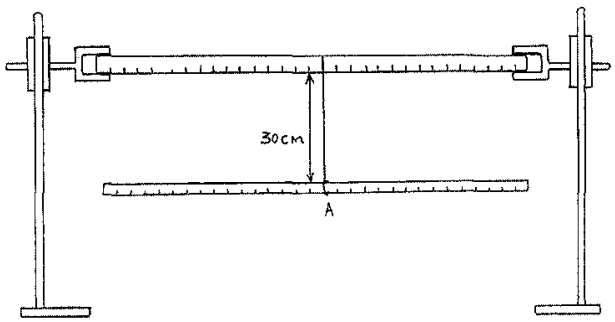
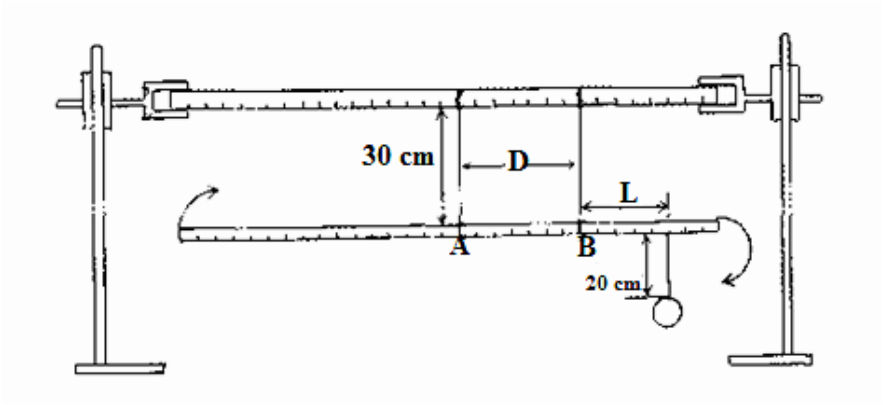


Fig.1

(b) Set the length of the string on which the metre rule is suspended to be 30cm. Tie a second support to the metre rule a distance D from the string. Let the point of support be point B

(c) Suspend the pendulum ball with a string a distance L from B and set the length of the string to 20cm. See figure 2 below.

Fig.2



Starting with a distance D = 15cm, and distance L = 25 cm. displace the hanging metre rule on a horizontal plane and record the time taken for it to make 20 complete oscillations on table 1.

(d) Repeat part (c) above for other values of D and complete the table below. (5marks)

D (cm)	Time for 20 oscillations (S)	Periodic time (T) (S)	T^2 (S^2)
15			
20			
25			
30			
35			
40			

e) On the grid provided, plot a graph of D (cm) against T^2. (5marks)

(f) Determine the slope of the graph at D= 25cm. (3marks)

(g) Use your graph to determine the periodic time when the length of distance D is 33cm. (2marks)

PART B ;

You are provided with the following:

- A cylindrical container (about 20cm high and diameter 8cm or more)- used plastic containers can be used by cutting the upper section
- Some water
- A stop watch
- Ametre rule or half-metre rule
- A boiling tube
- Somesand (in 100ml beaker)
- Spatula
- A rubber band

Proceed as follows:

c) Starting with **u**=30cm, vary the position of the screen S until a sharp image of the cross wire is observed on the screen. Measure and record the value o the image distance **v.**

(d) Repeat the experiment above for other values of u35cm, 40cm, 50cm, and 55cm. (4marks)

U (cm)	**30**	**35**	**40**	**45**	**50**	**55**
V(cm)						
M = $\frac{v}{u}$						

e) Plot a graph of M against **v**. (5marks)

f) Determine the slope of the graph. (3marks)

g) The equation of the graph is given by M = $\frac{v}{f}$ -1,use the graph to obtain the value of ***f.*** (3marks)

QUESTION2 :PART B

You are provided with the following apparatus.

- new dry cells size D
- A cell holder.
- switch
- Voltmeter 0 - 3V.
- Ammeter 0-1A,
- 8 connecting wires (4 with at least 1 crocodile clip).
- Resistor wire mounted on cardboard.R

(a) Connect the circuit as shown below in figure 4.0.

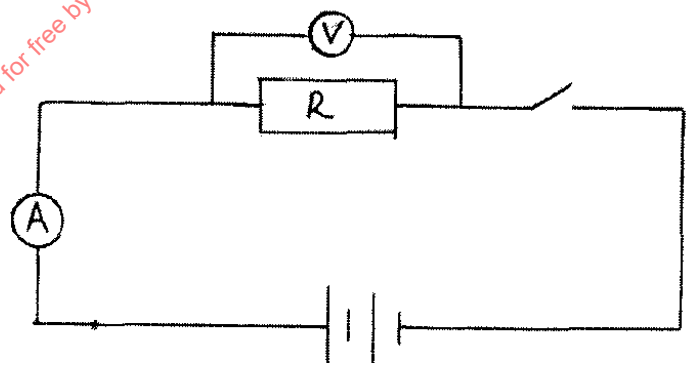


Fig 4

Record the reading of

(i) Ammeter, I=……..A (1mark)

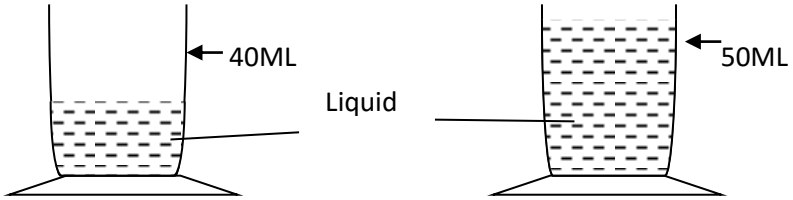
(ii) Voltmeter, V=…….V (1mark)

(iii) Given that K = $\frac{v}{l}$, find K=…… (2marks)

NYANDARUA WEST CLUSTER EXAM 2019
232/1
PHYSICS PAPER 1

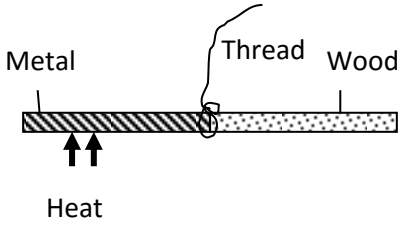
SECTION A: 25 MARKS

1. A stone of mass 40g was completely immersed in a liquid. The level of liquid are shown in the figure



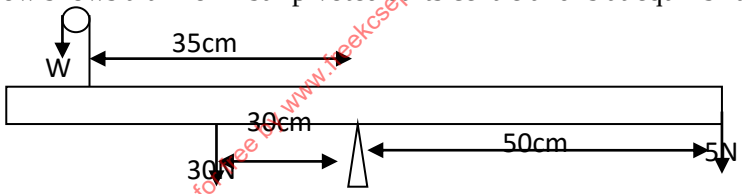
Determine the density of the stone in SI units (2mks)

2. The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



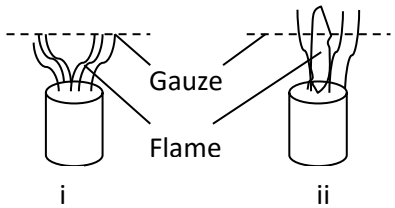
The side made of metal is now heated with a Bunsen flame. State with a reason, the side to which the rod is likely to tilt (2mks)

3. Estimate the size of an oil molecule if a drop of oil of volume 6.0×10^{-10} m^3 forms a patch of 32 on a water surface. (2mks)
4. Other than oil patch being monolayer, sate any one other assumption in the oil drop experiment. (1mk)
5. An immersion heater rated at 180W is placed in a liquid of mass 2kg. When the heater is switched on for 7.5 minutes the temperature of the liquid rises by 400C. Determine the specific heat capacity of the liquid.(3mks)
6. Other than temperature state one other factor that affects the surface tension of water. (1mk)
7. The figure below shows a uniform bar pivoted at its centre and is at equilibrium.



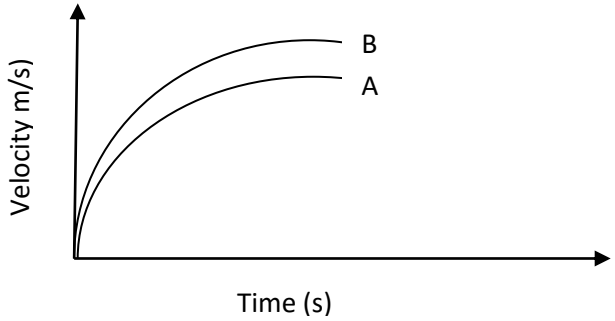
Determine the value of w. (3mks)

8. When a Bunsen burner is lit below wire gauze, it is noted the flame initially burns below he gauze as shown in
   (i) After sometime, the flame burns below as well as above the gauze as shown in



(ii) Explain this observation (2mks)

9. The figure shows the velocity time graph of two identical spheres released from the surfaces of two liquids A and B.



d) In an experiment to investigate the variation of centripetal force with radius r of a circle in which a body rotates, the following results were obtained.

Mass(g)	60	50	40	30	20
Radius® cm	50	41	33	24	16
F(N)					
R(m)					

(i) Complete the table above (2mks)
(ii) Plot a graph of force F against the radius (5mks)
(iii) Given that mass of the body is 100g, use the graph to determine the angular velocity. (3mks)

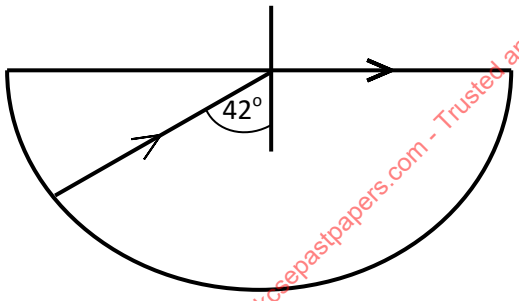
e) State one application of circular motion (1mk)

NYANDARUA WEST CLUSTER EXAMS
232/2
PHYSICS (THEORY)
PAPER 2

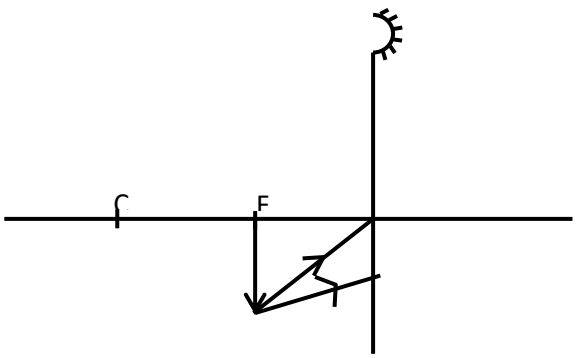
SECTION A: (25 MARKS)

*Answer **ALL** questions this section in the spaces provided.*

1. What property of light is suggested by the formation of shadows? (1mark)
2. Why are audio recording hall walls covered with soft materials. (1mark)
3. A highly negatively charged rod is gradually brought close to the cap of a positively charged electroscope. It is observed that the leaf collapses initially and then diverges. Explain this observation. (3marks)
4. The figure **below** shows a ray of light incident on a face of semicircular prism.
   Determine the refractive index of the glass prism. (3marks)



5. Explain why repulsion is the only sure test for polarity of a magnet. (1mark)
6. State the use of manganese (IV) oxide in a dry cell. (1mark)
7. A lamp of height 6cm stands infront of pin-hole camera at a distance of 24cm from the pin-hole. The camera screen is 8cm from the pinhole. Calculate the height of the image formed on the screen. (3marks)
8. A car accumulator is rated 40AH and is expected to supply a constant current for 120 minutes. Calculate the amount of current delivered. (2marks)
9. The figure **below** shows two incident rays on a concave mirror from the top of an object.
   Complete the ray diagram showing the reflected rays. (2marks)



(i) State and explain the effect on the metre rule when the switch S, is closed. (2marks)
(ii) What would be the effect of reversing the battery terminals? (1mark)

(c) The figure **below** shows two parallel current carrying conductors **A** and **B** placed close to each other. The direction of the current is into the plane of the paper.

On the same figure.
(i) Sketch the magnetic field pattern. (1mark)
(ii) Indicate the force F due to the current on each conductor. (1mark)

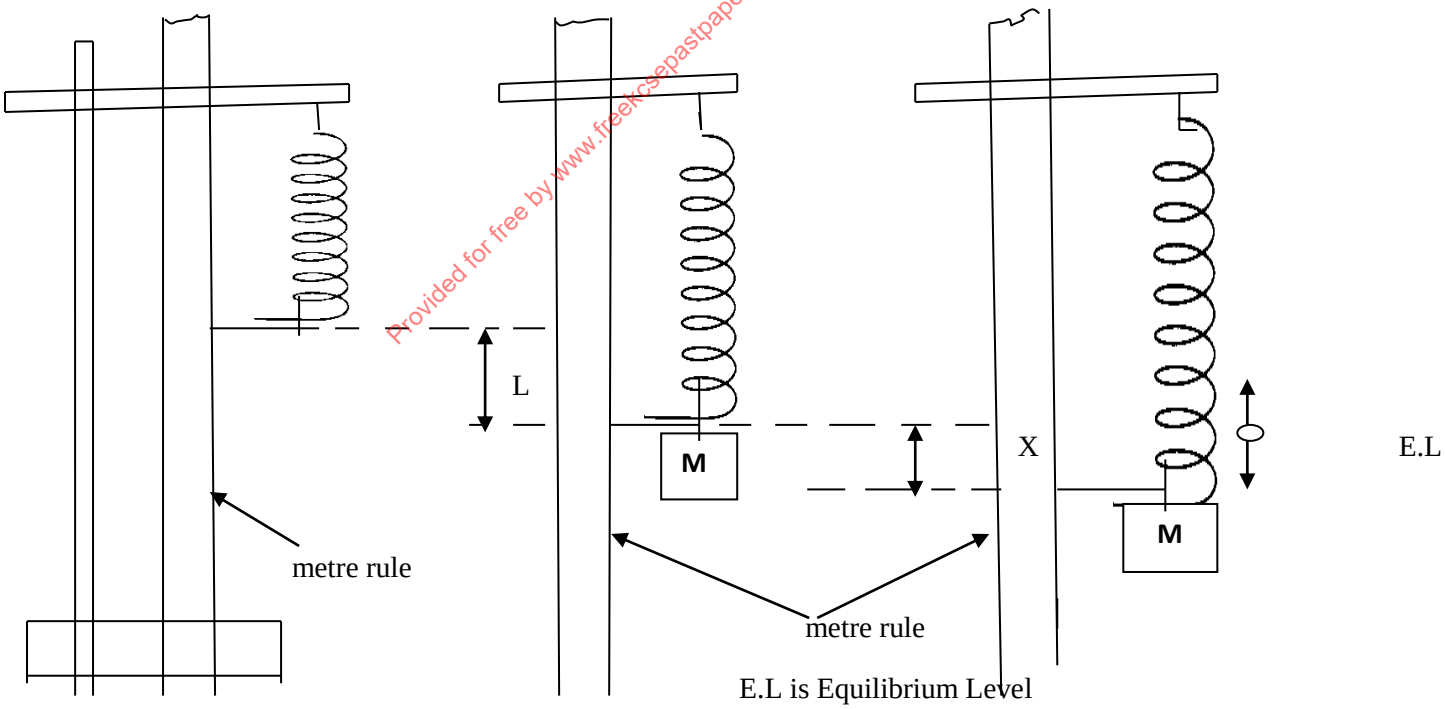
NYANDARUA WEST CLUSTER EXAM
232 / 3
PHYSICS
PAPER 3
(PRACTICAL)

Question 1

1. You are provided with the following apparatus

- A metre rule
- A mass marked M
- Six 20g masses
- A stop watch
- A complete stand
- A balance for sharing

Arrange the apparatus as shown in the figure 1.1(a) below



1.1(a) **1.1(b)** **1.1(c)**

(A) Attach the mass marked M to the free end of the spring to exert a downward force Mg in newtons as shown in figure 1.1(b) above. if the mass causes an extension L called static extension, then Mg=kL where k is the spring constant and g is acceleration due to gravity.

i) State the static extension L caused by M in cm (½mk)
ii) Using the balance, weigh the mass of M in grams …….g (½mk)
iii) Determine the spring constant k in Newton per meter if g=10.0ms^{-2} (1mk)

(B) Pull the mass M down a further distance x below the equilibrium position as shown in figure 1.1c. (x must be very small ≈5mm). Release the mass so as to oscillate up and down. Measure the time for 10 oscillations and record your values in the table shown below.

Repeat the experiment for the other values as shown and complete the table.

Mass m(g)	Extension L(cm)	Time for 10 oscillations (s)	Period T (s)	T^2 (S^2)
M				
M+20				
M+40				
M+60				
M+80				
M+100				
M+120				

(6marks)

(C) Plot the graph of L (in meters) against T^2 on the graph paper provided (5marks)
From your graph, determine:
(i) The slope of the graph (2mks)
(ii) The intercept of the L – axis (1mk)

(D) If Ms is the effective mass of the spring, the period T of the oscillating system is given by

$L = \frac{g.T^2}{4\pi^2} - g\frac{Ms}{K}$ Using this formula calculate:

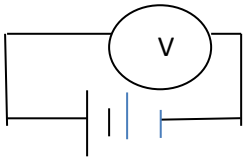
(i) Acceleration due to gravity g (2mks)
(ii) The effective mass Ms of the spring (2mks)

2. You are provided with the following apparatus

- A voltmeter
- An ammeter
- A 1.5V dry cell
- Six pieces of connecting wires
- A meter rule
- Mounted resistance wire

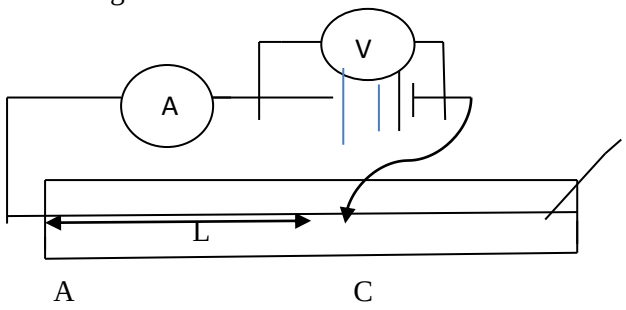
(a) Connect the voltmeter across the two dry cells on an open circuit as shown in figure 2.1 below.

