K.C.S.E 1995 PAPER 1 MARKING SCHEME

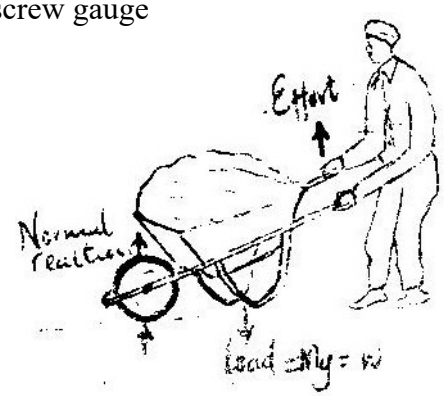
1. Micrometer screw gauge
2. 

Fig. 1
3. Effort would reduce
4. Flow from a to B
5. Pressure difference between liquids in A and B is P = egh where e is liquid, g = acceleration due to gravity and h is height
   But force = P x cross section area of siphon, P = F/A
   Thus F = egh A Since e.g. A are constants
   Fα h
6. No change in flow OR the flow will still continue
7. Oil spread until it is one molecule thick or film taken as a perfect circle or oil drop has been taken as perfect sphere/ cylinder/ uniform thickness
8. The liquid expand uniformly, expansion is measurable (large enough), thermal conductivity
9. Rectilinear propagation/ light travels in a straight line
10. Water/ or glass are poor conductor of heat
11. Each material is brought in turn to touch the cap. The conductor will discharge the electroscope while the insulator will not (accept bring near conductor gauge)
12. Can be short – circuited without being destroyed
    - Longer life/ electrolyte never need attention
    - Can stay discharged without being destroyed
    - Can be charged with large currents faster charging
    - More rugged/ not damaged by rough condition of use/ robus
    - Delivers large current, light
13. Surface tension / adhesive forces supports water column or more capillarity in tube 2 than tube 1
    - Surface tension is the same in both tubes and equal to the weight of water column supported
    - Narrow tube has longer column to equate weight to wider tube
    - Volume of water in the tubes is same hence narrower tube higher column

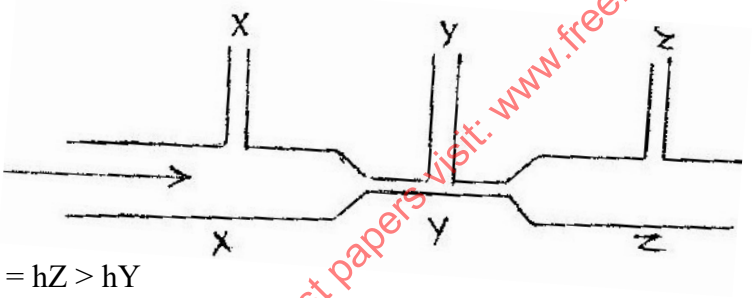
14. – Length of conductor in the field
    - Angle between conductor and fields
15. All ferromagnetic materials are attracted by magnets or any magnetic materials is attracted

16. – increasing the tension
    - Reducing the length
17. At equilibrium sum of clockwise moment = sum of anti – clockwise moments
    Clockwise moments = P x X = QY
    Px = Qy
18. h glass = V air / V glass
    Vg = $3 \times 10^8 / 1.5$
    $1.5 = 3 \times 10^8 \sqrt{g}$
    $= 2 \times 10^8 \ ms^{-1}$
19. $V = f\lambda$ sine V is constant reducing f to 1/3 $\Rightarrow$ λ increases 3 fold
20. While light is composed of seven colour different/ many colour. For each colour glass had different value of refractive index/ different velocities of different λ. So each colour is deviated differently causing dispersion

21. A body at rest or in state of uniform motion tends to stay in that state unless an unbalanced force acts on it.

22. Heat capacity is quantity of heat required to raise the temperature of the body by 1 k or 1 ^{0}C while, specific heat capacity is quantity of heat required to raise temperature of unit mass of body by 1 k/ 1^0 C.

23. (If x ≠z but both above y give 1 mk. Accept difference of 1.0 mark)



hX = hZ > hY

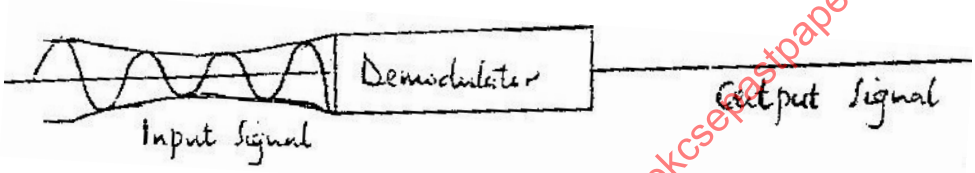
24. – Reducing - Increasing

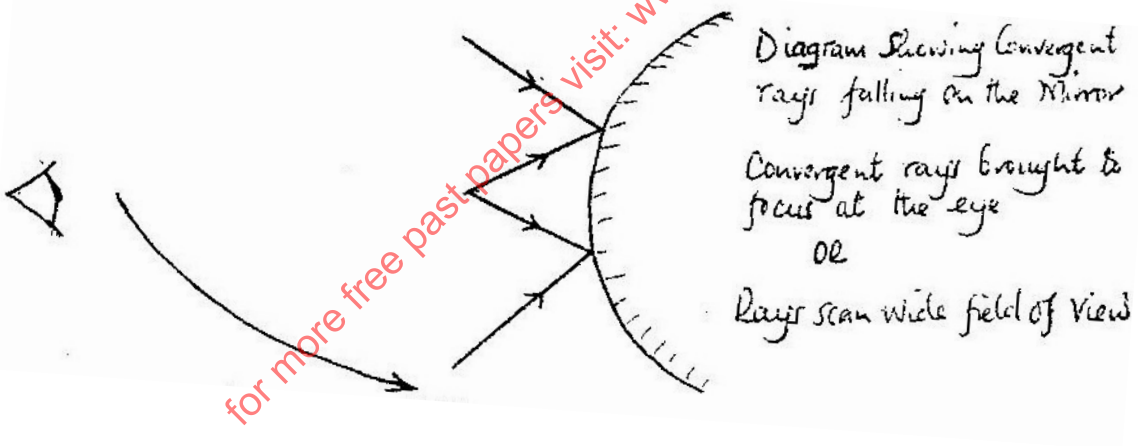
25. Polarization

26.

Type of radiation	Detector	Uses
Ultra violet	Photographic paper fluorescence material	Cause ionization kills bacteria OR operating photosular cells photography
Infrared	Phototransistor blackened thermometer	Warmth sensation
Radio waves	Radio receiver or TV receiver	Communication

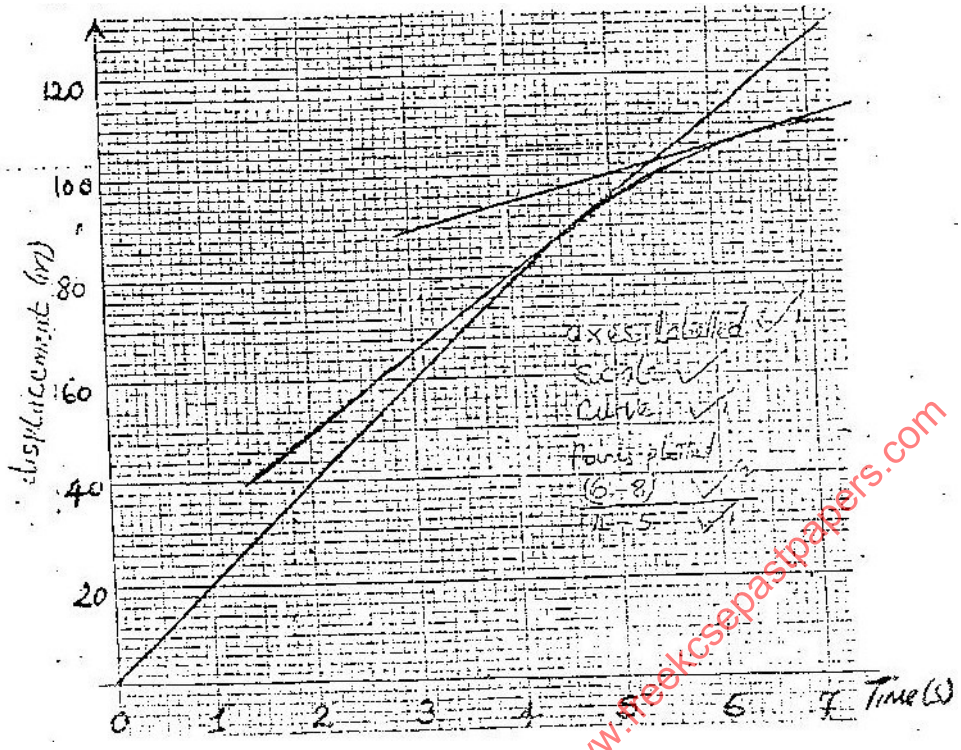
27. $E_2 = E_1 + h\,f\,i$ or $E_2 - E_1 = h = c/\lambda$
    h= plank constant
    c- Velocity of light
    λ- Wave length of light

28. – Lead - Very dense/ has high atomatic mass
29. Extrapolation on graph (line to touch frequency)
    Reading on graph to (4.0 + - 0.2) x 10^{14}Hz
30. Lines parallel to the one shown but cutting of axis further in
31. Quality / Timbre
32. X = 14
33. The point where the weight of the body acts
34. Temperature of source be the same
    - Length of rods be the same / wax
    - Amount of wax (detector) be the same
35. 

36. 

