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

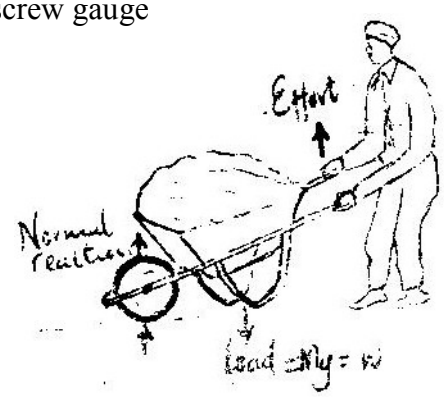
1. Micrometer screw gauge
2. 

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
   $F \alpha h$
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

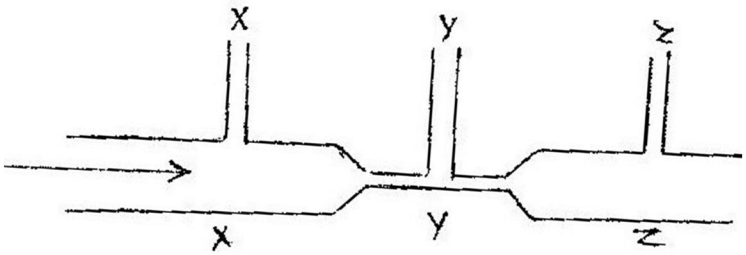
- Reducing the length

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

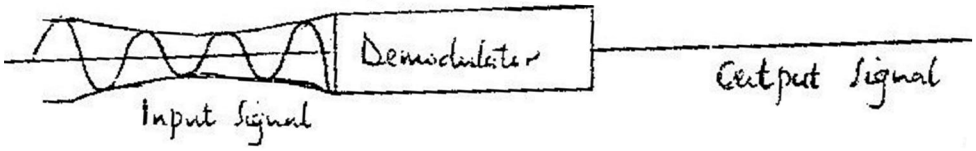
24. – Reducing - Increasing

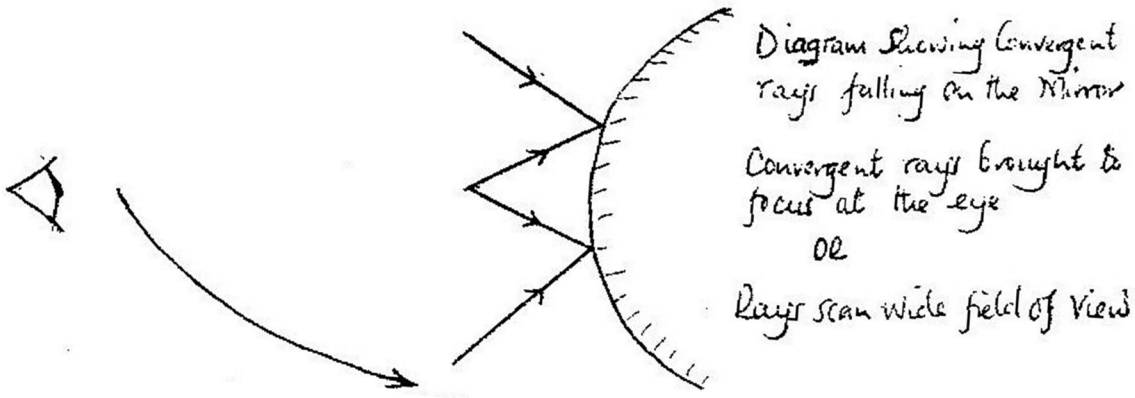
25. Polarization

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

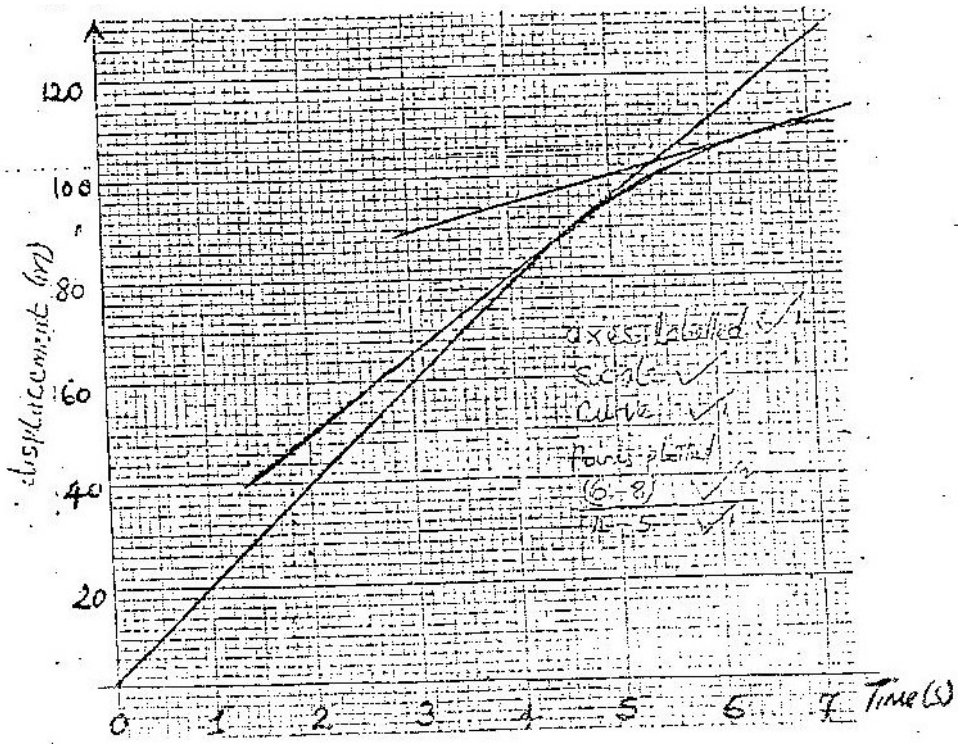
27. $E_2 = E_1 + h\ f\ i$ or $E_2 – E_1 = h = c/\lambda$
    h= plank constant
    c- Velocity of light
    λ- Wave length of light

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 vet - 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

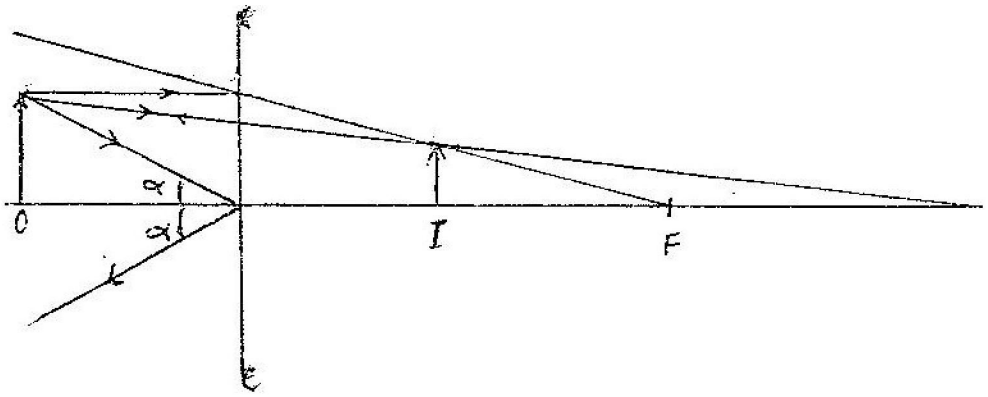
E = 1(YFR) Or $I = \frac{V}{R}$

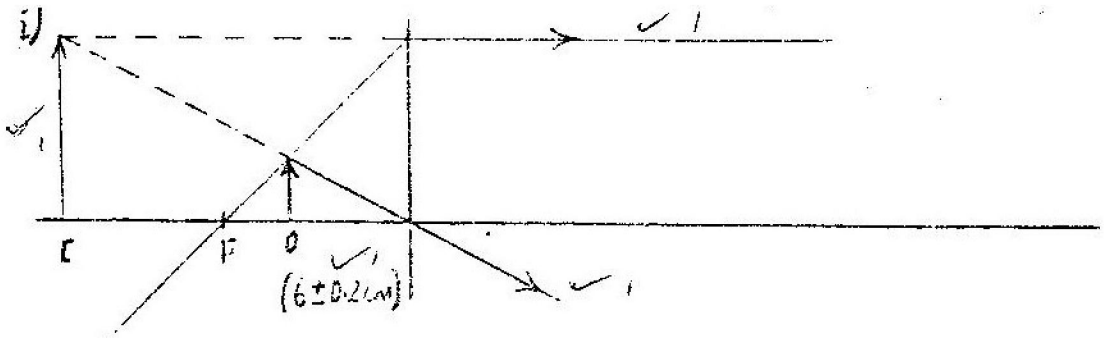
2 = Ll

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

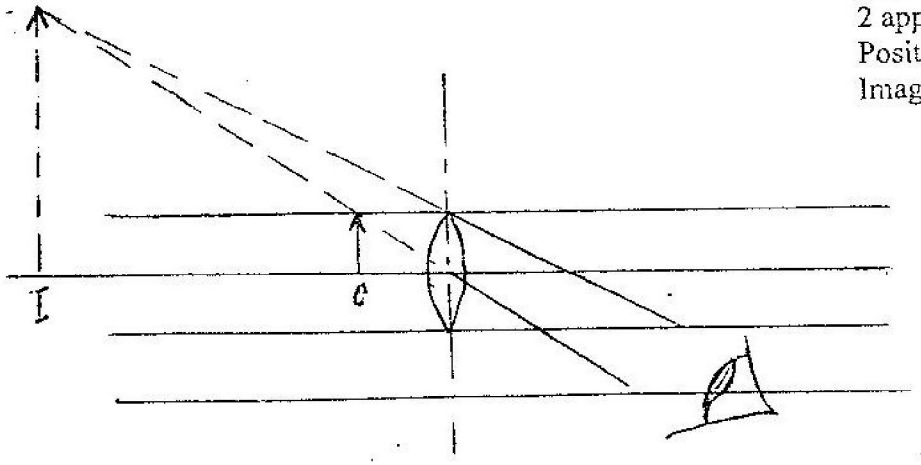
(b) $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ $\frac{1}{u} = \frac{10}{60}$