Figure 2.1



What is the reading of the voltmeter …… (1mk)

(b) Now connect the dry cells to an external circuit in the form of a resistance wire by placing the jockey on the wire AB starting from L=20cm.



Resistance wire

Record the terminal p.d V in volts and the corresponding current **I** in amperes. Repeat the experiment for other values of L shown and complete the table. (8mks)

Length L (cm)	Terminal p.d V(volts)	Current **I**(A)	R=V/**I**	I/**I** (A^{-1})
20				
30				
40				
50				
60				
70				

(c) Plot a graph of R against $^{1}/\mathbf{I}$ (5mks)

(d) determine

(i) The slope (2mks)

(ii) The intercept of the R axis (1mk)

(e) Given that R=(E. 1/**1)** -r

Where E is the emf of the cell, **r** is the internal resistance of the cell, Determine from the graph:

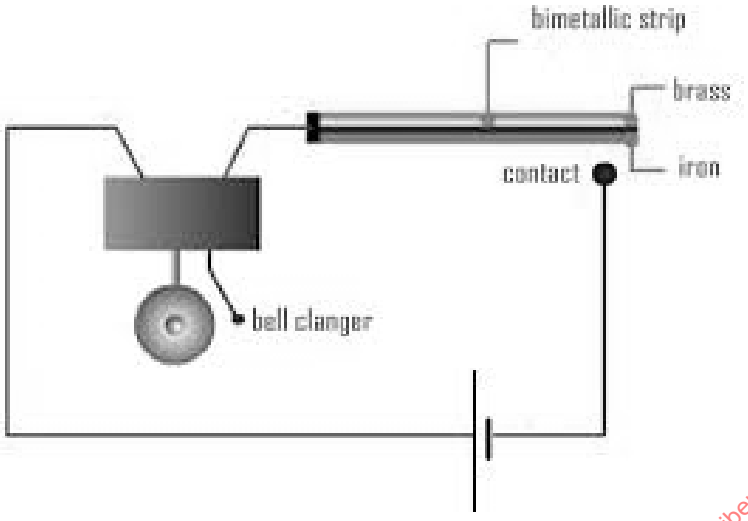
(i) The emf E of the cell (1mks)

(ii) The internal resistance **r** of the cell (2mks)

NYANDARUA WEST CLUSTER EXAMS 2019
PHYSICS
PAPER 1
MARKING SCHEME.

1. P= m/v = 409/ $10cm^3$ = $4gcm^3$
   = $400kg/m^3$
2. It tilts to the side with woo because when metal is heated it expands and becomes lighter.
3. T= v/A
   = $\frac{6 \times 10 -10}{3.142.1.1 \quad x\ (0.16)2}$
   = 7.459×10^{-9} m
   ($7.45942075 \times 10^{-9}$m)
4. The molecules in oil patch are closely packed. The oil drop b a perfect sphere/the oil patch perfect circular.
5. Pt = mcΔo
   180 x 7.5 x 60 = 2 x e x 40
   C = 1012.5J/kgk
6. Impurities
7. Sum of clockwise moments = sum of anticlockwise moments
   (5 x 50) + 35W = 30 x 30
   W = 18.57 N.

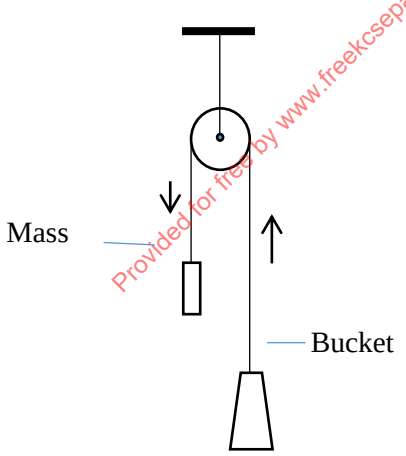
11. The picture shows a bimetallic strip in a fire alarm. Explain how it can be used to set the alarm on during fire outbreak (2mks)



When there is fire outbreak the bimetallic strip heats up and bend downwards, complete the circuit and the alarm rings.

SECTION B (55 MARKS)

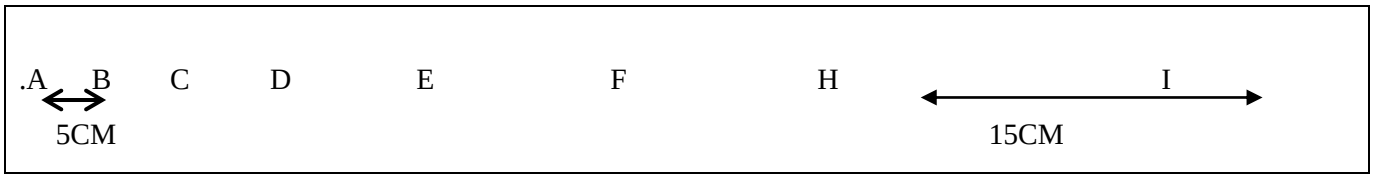
12. a) Distinguish between load and effort (1mk)
    b) Explain why the efficiency of a machine is never 100% (1mk)
    c) A body of mass, m is allowed to slide down an inclined plane. State two factors that affect its final velocity at the bottom of the inclined plane (2mks)
    d) A weight with the mass of 0.55 kg and a bucket with the mass of 0.45 kg, hang on a fixed pulley. Determine the acceleration of the system and the force with which the pulley acts upon its axis. Neglect the friction and the mass of the pulley and the string. (4mks)



13. A 5 kg block is moved up a 30 degree incline by a force of 50 N, parallel to the incline. The coefficient of kinetic friction between the block and the incline is .25.
    a) How much work is done by the 50 N force in moving the block a distance of 10 meters? (3mks)

    b) What is the total work done on the block over the same distance? (4mks)

14. a) The diagram below shows a section of ticker –tape produced timer operating at frequency of 50 Hz .

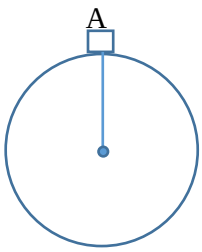


xiii. Find the average velocity between A and B (2MKS)
ii) Find the average velocity between H and I (2MKS)
iii) Determine the average acceleration (2mks)

b) A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the car. (2MKS)

15. a) Define the following terms
i. Angular velocity (1mk)
ii. Centripetal force (1mk)

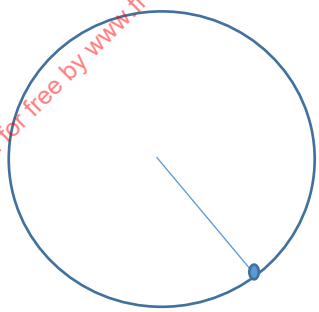
b) The diagram below shows the path of an object of mass M attached to a string of length r and whirled in a vertical circle at a constant speed v.



i) State the forces that provide the centripetal force on the object when it is at a A (2mks)

ii) Indicate with an arrow on the diagram of the net force f acting on the object when it is at A

c) 0.1-kg ball, attached to the end of a horizontal cord, is revolved in a circle of radius 50 cm and ball's angular speed is 4 rad s^{-1}. What is the magnitude of the centripetal force? (3MKS)



16. a) State Archimedes principle (1mk)
b) A Stone has a density of 24 g/cm^3 and a volume of 18cm^3. Determine:
i. The mass of the stone. (1MK)
ii. The weight of the stone. (2MKS
iii. The apparent weight of the stone in air. (2MKS)
iv. Apparent weight of the stone in water (density of water =1g/cm3) (3MKS)

17. a) Give the name of the law that compares gases at two different sets of conditions, with temperature as a constant and pressure and volume as variables? (1MK)

THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET)

232/2
PHYSICS
PAPER 2
THEORY

SECTION A (25 MARKS)

1. a) Define a virtual image as used in geometric optics (1mk)

   b) **Figure 1** below shows a pin-hole camera focusing a tree.

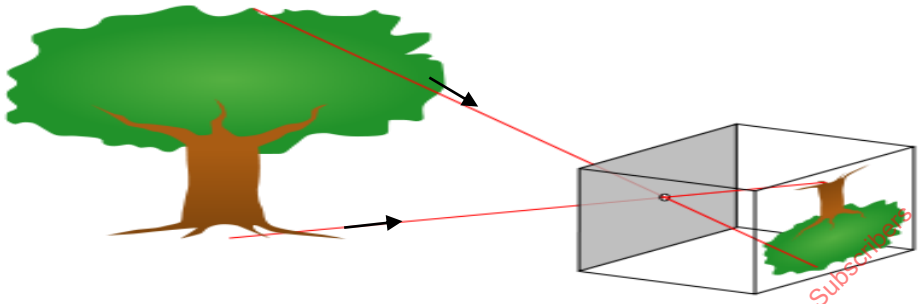


Figure 1

   Explain the effect on the image when the size pin-hole is enlarged (2mks)
2. A mosquito is believed to produce shrill sounds by flapping its wings at a frequency of 0.1 KHz. determine the periodic time (3mks)
3. Give a reason why Lead Acid Accumulators must be kept away from bare flames during charging (2mks)
4. **Figure 2** shows a wire wound on a magnetic material. The wire is then connected to a d.c supply. A north pole of the magnet is near the end of the core B.

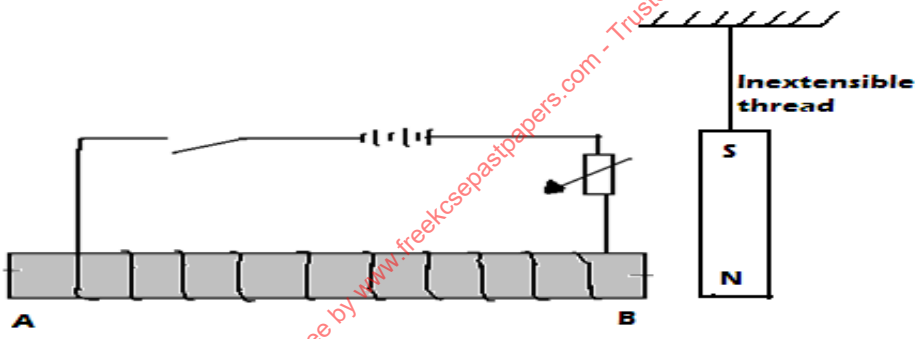


Figure 2

   a) State the polarities of A and B once the switch is put on
   A..... (1mk)
   B..... (1mk)
   b) What effect will end B have on the suspended magnet once the switch is put on (1mk)
5. **Figure 3** shows the path of a ray of light through a transparent material placed in air.

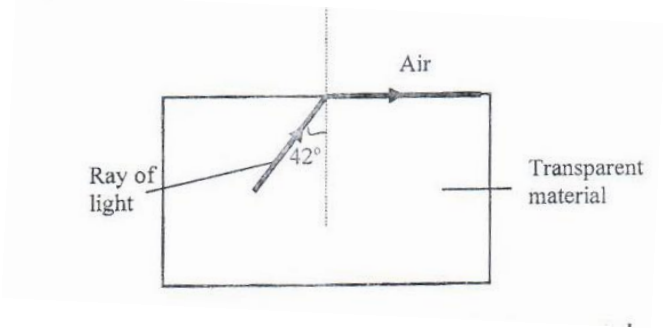


Figure 3

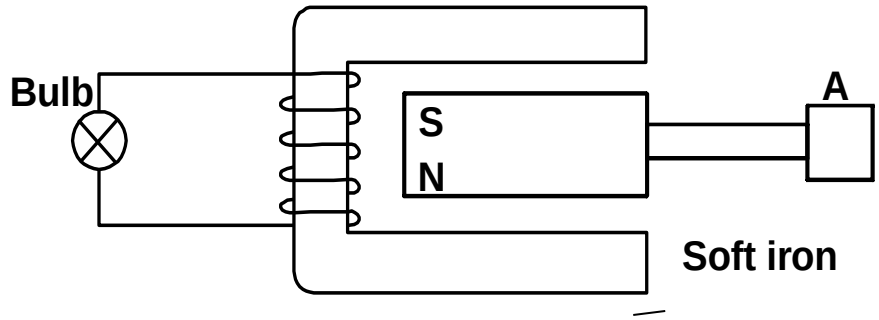
   a. Determine the refractive index of the transparent material (3mks)
   b. State one condition necessary for total internal reflection to occur (1mk)

(b) An ideal transformer steps 8.0V up to 2KV, and the 4000 turns secondary coil carries 2.0A. Calculate;

(i) The number of turns in the primary coil. (3mks)

(ii) the current in the primary coil. (3mks)

(c) **Figure 12** below shows a diagram of a bicycle dynamo. Wheel A is connected by an axle to a permanent cylindrical magnet and is rotated by the bicycle wheel.



(i) Explain why the bulb lights. (2mks)

(ii) How would the person riding the bicycle make the bulb brighter? (1mk)

THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET)
232/3
PHYSICS
PAPER 3
PRACTICAL

QUESTION ONE

This question consists of two parts A and B.

PART A

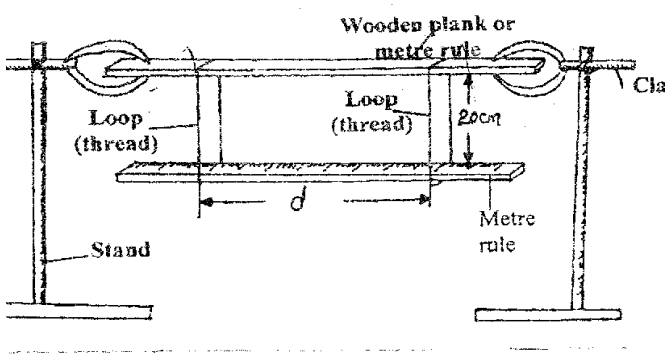
You are provided with the following apparatus

- 2 metre rules
- A half metre rule
- Two complete retort stands
- Some thread
- A stop watch

Proceed as follows

a) Set up the apparatus as shown below; ensure that the loops on the metre rules are loose to enable easy sliding of the threads.

The distance between the metre rules **must remain 20cm throughout** the experiment



b) Adjust the positions of the thread such that one is at the 15cm mark while the other is at 85cm mark, so that the distance **d** is 70cm.

c) Maintain the threads vertically by only moving the loops.
Displace the one end of the metre rule slightly on a horizontal plane, so that it oscillates on a horizontal plane when released

d) Measure the time taken by the metre rule to make 10 oscillations and record in the table below

Repeat the procedure in (b) above for all the values of d shown in the table. (6mks)

d (m)	0.7	0.6	0.5	0.4	0.3	0.2
$\frac{1}{d^2}$(m^{-2})						
Time for 10 oscillations (s)						
Period T(s)						
T^2 (s^2)						

e) On the grid provided, plot a graph of T^2 against $\frac{1}{d^2}$. (4 mks)

f) Determine the slope of the graph. (3 mks)

g) Given that $T^2=\frac{16K^2}{5d^2}$ where K is a constant, use the graph to determine the value of K. (2 mks)

PART B

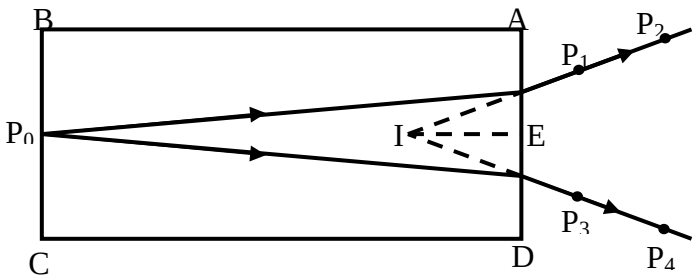
You are provided with the following apparatus

- 5 optical pins
- A glass block
- A plain paper
- A soft board
- 4 thumb pins.

Proceed as follows

a) Fix the white piece of paper on a soft board using the thumb pins provided.
b) Place the glass block on the white plain paper and draw the outline of the block.
c) Remove the block and indicate the sides ABC and D as shown in the diagram below.
d) Determine the centre on the side BC using your ruler and fix pin P_0.
e) Replace the block and observe from one side at the opposite end of the block.
f) Fix p_1 and P_2 so that they are in line with the image I of P_0.
g) On the other side of the block, locate the same image using pin P_3 and P_4.
h) Remove the glass block and produce lines P_1,$P_2$and P_3,P_4 to their points of intersection as shown in the figure.

I.



Using the half metre rule, measure the lengths

a. EP_0 =……cm (1mk)

b. EI = …….. cm (1mk)

II. Work out the ratio n = $\frac{EP_O}{EI}$ (2mks)

III. What does n represent? (1 mk)

QUESTION TWO

You are provided with the following apparatus.

- A voltmeter
- 2 dry cells
- A switch
- 10Ω resistor
- A micrometer screw gauge
- Resistance wire on a mm scale labeled Q.