K.C.S.E 1995 PHYSICS PAPER 232/2 MARKING SCHEMES

1. (a)



(b) Constant Vel^0 Uniform vel - zero accl^n

(c) $\sqrt{4.5} = \frac{118 - 50}{6.5-2} = 15 m/s$ 15.5 + -1.5 (14-17)

$\sqrt{6.5} = \frac{112 - 70}{7} = 6 m/s$ (4=6)

Average accln = $\frac{\Delta v}{t} = \frac{v - 11}{t} = \frac{(6-15)}{2}$

$= -4.5 m/s^2$

2. $\frac{1}{R_C} = \frac{7}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{1}{6} + \frac{1}{3} + \frac{1}{6}$

$= \frac{1}{6}$

$R_C = \frac{6}{4} = 1.5 \Omega$

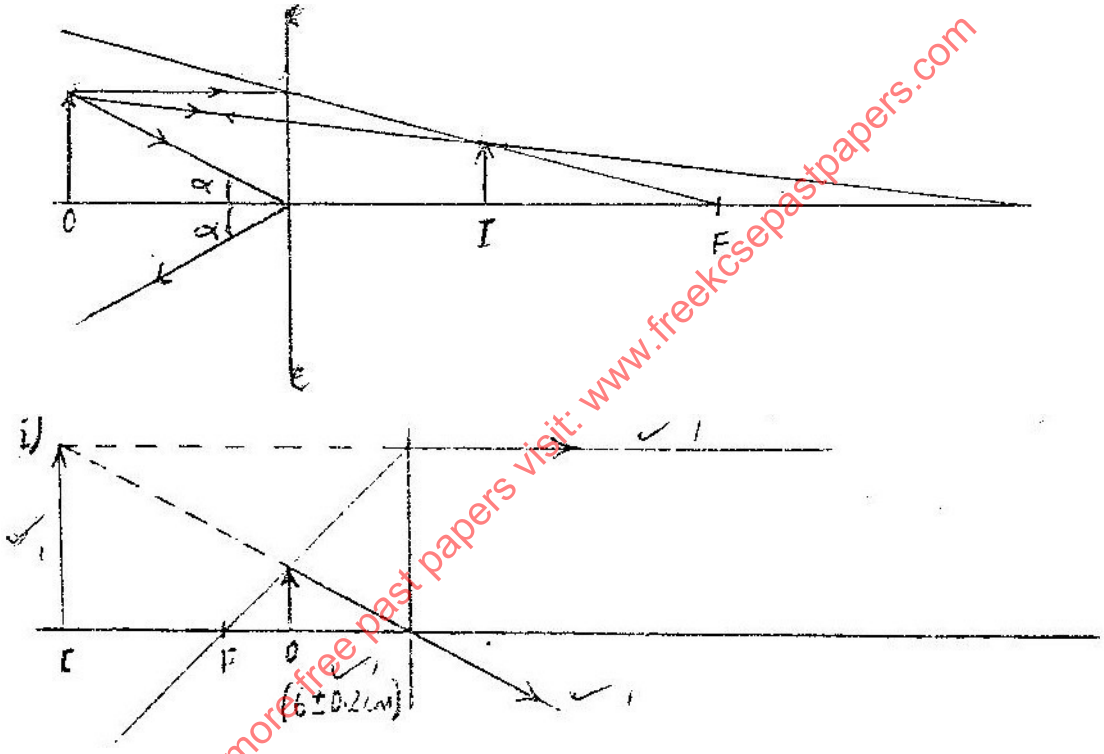
(b) Total resistance = 1.5 + 2.5 = 4 Ω

E = 1(YFR) Or $I = \frac{V}{R}$

2 = Ll
Current through xy l = 0.5 A
P.d across yz = 0.5 x 1.5 V
s= current through 3 Ω = $\frac{0.5 \times 1.5}{3}$ = 0.25 A

(c) R = /L A
I = RA = $\frac{6 \times 5.0 \times 10^{-6}}{1.0}$ $\frac{\Omega m^2}{m}$
L
= 3.0 x 10^{-5}Ω m

3. (a)



(ii) Magnification = $\frac{V}{u}$ $\frac{Isign}{Osign}$ = $\frac{1.1}{1.6}$ OR $\frac{1.75}{2.5}$ = 0.7 ± 0.05

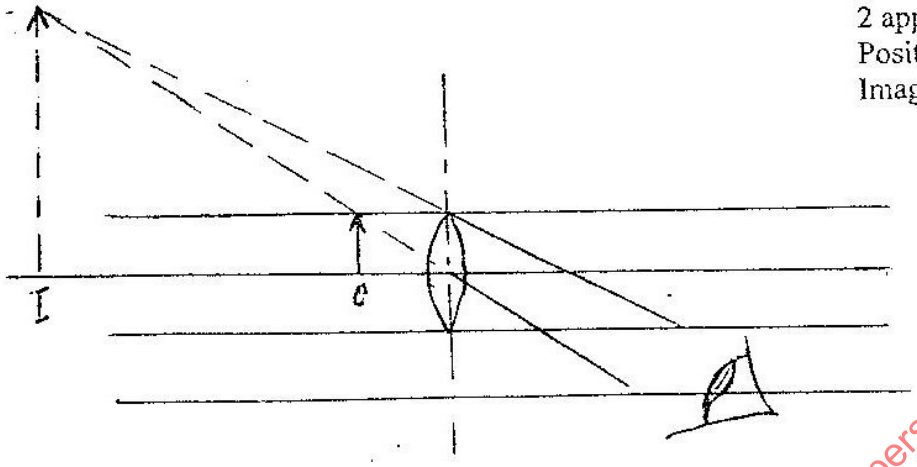
(b) $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ $\frac{1}{u} = \frac{10}{60}$

$\frac{1}{10} = \frac{1}{u} + \frac{1}{v}$ u = 6cm

$\frac{1}{U} = \frac{1}{10} + \frac{1}{15}$ Objects is 6 cm from the lens

4 (a) Lens symbol object between f & F 2 appropriate rays position of image
Image correctly drawn

Lens symbol
Object between f & F
2 appropriate rays
Position of image
Image correctly drawn



The diagram in figure 3 shows a certain eye defect

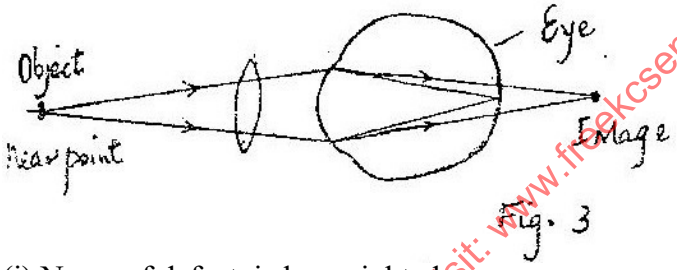


Fig. 3

(b) (i) Name of defect is long sightedness
(Refer to the diagram in the figure 3 above)

(c) (i) For water not to pour weight of the water must be less centrifugal force OR for water to pour out $\frac{MV^2}{r} > mg$

(ii) Frictional force F = Centripetal force

$$\frac{MV^2}{R} = \frac{1200 \times (25)^2}{150}$$

$$= 5.0 \times 10^3 N$$

5. (a) (i) The magnitude of the induced e.m.f is directly proportional to the rate at which the conductor cuts the magnetic field lines
The induced current flows in such a direction as to oppose the changes producing it.

(ii) Plugging a magnetic into a coil

- in speed its g twins as straight of magnetic field
- Results in an increased in the induced e.m.f

(b) (i) Energy is neither created nor destroyed
Make power constant
VU = Joules (½) current = charge (½)
Count time
P = IV
For large V, 1 must lower for power input to be equal to power output

(ii) $\frac{Vs}{Ns} - \frac{Vp}{Vp}$ OR $\frac{Vs}{Vp} - \frac{Na}{NP}$

$Ns = \frac{Vs \times Np}{Vp} = \frac{9 \times 480}{240}$ $Ns = 18$

SECTION II

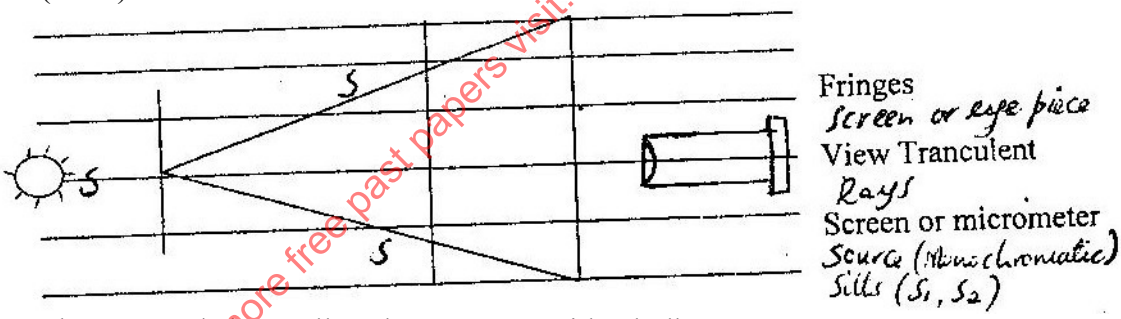
6. (a) Progressive wave- Wave profile moves along with the speed of the wave
Stationary wave – wave profile appears static

Progressive wave – Phase of points adjacent to each other is different
Stationary wave – All points between successive node vibrate in phase

Progressive wave – Energy translation in the direction of the wave travels
Stationary wave- No translation of energy but energy associated in the wave

(b) (i) A glass slide i.e. blackened with soot or paint lines are drawn close together using a razor blade or pin.

(ii) Path differences equals to an odd number of half wavelengths or completely out of phase (180^0)



(iii) Photometer / photocell or thermometer with a bulb

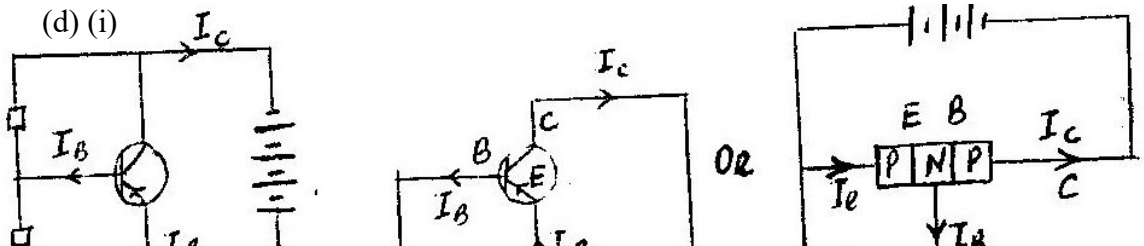
7. (a) Common or sillen (semiconductor) is doped with impurity atoms which trivalent (e.g boron or indium) intensity in currency on pole group 4 doped with trivalent

(b) p-n-p emitter and carries made of p type material are of n- type material for charge carries holes

- n – p – n – emitter and collector made of n- type material are made of p- type (or charge carries electrons)

(c) At the middle of the reaction of a curve a tangent is drawn change on output (ΔV_0) is determined and a corresponding change input (ΔV_1) also attained change amplification.

