NAME: ..... MARKING SCHEME .....ADM.....CLASS .....

232/1

PHYSICS PREMOCK

PAPER 1 (THEORY)

JUNE / JULY 2022

TIME: 2 HOURS

BUNAMFAN CLUSTER EXAM

Kenya Certificate of Secondary Education (K.C.S.E.)

PHYSICS

PAPER 1 (THEORY)

INSTRUCTIONS TO THE CANDIDATES:

- *Write your **name, school** and **index number** in the spaces provided above.*
- *Answer **all** the questions both in section **A** and **B** in the spaces provided below each question*
- *All workings **must** be clearly shown; marks may be awarded for correct steps even if the answers are wrong.*

For Examiner's Use

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1-10	25	
B	11	09	
	12	14	
	13	11	
	14	10	
	15	11	
TOTAL		80	

This paper consists of 11 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing

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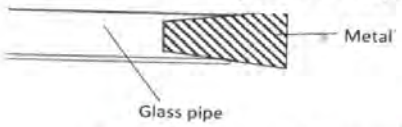
SECTION A 25 MARKS: Attempt all the questions in this section

1. The figure below shows a piece of metal stuck in a hollow glass pipe. .Explain how temperature change may be used to separate them (2 mark)



Cool the joint ✓

The metal Contracts at a higher rate than glass hence the separation ✓

2. Form four students were playing football game during which the ball got deflated. Explain what happened to its density (2marks)

The density increases ✓ since the volume reduce due to the exit of air and $\rho = \frac{m}{V}$ ✓

3. Micrometer screw gauge A has a zero error of – **x** mm. Micrometer screw gauge B has a zero error of **x** mm When used to measure the diameter of a tube the difference between their readings is 0.04mm. If the actual diameter of the tube is 5.56mm determine **x** hence state the reading of micrometer screw gauge A (3 marks)

$A = R - E$ ✓

$R = A + E$

$R_A = A - x$

$R_B = A + x$

$R_B - R_A$

$(A+x) - (A-x) = 0.04$

$A + x - A + x = 0.04$

$2x = 0.04$

$x = 0.02$ ✓

$R_A = A - x$

$5.56 - 0.02$

$= 5.54mm$ ✓

4. A car of mass 1000kg travelling at a constant velocity of 40m/s collides with a stationary metal block of mass 800kg. The impact takes 3s before the two move together. Determine the impulsive force (3marks)

$m_1 v_1 + m_2 v_2 = (m_1 + m_2) V$

$1000 \times 40 + 0 = 1800 V$

$V = 22.22 m/s$ ✓

$F = \frac{mv - mu}{t} = \frac{1000 \times 22.22 - 1000 \times 40}{3} = -5927N$ ✓

OR $\frac{800 \times 22.22 - 0}{3} = +5925N$

10

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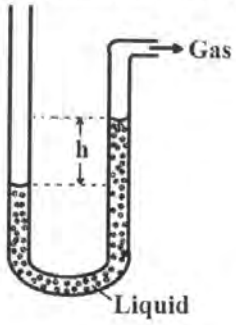
5. The figure below shows a drop of water about to fall from a pipette and after falling. Explain why the shapes of the drop are different (2 marks)

Adhesive force holds part of the drop against the pipette.

Cohesive force holds the water molecule together as a sphere.

6. Figure shows a liquid manometer. The gas pressure is 755mmHg and that of the surround is 760mmHg. The height h is 80mm. Determine the density of the liquid. (Take density of mercury = 13600kgm^{-3} and g =10Nkg^{-1}) (3 marks)



$Atm = GP + CP$

$760 = 755 + CP$

$CP = 760 - 755$

$= 5mmHg$

$\rho gh = \rho gh$

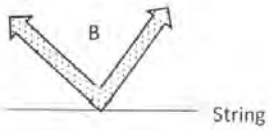
$13600 \times 10 \times \frac{5}{1000} = \rho \times 10 \times \frac{80}{1000}$

$680 = 0.8\rho$

$\rho = 850 kg/m^3$ or $0.85 g/cm^3$

7. A student balances an L- shaped uniform wire on a tight string as shown in A and B. With reason state the one which is easier to do (2marks)

A



In A the cog is lower than the point of support unlike B.