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

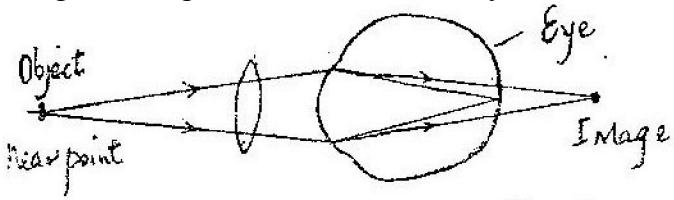


Fig. 3

(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

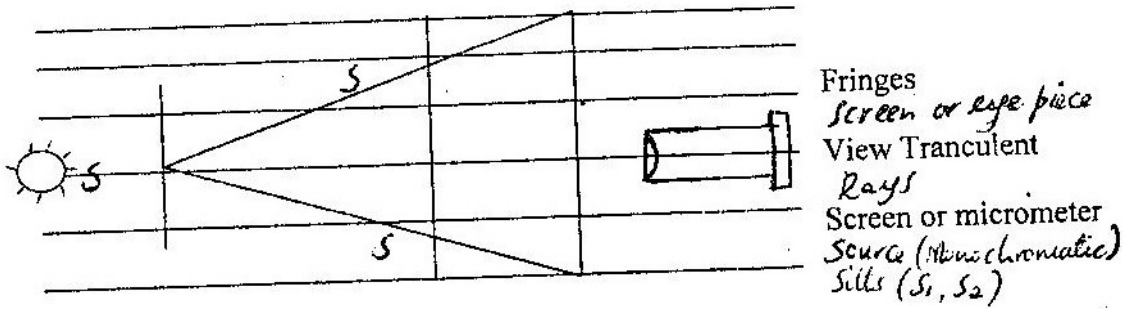
6. (a) Progressive wave- Wave profile moves along with the speed of the wave
Stationary wave – wave profile appears static

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

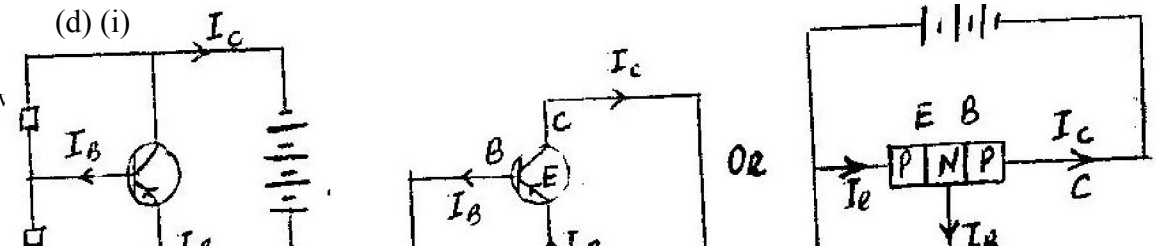
7. (a) Common or sillen (semiconductor) is doped with impurity atoms which trivalent (e.g boron or indium) intensity in currency on pole group 4 doped with trivalent

(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 $h_1\ p_1 = h_2\ p_2$

   $h_1 = \frac{h_2\ p_2 g}{pg}$ $= 8 \times \frac{18}{08}$

   $= 18$cm;

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

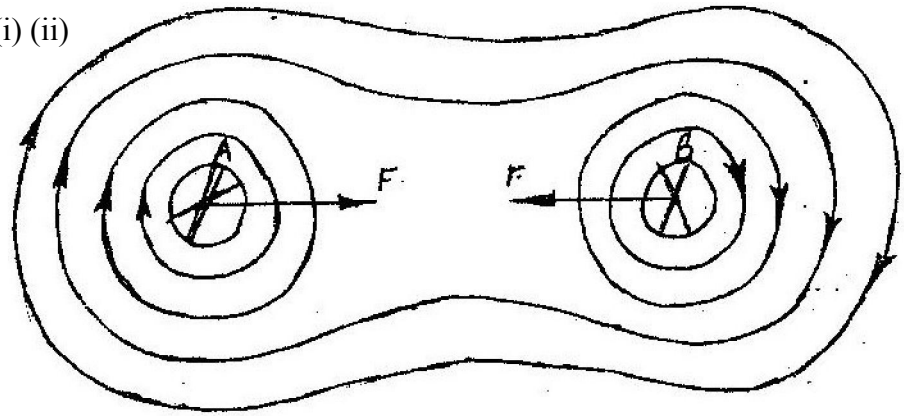
    Or (linear density/ thickness/ cross – sectional area/ diameter, radius

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;

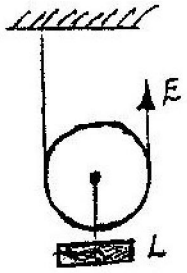
13. (i) (ii)



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 $5(80 - 40) = m(40-15)$ Heat gained MCD θ (80- 40)

    $5(40) = 25m$ Heat post MCD $\theta = m (40 - 15)$ MC $40 - 15$

    $5(80-40) = 25$ m

    $25m = 200 = m = 8$ kg

21. Equal qualities of heated supplied;

    $MC_W\theta_W = MC_P\theta_P$ $MC_W (Qw - Q) = MC_P (Q_p - Q)$
    Since $\theta P > \theta W$ or $MC_w > \theta_0 = MC_P > Q_P$
    $C_W > \theta_P C_p$

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

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

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

= 8.400J

Heat lost by condensing steam = m/

$(163.5 - 160) \times 10^{-3}$/J

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

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

$3.5 \times 10^{-3}\ (100 - 45) \times 4{,}200$;

= 808.5J

Heat given = heat gained

Hence:

$3.5 / \times 10^{-3} + 808.5$ 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 $\frac{(x - 400)}{320}$ = 2.5 + 2);
= 1120m;

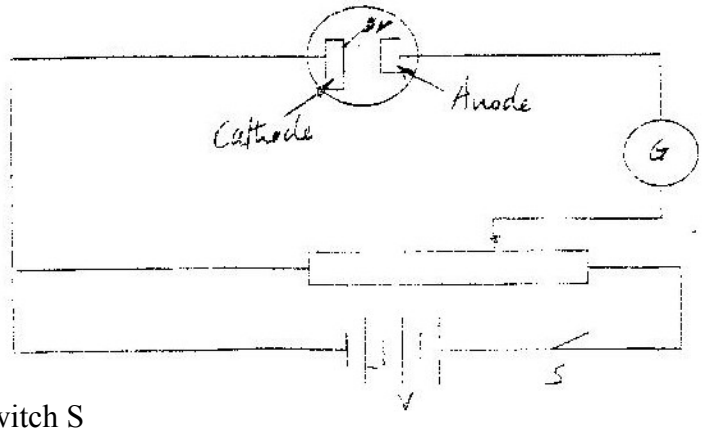
(c) (i) Double slit provides coherent sources;
(ii) Dark and bright fringes;
The central fringe is the brightest while the intensity of the other fringes reduces away from the central fringe;
(iii) I. The separation of fringes increases
II. Central fringe is white; fringes on either side are colored;

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
= 0.625 – 0.1 = 1.167 N
0.525 – 0.075
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 rad s^1

7. (a)



Close switch S
Vary pd until G deflects

(b) l)

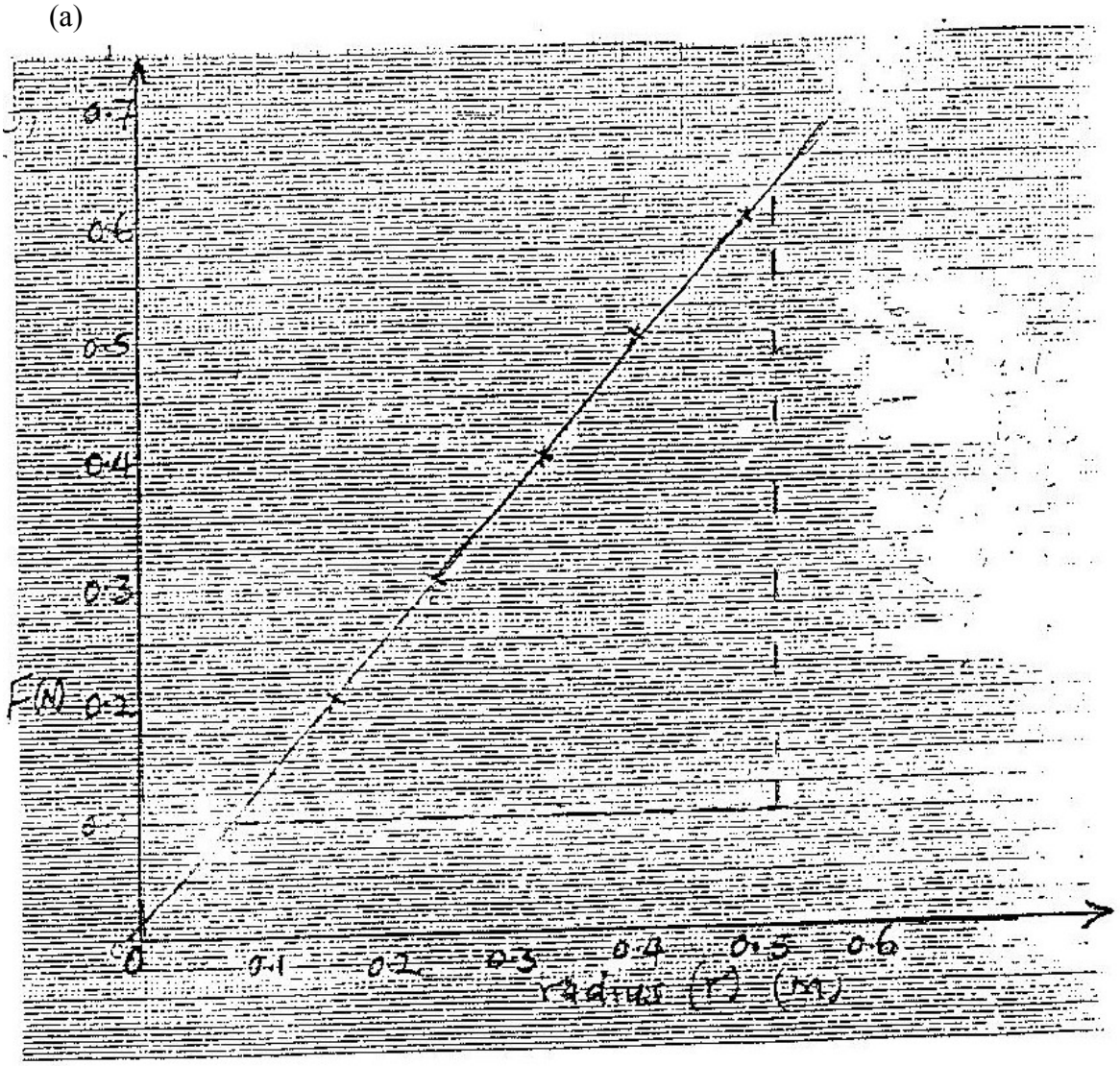
K (J) x 10^{-19}	5	10	10	30	4
F = C/D (H_E) x 10^{-15}	1.89	2.64	4.11	5.55	6.5