(d) (i)



(ii) $i_2 = l_C \; r \; l_B$

(e) Base – emitter – forward biased Base collector – reversed biased

PHYSICS PAPER 231/1A 1996 MARKING SCHEMES

- Correct full marks to be given
- Wrong units no marks given
- Wrong substitution no mark
- No units full mark

1. 15.00 + 0.30 = 15. 30 mm; or 1.53 / 1.53 x 10^2m

2. Frequency: OR wavelength or energy

3. Length of container/ height

   Width of the base/ base area/ diameter/ radius of the base/ thickness

4. $h_p\ p_1\ g = h_2\ p_2 g$ Same as $h_1\ p_1 = h_2\ p_2$
   $h_1 = \frac{h_2\ p_2 g}{pg}$ $= 8 \times \frac{18}{08}$
   $= 18cm;$

5. (i) Rubber is elastic and when a nail pushed through it stretches and grips the nail firmly without allowing air leakage

   (ii) Valve effect pressure from inside causes tyre rubber to press firmly on the nail

6. Concrete mixture and steel have approximately the same linear expansively. The expand/ contract at the same rate;

7. Radiation is at the electromagnetic waves Φ infrared while conduction involves particles, which move at lower speed

8. There are three different sources of light of the different intensities; brighten/ dimmed / different direction/ amount quality. Similar sources/ at different distances from the object

9. like charges repel unlike charges attract

10. Mass per unit length

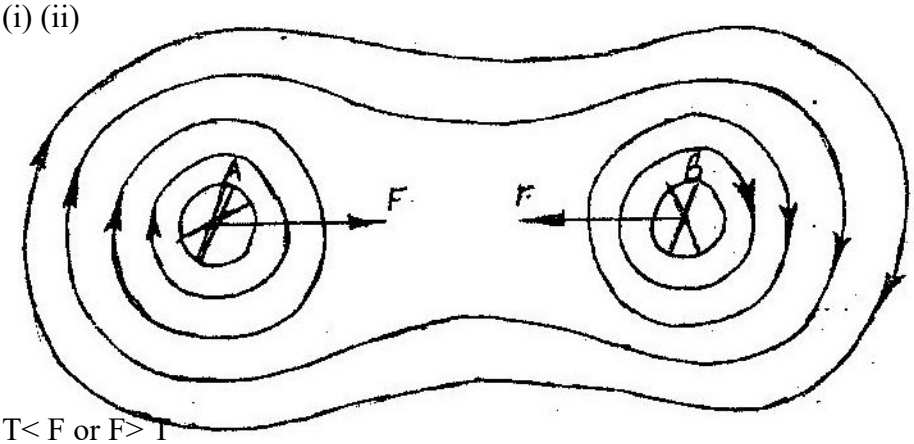
    Or (linear density/ thickness/ cross – sectional area/ diameter, radius

11. Adhesion

    Cohesion/ surface tension

12. As the thermistor is heated its resistance reduces/ conductivity increases hence drawing more current through it; hence less current flowing through B;

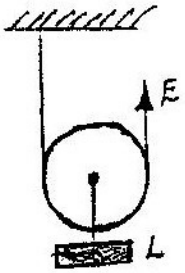
13. (i) (ii)



14. T< F or F> T

    Moments of T and F about are equal; but the perpendicular distance from O to T perpendicular distance from O to F/ Resultant moment are zero

15. Turn anticlockwise about O, OR Oscillate about O

16. 

    Correct diagram
    Correct label E,L and arrow

17. The wavelength/ velocity of the water waves reduces; away from the centre because the pond becomes shallower/ pond deeper at centre

18. Interferences (accept beat)

19. Parallel resistor allow diversion of current; hence may not overheat; / current shared by parallel resistor

20. Heat gained 5(80 – 40) = m(40-15)

    5(40) = 25m

    Heat gained MCD θ (80- 40)

    Heat post MCD θ =m (40 – 15) MC 40 – 15

    5(80-40) = 25 m

    25m = 200 = m = 8 kg

21. Equal qualities of heated supplied;

    $MC_W\theta_W = MC_P\theta_P$
    Since $\theta P > \theta W$
    $C_W > \theta_P C_p$

    or

    $MC_W (Q_W - Q) = MC_P (Q_P - Q)$
    $MC_w > \theta_0 = MC_P > Q_P$

22. Magnified, enlarged upright, virtual , image behind the mirror, negative distance

23. Apparent depth = $\frac{\text{Real Depth}}{\text{Refractive indese of water}}$ $\quad \frac{12m}{1.3} = 0.9$ m

24. Pressure is inversely proportional to the speed OR speed increases as pressure distance

25. Maintaining a stable voltage during make and break/ storing charge during make and break and stops arcing sparking

26. High temperature causes high – pressure build up in the cylinder, which causes the explosion; OR increases of KE of gas molecules which result to pressure, build up causing an explosion (2 mks)

27. A Polaroid absorbs/ cuts off light waves in all planes except in a particular plane of propagation (1mk)

28. A hears a constant frequency produced by the siren/ same roundness/ pitch B hears a frequency that increases as the vehicle approaches/ sound of increasing loudness/ higher sound (2 mk)

29. Solid copper is denser than water hence the solid sphere sinks; weight is greater than upthrust. Hollow sphere experiences an upthrust equal to its weight so it will float/ density of hollow sphere is less than that of water (2 mks)

30. The weight of the door and the force are perpendicular to one another (1 mk)

31. Eddy current (1 mk)

32. Low negative voltage is applied on control grid, which control the number of electrons reaching the screen (1 mk)

33. Low speed / high charge / more massive/ size is large/ bigger` (1 mk)

34. n.p.n

35. Limit the current through the base controls the current/ protect transistor from high current or voltage/ regulate reduce voltage.

36. Diode is forward biased; Base currents flows; hence collector current flows and lights the bulb/ current amplification (3 mks)
air molecule are in constant random motion; smoke particles collide with these air molecules hence their random motion

PHYSICS PAPER 232/1B MARKING SCHEMES 1996

1. (a) (i) Acceleration a is rate of change of velocity

$a = \frac{v - u}{t}$

$V = U + at$

(ii) Distance is average velocity * time

$S = \frac{(v + u)t;}{2}$

Substitution for V with u + at;

$S = ut + \frac{1}{2} at^2$

(iii) Using $t = \frac{v - u;}{a}$ in $s = ut - \frac{1}{2} at^2$

$s = u \frac{(v-u)}{a} + \frac{1}{2} a \frac{(v-u)^2}{a} = V^2 = u^2 \div 2$ as

(b) u = 50 – v = 0 a =2

Using $v^2 = u^2 - 2as;$

Substitute $0 = 50^2 + 2 (-2) s;$

S = 625m;

2. (a) (i) Each bar is suspended at a time using the string;
The suspended bar is allowed to rest;
Its orientation is observed and recorded;
This is repeated several times for confirmation

(ii) The bar magnet settles in the N – S specific direction, due to its
Interaction (l) with magnetic field of the earth (l)
The iron bar settles in any direction; (l) because it does not have a magnetic field to the interact with that of the earth; (l)

(b) P and Q are magnetized to the same level, by applying two different (l) current lp and lq such that lq > lp (l)
Thus Q requires greater magnetizing power, (l) since its domains are more difficult to align;
(l) P is easier to magnetize, since its (l) domain are more easily aligned: (1 mk)

(Total 14 mks)

3 (i) Series resistors $4 + 1 + 5\Omega$ (1 mk)

Parallel resistors $2 + 3 + 5\ \Omega$ (1mk)

$R_p = {}^5/_2 = 2.5$

Total effective resistance $5.5 + 2.5 = 8.0\ \Omega$ (1 mk)

(ii) Current $I = \frac{V}{R}; = \frac{4.0}{8.0}; = 0.5A;$

(iii) Current through each wing $= \frac{0.5}{2} = 0.25$ A; (1 mk)

Potential at Y = 0.5 x 4; 11; (2 mks)

Potential at Q = $\frac{0.5}{2}$ x 2; = 0.51; (2 mks)

Potential difference between Y and Q

= 1-0.5 V; = 0.5 (2 mks)

= 0 -0.5 V; + 0.5V Total 13 mks)

4. (a) (i) The aluminium block is heated using the electric immersion heater for some time t; The temperature changes (2) $\Delta\ \Phi$ of the block is recorded;

(ii) Mass of the block m

Time taken t

Initial temperature Φ_1 final temperature Φ_2

Current I voltage V;

Heat given = heat gained by electrical heater the block

$1\ Vt = mc\ (\Phi_2 - \Phi_1)$

$C = 11.1$

$M\ (\Phi - \Phi)$

(iii) Oiling the holes for better thermal; contact lagging

(b) Heat gained by calorimeter

$= 60 \times 10^{-3} \times 378\ (45 - 25)$ J;

= 453.6 J

Heat gained by water

$= 100 \times 10^{-3}$ x 4.200 (45 – 25J;

= 8.400J

Heat lost by condensing steam = m/

(163.5 – 160) x 10^{-3}/J

$= 3.5 \times 10^{-3}$ x / J

Heat lost 3.5 g of (condensed steam) water cooling to 45^0C

3.5×10^{-3} (100 – 45) x 4,200;

= 808.5J

Heat given = heat gained

Hence:

$3.5 / \text{x } 10^{-3} + 808.5$ J = 453 6J + 8,400J;

$= 2.3 \times 10^{-6}$J/Kg;

5. (a) (i) Particles of the transmitting medium vibrate in the direction of the wave for a longitudinal wave, but at right angles for a transverse wave:

Sound requires medium but no medium required for electromagnetic wave; speed of sound lower than that of electromagnetic wave;

(b) (i) Speeds of sound;
2.5 x s = 400 x 2
S = 320 m/s;