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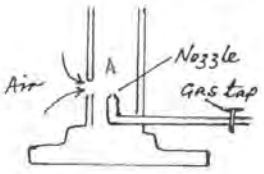
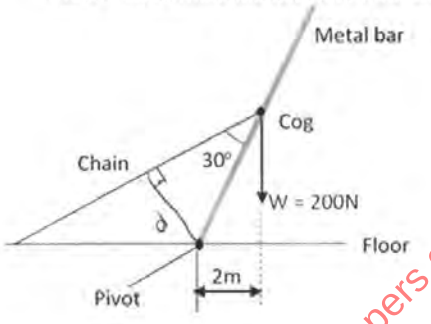
8. The figure below shows a Bunsen burner. Explain how air is drawn into the burner when the gas tap is opened. (2marks)



Gas passes the nozzle at a high speed
Creates a region of low pressure at A
Atm pushes air in through the hole

9. The figure shows a uniform metal bar of length 10m and weight W = 200N held at equilibrium by a light chain fixed at the cog and tethered on the floor using a light chain. Determine the tension of the chain (3marks)



$\sin 30 = \frac{d}{5}$

$d = 5 \sin 30$

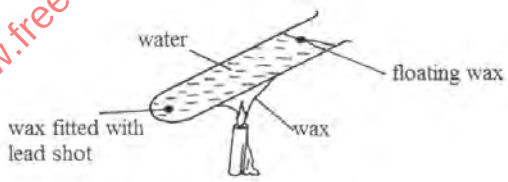
$= 2.5m$

$F_1 d_1 = F_2 d_2$

$F_1 \times 2.5 = 200 \times 2$

$F_1 = 160N$

10. A student set up the apparatus as shown below. The boiling tube was heated in the middle as shown



a. State the role of the lead shot in the experiment (1mark)

Hold the wax to prevent it from floating

b. With reason, state the wax that will melt first (2marks)

Floating wax, Heat reaches it by Convection of heat (hot water rises)

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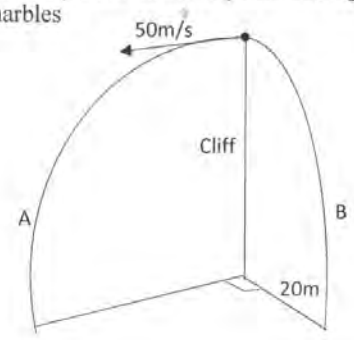
SECTION B 55 MARKS: Attempt all the questions in this section

11. Marble A is projected horizontally from the top of a cliff at a velocity of 50m/s. The height of the cliff from its foot is 31.25m. At the same time another marble B is projected horizontally from the same point. The figure below shows the trajectories taken by the marbles



Determine

a. The distance of marble A from the foot of the cliff as it hits the ground (3marks)

$h = \frac{1}{2}gt^2$

$31.25 = \frac{1}{2} \times 10 \times t^2$

$t = 2.5s$

$R = u_x t$

$= 50 \times 2.5 = 125m$

b. Vertical velocity of marble A as it hits the ground (2marks)

$V = gt$

$V = 10 \times 2.5$

$= 25m/s$

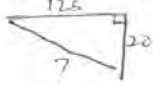
c. Horizontal velocity of marble B as it hits the ground (2marks)

$R = u_x t$

$20 = u_x \times 2.5$

$u_x = 8m/s$

d. The shortest distance between the marbles upon hitting the ground (2marks)