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

   = 3.1×10^8 cm
   = 3.11×10^8

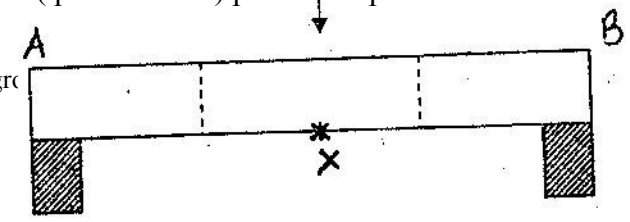
7. Glass is a bad conductor of heart, the difference in temperature between the inside and the outside cause unequal expansion

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

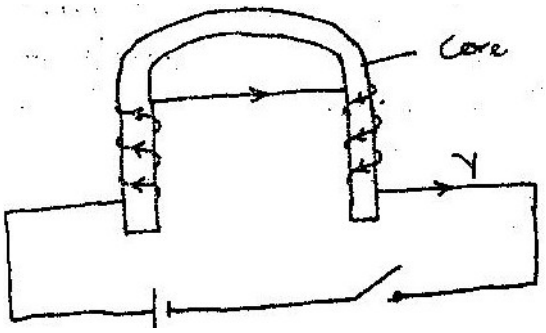
10. A ray from A A ray from B
    Relative positions of A and B correctly drawn

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

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

21. 6V

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

YZI = V = 12 = 0.02A
R 60

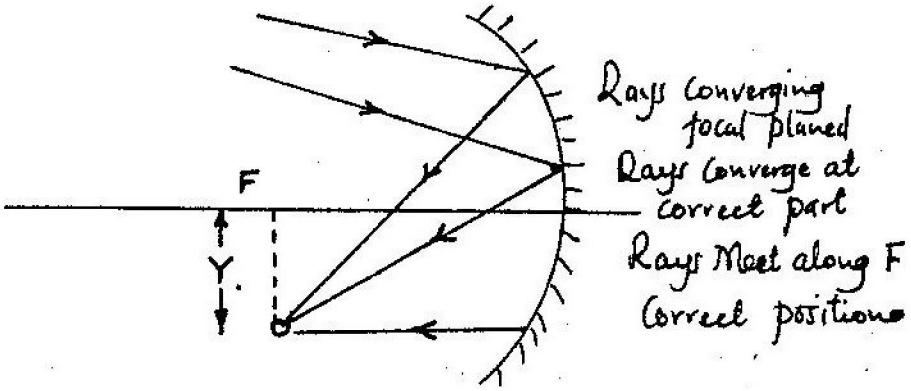
I = V = 12 = 0.02 A
R 60

$\frac{400}{600} \times 12 = 8V$

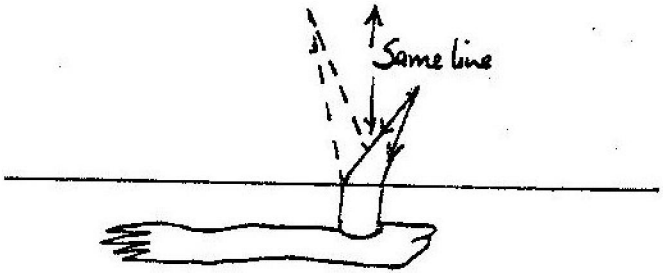
23. (No of irons) x 1000) = IV
Number = $\frac{13 \times 240}{1000} = 3.12$;

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

25.



26.



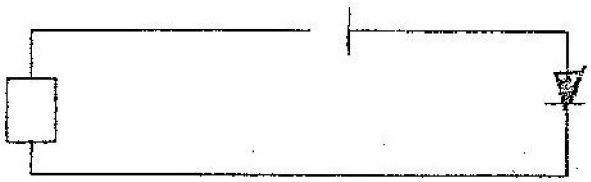
27. A trolley slows down/ motion decreases since mass increases and the momentum is conserved, the velocity goes down

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

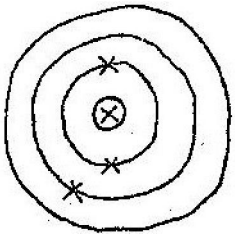
$= C_T = \frac{C_P \ C_3}{C_P + C_3}$

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}

PHYSICS PAPER 232/2 K.C.S.E 1997
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 = $0.04 \times 334 \times 10^3$

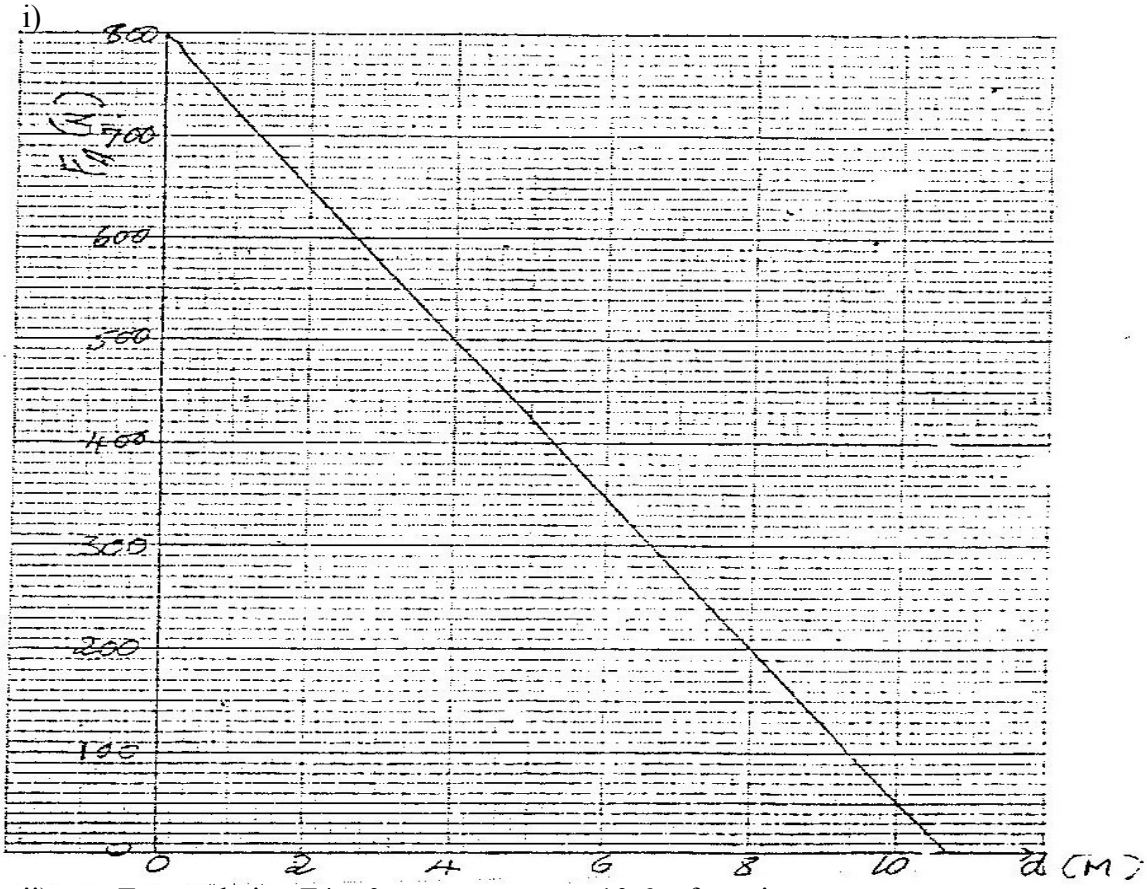
Heat gained water = $0.04 \times 4200 (\theta_2 – 0)$

Heat lost = Heat gained.

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

$\theta_2 = 5.36^oC$

2(a) i)



ii) Extrapolation F4 – 0 — 10.6m force is zero

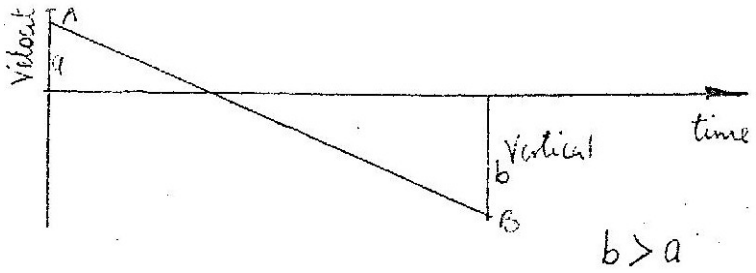
Leading x axis = 10.6 + 0.2 — 10.6 -8

Intercept 10.6

10.6 – 8 = 2.6 — = 2.6m away from B

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

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 $S = ut + {}^1/_2\ at^2$

$\frac{10 - 202}{2(-10)} = \frac{400}{20} = 20$ $= (20 \times 2.2) + {}^1/_2 + 10 \times 2.2^2$

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 $= hf_o + ½\ mv^2$

$= (3.2 + 82) \times 10^{-19} = 11.2 \times 10^{-19}$ $f = \frac{11.2 \times 10^{-19}}{6.63 \times 10^{-19}}$

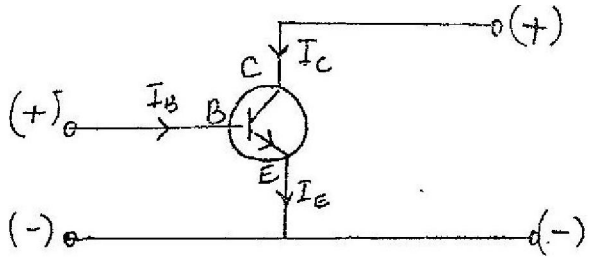
$\lambda = c = \frac{3.0 \times 10^8 \times 6.63 \times 10^{-34}}{F \qquad 11.2 \times 10^{-9}} = 1.76 \times 10m$