(ii) $2 \quad \frac{(x - 400)}{320} = 2.5 + 2);$
$= 1120m;$

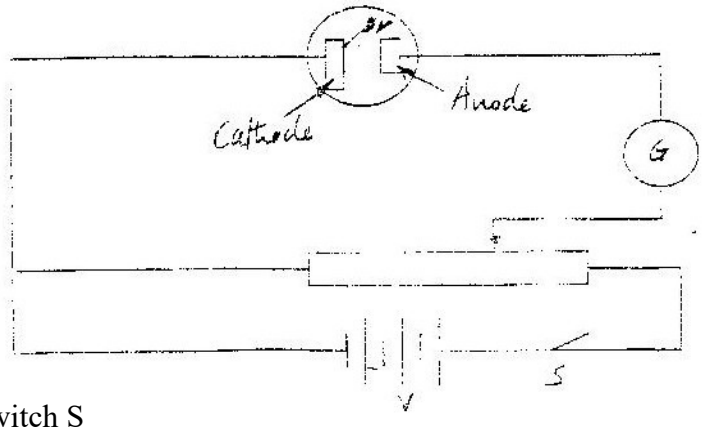
(c) (i) Double slit provides coherent sources;
(ii) Dark and bright fringes;
The central fringe is the brightest while the intensity of the other fringes reduces away from the central fringe;
(iii) I. The separation of fringes increases
II. Central fringe is white; fringes on either side are colored;

6. (a) Keep angular velocity Wl constant;
Centripetal force provided by mg;
Fix the mass m and measure of m;
Repeat for different values of m;

(b) (i) graph (see on the next page
Axes labeled
Scale
Pts plot
Straight line

(ii) Gradient of the graph
$= \frac{0.625 - 0.1}{0.525 - 0.075} = 1.167$ N
Force F on the body = $m_b W^2 r$
Where mb = mass of the body
$M_b w^2 r$ = Gradient of the graph = 1.167
$W^2 = \frac{1.167}{0.1} = 11.67$
$W = \sqrt{11.67}$
$= 3.42 \text{ rad } s^{1}$

7. (a)



Close switch S
Vary pd until G deflects

(b) l)

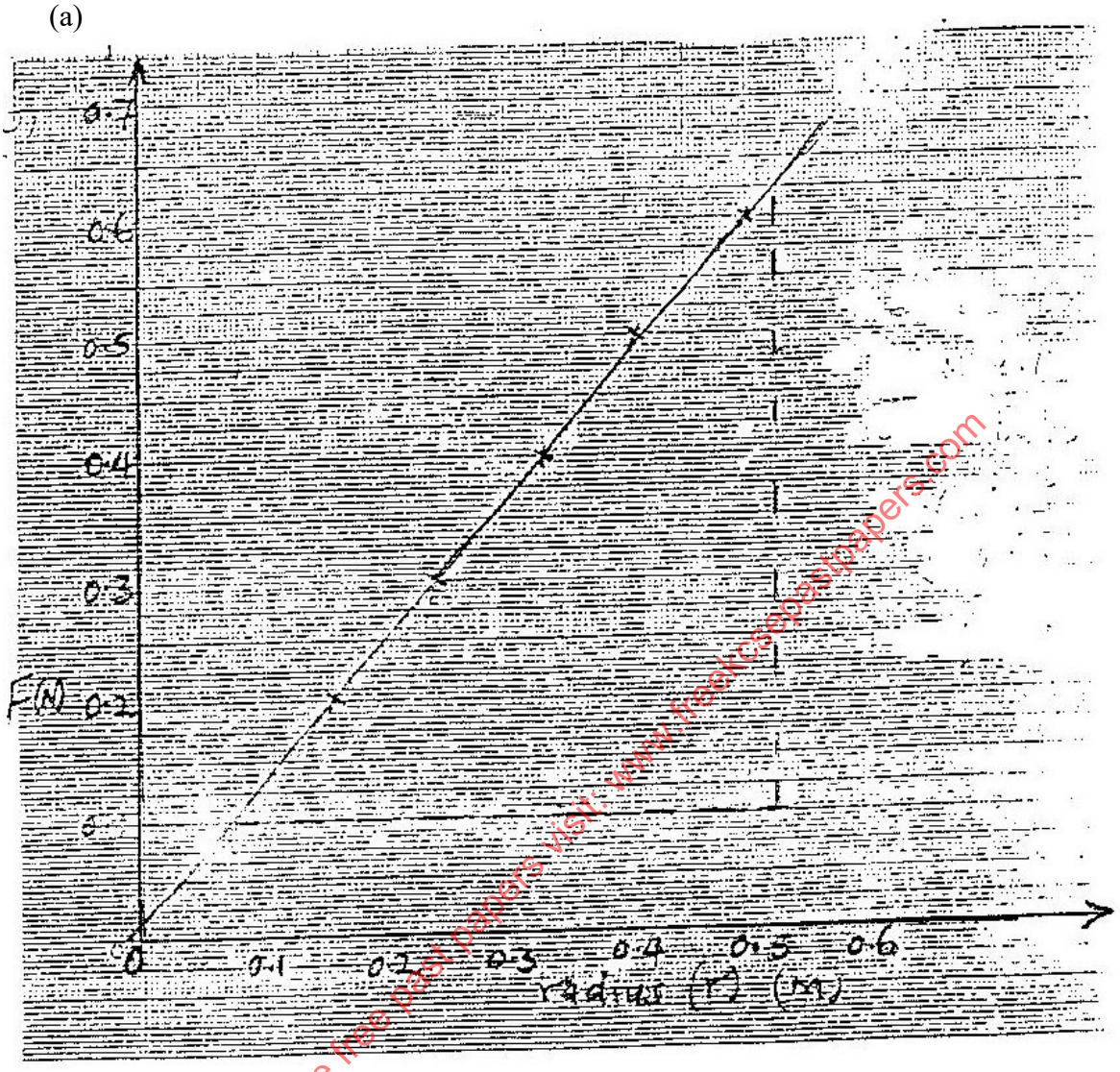
K (J) x 10^{-19}	5	10	10	30	4
F = C/D (H_E) x 10^{-15}	1.89	2.64	4.11	5.55	6.5

Finding f
See graph
Axes labeled
Scale
Pointed plotted
Straight line

(ii) Work function Φ is given by Φ hf_0
F_0 is the x – intercept of graph
F_0 (from graph) = 1.2 x 10^{15} H_E
Φ = 6.63 x 10^{-34}0.5 x 1.2 x 10^{15}
= 7.96 x 10^{-19} J

No. 6

(a)



KCSE 1997 PHYSICS PAPER 232/1 MARKING SCHEME

1. Volume = 7.4 – 4.6 cm
   2.8cm
   Density = $\frac{\text{mass}}{\text{Volume}}$
   = $\frac{11g}{2.8\ cm^3}$
   = $3.9gcm^{-3}$

2. F_1 and F_6

3. Either altitude or latitude/ radius of earth changes/ acceleration due to gravity from place to place away from the earth

4. Balance: meat + 0.5 kg on one side and 2 kg on the other:

5. $H_1\ P_1g = h_2\ p_2g$
   $H_2 = \frac{1.36 \times 10^4 \times -64}{8 \times 10^2}$
   = 1088cm;/ 10.88m.

6. Volume of 1 molecule = $\frac{18cm^3}{6 \times 10^{23}}$

   Diameter of the molecule = $18cm^3$
   6×10^{23}

   $\sqrt{}$ $\frac{18cm^3}{6 \times 10^{23}}$

   = 3.1×10^8 cm
   = 3.11×10^8

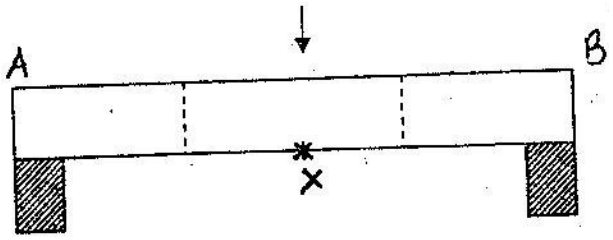
7. Glass is a bad conductor of heart, the difference in temperature between the inside and the outside cause unequal expansion

8. Adhesion of water to glass is greater than cohesion

9. The rate of cooling depends on the rate of evaporation
   Rate of evaporation depends on the surface area
   Surface area A, < surface area B for evaporation

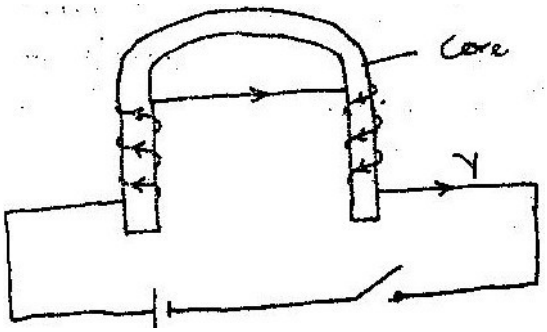
10. A ray from A A ray from B
    Relative positions of A and B correctly drawn

11. Solar cell (photovoltaic) photocell/ photo electric cell

12. 

13. Soft magnetic materials loose their magnetism easily while hard magnetic materials retain magnetism longer

14. Q = It Q = 0.5 x 4x x 60; = 120C

15. 