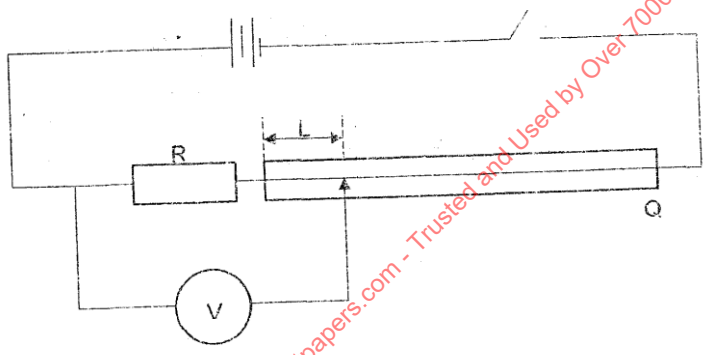
Proceed as follows

a) Using a micrometer screw gauge, measure the diameter of the wire
D_1=……mm (½ mk)
D_2=……mm (½mk)

b) Calculate the average diameter D of the wire, giving your answer in S.I units. (1 mk)

c) Determine the cross-sectional area A of the wire (2 mks)

d) Setup the circuit as shown below.



e) Starting with L=10cm, close the switch and record the voltmeter reading.

f) Repeat the procedure (d) with different values of L as indicated in the table below.

g) Complete the table. (6mks)

L(m)	0.1	0.2	0.4	0.5	0.6	0.8
V(volts)						
$\frac{L}{A}$(m^{-1})						

h) Plot a graph of V against $\frac{L}{A}$. (5 mks)

i) Calculate the slope of the graph. (3 mks

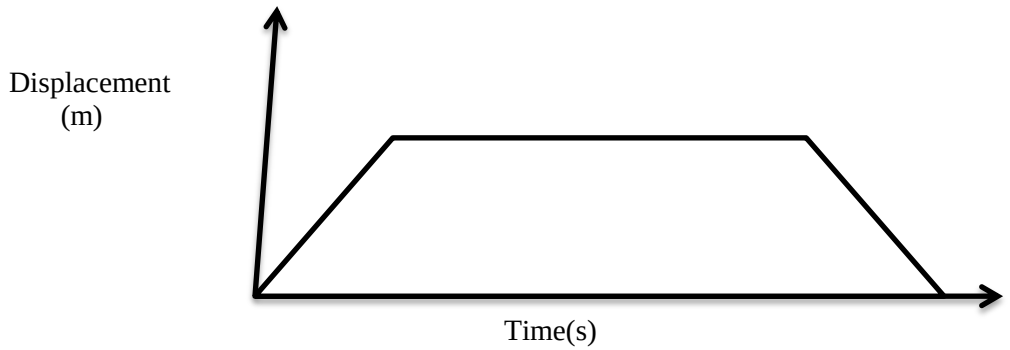
j) The graph is related by the equation V=$\frac{L}{A}$ (49×10^{-8}P) +K

Determine:

I. The value of P (1mk)

II. The value of K (1 mk)

9. The diagram below shows the Displacement-Time graph sketch for a certain body in motion.

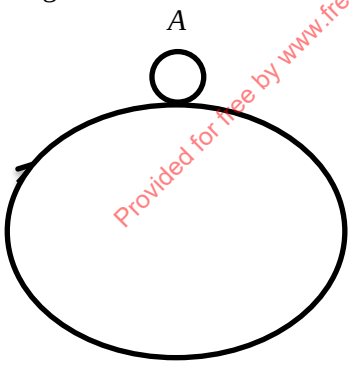


Sketch the Distance–Time graph for the same body. (2 mks)

10. A wet umbrella gets dried faster when the handle is rotated at high speed. Explain. (2 mks)
11. State the factors which cause the temp at which water boils to rise. (2 mks)
12. A solid displaces 9cm^3 of oil when floating and 15cm^3 when fully Immersed in it. Given that the density of oil is 0.8g/cm^3, calculate the density of the solid. (3 mks)
13. Suggest a suitable instrument that can be used for measuring the width of an object stated as 2.8 x 10^{-1}cm. (1 mk)

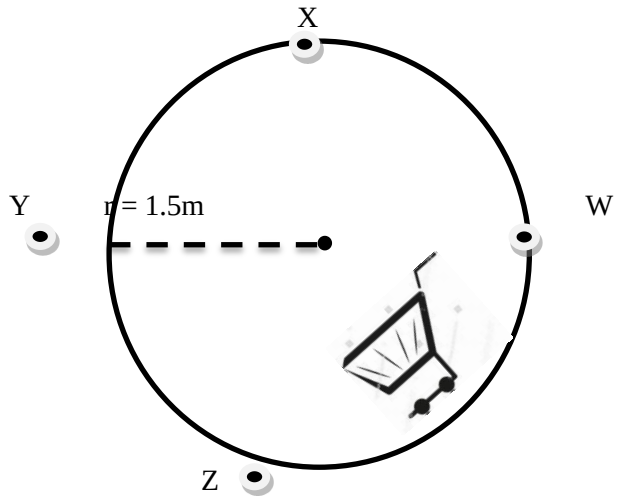
SECTION B (55 Marks)

14. (a) In an experiment to demonstrate Brownian motion, smoke was put in an air cell and observed under a microscope. Smoke particles were observed to move randomly in the cell.
    (i) Explain the observation (1 mk)
    (ii) Give a reason for using small particles such as those of smoke in this experiment. (1 mk)
    (iii) What would be the most likely observation if the temperature in the smoke cell was raised. (1mk)
    (b) An oil drop of average diameter 0.7mm spreads out into a circular path of diameter 75cm on the surface of water in a trough.
    (i) Calculate the average thickness of a molecule (4mks)
    (ii) State two assumptions made in (b) i) above when calculating the thickness of the oil molecule (2 mks)
15. The following diagram shows a ball whirled in a clockwise direction along a vertical plane.



i) Sketch the path followed by the ball if the string breaks when the ball is at position *A*. 1mk
ii) A body having a uniform motion in a circular path is always accelerating. Explain. (1mk)

b. The diagram below shows a trolley moving on a circular rail in a vertical plane. The mass of the trolley is 200g and the radius of the rail is 1.5m.



i) Determine the minimum velocity at which the trolley passes point *X* (2 mks)

ii) If the trolley moves with a velocity of 4m/s as it passes point Z, find its angular velocity at this point. (2mks

iii) Find the force exerted on the pin at point Z. (3mks)

16. (a) State Hooke's Law for spring/

(b) Forces of varying sizes are exerted on the lower end of a spiral spring whose upper end is attached to a rigid support. The extension of the spring is determined for each force. The graph below shows the relationship between the forces and extensions of the spring.

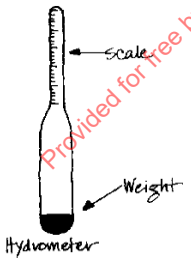
i. Determine the gradient of the graph. (3mks)

ii. From the gradient, determine the spring constant. (2 mks)

(c) Two identical springs are attached to each other end to end and the combination attached to a rigid support. If the spring constant for each spring is 500N/m, determine the work done in extending the combination by 10cm. (2mks)

17. a) A solid weighs 40N in air, 15N when fully immersed in water and 20N when fully immersed in liquid X. Determine the relative density of liquid X. (2 mks)

b.



(i) State the principle used in Hydrometer (1 mk)

(ii) Explain why a Hydrometer has a weighted bulb. (1 mk)

(iii) State two examples where a Hydrometer is commonly used in practical life. (2mks

(iv) A simple Hydrometer is setup with a test tube partly field with lead shots. Its mass is 10g and its cross-sectional area is $0.5cm^2$. Determine the length of the tube immersed in brine of density $1.20g/cm^3$. (3 mks)

18. (a) i) Distinguish between heat and temperature (2 mks)

ii) Define Specific Heat Capacity of a substance. (1 mk)

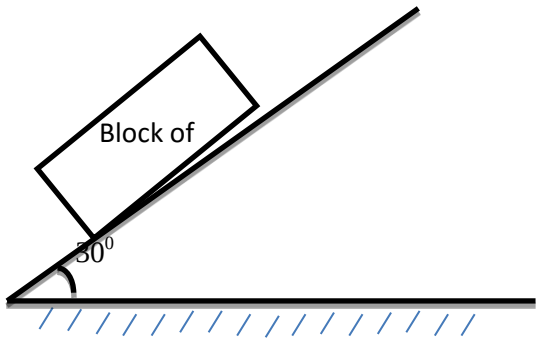
b) Two substances of equal masses contain equal quantities of heat but are at different temperature. Justify this statement with a suitable example. (3mks)

c) A piece of iron of mass 200g at 300 ^{0}C is placed in a copper container of mass 200g containing 100g of water at 20 ^{0}C.

i) Find the final steady temperature of the mixture. (4 mks)

ii) What assumption have you made in arriving at the answer. (Specific Heat Capacity of copper, iron and water are 390j/kg^{-1}, 460j/kg^{-1} and 4200j/kg^{-1}) (1 mk)

19. a) State Newton's third Law of Motion. (1 mk)
    b) A ball of mass 0.75kg rests on the surface of a level bench.
        i) Draw a sketch showing the forces acting on the ball and give the magnitude of the forces. (2 mks
        ii) If the ball was raised 1.5m above the surface and then released, what would be its Kinetic energy just before hitting the surface? (2 mks)
    c) The figure below shows a block of wood of Mass 5kg sliding down from rest on a plane inclined at an angle of 30^o to the horizontal. A frictional force of 6N acts between the wooden block and the plane.

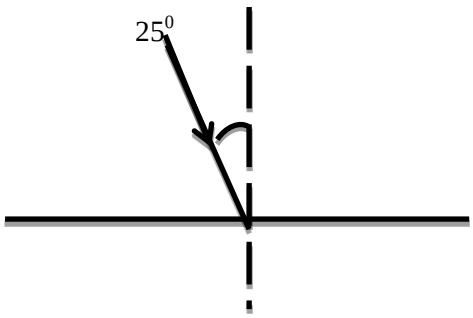


        i) Show on the diagram the forces acting on the wooden block. (3 mks)
        ii) Determine the force accelerating the wooden block down the plane. (1 mk)

STRATEGIC ALLIANCE EXAMINATION - 2019
232/2
PHYSICS
PAPER 2
TIME : 2HRS

SECTION A (25 Marks)

1. State the effect of polarization in the performance of a simple cell. (2 mks)
2. Explain why a soft iron core is more suitable than steel core for use in an electro-magnet. (2 mks)
3. Explain why sound waves are not propagated through vacuum. (2 mks)
4. The figure below shows a ray of light falling on a plane mirror lying on a horizontal plane with an angle of incidence of 25^0.



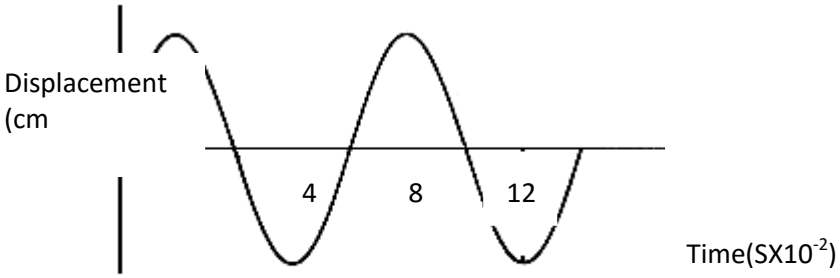
   The mirror is rotated through an angle of 150 with the direction of the incident ray being constant. Determine the angle of rotation of the reflected ray. (2 mks)
5. Explain why Nichrome wire is used as a heating element rather than copper. (1 mk)

6. Three different rods were brought near a negatively charged electroscope and the following observations were made.

ROD	OBSERVATION
A	Divergence increased
B	Divergence did not change
C	Divergence decreased to zero

Identify the changes A, B, C. (3 mks)

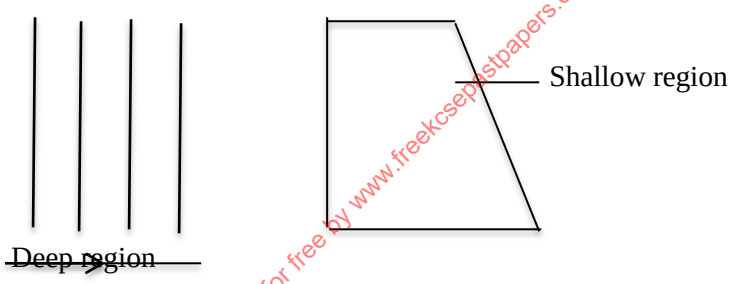
7. The wave shown in the diagram below has a velocity of 125m/s



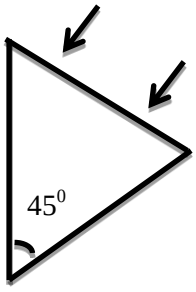
Determine the wavelength of the wave. (3 mks)

8. The following figure shows a human eye with a certain defect.
Sketch a ray diagram to show how the defect is corrected using a suitable lens. (2mks)

9. The figure below shows a wave fronts of water approaching a shallow region. (2 mks)



10. State two factors that determine speed of sound in air. (2 mks)
11. The figure below shows two rays of light incident on face PQ of a glass prism whose critical angle is 42^0. Show how rays go through the glass prism. (2 mks)

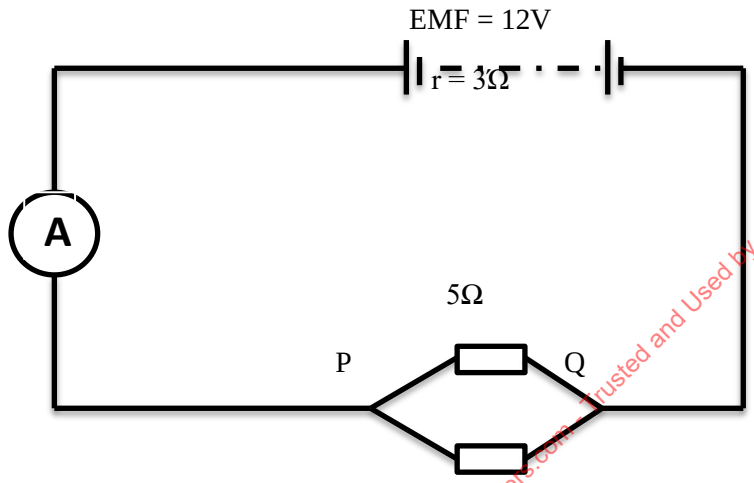


12. Determine the values of *a* and *b* in the following nuclear reaction. (2 mks)

$$^{212}_{84}P_0 \longrightarrow {}^{a}_{82}x + {}^{4}_{b}y$$

SECTION B (55 Marks)

13. a) State two applications of a cathode ray oscilloscope. (2 mks)
    b) The diagram below shows a cathode Ray Tube (CRT) of a Cathode Ray Oscilloscope (CRO)
    i) Explain how electrons are produced in the tube. (3 mks)
    ii) Explain how the control grid controls the brightness of the spot on the screen. (2 mks)
    iii) Why is it necessary to earth the screen. (2 mks)
    iv) If it is possible for X-rays to be produced in this tube. Explain. (2 mks)
14. A battery made up a number of cells has a total e.m.f of 12V and an internal resistance, r of 3Ω. If it is placed in series with two resistors and an ammeter of 1Ω resistance as shown below.



Determine

a) The reading on the ammeter (3 mks)
b) The reading on a voltmeter placed across the terminal of the battery. (2 mks)
c) The reading on the same voltmeter placed across PQ (2 mks)
d) The current through each resistor. (2 mks)

15. A polythene rod is rubbed with a cloth and held near the cap of an uncharged metal leaf electroscope. The meat leaves more apart as shown below.
    Explain in terms of the electrons
    i) What happens to polythene rod when it is rubbed with cloth. (1 mk)
    ii) Why the metal leaves move apart when the polythene rod is brought near to but not touching the metal cap. (2 mks)
    iii) Give two factors that determine the amount of movement of the leaves. (2mks
    b) Complete the table to describe the functions of the parts of a lightening conductor. (3 mks)

PART	FUNCTION
Spike	
Thick copper plate	
Earthed metal plate	

16. a) Differentiate between nuclear fusion and nuclear fission. (2 mks)
    b) An atom of uranium is represented by symbol

$^{234}_{92}U$

i) What information do the numbers 234 and 92 give? (2 mks)
ii) The Uranium emits an alpha particle to become U_n . Write the equation for the reaction. (3 mks)
c) How is the rate of decay of a radioactive element affected by temperature? (1mk)

17. a) A transformer is connected to a d.c source. The secondary coil is connected to a centre zero galvanometer. State and explain the observations made on the galvanometer. (2 mks)
b) State three ways in which energy is lost in a transformer and how it can be minimized in each case.(3 mks)
c) The figure below shows a transformer with 960 turns in the primary coil and *N* turns in the secondary coil which is connected to a 240V supply.
Given the transformer is 100% efficient and it will operate a 6V 24W bulb, find:
i) The number of turns in the secondary coil. (2mks)
ii) Current flowing in the primary coil. (2mks)
iii) a) State two factors that determine how far X-rays penetrate a given material. (2mks)
d) The diagram below shows an X-ray tube in operation.
i) State and explain the adjustment that should be made on the tube in order to vary the intensity of the X-rays produced. (2 mks)
ii) The X-rays from the tube were soft X-rays. Explain what should be done so that the tube produces hard X-rays. (2 mks)
iii) What property of copper makes it suitable for use as the anode material. (1mk)
e) The accelerating P.d in a certain X-ray tube is 15kv. Determine the maximum kinetic energy at which the electrons strike the target. (charge of an electron, $e = 1.6 \times 10^{-19}$ C) (3 mks)

PHYSICS CONFIDENTIAL
QUESTIONS 1

- A meter rule
- A knife edge raised 20cm above bench
- One 50g mass and one 100g mass
- Two pieces of thread
- Some water in a beaker
- Kerosene in a beaker labelled liquid L
- Tissue paper
- A rectangular glass block
- Four optical pins
- A piece of soft board
- A plain sheet of paper
- A thumb pin/tack

QUESTION 2

- A Milliameter
- A Voltmeter
- A wire mounted on a milliameter (Gauge 32)
- A switch
- A new dry cell and a cell holder
- Micrometer Screw Gauge (to be shared)
- 6 connecting wires

STRATEGIC ALLIANCE EXAMINATION 2019
232/3
PHYSICS
PAPER 3

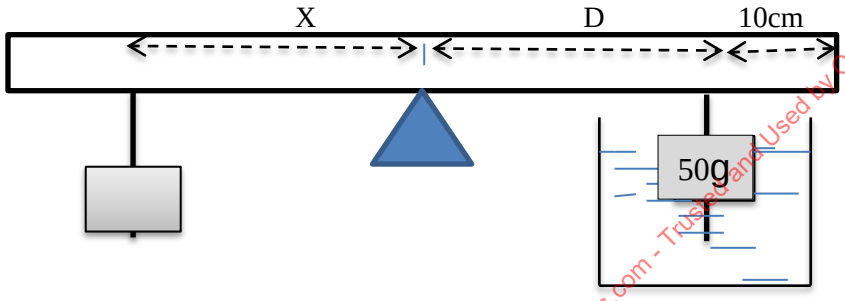
QUESTION 1
PART A
You are provided with the following:

- A Meter Rule
- A knife edge raised 20cm above bench
- One 50g mass and one 100g mass
- Two pieces of thread
- Some water in a beaker
- Kerosene in a beaker labelled liquid L
- Tissue paper

Proceed as follows:

a) Balance the Meter Rule on the knife edge and record the reading at this point.
Balance point = _____ cm. (1 mk)

b) Set up the apparatus as shown in the figure below. Use the thread provided to hang the masses such that the positions of support can be adjusted.