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

$\triangle I_b = 0.02 - 0.01 = 0.01$

$I_C = 4 - 0.02 = 3.98$mA $\triangle I_c = 3.98 - 1.99 = 1.99$

$h_{FE} = \frac{3.98}{0.02} = 1.99$

$\triangle I_c = 3.98 - 1.79 = 1.99$

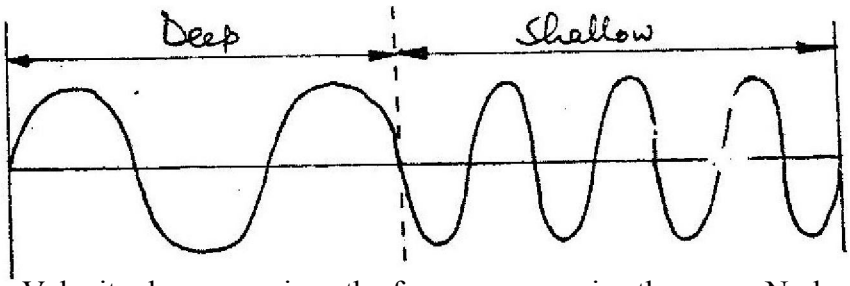
$\triangle I_b = 0.02 - 0.01 = 0.01$

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

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

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)



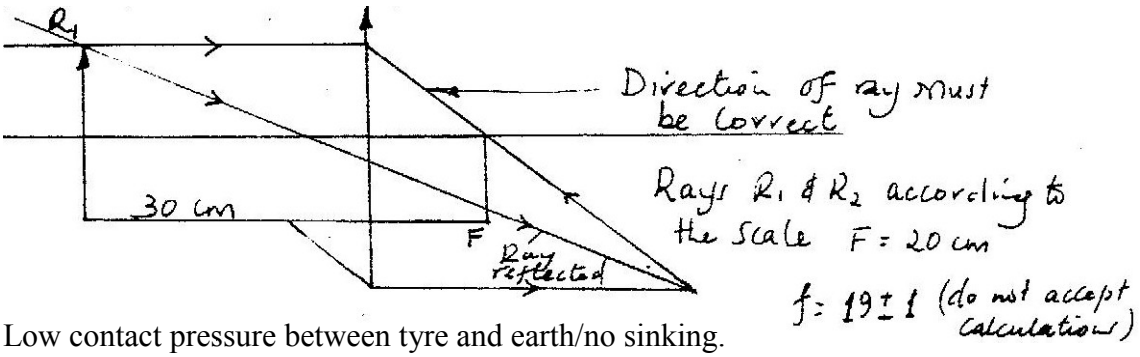
ii) Velocity decreases since the frequency remains the same. No loss of energy therefore amplitude does not change.

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

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

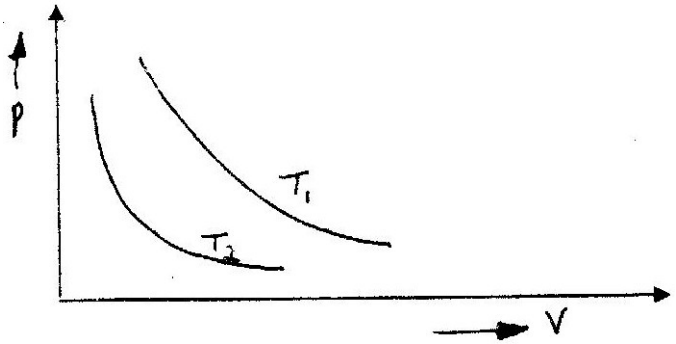
d) A long AA' – loud and soft sound (constant)
a long OO' – loud and solid.

PHYSICS PAPER 232/1 K.C.S.E 1998 MARKING SCHEME

1. Accuracy of measuring tape is 10m or o.1 cm $\pm$ 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. $I_P = N_3$ = N_P= 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 $\frac{72}{}$ = 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 = $\frac{2.0 \times 10^6 x 0.5}{4.9 x 20^7}$ = 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. 

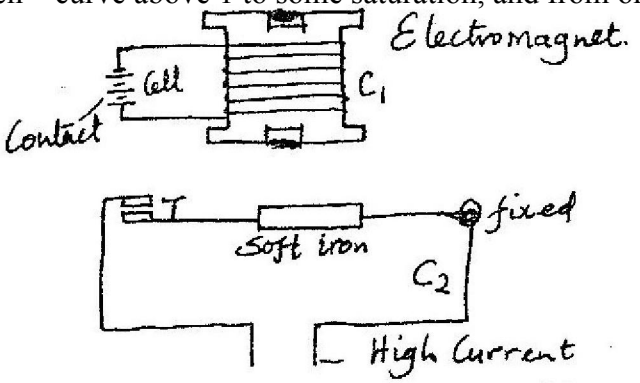
26 Addition of impurities with higher boiling points/presence of impurities. Water heated under a higher pressure than atmospheric/below sea level.
27. Moon covers the sun/obstruction of sun by the moon
Both heat and light have same velocity/both are electromagnet waves.
28. Overtones/harmonics
29. Since 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.

PHYSICS PAPER 232/2 K.C.S.E 1998 MARKING SCHEME

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

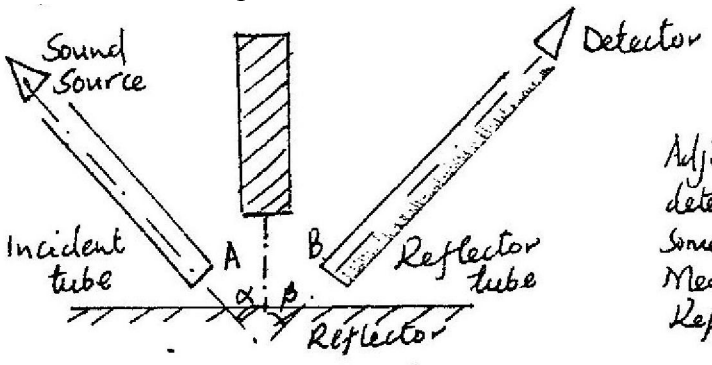
iv) As the number of turns is increased, alignment of domain with field increases. After 35-36
turns, all domains are aligned, so that magnet is saturated.

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}

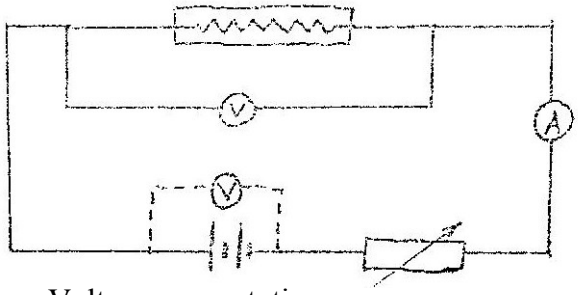
S = ut + ½ at2
For freefall u = 0 t=√2h/g T= 6sec
Horizontal distance = vxt = 6x50 = 300m
V2= U2 + 2as OR v= 2U + at OR ½ Mu2 = mgh
From above u = 30m/s

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).

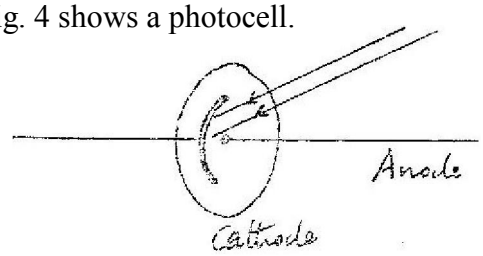
(ii) Tabulation values of p and length of air column (volume)
Plot graph of I/V vs P OR L vs I/P
Graph is a straight line. Hence pa I/v
Tabulate P and V (I) Calculate PV or PL
PV (1) = PL Hence Pa $^{1}/_{v}$

4. a) i)



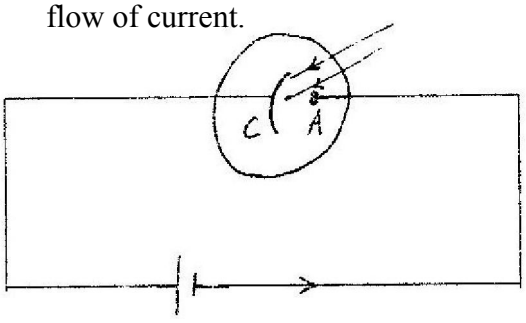
(ii) Voltage, current, time
(iii) Q v/t Rate= Q/t = v/tT (T=time taken for sun to heat)

b) Fig. 4 shows a photocell.

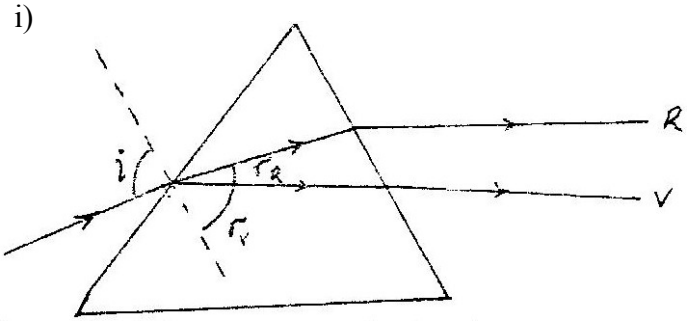


ii) When light rays strike cathode C surface electrons gain photon (energy) hence the cathode.

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 $\pm$ 0.2A.

7a) 2 complete rays, 2 with arrow at one end image (inverted real) (continuous tie) locating F size 2.4 $\pm$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

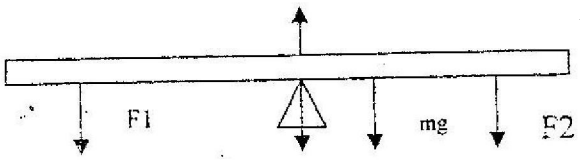
ii) $^1/_f = {}^1/_u + {}^1/_v$ Intercept $^1/_f$

0.1 = 1/f $\therefore$ f = 10cm

PHYSICS PAPER 232/1 K.C.S.E 1999 MARKING SCHEME.