16. d= speed x t; 340 x 2; 680m

17. At low speeds the speed is streamline
At high speed the flow is turbulent

18. $\frac{V_r}{V} = \frac{l}{l_r}$
$\frac{240}{6} = \frac{30}{l_r}$ $l_r = 0.75A;$

19. $mgh = \frac{1}{2} mv^2$ OR $V^2 = U^2 + 2as;$
$h = \frac{1}{2}$ $S = V^2 = 36$
$= 18m;$ $2as \quad 2(10)$
$S = ut + \frac{1}{2} at^2$ $= 1.8m;$

20. V = f;
$V = \frac{3.0 \times 10^8 \ ms^{-1}}{95.6 \times 10^6 S^{-1}}$ = 3.14m;
F

21. 6V

22. parallel $\frac{1}{R_P} = \frac{1}{400} + \frac{1}{400} + \frac{2}{400}$

YZI $= \frac{V}{R} = \frac{12}{60} = 0.02A$

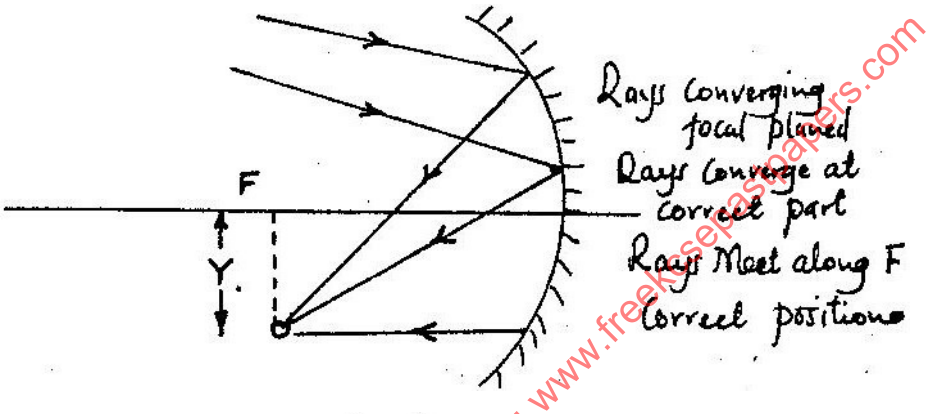
I = V = 12 = 0.02 A
R 60

400 x 12 = 8V
600

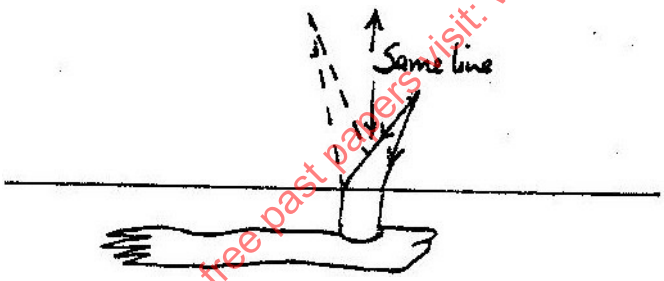
23. (No of irons) x 1000) = IV
Number = 13 x 240 = 3.12;
1000

24. Extra heat is required to change ice to water / latent heat of fusion

25.



26.



27. A trolley slows down/ motion decreases since mass increases and the momentum is conserved, the velocity goes down

28. $C_T = C_1 - C_2 = 1 = 1 + 1$
$C_T \quad C_P \quad C_3$

$= C_T = \frac{C_P \ C_3}{C_P + C_3}$

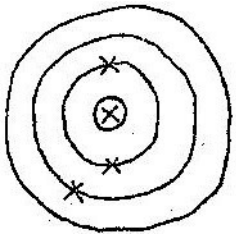
29. $^0C + 273 = -20 + 273 = 252K$

30. (a) Dark and bright fringes (b) Coloured fringes

31. Small differences in frequencies

33. By using laminated core

34.



35. After 3 secs number decayed = ½ x 5.12 x 10^{20} = 2.56 x 10^{20}
Next 3 secs. Number decayed = ½ x 2.56 x 10^{20} = 1.28 x 10^{20}
Total number decayed = (1.28 + 2.56) x 10^{20}
= 3.84 x 20^{20}

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MARKING SCHEME.

1. i) -To make and beak contact / circuit
- It bends and straightens or the metals expand differently.

ii) Current flows, heating takes place, temperature rises, strip is heated and bends way from contact ; disconnects heater; temperature; drops reconnected heater or completes circuit.

b) Let final temperature be θ_2

Heat lost by water = $4200 \times 0.2 (20- \theta_2)$

Heat lost by glass = $0.2 \times 670 \times (20 - \theta_2)$

Heat gained by ice = $0.04 \times 334 \times 10^3$

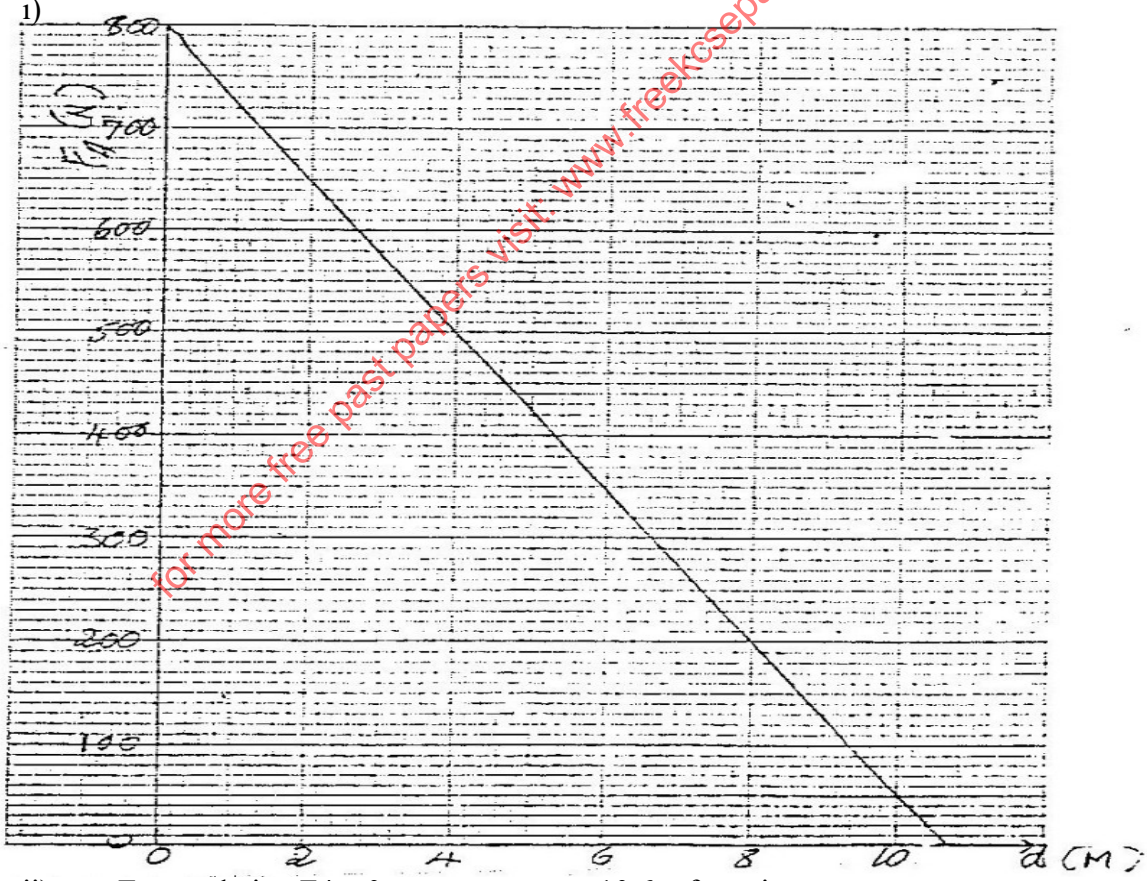
Heat gained water = $0.04 \times 4200 (\theta_2 - 0)$

Heat lost = Heat gained.

$4200 \times 0.2 (20 - \theta_2) + 0.2 \times 670 \times (20 - \theta_2) = 0.04 \times 334 \times 103 + 0.04 \times 4200 (\theta_2 - 0)$

$\theta_2 = 5.36^oC$

2(a) i)



ii) Extrapolation F4 – 0 10.6m force is zero

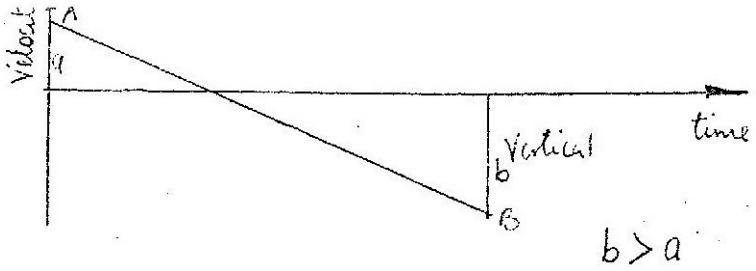
Leading x axis = 10.6 + 0.2 10.6 -8

Intercept 10.6

10.6 – 8 = 2.6 = 2.6m away from B

b) $10w + (10x60) = 2.0 \times 40 \Rightarrow 10w + 6x = 80$ $w = {}^{x}/_{10} = 2N$

3a)



b) i) $V = u + at$ Deceleration = $\frac{u - v}{t}$

$0 = 20 + 2a$ OR $= \frac{20 - 0}{2}$

$a = -10ms^{-2}$ $= 10ms^{-2}$

ii) Stopping time = 2.2s Total time stop = 2.2 sec

Before stopping = 0.2 x 20 = 4m $S = ut + {}^{1}/_{2}\,at^2$

$\frac{10 - 202}{2(-10)} = \frac{400}{20} = 20$ $= (20 \times 2.2) + {}^{1}/_{2} \times 10 \times 2.2^2$

20 + 4 = 24m = 19.8m

4a) AB: (2000 x 20) + (600 x 200) + ½ x 10 x 4000) + (½ x 30 x 4000)

40000 + 120000 + 60000

Total 200000J = 200KJ

b) 6000 x 0.6 = 3600w

c) Power Input = $\frac{3.0 \times 10^5 \times 10 \times 360}{60 \times 60} = 3.0 \times 10^5 wx$

Total = (3 + 2_ x 10^3 = 5.0 x 10^3kw Eff. ${}^{3}/_{5}$ x 100 = 60

5a) Amount of current No of coils / shape of core / X – core

b) i) End of coil facing up becomes a south pole and the metre rule is pulled down / attraction occurs. Or Rule tips; core magnetized; top of core becomes south pole; attracts magnet.

ii) The metre rule to have appointer attached to read zero when switch S is open. Use rheostat to vary current to maximum and calibrate accordingly.

c)HF = $hf_o + \frac{1}{2} mv^2$

$= (3.2 + 82.0) \times 10^{-19} = 11.2 \times 10^{-19}$ $f = \frac{11.2 \times 10^{-19}}{6.63 \times 10^{-19}}$