The balance is attained by adjusting the position of the 100g mass. Note that the distance X and D are measured from the knife edge and the 50g mass is fully submerged in the water. Record the value of X and D.
X = _____ cm (1 mk)
D = _____ cm (1 mk)
Apply the Principle of moments to determine the weight W_1 of the 50g mass in water and hence determine the upthrust *Uw* in water.
W_1
Uw
Remove the 50g mass from the water and dry it using tissue paper.

c) Now balance the metre when the 50g mass is fully submerged in the liquid L. Record the value of distance *X*.
X = _____cm (1 mk)
Apply the principle of moments to determine the weight W_2 of the 50g mass in the liquid L and hence determine the upthrust U_L in the liquid.

W_2 = (1 mk)

U_L = (1 mk)

d) Determine the relative density RD of the liquid L, given that

$$RD = \frac{UL}{Uw}$$

PART B:
You are provided with the following:
A rectangular glass block
Four optical pins
A piece of soft board

A plain sheet of paper
A thumb pin/tack

a) Place the plain sheet of paper on the soft board and fix it using the thumb tacks provided. Place the glass block at the centre of the sheet, draw its outline. Remove the glass block.
b) Draw normal at point 2cm from the end of one of the longer side of the block outline. This normal line will be used for the rest of the experiment.
c) Draw a line at an angle $\Theta = 25^0$ from the normal. Stick two pins P1 and P2 vertically on this line.
d) By viewing through the glass from the opposite side, stick two oher pins P3 and P4 vertically such that they are in line with the images of the first two pins. Draw a line through the marks made by P3 and P4 to touch the outline. Extend the line P1 and P2 through the outline (dotted line).

Measure and record in the table below the perpendicular distance ***d*** between the extended line and the line P3 and P4. (3 mks)

θ(degrees)	25	30	35	40	45	50	55
d(cm)							

e) Repeat the procedure in (b) and (c) for other values of the angles shown in the table.
N.B: The sheet of paper with the drawing must be handed in together with the question paper.
f) (i) Plot a graph of d against θ. (4 mks)
(ii) Use the graph to estimate the value of d when θ = 0 (1 mk)

QUESTION 2

You are provided with the following:
A Milliameter
A Voltmeter
A wire mounted on a milliameter
A switch
A new dry cell and a cell holder
Micrometer Screw Gauge (to be shared)
6 connecting wires

Proceed as follows:
a) Measure the diameter d of the wire at three different points.

D_1 = _____cm, D_2 = _____cm D_3 = _____cm

b) Setup the apparatus as shown in the circuit diagram
Close the switch and tap the mounted wire with crocodile clip as shown in the circuit.
Ensure that both meters show positive deflection.
Open the switch.
c) Tap the wire at L = 20cm, the switch, read and record in the table the voltmeter and milliameter reading.
d) Repeat the procedure in (c) for other values of L shown in the table and complete the table. (6mks)

e)

L (cm)	V (volts)	I (mA)	I (A)	$R = \frac{V}{I}$
20				
30				
40				
50				
60				
70				
80				

f) Plot a graph of R against L(m) (5 mks)

i) Determine the slope of the graph (3 mks)

ii) Given that $R = \dot{\rho}\frac{L}{A}$

Where A is the area of cross section of the wire $\dot{\rho}$ is a constant for the material of the wire. Determine the value of constant $\dot{\rho}$ (5 mks)

232/1
PHYSICSMARKING SCHEME
2 HOURS
JULY/AUGUST 2019
FORM FOUR STRATEGIC ALLIANCE EXAMINATION - 2019

SECTION A- (25 Marks)

1. The pressure built up inside the bottle might cause an explosion.
2. In a thin glass there is even distribution of heat as compared to the tick glass making it more liable to cracking.
3. Temperature gradient between the ends of the conductor
   The length of the conductor
4. It will tip over to the right. The dull surface absorbs more radiant heat and expands more increasing moments on its side.

5. $V^2 = U^2 - 2gs$ v = 0

   $U^2 = 2gs$
   $U^2 = 2 \times 10 \times 40$
   $U = \sqrt{800}$
   $U = 28.28$

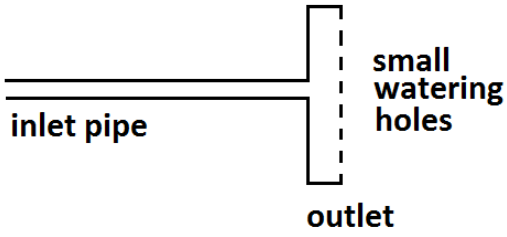
6. When the pressure is high, the speed of the fluid is low and vice versa(inverse proportionally)
7. $\frac{P1}{T1} = \frac{P2}{T2}$

   P1 = 740mmHg T1 = 37 + 273 = 310
   P2 = ? T2 = 17 + 273 = 290

   $P2 = \frac{740 \times 290}{}$

15 metal balls are gently lowered. Show on the diagram the final volume of water if the metal balls have a density of 1200kg/m^3 and the mass of each ball is 7.2g. (4 mark)

8. a) Define pressure and state its SI unit (2 mark)

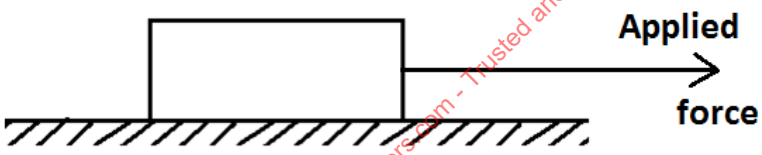


b. The diagram below shows a device used for watering crops out let has **N** number of holes. Inlet has a cross-section area of 2.4cm^2 and water flows at 15m/s. calculate the number of small holes if each hole has a cross-section area of 3mm^2 and water come out at 25m/s. (3 mark)

SECTION 55 MARKS

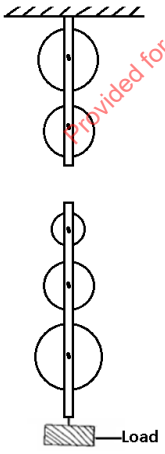
9. a) A trailer of mass 30000kg travelling at a velocity of 20m/s collide with a bus of mass 10000kg travelling at 10m/s in the opposite direction. The impact takes 0.5 seconds before the two vehicles move off together at a constant velocity for 15 seconds. Determine.
   i. The common velocity. (3 mark)
   ii. The impulsive force on the trailer on impact. (3 mark)

   b. An wooden block of mass 600g is pulled along a horizontal bench with a constant force as shown below



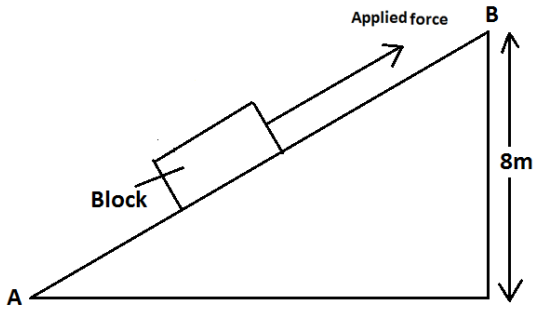
If the block accelerate at 2m/s^2 and coefficient of friction between the block and the table is 2.5 calculate applied force. (3 mark)

10. a) The diagram below shows a block and tackle. Show on the diagram the path string passes through the pulleys and state velocity ratio (2 mark)



a. Define a transducer, give one example that illustrate how it work (2 mark)

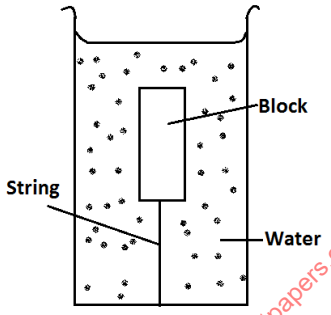
b. A block of weight 120N is pulled along an inclined plane using a steady force as shown below



If distance AB is 25m and work done against friction is 240J calculate the value of applied force (3 mark)

11. a) State pressure law (1marks)
    b. In an experiment to verify Charles laws state two quantities that are kept constant. (2marks)
    c. A balloon seller has a cylinder containing hydrogen of volume 3.0m^3 at a pressure of 2.6× 10^5 N/m^2 at 27^{0}C he sells a balloons of volume 1250cm^3 at a pressure of 1.04× 10^5 N/m^2 at 27^{0}C. Calculate the number of balloons he can sell. (3marks
    d. Calculate the maximum pressure of a glass block of density 2500kg/m^3 would exert on a horizontal surface, if the block measured 30 x 12 x 20cm. (3mark)

12. a) A rectangular block is held at the bottom of a container by a string as shown below



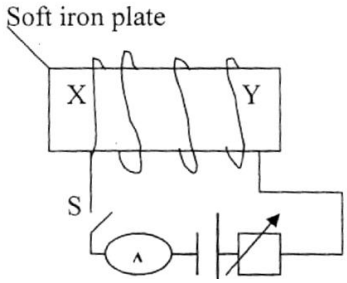
On the diagram show the forces acting on the bock (3mark
    b. If density of water is 1000kg/m^3 and the block has a volume of 750cm^3 and a density of 0.8g/cm^3 calculate the value of each force. (3marks)
    c. An object weighs 1040g in air, 640g when fully immersed in water and 720g when fully immersed in a liquid. If the density of water is 1000kg/m^3, find the density of the liquid. (3marks)
    d. In a hydrometer what is the purpose of
        i. Lead shots. (1marks)
        ii. Narrow stem (1marks
        iii. Wide bulb (1marks)

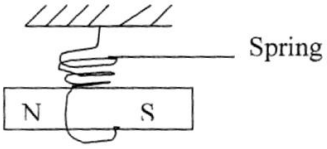
13. A copper of heat capacity 600J/K contains 200g of water at 20^{0}C. Dry steam at 100^{0}C is passed through the water while stirring until it reaches a final temperature of 60^{0}C. Given that specific heat of capacity of water as 4200J/Kgk and specific latent heat of steam as 2260,000 J/kg
    a. Heat absorbed by water (2 marks)
    b. Heat absorbed by calorimeter (2 marks)
    c. Write an expression on heat lost by steam heat lost by steam (2 marks)
    d. Calculate the mass of the steam condensed (2 marks)

14. a) Explain why a body moving in a circular path at constant velocity is said to be accelerating. (1 marks)
    b. A stone is projected horizontally from top of a cliff with initial horizontal velocity of 20m/s if the stone land s 100m from the bottom of the cliff, calculate height of the cliff. (3 marks)
    c. A string of negligible mass has a bucket tied at the end. The string is 70cm long and the bucket has a mass of 450g. The bucket is swung horizontally making 8.4 revolutions per second. Calculate
        i. The linear velocity. (3 marks)
        ii. The tension on the string. (3marks)

KIGUMO
232/2
PHYSICS
Paper 2
(Theory)

1. State any 2 ways of in increasing the size of an image formed by a fixed pinhole camera. (2 mks)
2. State 2 advantages of alkaline battery over a lead acid battery. (2 mks)
3. The diagrams below show a soft iron plate in a solenoid and a permanent magnet suspended by a spring.



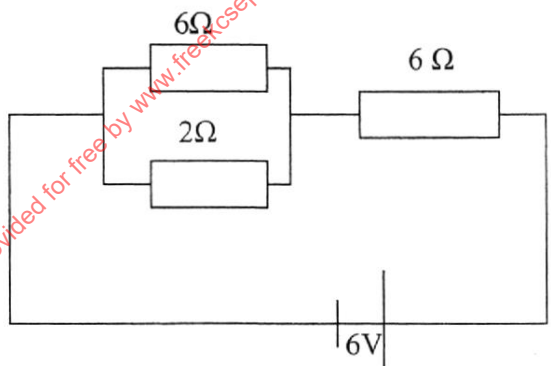


State with reason the behaviour of the magnet when the switch S is closed. (2 mks)

4. A man, standing between 2 parallel vertical walls, claps his hands. He hears the first echo 0.3 seconds later and the next echo after a further 0.2 seconds. If the velocity of sound in air is 300m/h. Calculate the distance between the walls. (3 mks)
5. The table below shows an electromagnetic spectrum. Complete the table in the order of increasing wavelength from A- B. (2 marks)

A			Visible Light			B

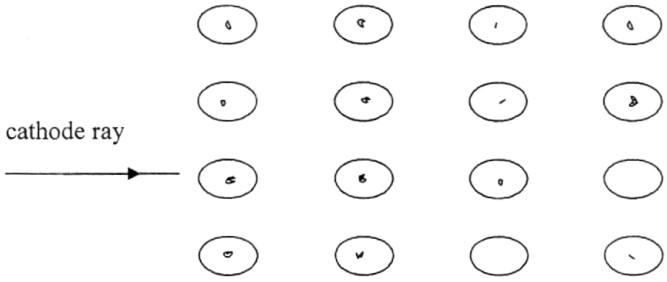
6. The figure below shows a 6V battery connected to an arrangement of resistors.



Determine the current flowing through 2 Ω resistor. (4 marks)

7. State difference between semi conductors and metallic conductors. (1 mark)
8. A radioactive sample has a mass of 16g and a half-life of 10 days. How much of the original sample remains after 40 days. (2 marks
9. Negatively charged rod is brought near the cap of a lightly charged electroscope. The leaf divergence first reduces but as the rod comes nearer, it diverges more.
   i. State the charge of the electroscope. (1 mark)
   ii. Explain the behaviour of the leaf above. (1 mark)
10. Water waves pass a point in a swimming pool at the rate of 30 crests per 60 seconds. One of the crests was observed to take 2 seconds to travel between 2 points, 6m apart. Determinethe wavelength of the water waves. (2 marks)

b. The figure below shows a cathode ray beam entering a magnetic field, perpendicular to the plane of the paper complete the diagram to show the path of the beam in the field. (1 mark)



11. The diagram below shows a junction diode.

p	n

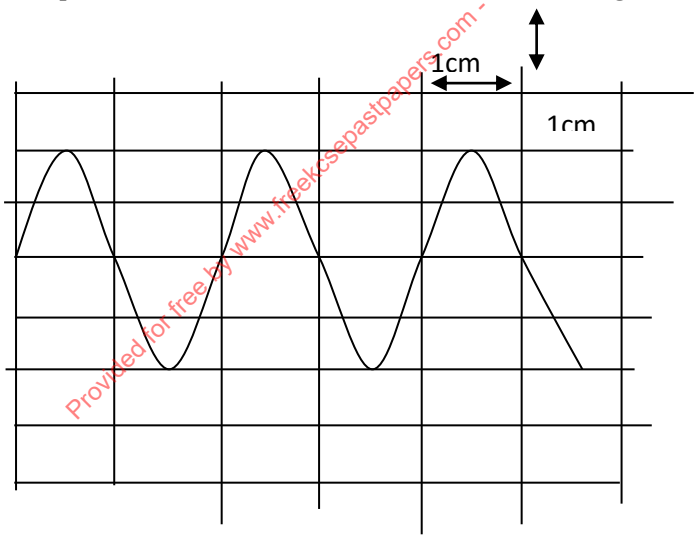
Complete the diagram to show how the diode can be connected in a reverse bias mode. (1 mark)

12. An Uranium 236 isotope has a symbol $^{2361}_{92}U$ when bombarded by a neutron, it splits to give Substances K and L and 2 neutrons. Calculate the values of a and b in the equation below. (1 mark)

$$^{236}_{92}U + {}^{1}_{1}n \longrightarrow {}^{95}_{56}K + {}^{a}_{b}L + {}^{+2}_{0}n$$

SECTION B 55MKS

13. a) Explain why a cathode ray tube is evacuated (1 mark)
b) State four properties of cathode rays (2 marks)
b) The figure shows the waveform displayed on the cathode ray oscilloscope screen when an alternating voltage is applied on the Y-input. The time- base is set at 1ms/cm and the Y-gain at 10v/cm



Calculate;
i. The amplitude of the ac input voltage (2marks)
ii. The frequency of the ac input voltage signal (2 marks)
c) The threshold frequency of sodium is $5.6\text{x}10^{14}$Hz .Find
i. Work function of sodium (2marks)
ii. The kinetic energy of the ejected electrons when sodium is shone with light of frequency $8.6\text{x}10^{14}$ Hz (2 marks)

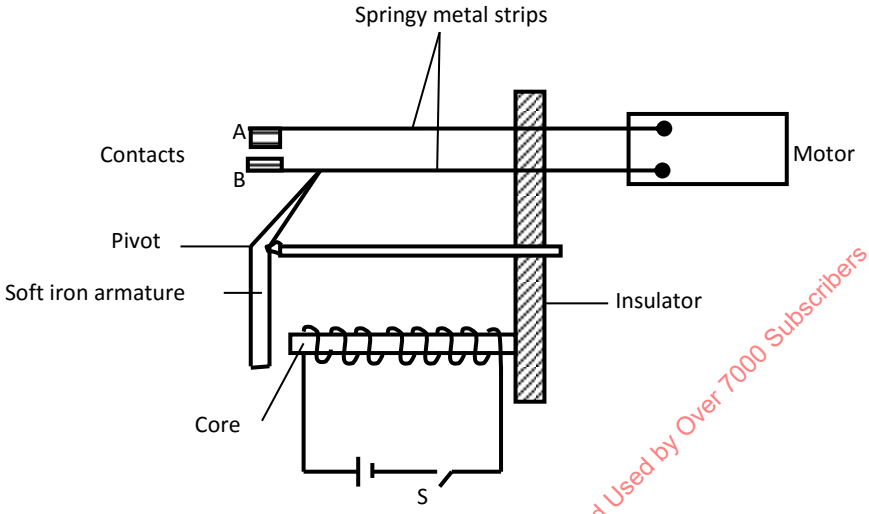
14. State the meaning of the term critical angle as applied in refraction of light. (1 mark

i. Name the parts labelled A and B. (2marks)
ii. Explain how change in the potential across PQ change the intensity of the x-rays produced in the tube. (1marks)
iii. During the operation of the tube, the target becomes very hot. Explain how the heat is caused.(1mark
iv. What property of lead makes it suitable for use as shielding material? (1mark)

b. In a certain X ray tube, the electrons are accelerated by a p.d of 12000v. assuming that all the energy goes to produce x rays, determine the frequency of the x rays produced(take planks constant h=6.62x10^{-34}Js, and the charge of an electron e=1.6x10^{-19} (3marks)

16. **Figure 8** shows an electromagnetic relay being used to switch an electric motor on and off. The electromagnet consists of a coil of wire wrapped around a core. The motor in figure is switched off.