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

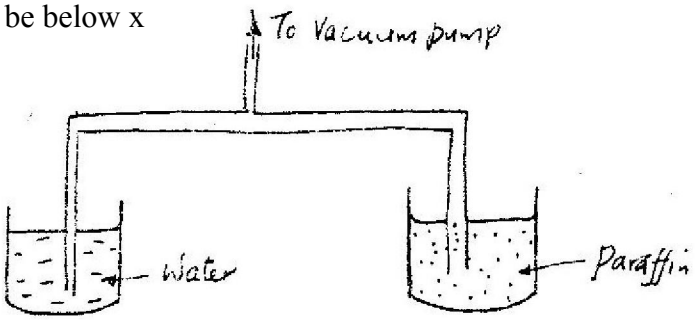
2. Third force F3 acting on the ruler is either upwards or downwards.



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.

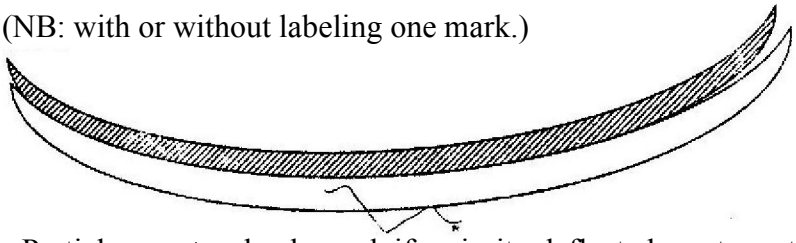
4. Y must be below x



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.)

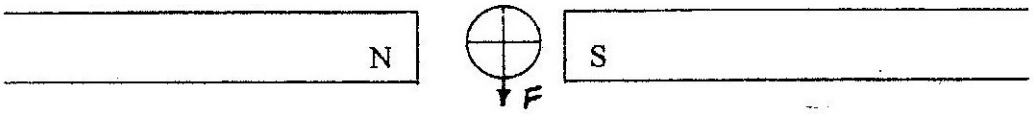


7. αParticles are + vely charged, if majority deflected most ⇒atom is empty.
   Deflection ⇒ existence of a +vely charged nucleus.
   Few deflected ⇒ nucleus is small/mass is concentrated at the centre

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

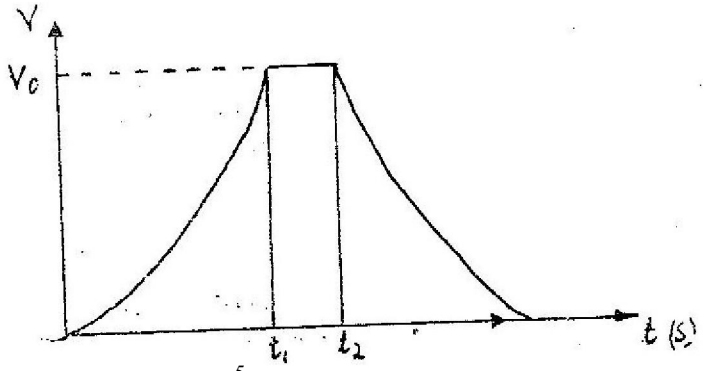
9. Charge concentrate at sharp point causing heavy discharge/ ionization neutralization, leaf falls off.

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

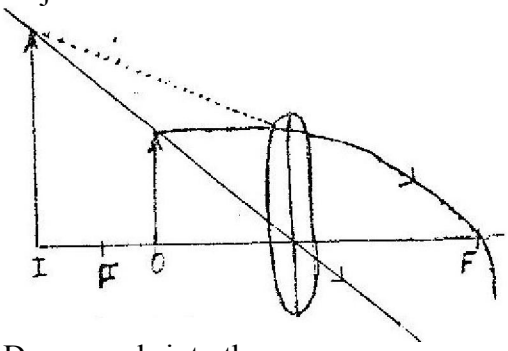
11. 4mm=20N
    1.5 =? F = Ke
    1.5x 20 K = F = $\frac{20}{4}$ = 5 x 10^3 N
    = 7.5 N e 4x 10^{-3}
    F=5x 10^3 x 1.5 x 10^{-3}
    =7.5N
12. -Dipping a magnet into a container with iron fillings, most of them will cling at the poles ⇒
    - Use of plotting compass to trace.
13. 

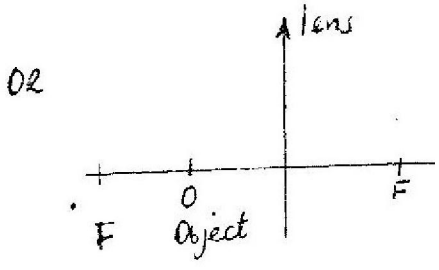
14. Moment of couple = Force x distance between forces.
    =10 x 2 = 20NM.
15. F = Ma = 70 x 0.5 F 35N
    35N = 20a a = $\frac{35}{20}$ = 1.75M/s^2
16. P = force x velocity Power = Fd/t = $\frac{20 \times 10 \times 20}{40}$
    Mg x h/t = 20x 10 x $^{20}/_{40}$ = 100j/I
    = 100w
17. F = I/T = $^{1}/_{0.5}$ = $^{10}/_{5}$ = 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 $\frac{\text{real depth}}{} = \frac{30}{} = 1.5$

Apparent depth 20

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.

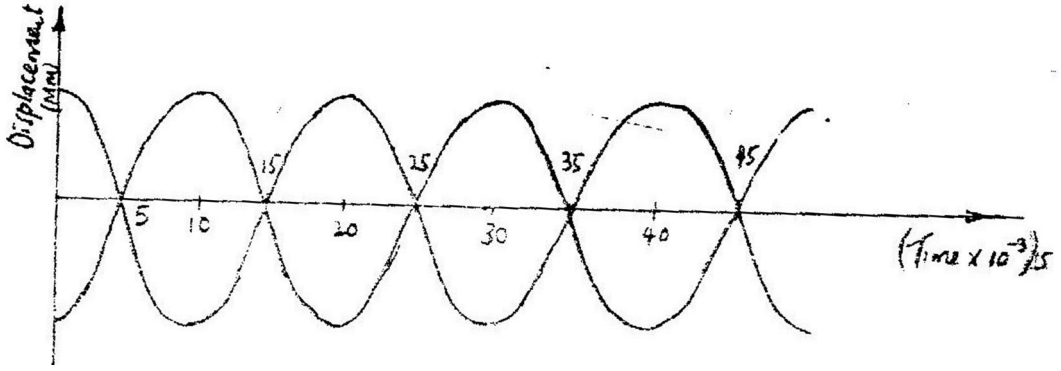
b i) $YP - XP = 2\lambda$

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

ii)



2.a)

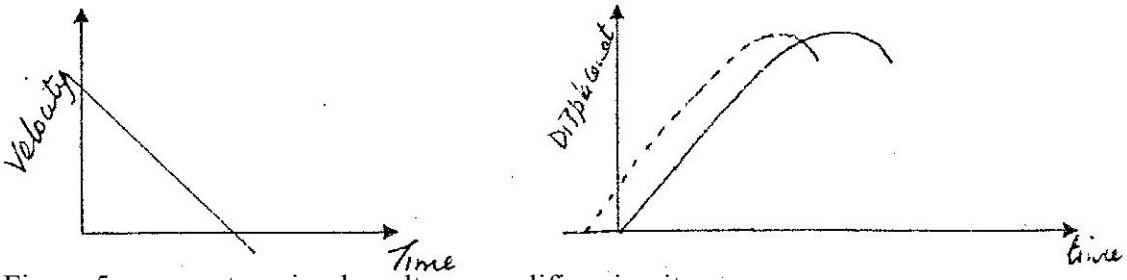
3i) Average velocity at intervals AB and CD.

$T = 1/50 \times 56$	$V_{AB} = 1.5cm/0.1s$	$V_{CD} = 3.2cm/0.1s$
$= 0.1s$	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.

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

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

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

ii) Load resistance, R_L $IcRL = Vcc = 5.5$
P.d across R_L $RL = \frac{5.5}{} = 2.2k\Omega$

2.5×10^{-3}

$10 - 4.5 = 5.5$ 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
$R.D = \frac{\text{Wt. in air}}{\text{Upthrust}} = \frac{2.0}{2.5} = 0.8$
€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

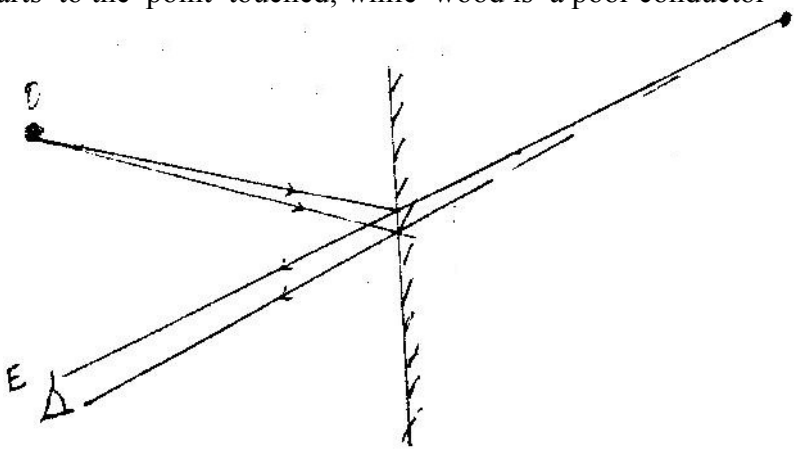
PHYSICS PAPER 232/1 K.C.S.E 2000 MARKING SCHEME

1. 

2. Acceleration of gravity on Jupiter is higher than that of earth, so a bag of saw dust must be less massive if the greater acceleration on earth is to produce the same pull as sugar bag on earth.
3. Beaker becomes more stable because the position of C.O.G is lowered on melting or water is denser than ice.
4. On earthing negative charges flow to the leaves from earth to neutralize positive charges when the rod is withdrawn the leaves are left with net negative charge.
5. Since the system is in equilibrium let A be the area of piston and P the pressure of steam

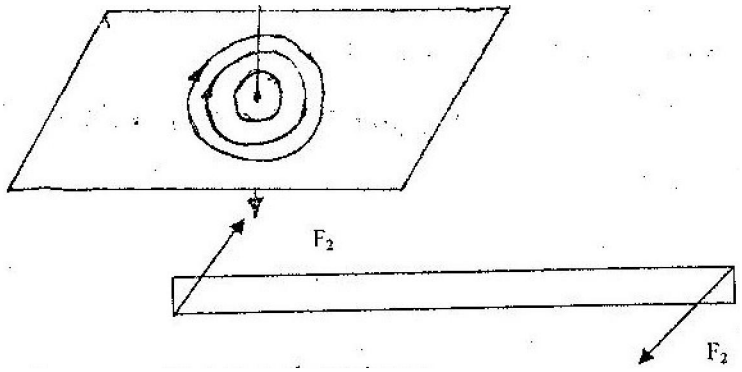
   $P \times A \times 15 = W (15 + 45)$

   $2.0 \times 10^5 \times 4 \times 10^4 \times 15 = W \times 60$

   $W = 20N$
6. Particles of gases are relatively far apart while those of liquids and liquids are closely parked
7. Since the strip is bimetallic when temperature rises the outer metal expands more than the inner metal; causing the strip to try and fold more; this causes the pointer to move as shows
8. This is because metal is a good conductor, so that heat is conducted from outer parts to the point touched; while wood is a poor conductor
9. 