$= \sqrt{125^2 + 20^2} = \sqrt{15625}$

$= 126.6m$

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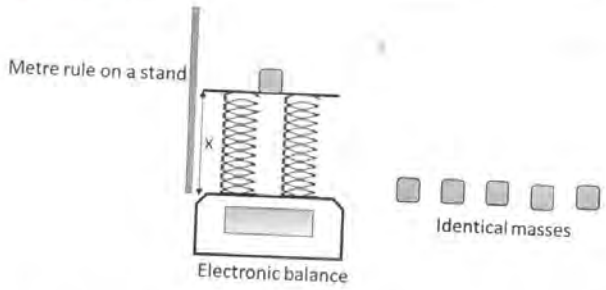
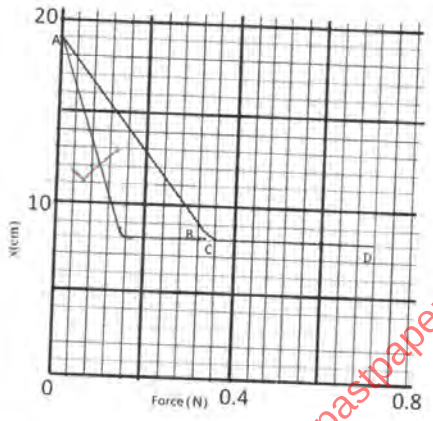
12. The figure below shows two identical light springs and other apparatus used in an (14) experiment



After the data was collected the following graph was obtained



a. State two measurements taken in the experiment (2mark)
- Mass of the springs ✓
- Length x of the compressing springs ✓

b. Explain how the measurements can be used to come up with the graph (2marks)
- Gradually add the masses each time getting the corresponding length x
- Draw the graph of x against Force (x-axis) ✓

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c. Explain the graph in sections

i. AB (2marks)

The length x reduces as the weight increases due to Compression.

ii. CD (2marks)

No change in length

Since all the turns had come into Contact with each other / one another.

d. Determine the spring constant of each spring (3marks)

Combined spring Contant

Grad $= \frac{19-09}{0.32-0}$

$= 31.25$

$k_T = \frac{1}{\text{grad}} = 0.032\ N/cm$

each spring

$k = \frac{0.032}{2}$

$= 0.016\ N/cm$

e. Determine the work done in section CD (2marks)

Area under the graph = work

length $= 9 \times 0.04 = 0.36\ N$

width $= \frac{8}{100} = 0.08\ m$

work $= 0.36 \times 0.08$

$= 0.0288\ J$

f. On the same axes sketch the graph expected when the experiment is repeated using one of the springs only (1mark)

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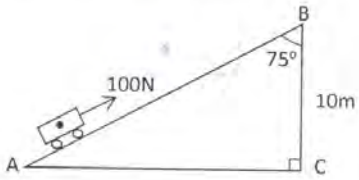
13. The figure **below** shows an inclined plane on which a trolley of mass 30kg is pulled up a slope by a force of 100N, parallel to the slope. The trolley moves so that its centre of mass travels from points A to B.



(i) Determined the work done on the trolley against the gravitational force in moving from **A** to **B**. (2 marks)

$W = mgh$ ✓

$30 \times 10 \times 10 = 3000\,J$ ✓

(ii) Determine the work done by the force in moving the trolley from **A** to **B**. (3 marks)

$\cos 75 = \frac{10}{AB}$

$AB = \frac{10}{\cos 75}$

$AB = 38.64m$ ✓

$W = F \cdot d$ ✓

100×38.64 ✓

$= 3864\,J$ ✓

(iii) Determine the percentage of the work input that goes to waste (3 marks)

Wastage $= 3864 - 3000 = 864J$ ✓

$\frac{864}{3864} \times 100 = 22.36\%$ ✓

(iii) Determine the frictional force. (1 mark)

Wastage $= F_f \times$ distance AB

$864 = F_f \times 38.64 \Rightarrow F_f = 22.36J$ ✓

(v) Determine the mechanical advantage of the system. (1 mark)

$MA = \frac{L}{E} = \frac{300}{100} = 3$ ✓

(vi) Find the velocity ratio (1 mark)

$VR = \frac{Ed}{Ld} = \frac{38.64}{10} = 3.864$ ✓

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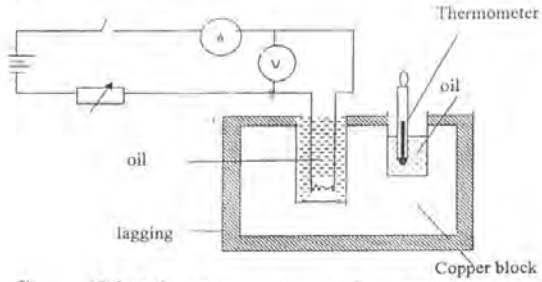
14. a. The figure below shows a set-up that can be used to determine the specific heat capacity of a metal block.