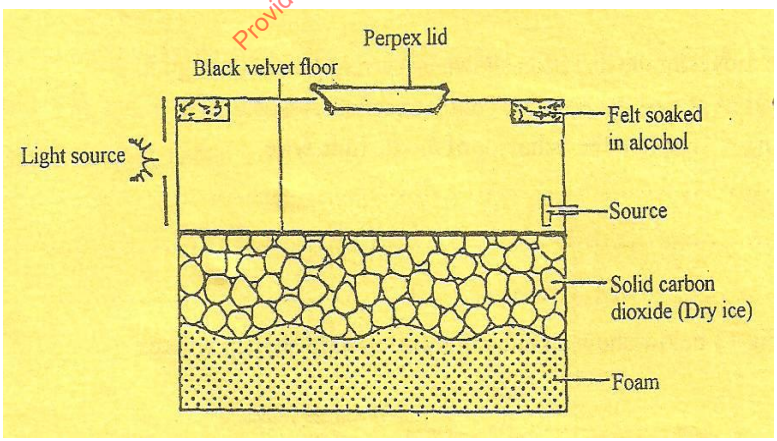
Figure 8



(a) Suggest suitable material for the core. (1mark)
(b) What happens to the core when switch S is closed? (2marks
(c) Why do the contacts A and B close when the switch S is closed. (2marks)
(d) When the switch S is opened, what will happen to;
(i) The core (1mark)
(ii) Soft iron armature. (1mark)
(e) Give **one** other application of an electromagnet. (1mark)
(f) State **two** ways in which an electromagnet could be made more powerful. (2marks)

17. Explain why carbon-14 ($^{14}_{6}C$) is radioactive while carbon $^{12}_{6}C$ is not. (1 mark)

(b) The figure below shows features of a diffusion cloud chamber used for detecting radiations from a radioactive source.



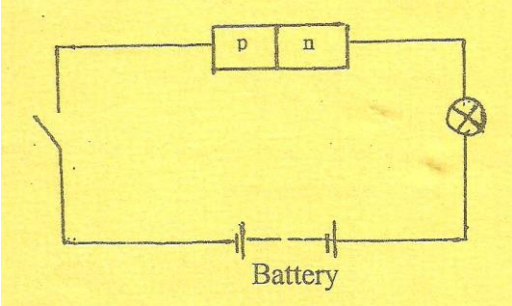
Explain how the chamber works when a radioactive particle is introduced at the source. (2 marks)

(c) (i) What is the purpose of solid carbon (iv) oxide. (1 mark)

(d) (i) Using a diagram explain how doping produces a p-type semi-conductor. (3 marks)

(ii) What is biasing? (1 mk)

(iii) The diagram below shows a circuit with a p-n junction and a very low power bulb.



State with reason the observations made on the bulb when the switch is closed. (2 marks)

KIGUMO
TERM 2 2019

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

The information contained in this paper is to enable the head of school and teacher in charge of physics to make adequate preparations for this year's physics mock practical examination. NO ONE ELSE should have access to this paper to acquire knowledge of its contents. Great care must be taken to ensure that the information herein does not reach the candidates either directly or indirectly.

The physics teacher is NOT expected to perform the experiments

The apparatus required by each candidate for the physics mock practical examination are set out on the next page. It is expected that the ordinary apparatus of a physics laboratory will be available.

The physics teacher should not that it is his/her responsibility to ensure that each apparatus acquired for this examination agrees with specifications on the next page.

The following apparatus are required for the successful performance of physics practicals examination.

QUESTION ONE

1. Two dry cells
2. One ammeter **(0-2.5A)**
3. One voltmeter **(0-5v)**
4. A variable resistor **(0-50Ω)**
5. A switch
6. 6 connecting wires

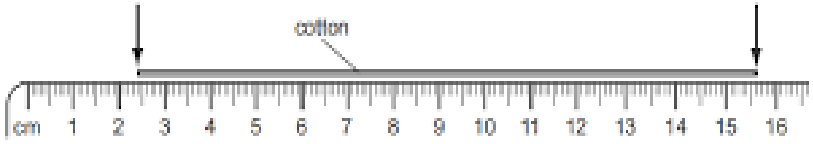
QUESTION TWO

1. A meter rule
2. One stop watch, one stand, clamp and boss
3. One spring
4. Two pieces of wood
5. A beam balance or electronic balance (to be shared)
6. Lens **(school to use the available denomination and the teacher to make the necessary adjustments)**
7. lens holder
8. cardboard with cross wire
9. white screen S
10. candle
11. Match box **to be shared**

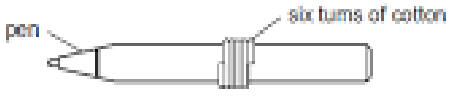
COMPLIANT TRIAL 2
231/ 1
PHYSICS -Paper 1

SECTION A (25 MARKS)

1. A piece of cotton is used to measured between two points on a ruler as shown



When the length of cotton is wound closely around a pen, it goes round six times.



Calculate the cir (3 marks)

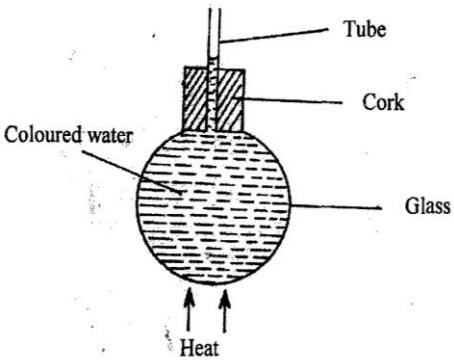
2. Koome heats 5kg of kg of water at 15°C the mixture attains a temperature of 40°C. (3mks)
3. 100 drops of oil, of c 2 x 10^{-4} kg. One of the drops is placed on a large clean water sur eter 50 cm^2. Determine; the diameter of the oil molecule. (3 mks)
4. The figure below sho 300N. Two masses measuring 25kg and 60kg are loaded on its ends.

Determine the distance from point A where a support should be placed for the plank to balance horizontally. (3mks)

5. An aircraft 300m from the ground, travelling horizontally at 400 m/s releases a parcel. Calculate the horizontal distance covered by the parcel from the point of release. (Ignore air resistance) (2mks)
6. The figure below the figure below shows two experiments to investigate energy transfer in water.

Name the process by which thermal (heat) energy travels through the glass. (1 mk)

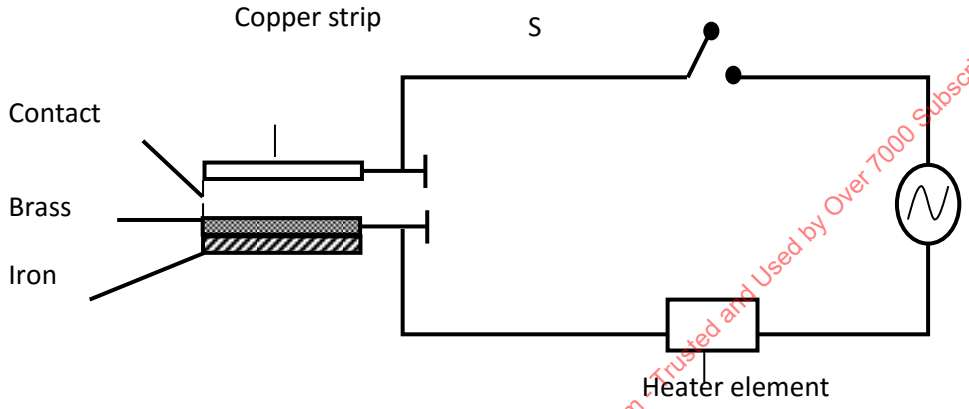
7. In the above experiment give a reason who the ice had to be wrapped on metal (1 mark)
8. Distinguish between speed and velocity. (1mark)
9. In the study of free fall, it is assumed that the force F acting on a given body of mass, m, is gravitational, given by F = mg. State two other forces that act on the same body. (2marks)
10. In the set up shown below, it is observed that the level of the water initially drops before starting to rise. Explain this observation. (2marks)



11. A wise cyclist will carry a load on the bicycle's carrier and not in a rack sack on his back. Explain (2mks)

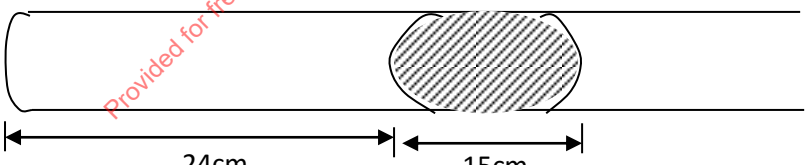
Section B (55 Marks)

12. (a) The figure below shows a circuit diagram for a device for controlling the temperature in a room.



(i) State the purpose of the bimetallic strip. (2mks)
(ii) Describe how the circuit controls the temperature when the switch S is closed. (3 Marks)
(b)(i) Differentiate between the term heat capacity and specific heat capacity of a substance (2mks)
(ii) An electric kettle rated 2.5kW is used to raise the temperature of 3.0kg of water through 50^0C. Calculate the time required to effect this (Specific heat capacity of water is 4200j/kgK) (3 Marks)

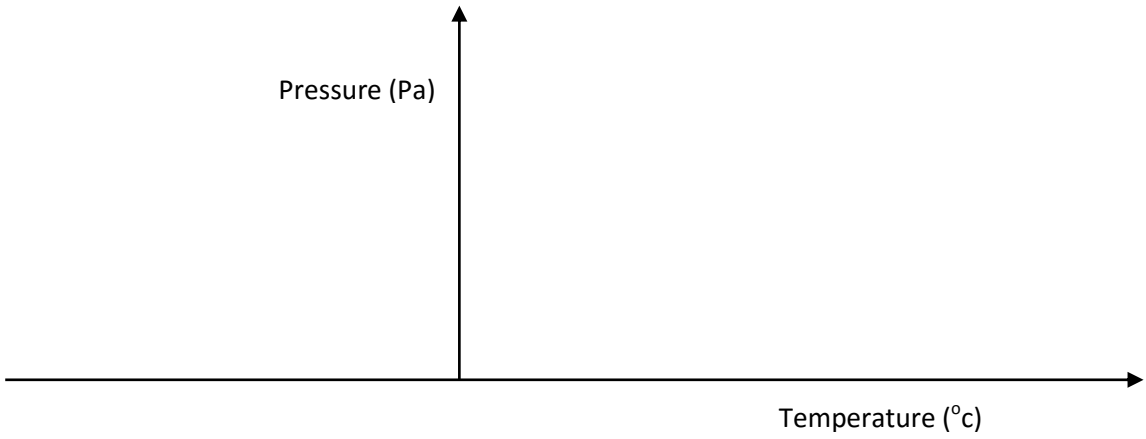
13. (a) A glass capillary contains enclosed air by a thread of mercury 15cm long when the tube is horizontal, the length of the enclosed air column 24cm as shown.



i) What is the length of the enclosed air column when the tube is vertical with the open end uppermost if the atmosphere pressure is 750mmHg? (2mks)
ii) Explain why the mercury does not run out when the tube is vertical with the closed end uppermost. (1mk)

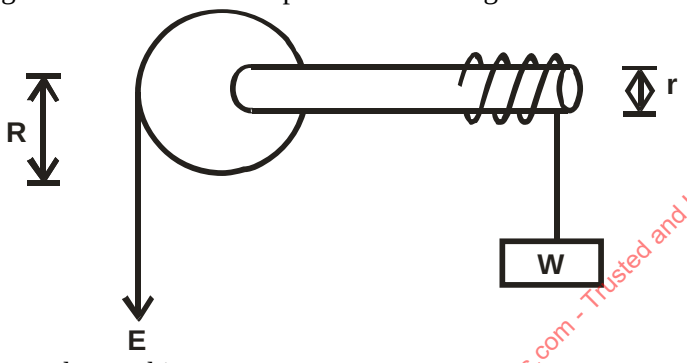
b) Explain why an air bubble increase in volume as it rises from the bottom of a lake to the surface. (1mk)
c) When an inflated balloon is placed in a refrigerator it is noted that its volume reduces, use the kinetic theory of gases to explain this observation. (2mks)
d) A certain mass of hydrogen gas occupies a volume of $1.6m^3$ at a pressure of 1.5×10^5 Pa and a temperature of 22^0c. Determine the volume when the temperature is 0^0c at a pressure of 0.8×10^5 Pa. (3mks)
e) i)State the pressure law (1mk)

ii) On the axis provided, sketch a graph of pressure against temperature on the celcius scale. On the same axis sketch another graph for a gas of a larger volume. (2mks)



14.a) A machine is a device that enables work to be done more easily and conveniently.
State **two** ways in which a machine ensures this. (2 marks)

b) The figure below shows a simple machine being used to raise a load W by applying an effort E.



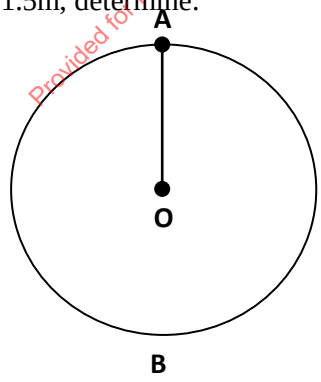
i) Name the machine. (1 mark)

ii) Show that the velocity ratio (V.R) of the machine is given by R/r. (2marks)

iii) Given that r =11cm and R = 99cm, determine the effort E required to raise a load of 2800N if the efficiency (η) of the machine is 95%. (4 marks)

c) Explain why as the load increases the value of mechanical advantage of a machine approaches the value of the velocity of the machine. (1 mark)

15. (a) The figure below shows a stone of mass 450g rotated in a vertical circle at 3 revolutions per second. If the string has a length of 1.5m, determine:



(i) The linear velocity (3mks)

(ii) The tension of the string at position **A** (3mks)

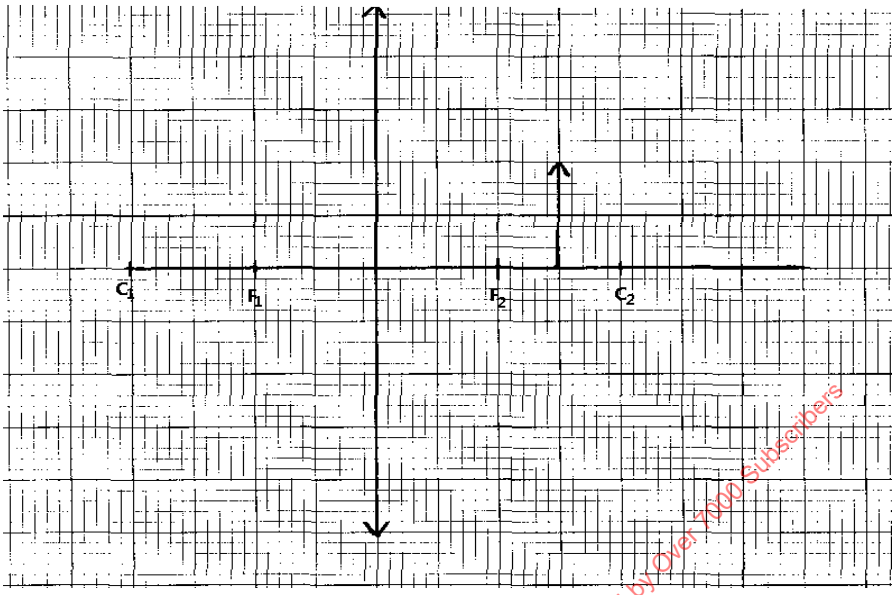
b) On the same diagram indicate the path that the stone will follow if the string snaps at point B (1mk)

c) A stone is whirled with uniform speed in horizontal circle having radius of 10cm. It takes the stone 10 seconds to describe an arc of length 4cm. Determine:

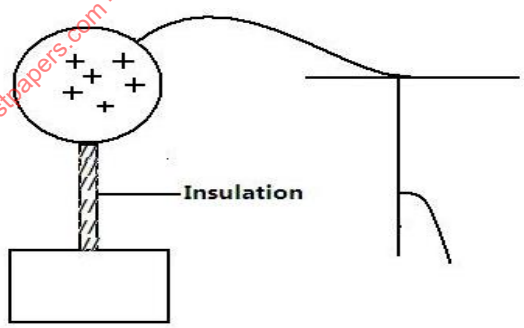
(i) The angular velocity **ω** (3mks)

(ii) The period **T** (3mks)

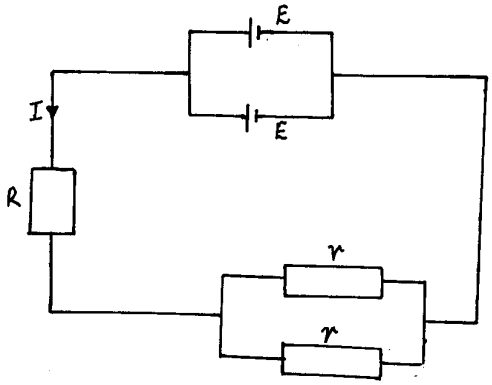
4. A man driving a car in rain discovers that the moment he alights from it, while touching its body he gets an electrical shock. Why was he not getting the shock while inside even if he touches metallic parts? (1 mk)
5. State and explain why TV tube has a wider screen than cathode Rays oscilloscope (C.R.O) tube (2mks)
6. The diagram below shows an image formed by a convex lens. By construction show the position of the object. (3mks)



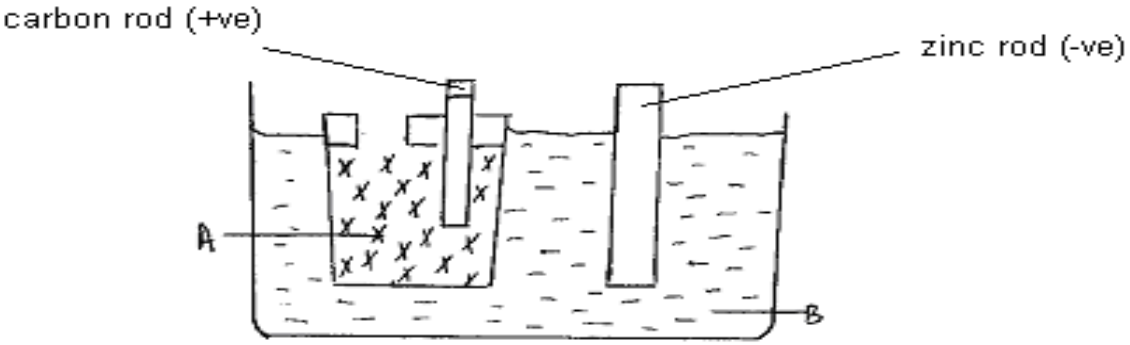
7. A charged metal sphere is connected to an uncharged electroscope as shown in the figure below. **State and explain** the observations made (2mks)



8. Using the circuit diagram below write formula relating E, I, R and r. (2 mks)



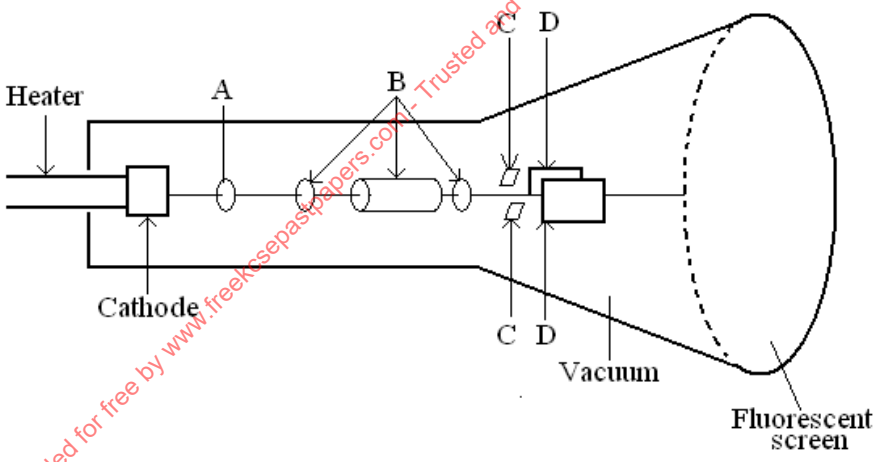
9. A thick sheet of plastic, n = 1.5, is used as the side of an aquarium tank. Light reflected from a fish in the water has an angle of incidence of 35^0. At what angle does the light enter the air. (3 mks)
10. Explain why an x-ray tube is evacuated. (1mk)
11. Distinguish between 'hard and soft' x – rays (1mk)
12. The figure below shows a laclanche cell.