10. Can withstand rough treatment
    Do not deteriorate when not in use

11. Struts are DE, DC, AD, BD Ties are BC; AB
12. The keepers become magnetized thus neutralizing the pole, this reduces repulsion at the poles, thus helping in retention of magnetism

14. 

Force F_2 at the ends perpendicular and turning to opposite to F_1

15. VR = 4;
16. Efficiency of the system

Efficiency $= \frac{M.A}{V.R} \times 100 = \frac{100}{20} \times \frac{1}{4} \times 100 = 89.3\%$

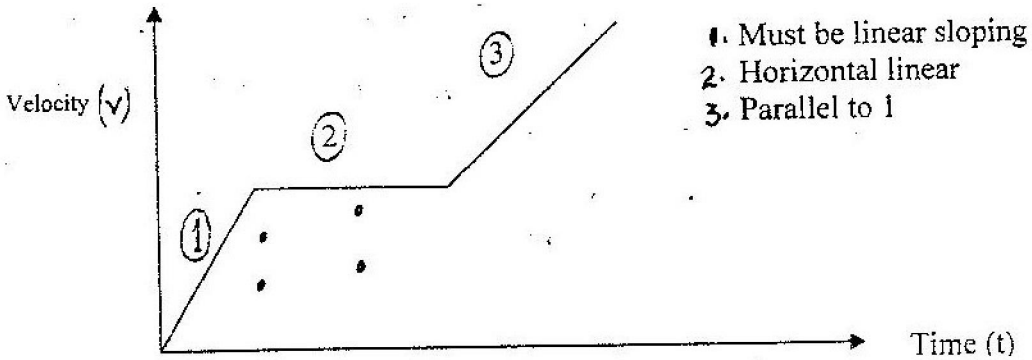
$= 89\%$

17. Sound waves
18. Let A's represent current through the Anometers using Kirchoffs Law

$$A_1 + A_2 = A_3$$

But	$A_1 = A_2$
So	$A_1 = A_2 = ½ A_3$
Similarly	$A_4 + A_5 = A_3$
So that	$A_4 = A_5 = ½ A_3$
So	$A_1 = A_2 = A_4 = A_5$

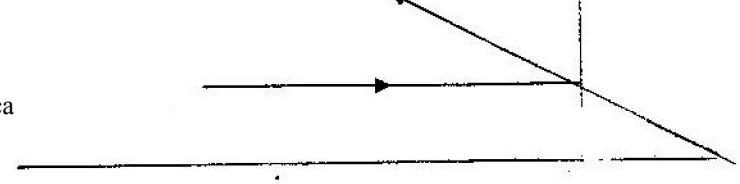
19. $P = \frac{V^2}{R}$; $40 = \frac{240^2}{R}$ $R = 1440\Omega$

20. 

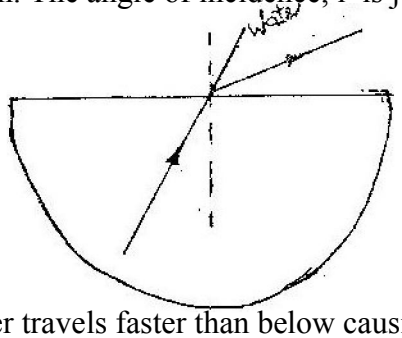
21. Wire expands becoming longer (reduces tension) this lowers frequency hence pitch.

22. Boiling point of spirit is lower than that of water. Specific heat capacity is lower than that of water.

23. Fig 12 shows a ray of light incident on a convex mirror



24. Fig 13 shows a semicircular glass block placed on a bench. A ray of light is incident at point O as shown. The angle of incidence, i is just greater than the critical angle of glass

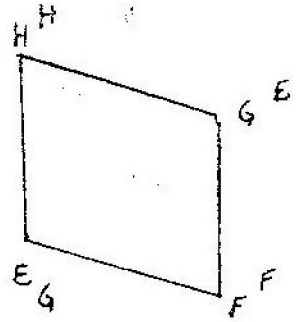


25. The air above paper travels faster than below causing lower pressure above. Excess pressure causes paper to be raised.

26. Combined capacitance = 1.5 μ F

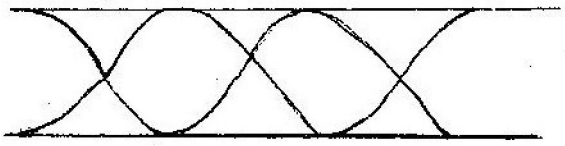
= CV = 1.5 x 3 = 4.5 μC.

27.



Correct Orientation either of those shown

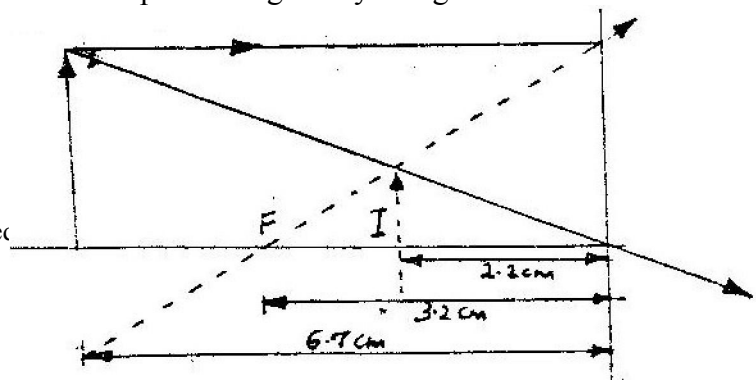
28.



correct resonance shape.

29. Microwave / cooker/ telephone/ radar etc

30. U.V removes electrons from zinc surface so leaf will not only collapse if electroscope was negatively charged.



32. Number of turns/ strength of magnetic field

33. To reduce eddy currents in the armature

34. Difference in energy of the state/ nature of atoms

35. X – rays produces - Hard X – rays are produced

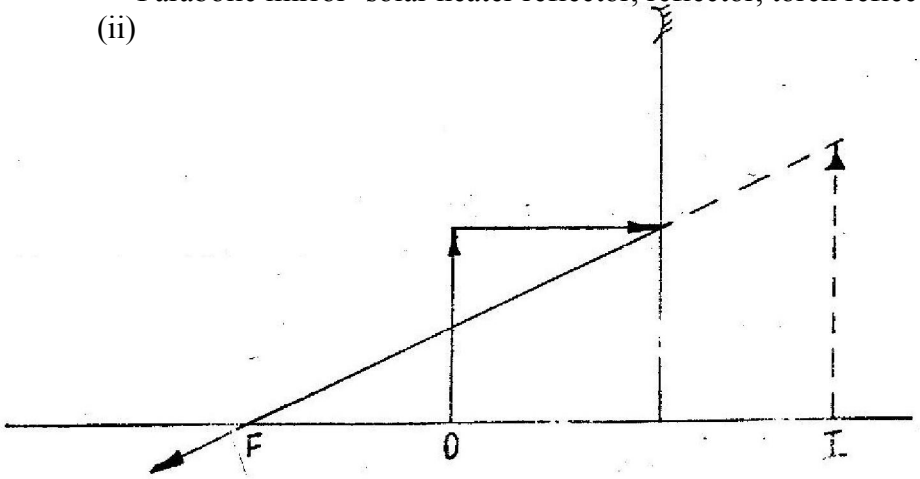
36. From 300 – 150 = 74 S 200 – 100 = 76 S
Average = 75 ± 1 other values on the graph could be used

Donor impurity is the atom introduced into the semiconductor(doping) to provide an extra electron for conduction.

PHYSICS PAPER 231/2 K.C.S.E 2000 MARKING SCHEME

1. (a) (i) Convex mirror – driving mirror/ supermarkets mirrors
Parabolic mirror- solar heater reflector, reflector, torch reflector etc.

(ii)



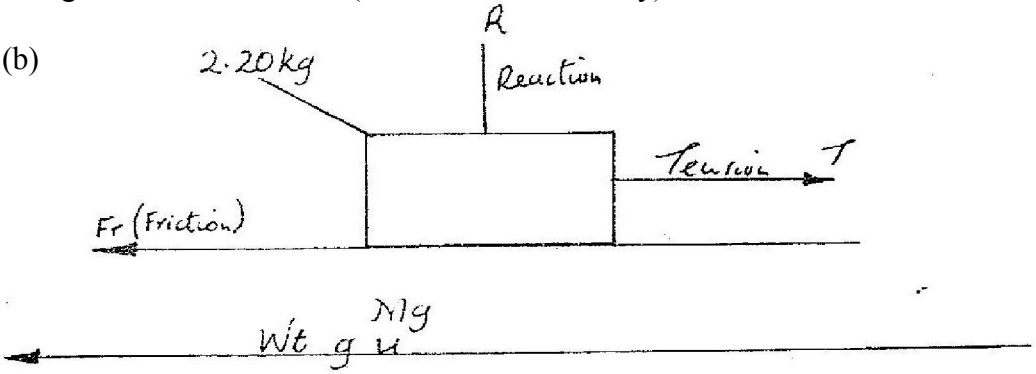
(b) (i) V= 45 M = 3.5 (from graph) m = v/u $\Rightarrow$ 3.5 = 45/u
U = 12.9 cm ± 0.4

(ii) Choosing convenient value of 'm'

M = I, V = 20 =u	M= v/f-1	M = v/f	-1/f= 1/45+ 1/12.9
1/f = 1/20 + 1/20	v= 45m = 3.5	m= 0 = f = v	
f= 10cm	f = 9.8 – 10.3	f= 10 cm	f = -10cm

2. (a) Initially the balls accelerates through the liquid because terminal viscosity is greater than viscous and upward forces after sometimes the vicious forces equals mg and the balls move at constant velocity. The difference due to the fact that the viscosity $L_1$is greater than that of L_2 (coefficient of viscosity)

(b)



(ii) (I) A. plot the graph of acceleration against the mass m
See graph paper
Graph 5 marks
Plot 2 marks
Axes 1 mark
Scale 1 mark
Line 1 mark

(II) Intercept = μg

Intercept = 2.80 ± 0.2 (from graph)

$M = \frac{2.80 \pm 0.2}{10}$

$M = 0.28 \pm 0.02$

3. (a) When temperature rises, K.E/speed of molecules of the gas increases. Since volume is constant this increases the rate of collision, with the walls of the container, and increase in collision increases pressure.