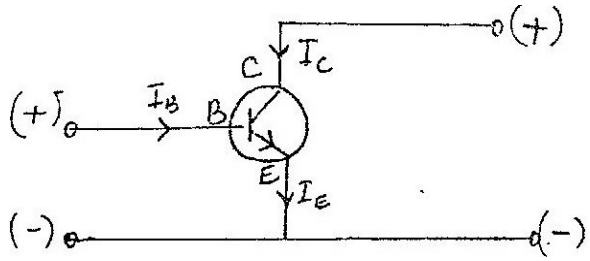
$\lambda = c = \frac{3.0 \times 10^8 \times 6.63 \times 10^{-34}}{F \qquad 11.2 \times 10^{-9}} = 1.76 \times 10m$

SECTION 2

6ai) Semiconductors – conducting is by holes Conductors – conducting is by electrons

ii) Semiconductors – silicon, germanium Conductors – copper , tin iron.

b)i)



ii) $I_B = \frac{0.5}{100} \times 2 = 0.01$ mA $I_C = 2 - 0.01 = 1/99$MA

$I_E = I_C + I_{rs}$

iii) $I_B = \frac{0.5 \times 4}{100} = 0.02$mA $I_c = 3.98$mA

$I_C = 4 - 0.02 = 3.98$mA $\triangle I_b = 0.02 - 0.01 = 0.01$

$h_{FE} = \frac{3.98}{0.02} = 1.99$ $\triangle I_c = 3.98 - 1.99 = 1.99$

$\triangle I_c = 3.98 - 1.79 = 1.99$

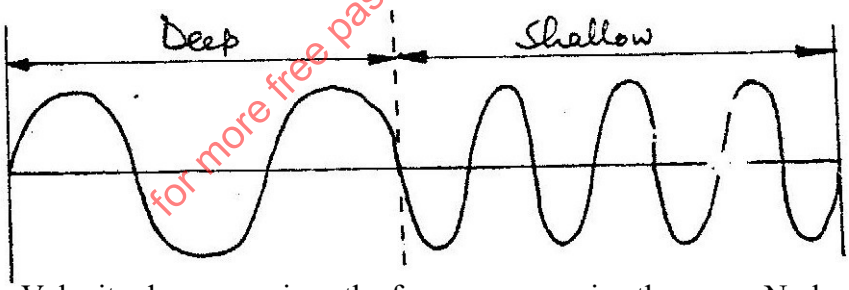
$\triangle I_b = 0.02 - 0.01 = 0.01$

$HFE = \frac{\triangle Ic}{\triangle Ib} = \frac{1.99}{0.01} = 1.99$

$\frac{\triangle I_c}{\triangle I_b} = \frac{1.99}{0.01} = 199$

7a(i) Transverse – particles in the wave perpendicular to the direction of the wave.
Longitudinal – particles move in the same direction as the wave.

b)i)



ii) Velocity decreases since the frequency remains the same. No loss of energy therefore amplitude does not change.

c) a) Frequency = $^{30}/_{60} = 0.5$ Hz

b) Speed = $^{6}/_{2} = 3$m/s $\lambda = V/f$ $^{3}/_{0.5} = 6$m

d) A long AA' – loud and soft sound (constant)
a long OO' – loud and solid.

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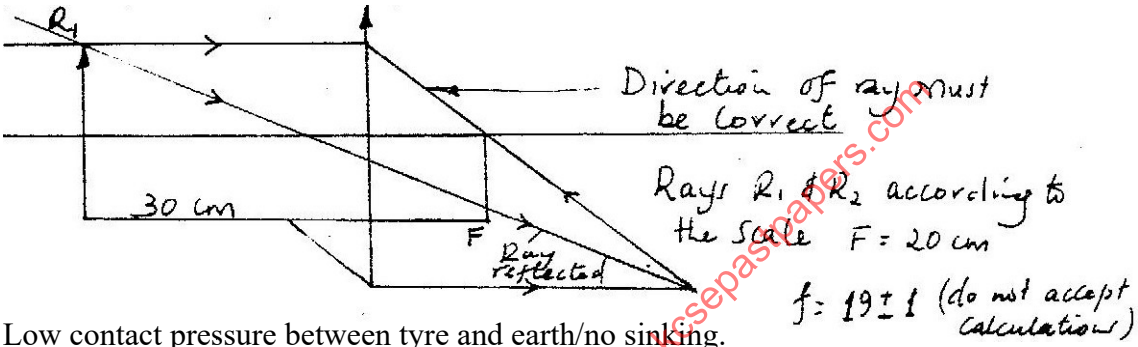
1. Accuracy of measuring tape is 10m or o.1 cm ± 5cm or o.o5m.
2. Length of post is 1.5 (1.50 x 1.55) Rangep = N3=
3. Quantity of heat equation 20x (42-26)x C=10^3 x 15 x60
   C=2.8x 103JKg $^{-1}$K = (2812.5 OR2813)
4. Detecting imperfection in metal structures/block/flaws
5. addition of soap solution to pure water reduces the strength of the skin total was holding pin from sinking and so it sinks. Surface tension supports the pin. Addition of soap reduces tension/weakens/broken.
6. 

7. Low contact pressure between tyre and earth/no sinking.
8. $I_P = N_3$ = Np= 20000x3= 2000
   $I_s = N_P$ 30
9. surface area of water . Nature of surface of the container/colour/texture /material/ (ambient temperatures).
10. Evaporation and cell reaction cause loss of water. Distilled water does not introduce impurities to the cell.
11. E=IR +h
    $I = \frac{E}{R+r} = \frac{2.0}{2.0x0.5} = 0.8A$
12. $\frac{50}{400} = (I)^n$ n =3(half-lives)
    $(2)^n$
    Half –life $\frac{72}{3}$ =24 min.
13. High resistance voltmeter takes less current/low current recording low current.
14. Domains/Dipoles initially organized are disorganized by mechanical forces.
15. As the rod approaches the cap, negative charges/electrons on the cap are repelled towards the rod. The leaf collapses since the positive charges on it are neutralized attraction. As the rod gets even closer to the cap moved more negative charges/electrons charges are repelled to the leaf, causing it to diverge.
16. Length of the rod; diameter/cross sectional area of the rod/thickness nature/type of rod material/conductivity.
17. $R=P^{1/4}$ I = $\frac{2.0 \times 10^6 x0.5}{4.9 x20^7}$ = 2m OR = 2.041 or 2.0408
18. Some energy is lost due to friction/air friction acts on the pendulum/air dumping on the apparatus air resistance.

19. In TV (CRT) deflection is by magnetic field, while in CRO deflection is by electric field. X-Y plates.
ATV (CRT)has two time bases while a CRO has only one.
In CRT it produced 625 lines per second while CRO is 25 lines per second.

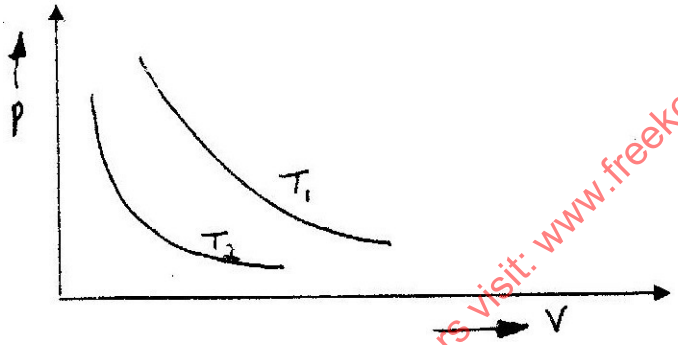
20. Heating/ cooking/communication/eye/photographic film or plate/LDR/photocell.

21. Diode is forward-biased, no current flows
Current flows when the switch is closed but when terminals are reversed, no current flows

22. Angle of inclination/nature of surface/length of inclination
Height of inclination/frictioal force between the surface.

23. layers of the crystal material are arranged according to faces/ plans/ flat surfaces.
Cleavage is only possible parallel to those faces/places/flat surfaces.

24. Principles of moment.
200 x1.5 R x 0.5, 0.5f=1x20x10or 0.5,R=600. R=F +200 = 400N take moments about O
F=600 -200 =400N
F=400N

25. 

26 Addition of impurities with higher boiling points/presence of impurities. Water heated under a higher pressure than atmospheric/below sea level.

27. Moon covers the sun/obstruction of sun by the moon
Both heat and light have same velocity/both are electromagnet waves.

28. Overtones/harmonics

29. Since F=MV2/V the sharper the corner (as B) the small the value of R hence the greater the F. (M& V constant).

30. Gas through the nozzle gains velocity. Hence its pressure reduces above the nozzle. The higher atmospheric pressure pushes air into the gas stream.

31. When mercury is heated (during a fire); it expands and makes contact, completing the circuit to ring the bell.

32. There will be no variation of intensity of light/ uniform intensity/no bands/one

33. Is the one which cannot form on a screen Is formed by rays which are not real
Is formed by extending rays. Formed by apparent rays.

34. Component of weight down the slope =50 sin 30^{0} =25N
Total force parallel to slope= (29+25) N 54N.

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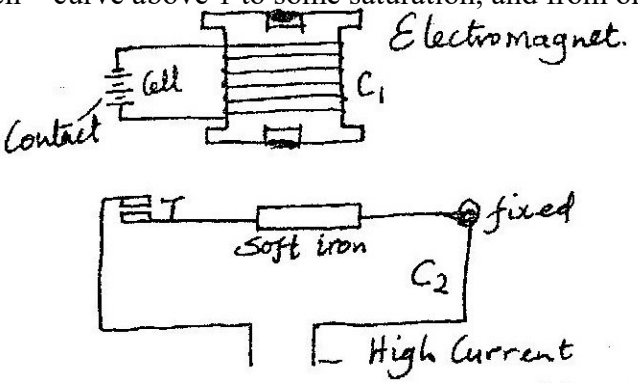
1. iii) Scale, axes label, unit-plotting 8-10-2 5-7-1 Curve (smooth)

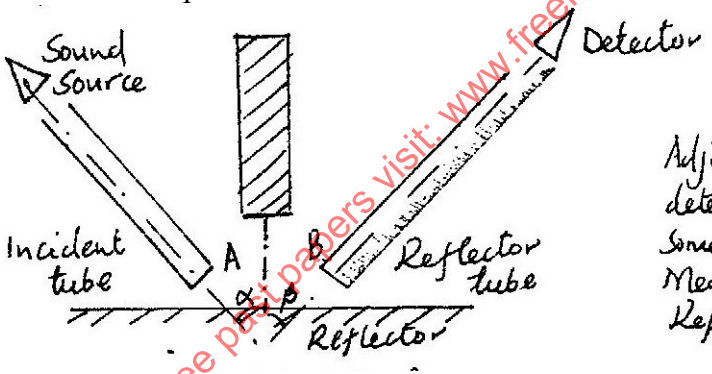
iv) As the number of turns is increased, alignment of domain with field increases. After 35-36
turns, all domains are aligned, so that magnet is saturated.