(10)

I) Other than temperature and current, state **two** measurements that should be taken in the experiment to determine the specific heat capacity of the block. (2marks)

- time of heating ✓
- P.d. across the heating coil ✓
- mass of the Copper block

II) Describe how the method can be used to determine the specific heat capacity of the metal block. (3marks)

- Determine the mass of the block ✓
- Record the initial temp
- Put on the switch for some time t ✓
- Note the Voltmeter and Ammeter reading
- Record the final temp

Electrical energy = Heat

$VIt = m c \Delta T$

$c = \frac{VIt}{m\Delta T}$ ✓

III) State the purpose of oil in the set-up. (1mark)

To create thermal contact between the thermometer/heater and the block ✓

(ii) A well lagged copper can together with a stirrer of total heat capacity 60JK^{-1} contains 200g of water at 20^{0}C. Dry steam at 100^{0}C is passed in while the water is stirred until the content reach a temperature of 50^{0}C. Determine the mass of condensed steam. (4marks)

Heat lost = Heat gained ✓

$mL + mc\Delta T = H.C \times \Delta T + mc\Delta T$ ✓

$m \times 2.26 \times 10^6 + m \times 4200(50) = 60 \times 30 + 0.2 \times 4200 \times 30$

$2470000m = 1800 + 25200$

$2470000m = 27000$ ✓

$m = 0.01093$ kg or 10.93g ✓

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15. a) A uniform metal strip is 3.0cm wide 0.6cm thick and 100cm long. The density of the metal is 2.7g/cm^3.

I. Determine the weight of the metal strip. (2marks)

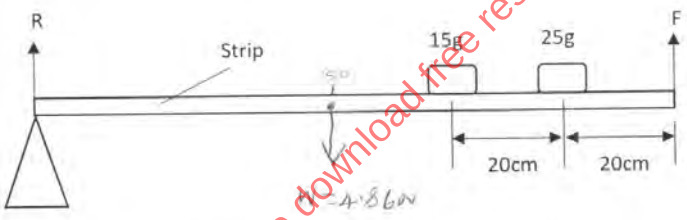
(11)

$m = \rho V = 2.7 \times 3 \times 0.6 \times 100 = 486g$ ✓

$W = mg$

$= 4.86N$ ✓

The strip is used to support two masses in equilibrium by applying force F as shown below.



II. Determine the value of F (3 marks)

Moment about the pivot

$50 \times 4.86 + 0.15 \times 60 + 0.25 \times 80 = 100F$ ✓

$243 + 9 + 20 = 100F$

$272 = 100F$ ✓

$F = 2.72N$ ✓

III. Determine reaction R due to the pivot (2 marks)

upward force = Downward force ✓

$2.72 + R = 4.86 + 0.15 + 0.25$

$2.72 + R = 5.26$

$R = 5.26 - 2.72$

$= 2.54N$ ✓

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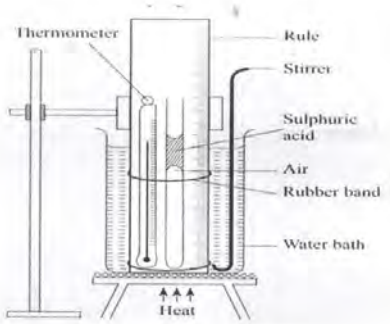
b) The Figure below shows a set up that may be used to verify a gas law.



I. State the law being verified (1mark)

The volume of a fixed mass of a gas is directly proportional to its absolute temperature Provided pressure remains Constant ✓

II. State two functions of the concentrated Sulphuric acid in the experiment (2marks)

- server as an index ✓
- Drying agent to keep the air dry.

III. State one assumption in the experiment (1mark)

The temperature of water is the same as the temperature of the air in the tube.

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