(b)

(i) Length of column of dry air — Temperature

Length/ height of the head — Volume of air

(ii) Temperature is varied and values of L and T. Measured and recorded; a graph of L versus T. (A) is plotted. This is a straight line cutting T axis at O (A) (or -273^0C) since tube is uniform $L \alpha T$.

(iii) The water bathy allows the air to be heated uniformly.

(c) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $= \frac{1.5 \times 10^5 \times 1.6}{285} = \frac{1.0 \times 10^5 \times V_2}{273}$

$= V_2 = 23m^3$

4. (a) (i) Easily magnetized and demagnetized

(ii) $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ $\frac{240}{V_s} = \frac{500}{50}$

$V_s = 24$; $V = V_{PR}$

$V_{QP} = 1/3$; $V_{PR} = 8$ V

(b) Volume of A displaced = 6.0×12 cmcm^3 or $P = G * g$

Mass $= 12 \times 10^6 \times 800$ $F = PXA$

$= 0.0096$ kg ans = 0.09N

Weight = mg = 0.096N

(ii) Volume of B displaced = 6.0×3 $= 18\ cm^3$

Weight = $18 \times 106 \times 1000 \times 10$ $= 0.18N$

(iii) Weight of block = weight of third displaced

0.096 + 0.18 = 0.276

Mass = 0.027 kg

$Volume = \frac{0.0276\ kg}{42 \times 10^{-6}m^3}$

$=657\ kgm^{-3}$ can also be in g/cm^3

5. (a) When whirled in air centripetal force is provided by bottom of container because of the holes, there is no centripetal force on water on the water, so it escapes through holes leaving clothes dry.

(b) (i) I Centripetal force equals force of friction

$F = Mw^2r = 0.4$

$W^2 = 0.4$ or $F = Mw^2r$

0.1×0.08 $0.4\ 0.1\ w^2 \times 0.08$

$W = 7.07$rad/s $W = 7.07$ rad/s

II $F = Mw^2r = 0.1 \times 7.07^2 \times 0.12$

$= 0.60$N

Force required $= 0.60 - 0.40$

0.20N

(ii) The block will slide this is because although the frictional force is greater centripetal force would be needed to hold it in place.

SECTION II

6. (a) Conditions of interference: Waves must equal frequency and wavelength; to be in phase or have constant phase relationship (comparable amplitude)

(b) Walking along PQ creates path difference between waves from L_1 L_2 when the path difference is such that the waves are in phase of full of wavelength loud sound is heard, when the path difference is such that the waves are out of phase. (½ of odd ½ λ) low sound is heard.

(ii) $L_1 A - L_2 A = \lambda$

From the figure $L_1A = 18.5$cm + 0.1

$L_2 A = 18$ cm + 0.1

$L_2A = L_1 A = 0.5$ cm + 0.2

Using scale given $\lambda = 0.5 \times 200$

$= 100$cm

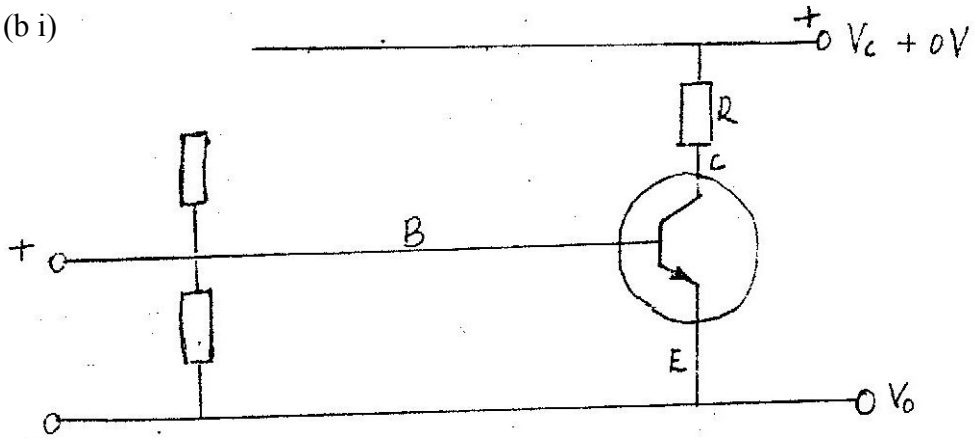
$V = f\lambda$ $= 350 \times 1$

$350m^{-1}$

(iii) The points interferences are closer; higher frequency $\Rightarrow$shorter wavelength; so if takes shorter distance along PQ to cause inference.

7. (a) Pure semi- conductors doped with impurity of group 3, combination creates a hole (positive), this accepts electrons.

(b i)



(i) At V_e E = 0
$V_{cc} = I_c R_L$
$L_c = 9/1.8$ K Ω $l_c = 10$
$V_eE = V_{cc} = 9$

(ii) Δl_c = (see graph) = 3.5 – 1.2 = 2.3 mA

$$B = \frac{\Delta l_c}{\Delta l_c}$$

2.40A
40 μ A
= 60.

PHYSICS PAPER 232 /1 K.C.S.E 2001 MARKING SCHEME

1. Volume removed = 11.5cm3
   Density = $\frac{\text{mass}}{\text{Volume}} = \frac{22}{11.5}$ $1.9cm^{-3}$
2. Weight on side A has bigger volume when water is added.

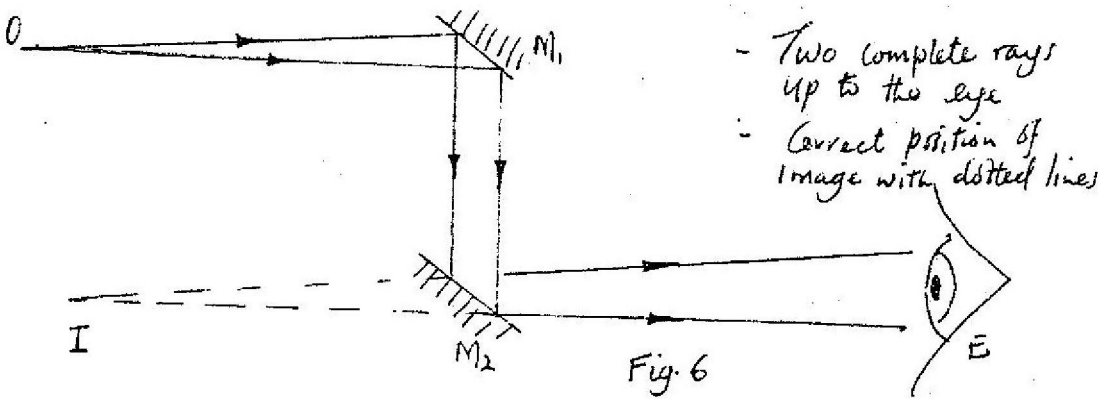
3. Centre of gravity of A is at (geometric) centre while that of B is lower when rolled. Centre of gravity of A stays in one position while that of B tends to be raised resisting motion as it resists; thus slowing down B. OR B there is friction force between the surfaces which resists motion.
4. No air on moon surface / no air pressure / no atmosphere.
5. When the permanganate dissolves / or breaks up into particles (molecules) these diffuse through the water molecules
6. When rises up the tube into the flask or water is sucked into the tube or bubbles are seen momentally.
7. Cold water causes air in the flask to contract // reduces pressure inside flask or when cold water is poured it causes a decrease in volume of air the flask or pressure increases in the flask // volume of the flask decreases.
8. 

Fig. 6

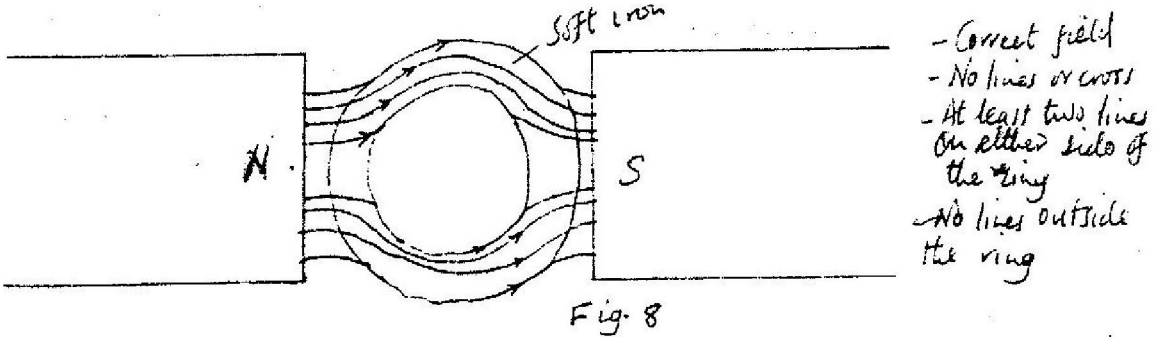
9. Point action takes place at sharp points (A , B, C, D), charge concentrates at sharp points causing high pd, this causes air the surrounding to be ionized. The positive ions are repelled causing points to move in opposite direction.
10. By forming hydrogen layer / cover or hydrogen atoms or molecules which insulate the copper plate OR forming it cells between hydrogen and zinc which opposes the zinc copper cell or by forming a hydrogen layer / cover which increases internal resistance.
11. 