Sketch – curve above 1 to some saturation, and from origin.



b) When switch is closed electromagnet attracts soft iron. This causes T to close and so circuit 2 is put on.

2.



Adjust position of R tube and detector for Max intensity (Sound Some sound, Loud Sound)
Measure/compare angles α & β
Repeat for other angles

bi) Volume of block = 4x4x16 = 256 cm3
Mass of block = 154 gm
D= m=154=0.6g/cm^3 deny ½ mk if not to d.p
V 256

ii) Volume of liquid ¾ of 256 = 192 cm3
Density of liquid = 154 = 0.8g/cm3
192

3. a i) The bullet will land on the track It has some horizontal (inertia) velocity as the track.

(ii) (Use g = 10ms-2}

S = ut + ½ at2
For freefall u = 0 t=√2h/g T= 6sec
Horizontal distance = vxt = 6x50 = 300m
V2= U2 + 2as OR v= 2U + at OR ½ Mu2 = mgh

From above u = 30m/s
S=ut+ ½ at2
T=ut + ½ at2
T= 6 D= vxt = 50x6 =300cm

(bi) Measure pressure with Bourdon gauge
Measure the length of air (reg volume at tone).

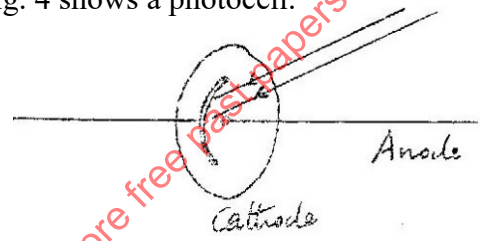
(ii) Tabulation values of p and length of air column (volume)
Plot graph of I/V vs P OR L vs I/P
Graph is a straight line. Hence pa I/v
Tabulate P and V (I) Calculate PV or PL
PV (1) = PL Hence Pa $^{1}/_{v}$

AC Block

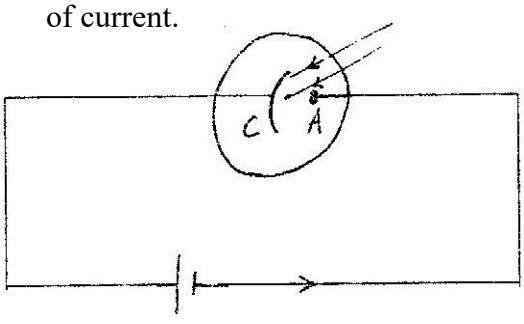
4. a) i)

(ii) Voltage, current, time
(iii) Q v/t Rate= Q/t = v/tT (T=time taken for sun to heat)

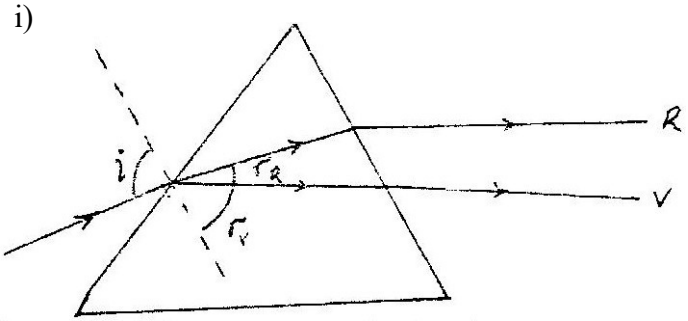
b) Fig. 4 shows a photocell.



ii) When light rays strike cathode C surface electrons gain photon (energy) hence the cathode.
iii) Draw a simple circuit including the photocell to show the direction of flow of current.



5 a) i)



ii) Since sin i is common and r < re then sin rv < sin re

b) n Sin C=1 OR Sin C $^1/_n$

sin C= $^1/_{1.4}$ C= 45.600 (45.58) or 45.35 min/45.36

SECTION II

6 a) When T and Y are connected C is charged by E, until C achieves same p.d. across it as for E C max p.d is achieved when T and Y are connected after first process. C acts, as source of e.m.f and discharges through r unit no more current flow or current is zero.

b) Current = dQ draw target at 30. Substitution I =3.6μA ± 0.2A.

7a) 2 complete rays, 2 with arrow at one end image (inverted real) (continuous tie) locating F size 2.4 ±0cm

b)

U (cm)	20	25	30	40	50	70
V(cm)	20	16.7	15	13.3	12.5	11.6
$\frac{1}{V(cm^{-1})}$	0.50	0.040	0.033	0.025	0.020	0.014
$\frac{1}{V(cm^{-1})}$	0.50	0.060	0.067	0.075	0.080	0.086

ii) $^1/_f = {}^1/_u + {}^1/_v$ Intercept $^1/_f$

0.1 = 1/f ∴ f = 10cm

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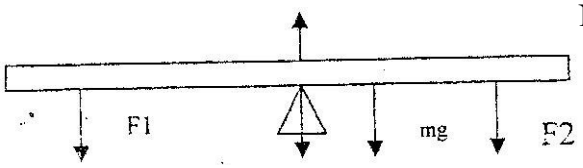
1. Reading on the vernier calipers
   0.5 + 0.01(5) 0.5 +0.05cm = 0.0055m/5.50mm.

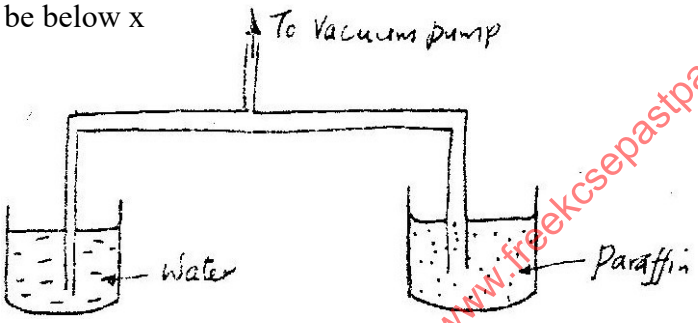
2. Third force F3 acting on the ruler is either upwards or downwards.



No: My must be at the centre.

3. Center of gravity rises when the body is tilted slightly and lowers when released / returns to original position.

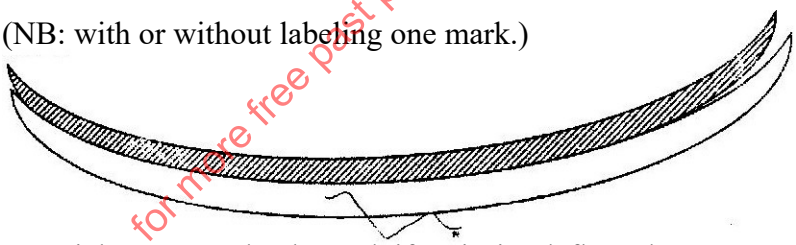
4. Y must be below x



Reason: P water is greater than paraffin = height of water required is therefore less than that of paraffin.

5. Cohesion between Hg molecules is greater than adhesion between Hg and glass molecules/cohesion force or adhesion. Force.

6. (NB: with or without labeling one mark.)



7. αParticles are + vely charged, if majority deflected most ⇒atom is empty.
   Deflection ⇒ existence of a +vely charged nucleus.
   Few deflected ⇒ nucleus is small/mass is concentrated at the centre

8. Angle of rotation of reflected ray=2(angle of rotation of mirror)
   $=2 \times 30 = 60^0$

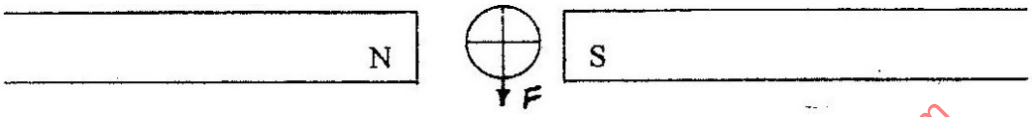
9. Charge concentrate at sharp point causing heavy discharge/ ionization neutralization, leaf falls off.

10. $V = IR \Rightarrow I = {}^{V}/_{R}$ $I = 3/! = 3A$
    ${}^{1}/_{R} = 1/R1 + 1/R2 = 2/2$
    ${}^{1}/_{R} = 1 = R = 1$

11. 4mm=20N
1.5 =? F = Ke
1.5x 20 K = F = $\frac{20}{4}$ = 5 x 10^3 N
= 7.5 N e 4x 10^{-3}
F=5x 10^3 x 1.5 x 10^{-3}
=7.5N

12. -Dipping a magnet into a container with iron fillings, most of them will cling at the poles
⇒
- Use of plotting compass to trace.

13.