Name the chemical substances in the parts labeled. (2mks)

SECTION B(55 MARKS)

13. (a) The fig 8 represents cathode ray oscilloscope (CRO)



1. **Name** the parts labelled A and B (2 marks)
2. **What** are the functions of the parts labelled C and D? (2 marks)
3. **Explain how** the electrons are produced (2 marks)
4. **Give a reason** why the tube is evacuated (1 mark)

(b) The work function of a tungsten is 7.2×10^{-19}J. **Calculate** the wavelength of the light photon that is capable of first removing an electron from the tungsten surface. (3 marks)

14. The current in a wire varied with voltage as shown in the following table.

Voltages(V)	1.05	1.40	1.80	2.20	2.60
Current (mA)	150	200	250	300	350

(a) Plot a graph of V against current. (5mks)

(b) From your graph, determine the resistance of the wire. (3mks)

15. i) **State three** properties of electric field lines. (3mks)

ii) With the help of a diagram **explain** how a lighting arrestor works. (5mks)

(b) (i) **Define** the term capacitance of a capacitor. (1mk)

(ii) Other than area of overlap of plates and the separation distance between plates. **State** any other factor that affects the capacitance of a capacitor. (1mk)

(iii) **Write down** an equation relating three factors in b(ii) above to the capacitance of a capacitor.

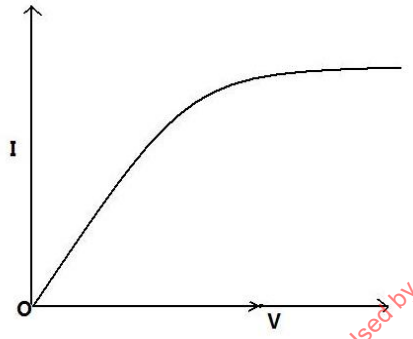
(c) 2 μ f capacitor is charged to a potential of 200v, then the supply is disconnected. The capacitor is then connected to another uncharged capacitor. The potential difference across the parallel arrangement is 80v. **Find** the capacitance of the second capacitor. (4mks)

16. (a) A car battery is used to light a 12V lamp A constant current of 3 A passes round the circuit.

(i) **Explain** what happens to the energy of the electron as they flow through the lamp wire. (3mks)

(ii) **How** much energy is transferred by the lamp in 20 seconds? (2mks)

(b) For a particular specimen of wire, a series of readings of the current through the wire for different potential differences across it is taken and plotted as shown.



i. **Explain** how the resistance of the wire changes (3mks)

ii. **How** would the resistance of a piece of wire change if

(I) the length were doubled (1mks)

(II) the diameter were doubled (1mks)

17. Define the terms ;

i. Work function: (1mk)

ii. Threshold frequency (1 mk)

(b) In an experiment of photoelectric emission from a clean metal surface, the following readings were obtained as shown below.

Frequency f (10^{15} H2)	0.6	0.7	0.8	1.0
Maximum kinetic energy EK (10^{-19}J)	0.58	1.25	2.56	3.26

(i) The metal surface used normally should be cleaned. 2maks**Explain** (2mks)

(ii) Plot a graph of kinetic energy, E_R against frequency f and use the graph to determine (4mks)

(i) The planks constant (2mk)

(ii) The work function of the metal in electron volts (eV) (2mks)

PHYSICS -Paper 3 (Practical)
Confidential

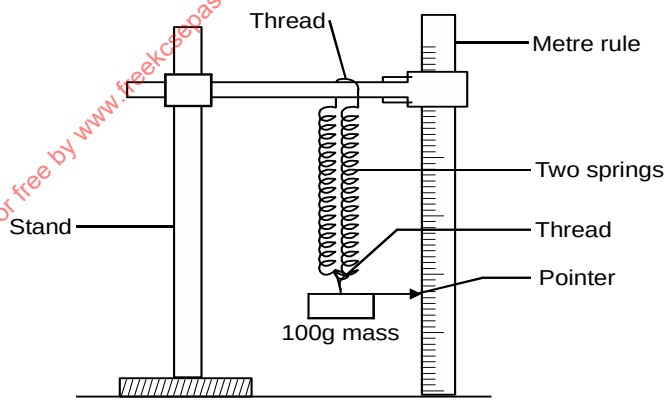
- One stand
- One boss
- One clamp
- Two pieces of thread
- One stopwatch
- One metre rule or half metre rule
- Two springs.
- Six 100g masses
- A piece of cellotape.
- Two dry cells.
- Nichrome wire mounted on a mm scale.

- An ammeter.
- Cell holder.
- Voltmeter
- 8 connecting wires.
- Metre rule
- Switch.
- Rectangular glass block
- 3 optical pins
- A soft board.
- A plane paper
- 4 paper pins.

COMPLIANT TRIAL 2
231/3 Physics Paper 3
(Practical)

1. You are provided with the following :
- One stand
- One boss
- One clamp
- Two pieces of thread
- One stopwatch
- One metre rule or half metre rule
- Two springs.
- Six 100g masses
- A piece of cellotape.

a)



a) i) Hang the springs from rod of a clamp as shown in the figure above.
ii) Tie together the upper end and the lower ends to springs with pieces of thread as shown in the figure.
iii) Hang a 100g mass from the lower ends of he springs so that the mass is supported by both springs.
iv) Clamp the rule vertically with zero centimetre mark uppermost.
v) Use cellotape to fix the optical pin on the top of the 100g mass so that it acts as a pointer.
vi) Adjust the rule so that the pointer is at 40.0cm mark from the top of the rule.

b) i) Add a 100g mass to the first mass. Record the new position of the pointer and the extension, e, in the table below.
ii) Add another 100g mass and record the new position of the pointer and the extension in the table.
iii) Repeat b(ii) until the total mass supported by the spring is 600g.

c) i) Remove the rule. Displace the 600g mass slightly downwards and release it to oscillate vertically.
ii) Time 20 oscillations. Record in the table the time, t_1 for 20 oscillations. Repeat this to obtain the average

time, t, and the period of oscillation T.

iii) Repeat (c) (i) and (ii) for 500g, 400g 300g and 200g masses.

iv) Find T^2 and complete the table.

Mass (g)	100	200	300	400	500	600
Position of point (cm)	40.0					
Extension, e, cm	0.0					
Time of t, (s)						
20 oscillations t2(S)						
Average time, t(s)						
Periodic time, T(s)						
$T^2(S^2)$						

d) i) On the grid provided plot a graph of T^2(vertical axis) against the extension, e. (5 marks)

ii) Determine the gradient of the graph. (2 marks)

iii) The equation of the graph is given by

$$T^2 = \frac{4\pi^2}{b}e + c$$

Where b and c are constants.

Determine the value of b. (1 mark)

What does the value of b represent? (1 mark)

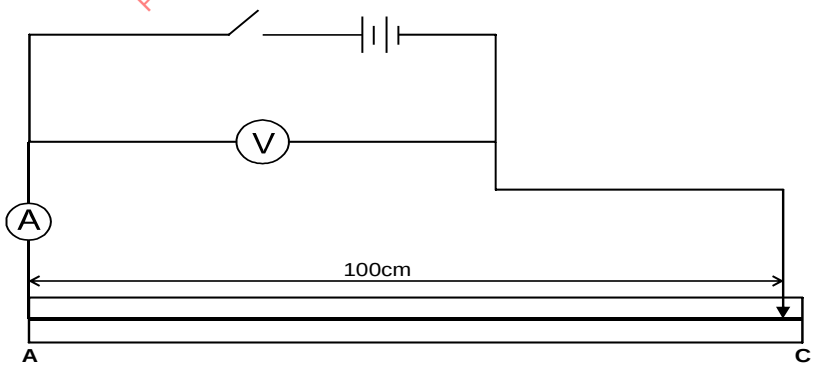
2. PART A

You are provided with the following apparatus.

- Two dry cells.
- Nichrome wire mounted on a mm scale.
- An ammeter.
- Cell holder.
- Voltmeter
- 8 connecting wires.
- Metre rule
- Switch.

Proceed

a) Connect the circuit as shown in the diagram below.



b) Connect the end A and C where AC is 100cm across the terminals as shown. Close the switch and measure both current I and p.d. across the wire AC.

Current = I ..... (½ mark)

P.d V = ... (½ mark)

(c) Measure the emf of the cells E = ... (½ mark)

(d) Reduce the length AC. In each case record the current I and the corresponding V. Complete the table below.

Length L(cm)	100	70	60	50	40	20
Current I (A)						
P.d. (V)						
E - V (v)						

(e) Plot a graph of (E - V) against I (A) (5 marks)

(f) Determine the slope of the graph. (2 marks)

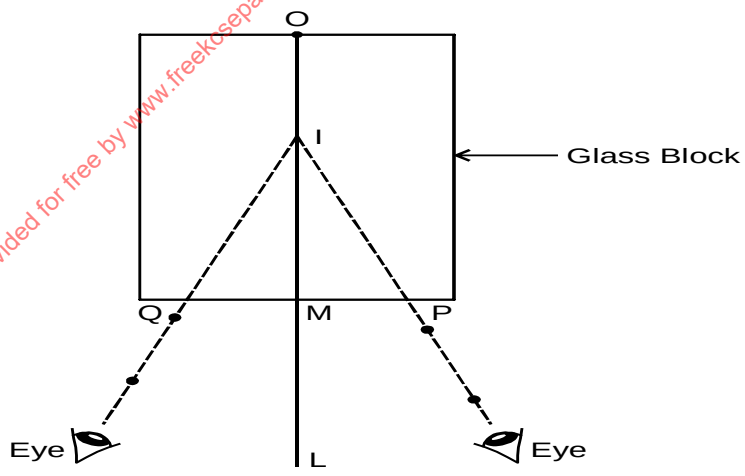
(g) Given that E = V + 1r determine r from your graph. (1½ marks)

Que 2 PART B

You are provided with the following apparatus.

- Rectangular glass block
- 3 optical pins
- A soft board.
- A plane paper
- 4 paper pins.

Place the rectangular glass block in the middle of the plane paper and trace its outline. Using a pencil remove the block.



Construct a perpendicular line LMO bisecting the shorter sides of M and O.

Mark points P and Q such that PM = MQ = 5cm.

a) Measure (1 mark)

OM.....

- Place the plane paper on the soft board and carefully replace the glass block so that it fit the outline.
- Press the object pin on O such that it is upright and touching glass block and the second pin on P also upright and touching the block.
- Press the third pin P_1 a short distance form the block such that P_1, P and I lie on a straight line when viewed through the block with one eye. I is the image of the object pin O.

Section B (55 Marks)

12.. a i) automatically switching on and off of the heater element

ii) when the heat increases beyond the required temperature brass expands more than the iron; the strip curves downwards breaking the contact; when the temperature lowers the strip contracts completing the circuit and the process continues;

b) i heat capacity- quantity of heat required to raise the temperature of a substance by 1k

specific heat capacity- quantity of heat required to raise the temperature of a unit mass of a substance by 1k.

ii) Q= pt;

3 x 4200 x 50 = 2.5 x 1000 x t;

T= 252s;

13. (a) i)

$P_1V_1=P_2V_2$

$24\times750= (750+15)V_2$

$V_2=\frac{24\times750}{765}$ =23.53cm

(ii) The mercury does not run out because the upwards atmospheric pressure in the mercury column is greater than the downward pressure due to the enclosed air and its own mass.

b) At the bottom of the lake, the bubble is under the pressure of water column + the atmospheric pressure on the surface of water. As the bottle rises the depth of the water column decreases as so does the pressure decreases in pressure results in increase in where since PV=a constant (Boyle's law)

c) Low temperature reduces the kinetic energy of molecules which lead to lower rate of collision which results to reduction of pressure.

d)

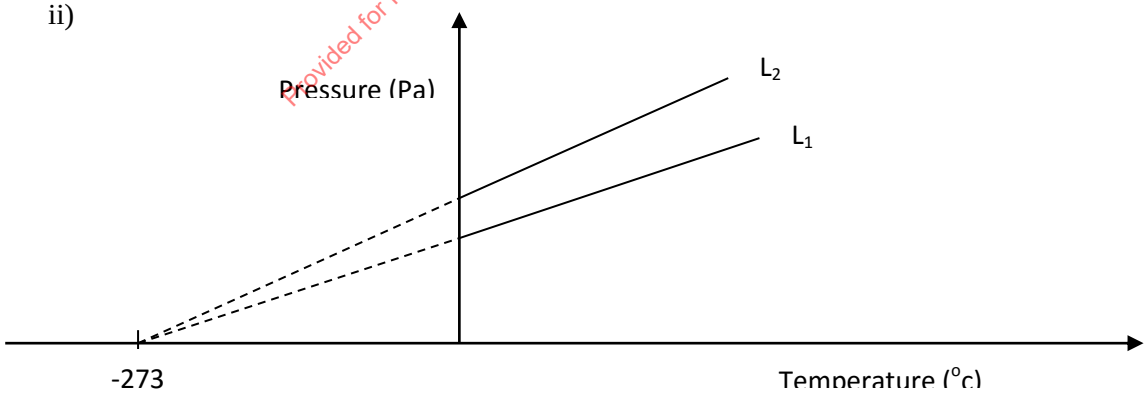
$$\frac{P1V1}{T1}=\frac{P2V2}{T2}$$

$$\frac{1.5\times10^5\times1.6}{295}=\frac{0.8\times10^5\times V2}{273}$$

$V_2= 2.776cm^3$

e) i) Pressure of a fixed mass of a gas is directly proportional to its absolute temperature provided volume is kept constant

ii)



14.(a) (i) Transferring the force that is required to do certain work. ✓1

Changing the direction of a force to more convenient direction ✓1

Increasing the rate at which work is done. ✓1 (Any two)

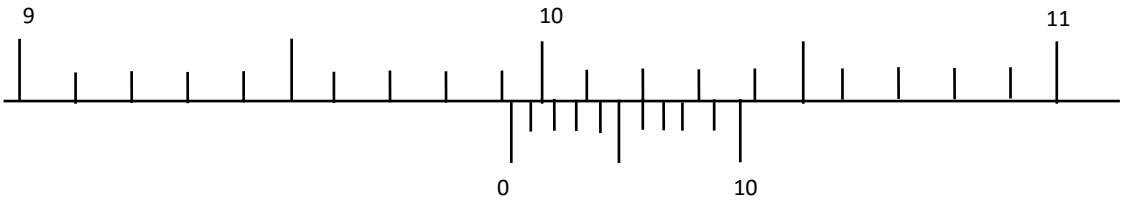
(ii) Friction between the moving parts of the machine. ✓1

Weight of the moving parts ofthe machine. ✓1

GATUNDU SOUTH SUB-COUNTY EVALUATION
232/1
PHYSICS
PAPER 1

SECTION A 25 MARKS
Answer all questions in this section

1. The figure I below shows the reading of a vernier calipers used to get the diameter of a cylindrical tin.



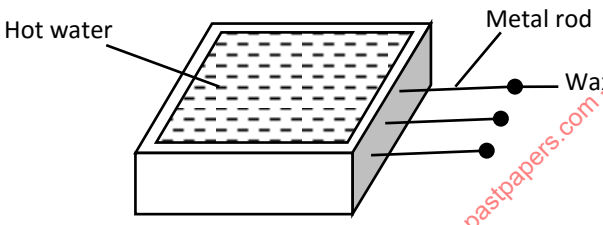
If the vernier caliper had a negative error of 0.02 cm, what is the actual diameter of the tin? (2 marks)

2 . A body is projected vertically upwards from the top of a building. Assuming that it lands at the base of the building. Sketch the velocity time graph of the motion. (2marks)

3 The stability of a body can be increased by increasing the base area and lowering its centre of gravity. State how the position centre of gravity can be lowered. (1mark)

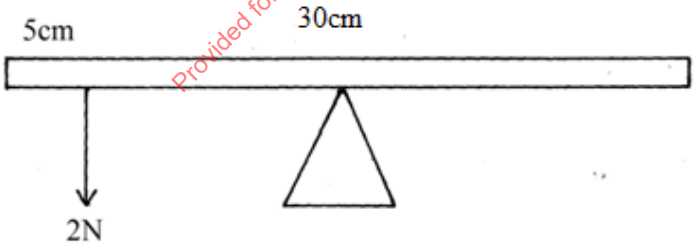
4. When a mercury thermometer is used to measure the temperature of hot water, it is observed that the mercury level first drops before beginning to rise. Explain. (2marks)

5. The figure below shows a hot water bath with metal rods inserted through one of its sides. Some wax is fixed at the end of each rod.