14. Moment of couple = Force x distance between forces.
=10 x 2 = 20NM.

15. F = Ma = 70 x 0.5 F 35N
35N = 20a a = $\frac{35}{20}$ = 1.75M/s^2

16. P = force x velocity Power = Fd/t = $\frac{20 \times 10 \times 20}{40}$
Mg x h/t = 20x 10 x $^{20}/_{40}$ = 100j/I
= 100w

17. F = I/T = $^{1}/_{0.5}$ = $^{10}/_{5}$ = 2HZ
OR
F = No. of waves made in 1 second = 2 Hz
OR
F = $\frac{\text{No of waves}}{\text{Time}}$ = 2/1 = 2.5 / 1.25 = 2Hz

18. Beat frequency f = f2 – f1 F = f2 – f1
= 258 – 256 256 – 258
= 2Hz =/-2/ = 2

19. P = V1 = 15000 = V x 2 W = QV but Q = It e = I^2Rt
10 x 60 =V = W 15000 1500 = 2 x 2 x R x 60 x 10
$^{W}/_{t}$ = VI = V = 1500 Q 60 x 10 x 2 60 x 10 x 2150 = 24R
10 x 60 x 2 V = 12.5v 25 = 4R
150 V = $\frac{25}{4}$ x 2
12 V = 12.5V
12.5V

20. Heat lost by substance = heat gained by water
$M_sC_s\triangle\theta_1 = M_wC_w\triangle\theta 2$
2 x 400 x 60 = M_w x 4200 x 1
$M_w = \frac{2 \times 400 \times 60}{4200} = \frac{30}{7}$ = 11.4kg

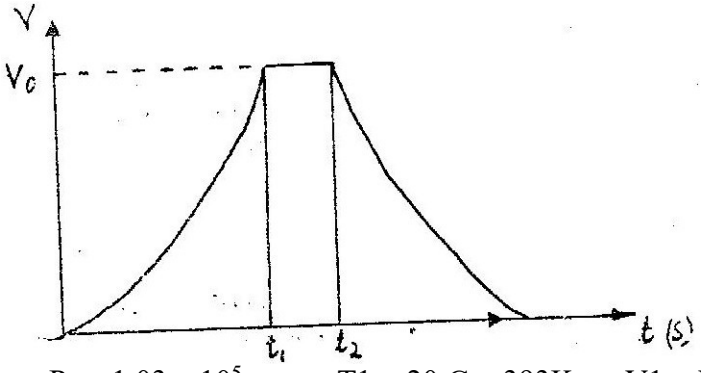
21. V = I(R +r)
5 = $\frac{10}{1000}$ (R + 50)500 ⇒ R + 50 ⇒ R = 500 - 50 = 450Ω

22. Apparent depth = 30 – 10 = 20cm $\frac{\text{real depth}}{\text{Apparent depth}} = \frac{30}{20} = 1.5$

23. Kinetic energy ray / heat energy.

24. - Horizontal acceleration is zero because g component horizontally is 0
    -Horizontal velocity remains constant
    - Resultant horizontal force is zero - resultant force is Zero.

25. V_2 is smaller than V_1 V_1 is larger than V_2

26. 

27. $P_1 = 1.03 \times 10^5$ T1 = 20:C = 393K V1 = V
    P_2 =? V2 = $^1/_8$V or $^v/_8$
    $P_1V_1 = P_2V_2$ $1.03 \times 10^5 - P^2/_8$ $= p^2 = 3.24 \times 10^5 N/M^2$

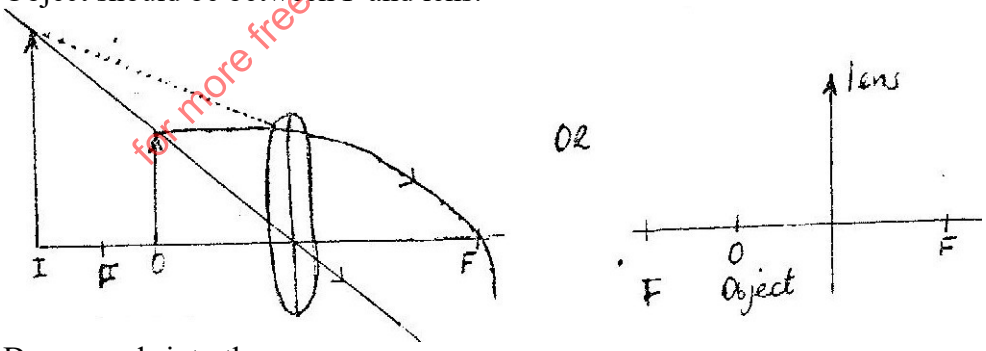
28. Radio waves, infrared, x-rays, Gamma rays.

29. Up thrust = PV x 10 = 10 PV

30. Ultra violet releases electrons from zinc plate by thermal emission.
    On removal of electrons, zinc becomes +vely charged.
    Positive charge on zinc discharges/ neutralizes the charged on the electroscope.

31. Tension = centripetal force.
    $T = Mv^2/r$ but v = wr $2 = 0.1 \times w^2 \times 0.33$
    $T = Mw^2r$ t = 0.2 x 10 = 2N $2N = Mw^2r$ 2 = 0.1 x w2 x 0.03
    $-w^2 = 2/0.003$ w √2000/3 w = √666.7 = 25.82 rads/s

32. Object should be between F and lens.



33. Downwards into the paper.

34. A-earth wire B – live wire C neutral wire

35. $Z \xrightarrow{Y} Z \xrightarrow{\beta} Z_{+1} +^o - 1e$

    Or Atomic number charges by / New is a head of the old or Z + 1

PHYSICS PAPER 232/2 K.C.S.E 1999. MARKING SCHEME

1a) Longitudinal waves - direction of the disturbance while ½ .Transverse waves – direction of propagation is perpendicular to that of the disturbances.

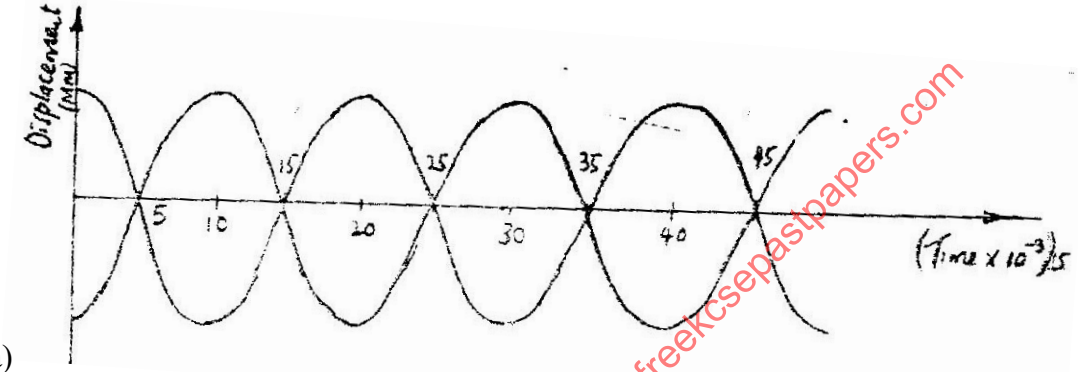
b i) YP – XP = 2λ

ii) Dark fringes; crests and troughs arrive at the same time OK destructive interferences
Bright fringes; crests arrive together at the same time OR constructive interference.

iii) No interference pattern because no diffraction takes place.

C i) T = (2.5 – 5) x 10 – 3
= 20 x 10 – 3s 10^3
F = 1/T = 50 Hz. $1/20 \times 10^{-3}$

ii)



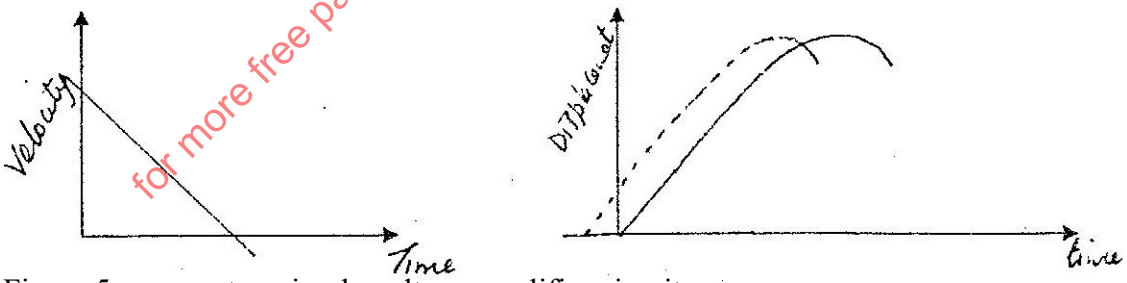
2.a)

3i) Average velocity at intervals AB and CD.
T = 1/50 x 56 V_{AB} = 1.5cm/0.1s V_{CD} = 3.2cm/0.1s
= 0.1s 15cm/s 32cm/s

ii) Average acceleration of the trolley.

(b) V2 = U2 + 2gh mgh = 1/2MV2
$V = \sqrt{2gh}$ $V = \sqrt{2gh}$

ci)



4a) Figure 5 represents a simple voltage amplifier circuit.

b i) Base current.

Current gain = $\frac{\text{Collector current}}{\text{Base current}}$ p2 = $1_a/I_b$

$\frac{62.5 = 2.5 \times 10\text{-}3}{I_b}$

$\frac{Ib = 2.5 \times 10\text{-}3 = 40uA}{62.5}$ (4x10-5)A

ii) Load resistance, R_L IcRL = Vcc = 5.5

P.d across R_L

$RL = \frac{5.5}{2.5 \times 10^{-3}} = 2.2k\Omega$

$10 - 4.5 = 5.5$ ICRL = 5.5

$RL = \frac{5.5}{2.5 \times 10^{-3}}$

5a) Ammeter reading decreases.
The resistance of metals decreases with increase in temperature.

i) $P = \frac{V^2}{R} = \frac{(240)^2}{100}$ P = 576w

ii) P = VI

$I = \frac{P}{V} = \frac{576}{240} = 2.4A$

SECTION II

6a) Benzene sinks in liquid benzene.
Water increases in volume on solidifying while benzene reduces in volume; ice is less dense that liquid water. Solid benzene is denser that liquid benzene.

b i) Weigh the metal block in air and in water
Fill the overflow can in water and place on a bench / diagram
Collect the overflow in the beaker and weigh
Compare difference in weight of metal block and weight of overflow
Repeat
Up thrust = tension + weight
= (0.5 + 2.0) = 2.5N
Weight of H2O) = 2.5N

$\frac{M_w}{V_w} = 1000$

Vw = 0.25 volume of wood

1000

Density of wood = $\frac{0.2}{0.25/100}$

$\frac{0.2 \times 1000}{25}$

800kg/m3

alternative
Up thrust = 2.5N

$R.D = \frac{Wt.\ in\ air}{Upthrust} = \frac{2.0}{2.5} = 0.8$

€wood
€wood
€wood

c i) Time taken for half of the radio acute material to disintegrate.
ii) Correct readings for 60 and 30 time 25 + 2 minutes