(a) What property of metals could be tested using this set-up? (1 mark)
(b) besides the length of the rods that is kept constant, what else should be kept constant when comparing the property for different metal rods (1 mark)

6. The figure below shows a uniform meter rule pivoted at 30cm mark. It is balanced by a weight of 2N suspended at the 5cm mark.



Determine the weight of the meter rule. (2 marks)

7. using the idea of particles, explain why the pressure inside the tyre is increased when it is pumped up (2marks)

8. A trolley of mass 0.5kg moving with a velocity of $1.2ms^{-1}$ collides inelastically with a second trolley of mass 1.5kg moving in the same direction with a velocity of $0.2ms^{-1}$.
(a) What is an inelastic collision? (1mark)
(b) Determine the velocity of the trolleys after collision. (3marks)

9 Ventilations in a house are normally placed high on a wall near the ceiling. Explain. (1mark)

10. State the reason why mercury is preferred as a barometric liquid and not water. (1mark)

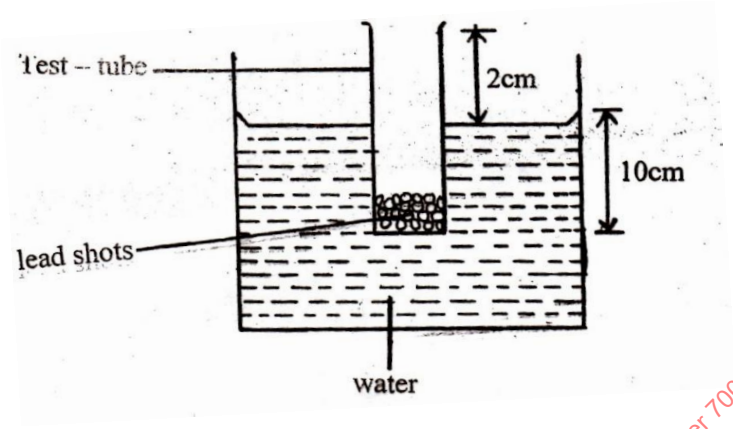
(ii) If an effort of 120N is required to lift the load using the machines determine the efficiency of the pulley system (3marks)

(iii) In the space provided below, sketch a graph of efficiency against load for the system. (2marks)

15. (a) State the law of flotation. (1 mark)

(b) A body weighs 40N in air, 30N in water and 35N when in liquid X. Find the relative density of liquid X. (3 marks)

(c) A simple hydrometer is set up with a test –tube of mass 10g and length 12cm with a flat base and partially filled with lead shots. The test – tube has a uniform cross – sectional area of 2.0cm^2 and 10cm of its length is under water as shown in the figure below.

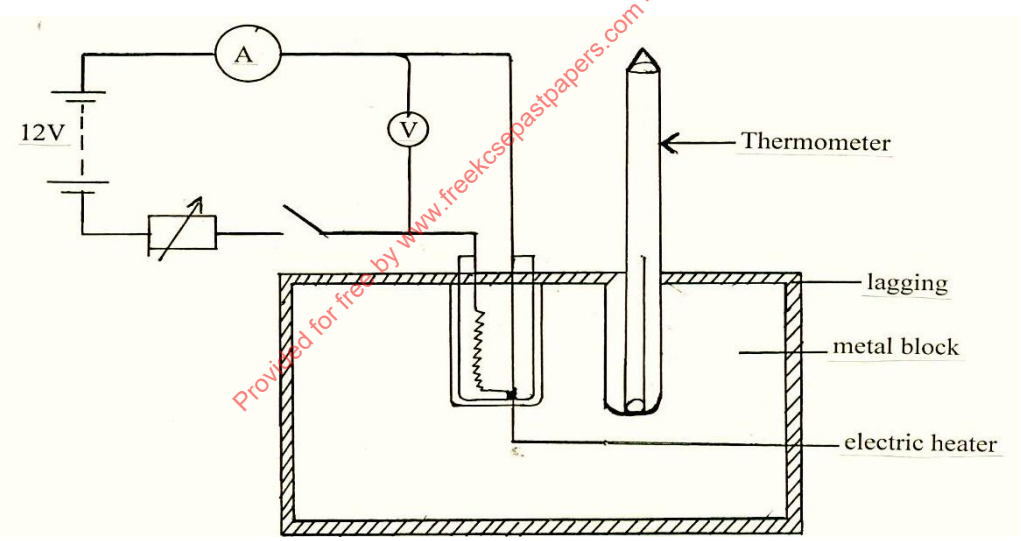


(i) Determine the mass of lead shots in the test – tube (Take density of water = 1000kgm^{-3}) (3 marks)

(ii) Calculate the mass of the lead shots to be added if the test – tube has to displace an equal volume of a liquid of density 1.25gcm^{-3}. (3 marks)

(d) What is the function of the lead shots? (1 mark)

16. The figure below shows a set up that can be used to determine the specific heat capacity of metal block.



(i) State the measurement that should be taken in the experiment to determine specific heat capacity of the metal block. (3marks)

(ii) Show how the measurement above can be used to determine the specific heat capacity of the metal block. (2marks)

(iii) State the function of the following in the set up

(I) Lagging (1mark)

(II) Drops of oil in the holes containing thermometer and the electric heater (1mark)

(b) A copper can together with stirrer of total heat capacity 600J/K contains 200g of water at 15^{0}C. Dry steam at 100^{0}C is passed through the water while stirring until it reaches a final temperature of 55^{0}C. Calculate the mass of the steam condensed. Take specific heat of capacity of water as 4200J/Kg/k and specific latent heat of steam as 2,260,000J/kg (5marks)

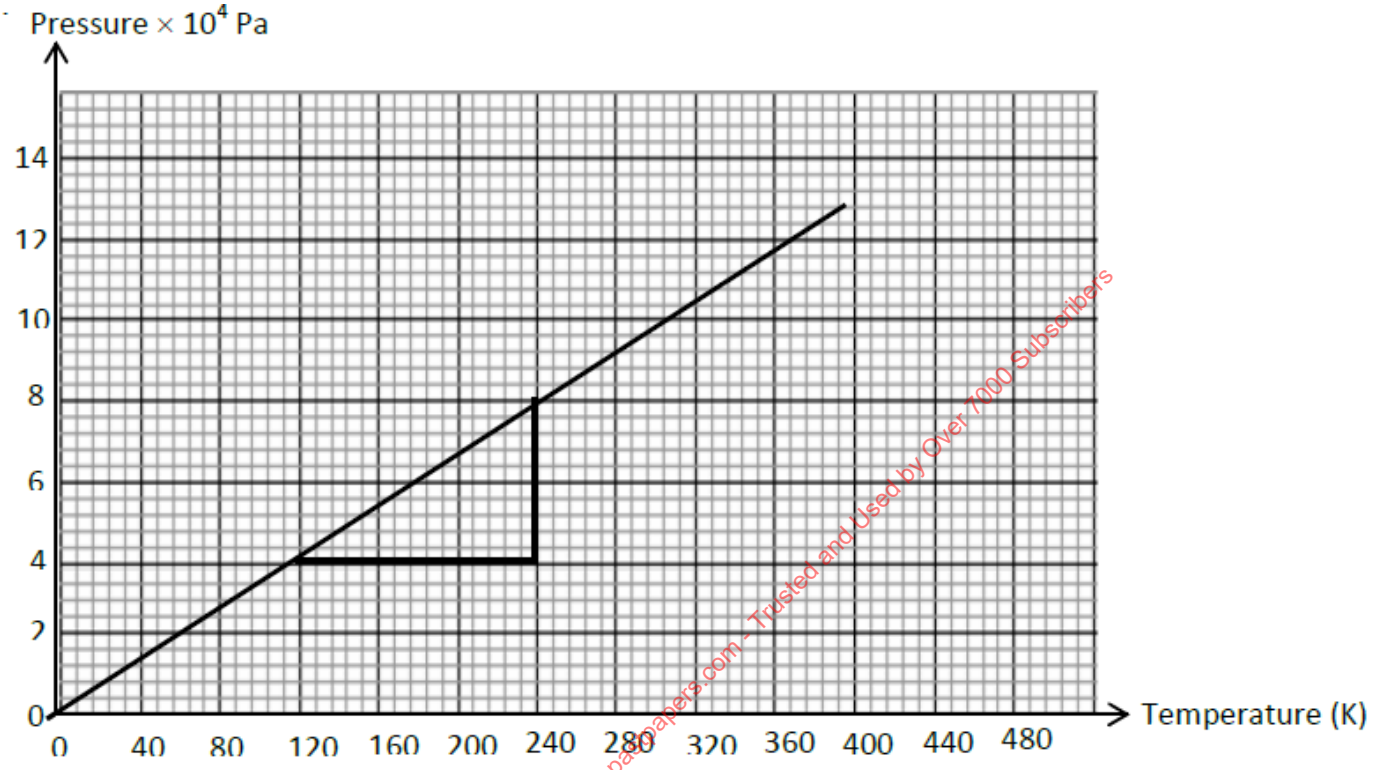
17. (a) A car is negotiating unbanked circular track. What provides the centripetal force of the car. (2marks)

(b) Given that the car above has a mass of 1000kg and the circular path has a radius of 25m. Determine the maximum speed with which the motorist can travel so as not to skid if the frictional force between the tyres and the road is 6500N. (3marks)

(c) A 200g mass tied to a string is being whirled in a vertical circle of radius 32cm with uniform speed, At the lowest position the tension in the string is 10.5N.: Determine -

(i) The speed of the mass (3marks)

18. The graph below shows the relationship between the pressure and temperature for a fixed mass of an ideal gas at constant
Volume



Given that the relationship between the pressure P and temperature T in Kelvin is in the form P = kT + C where k and C are constants.

i) Determine from the graph the values of k and C. (2marks)

ii) Why would it be impossible for the pressure of the gas to be reduced to zero in practice? (1mark)

iii) A gas is put into a container of fixed volume at a pressure of 2.1×10^5Pa and temperature of 50°C. The glass is then heated to a temperature of 400°C. Determine the new value of pressure. (3marks)

GATUNDU EVALUATION 2019 EXAMINATION PHYSICS PAPER 232/2
232/2
PHYSICS
PAPER 2
JULY / AUGUST, 2019

SECTION A (25 MARKS)

1. a) A plane mirror suspended on a vertical wall makes an angle of 60^0 with the wall. Determine the angle of reflection for a ray incident on the mirror and parallel to the horizontal.

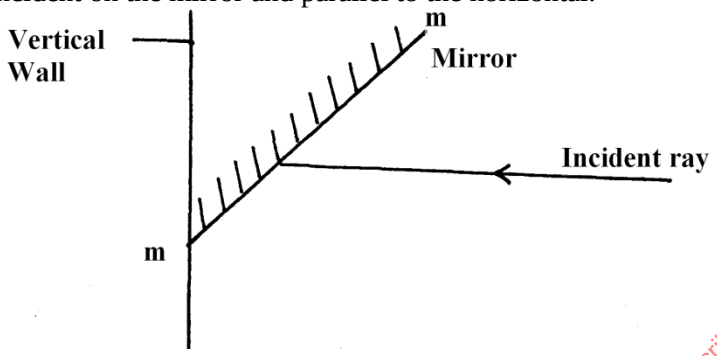
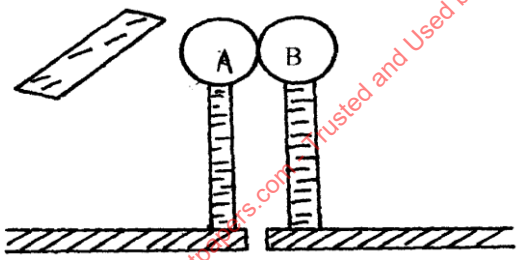


Fig. 1

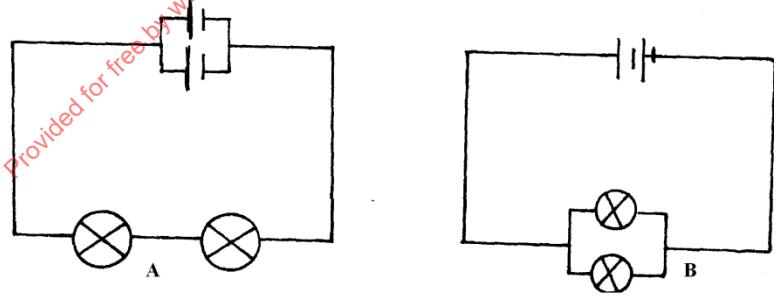
b) During total eclipse of the sun, both light and heat are observed to disappear simultaneously. Explain (1 mark)

2. Two identical sphere A and B each standing on an insulated base are in contact .A negatively charged rod is brought near sphere A as shown below.



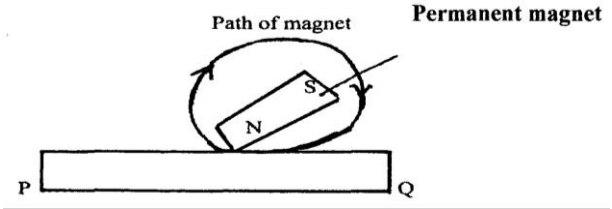
In what way will **A** differ from **B** if separated while the rod is held close to A ? (2mks)

3. A student was investigating the brightness of bulbs when set up in circuits. He used identical bulbs and cells. He set up circuit A and B consisting of two bulbs and two cells as shown below.



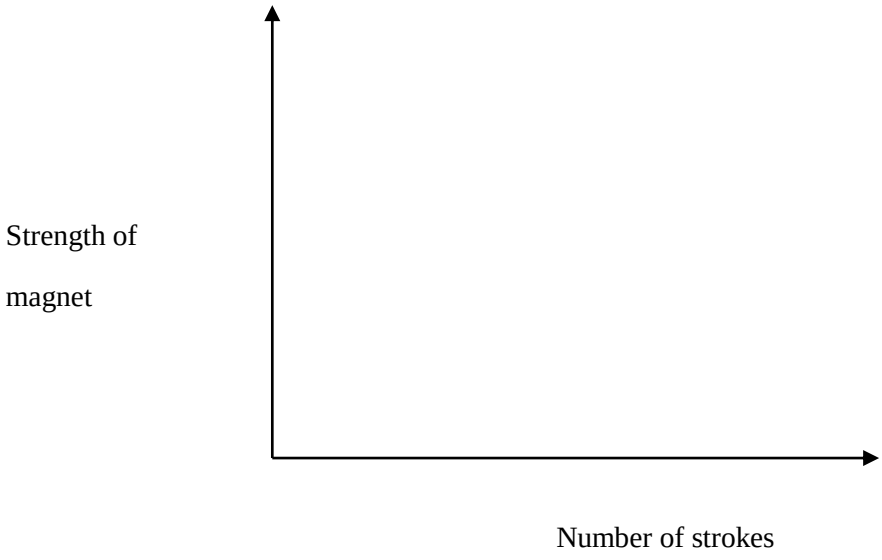
State and explain which set – up had the bulbs brighter (2mks)

4. (i) The diagram below show a ferromagnetic material being magnetized by the method shown.

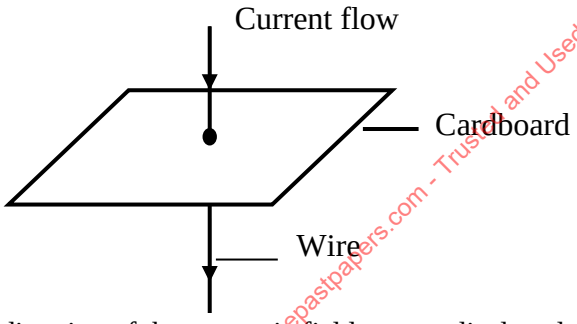


Identify the polarity of P (1mk)

(ii) On the axes given below , sketch a graph to show how the strength of the magnet being created varies with the number of strokes. (1mk)



5. Figure below shows a current carrying vertically right wire at right angle to a cardboard. Iron fillings are sprinkled on the card and card slightly tapped.



Draw and indicate the direction of the magnetic field pattern displayed on the card. (2 mks)

6. When a germanium crystal is doped with arsenic, it becomes an N-type semiconductor. Explain how this change occurs. (2 mks)
(Number of electrons in the outermost shell for germanium = 4, Arsenic = 5)

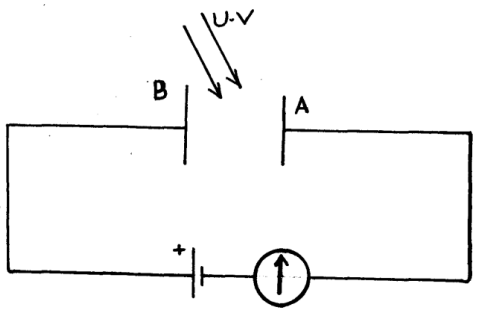
7. The following is a part of a radio – active series.

$$^{210}_{83}X \xrightarrow{r} {}^{210}_{84}Y \xrightarrow{\propto} {}^{c}_{d}Z$$

Identify the radiation r , find the values of C and d

r…… (1mk)
c…….. (1/2mk)
d…….. (1/2mk)

8. The figure below shows a set up to demonstrate photoelectric effect. Use it to answer Questions 8(a) and (b).



a) What observation will be made when UV light shines on plate A. Explain. (2mks)
b) What is the effect of introducing a barrier between plates A and B. (1mk)

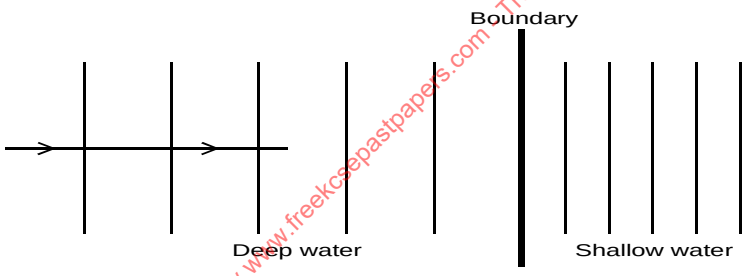
9. A house has a lighting circuit operated from a **240V** mains supply. Four bulbs rated **40W 240V** and six bulbs rated **100W 240V** are switched on for **5** hours a day. Determine the monthly bill for the consumer given that the cost of electricity is at shs. 5.50 per unit.
(Take 1 month = 30 days and the standing charge is sh. 150) (3 mks)

10. The chart below shows an arrangement of different parts of the electromagnetic spectrum.

P	Q	R	Ultra violet	S	Gamma rays

Name the radiation represented by letter Q and state one use of the radiation. (2 mks)

11. Plane water waves produced in a ripple tank are passed from a region of deep water into a region of shallow water. The figure below shows the top view of the tank.



a) State what happens at the boundary to the frequency of the waves. (1 mk)
b) The waves have a speed of 24cm/s in the deep water. Consecutive waves crests are 0.08m apart in the deep water. Calculate the frequency of the source producing the wave. (2 mks)

12. State one advantage and one disadvantage of a convex mirror when used as a driving mirror (1mk)

SECTION B (55 MARKS)

13. The image formed by a convex lens is erect. On Figure 10 below, draw the object andusing ray diagram, locate and draw the erect image. (3mks)

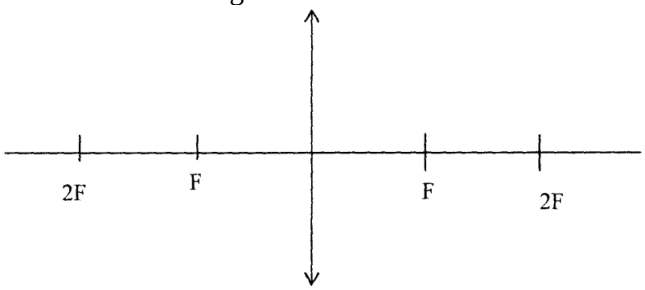
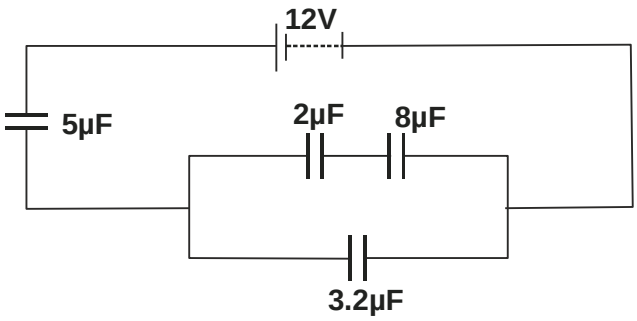


Figure 10

i) Determine the angle of refraction at point D. (2 mks)
ii) Find the angle of incidence of the refracted ray on the face AC to 1 decimal point. (2 mks)
iii) Complete the ray diagram to show the emergent ray from the face AC. (2 mks)
iv) State **two** conditions necessary for total internal reflection to occur. (2 mks)

(c) A girl standing at a distance claps her hands and hears an echo from a tall building 2 seconds later. If the speed of sound in air is 340m/s, determine how far the building is. (2 mks)

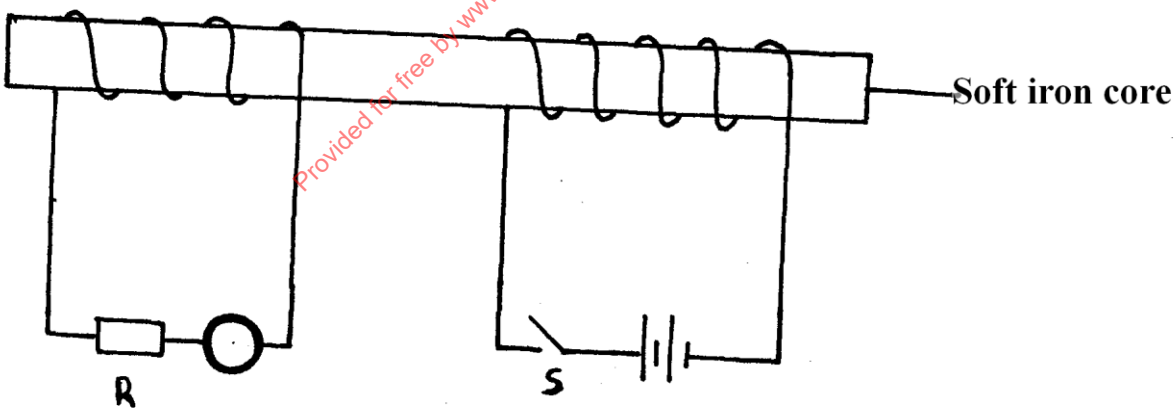
15. a) State one application of a capacitor. (1 mk)
b) Figure 7 shows four capacitors connected to a battery of 12 volts.



Calculate:
i) Effective capacitance. (2 mks)
ii) Charge on 3.2 μF (2 mks)
iii) Potential Difference across 5 μF (2 mks)
iv) The energy stored by 2 μF (2 mks)

(c) What are effects on capacitance of a parallel plate capacitor when :
(i) Increasing the area overlap of the plates ? (1mk)
(ii) Increasing the distance of separation between plates ? (1mk)

16. a) State Lenz's law of electromagnetic induction. (1mk)
b) The figure shows two coils of insulated copper wires wound on a single soft iron core. One coil is connected to a battery through a switch and the other is connected to a resister through a galvanometer.



It is observed that as the switch is closed, the pointer of the galvanometer deflects momentarily. The same as when the switch is opened.
i) Explain why the pointer deflects momentarily. (2mks)
ii) State one way in which the current through R can be increased. (1mk)

c) i) State one way in which power is lost in a transformer. (1mk)
ii) A transformer uses 240V ac supply to deliver 9A at 80V to a heating coil.
If 10% of the energy taken from the supply is lost in the transformer itself,
What is the current in the primary winding? (2mks)

d) **Figure 8** , shows the voltage – current relating for a certain battery used in the electrical circuit in a above

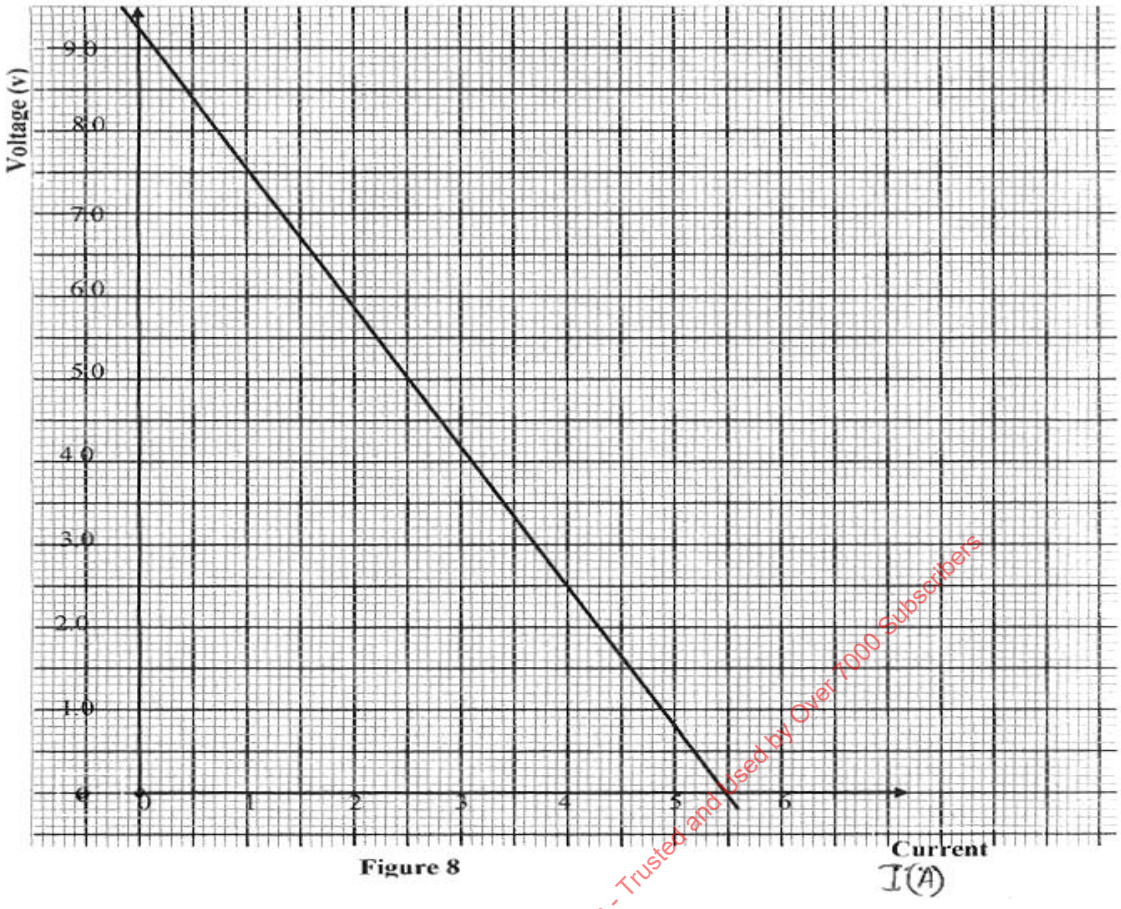


Figure 8

Given that the equation of the graph is V = E – Ir , from the graph , determine

(i) The e.m. fof the battery. (1mk)

(ii) The internal resistance of the battery used. (2mks)

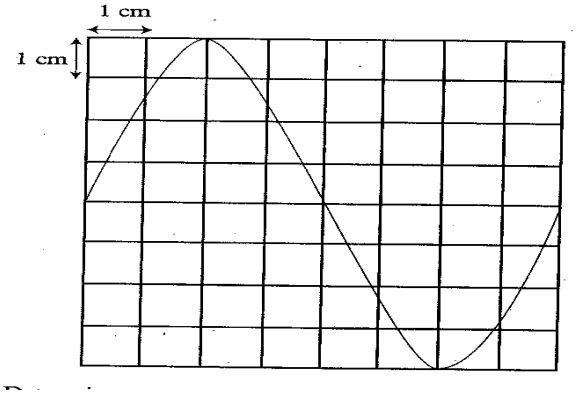
17. a) During the operation of an X-Ray tube, the target becomes very hot. Explain how this heat is caused. (1 mk)

(b) What property of lead makes it suitable for use as a shielding material in an X-Ray tube? (1 mk)

c) In a certain X- ray tube electrons are accelerated by p.d of 12 kV. Assuming all energy goes to produce X-rays, determine the frequency of the X-rays produced
(Planck's constant =6.63×10^{-34} Js. Charge of an electron=1.6×10^{-19}C) (2 mks)

d) X-Rays are used in detecting cracks inside metal beams. State the type of X-rays used for this purpose and state the reason. (2 mks)

e) The figure below shows the waveform of a voltage displayed on the screen of a C.R.O.
The Y-gain was 5V/cm and time base control was 10ms/cm.



Determine the:

i) Peak to peak voltage of the Y- input (1 mk)

ii) Period of the signal (2 mks)
iii) Frequency of the signal. (2mks)

GATUNDU EVALUATION 2019 EXAMINATION PHYSICS PAPER 232/2
232/3
PHYSICS
PAPER 3
PRACTICALS

JULY/AUG 2019

CONFIDENTIAL INSTRUCTIONS TO SCHOOLS

The information contained in this paper is to enable the head of school and teacher in charge of physics to make adequate preparations for this year's physics practical examination. NO ONE ELSE should have access to this paper or acquire knowledge of its contents. Great care must be taken to ensure that the information herein does not reach the candidates either directly or indirectly.
-The physics teacher is NOT expected to perform the experiments
- The apparatus required by each candidate for the physics practical examination are set out on the next page. It is expected that the ordinary apparatus of a physics laboratory will be available.
- The physics teacher should note that it is his/her responsibility to ensure that each apparatus acquired, for this examination agrees with specifications below.

Each candidate requires

- A micrometer screw gauge (to be shared)
- Nichrome wire mounted on a mm scale labeled AB
- A voltmeter (0-3v or 0-5v)
- Ammeter (0-1A)
- A switch
- A jockey/long wire with crocodile clip attached
- TWO new dry cells and cell holder
- At least 8 connecting wires with crocodile clips attached to one end
- Two metre rules
- Two stands and two clamps
- Two bosses
- Three pieces of thread 70cm,20 cm and 20cm.
- A helical spring length 4 inches
- One mass of 100g
- A stopwatch

Question 1

	b	c	d(i)	d(ii)	e	f	g	h	TOTAL
Maximum Score	1	1	5	5	1	2	2	3	20
Candidate's Score									

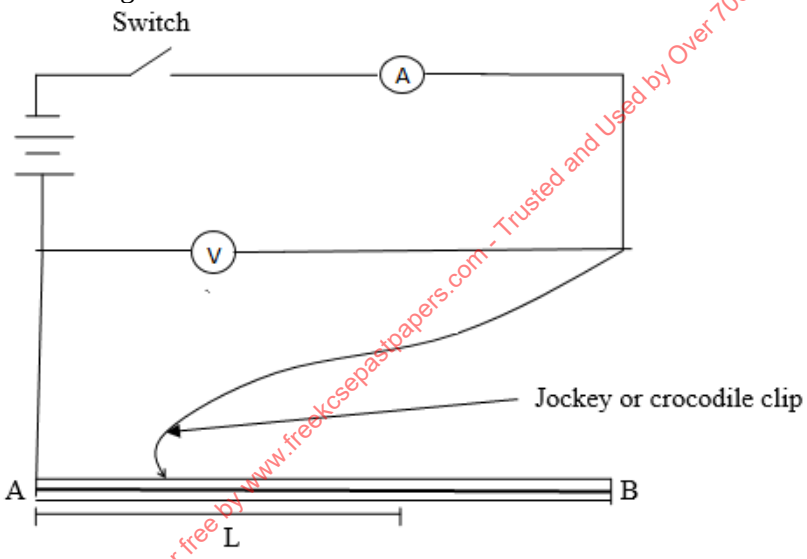
Question 2

	v	viii	Ix	x	xi	TOTAL
Maximum Score	1	8	5	3	3	20
Candidate's Score						

QUESTION 1 PART A

1. You are provided with the following
– A micrometer screw gauge (to be shared)
– Nichrome wire mounted on a mm scale labeled AB
– A voltmeter (0-3v or 0-5v)
– Ammeter (0-1A)
– A switch
– A jockey/long wire with crocodile clip attached
– TWO new dry cells and cell holder
– 8 connecting wires with crocodile clips attached to one end
Proceed as follows

a) Set up the circuit as shown below ensure that when the switch is open, both meters read zero, keep the switch open when readings are not being taken.



b) Measure and record the diameter d of the nichrome wire AB using the micrometer screw gauge.
$d =$ _____m (1mk)

c) Disconnect the jockey from wire AB and close the switch. Record the value E of the voltmeter reading.
$E =$ _____v (1mk)

d) Now, connect the jockey on AB at a distance L=10cm. Close the switch and record the voltmeter and ammeter readings, V and I respectively in table 1 below.

e) Table 1

L(cm)	10	20	30	40	50	90
V(v)						
I(A)						
IV(watts)						

i) Complete the table (5mks)

ii) Plot a graph of IV (y axis) against L (5mks)

f) Using your graph, find the value L_o from your graph (the horizontal axis)
(1mk)

g) Now, place the jockey on AB such that the length L is equal to the value of L= 63cm. close the switch and record both the voltmeter reading, V and the ammeter reading, I
(1mk)
(1mk)

g) Work out the values r where —— (2mk)

h) Work out the value of e where —— (3mk)

Question 2

You are provided with the following apparatus
- two metre rules
- two stands and two clamps
- two bosses
- three pieces of thread
- a spring
- one mass of 100g
- a stopwatch

i) Set the apparatus as shown in figure1 below.
ii) Suspend one end of the metre rule with a thread at 5cm mark from the end.

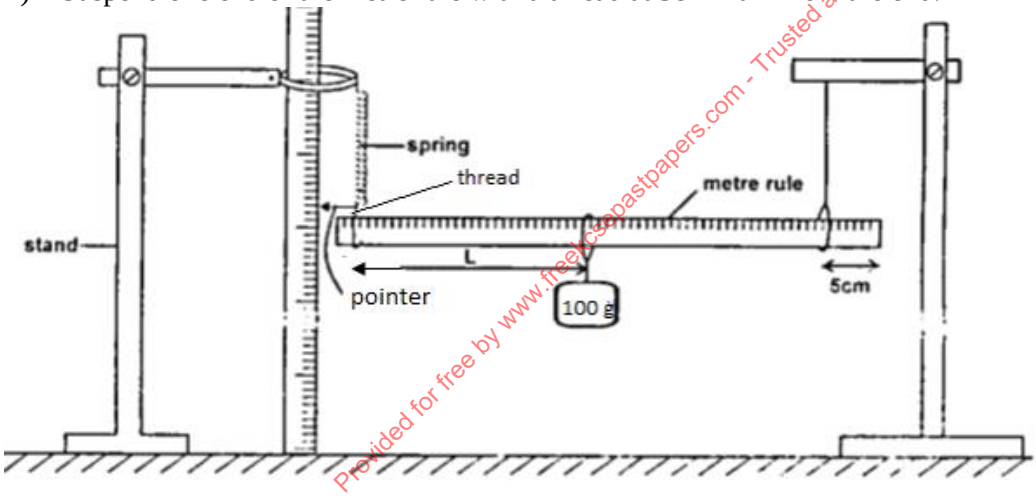


Figure 1

iii) Suspend the other end with a spring also 5cm from the end so that the metre rule is horizontal.
iv) Hold the other rule vertically on the bench so that it is near the end with a pointer as shown in the diagram above.
v) Read the pointer position, Lo ..... cm (1 mk)
vi) Hang on the horizontal metre rule, the 100g mass at a length, L = l0cm from the spring. Record the pointer position X, in the table below.
vii) Displace the mass slightly downwards and release it to oscillate vertically. Take time for 20 oscillations and record in the table below,