Fig. 8

12. F_2 F_3 or F_1 and F_4

13. Moment of a couple = one force x distance between the two forces.
Distance between F_1 and F_4 = 0.8sin 30°. Moment = 0.8sin 30° x 100 =10NM
Alternative (F_2 and F_3) Moment = f x 1M = 60N x1M = 60nM(or J)

14. V2 – U2 = 2aS OR S = $\left(\frac{v+u}{2}\ t\right)$
1502 – 3002 = 2a (0.5)
a= -67, 500ms^{-2} 0.5 = $\left(\frac{300 + 150/t}{2}\right)$ V = 150m/s u = 300m/s s = 0.5 t = 1/450s
or deceleration = 67,500ms^{-2}

$$a = \frac{v - u}{t} = \frac{150 - 300}{1/450} = -667{,}500 m/s^2$$

15. Efficiency = $\frac{\text{work done by machine x 100}}{\text{Work done on machine}}$ E = $\frac{\text{work out x 100}}{\text{Work input}}$

; Work done on machine (work input) = 550,000j.

16.

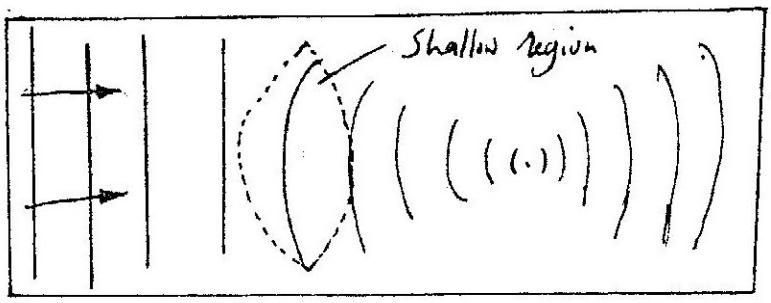


Fig. 10

17. R = V/I = 1.5 / 0.1 = 15'Ω
R = 15'Ω - 12'Ω = 3'Ω
OR E = 1(R +r)
1.5 = 0.1 (12 + r) = 1.5 =1.2 + 0.1r
0.3 = 0.1e = r = 0.3/0.1'Ω
R = 3'Ω.

18. Current in heater = $\frac{p}{V} = \frac{3000}{240} = 12.5A$
Fuse not suitable since current exceed the fuse value.

19. Heat loss will be higher in A
Methylated spirit will boil faster / evaporates / more volatile causing loss of heat through latent heat of vaporization.

20.

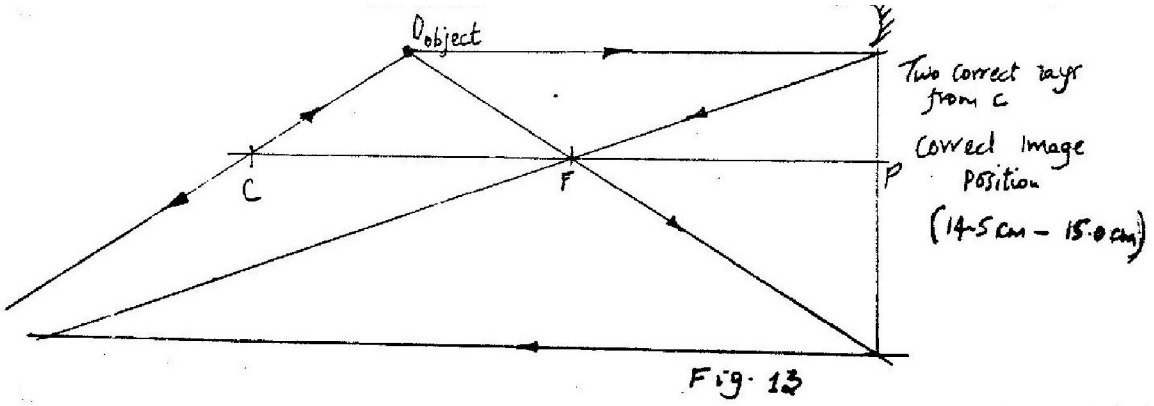


Fig. 13

21.

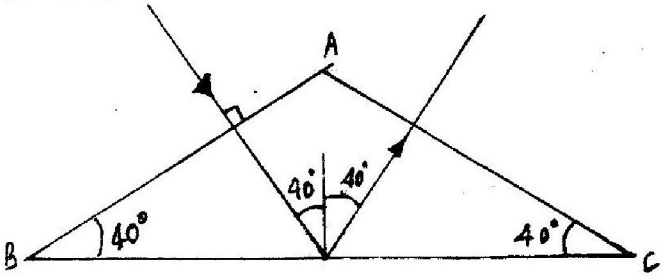


Fig. 14

22.

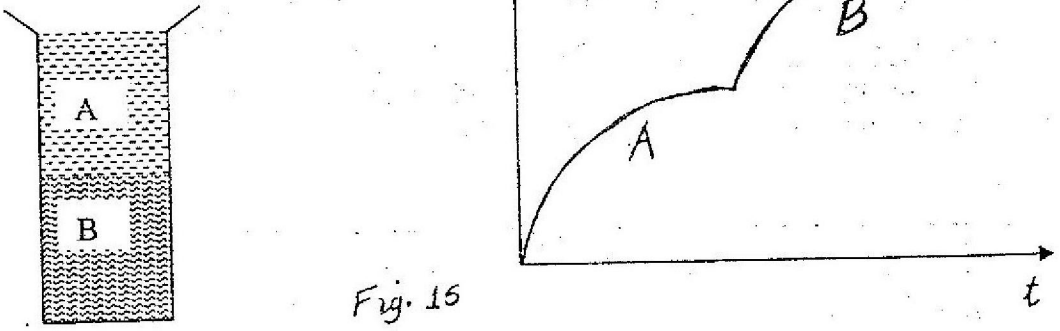


Fig. 15

23.

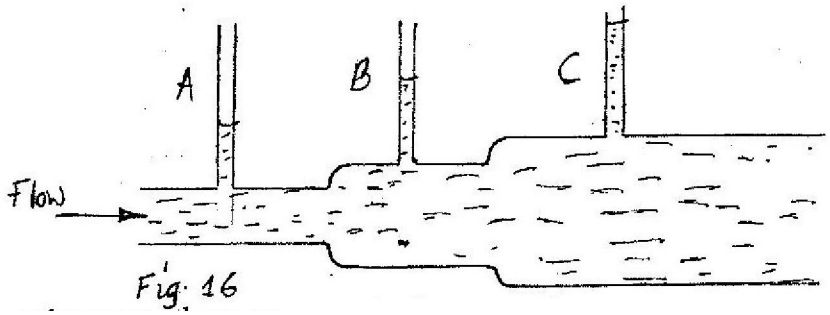
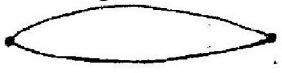


Fig. 16

24. Since masses are the same, there are more hydrogen molecules than oxygen molecules/more collision in B than in A and hence more pressure in B. Collision in B is higher than in A.

25.



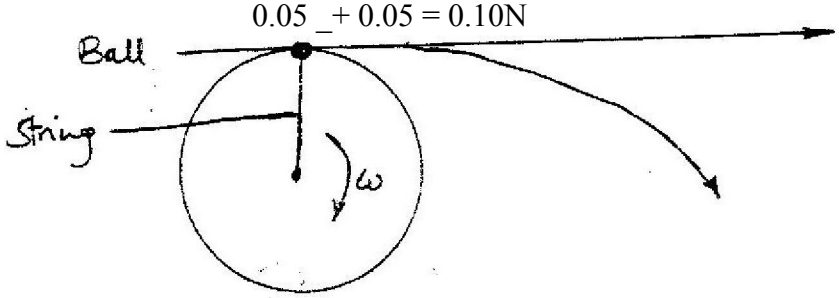
(i) Fundamental Mode

(ii) 2nd harmonic

26. Fh = f1 – f2 OR Fh = f1 – f2
Fh = 6 – 4 = 6.25Hz – 4Hz
Fh = 2 =2.25Hz.

27. Longer radio waves are easily diffracted around hills/ radio waves undergo diffraction easily.

28. Tension in A = 1.05N – 1.0N = 0.05N
Tension in B = tension due to A + Tension due to B
0.05 _+ 0.05 = 0.10N

29. 

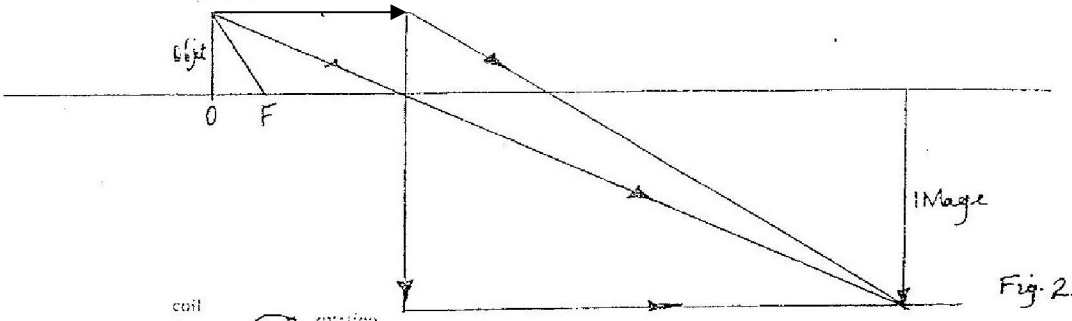
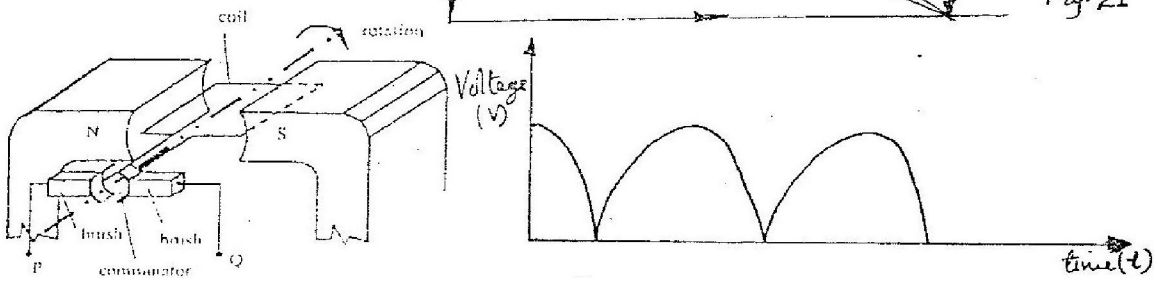
30. 

Fig. 21

31. 

32. E = pt = 60 x 30 x 60 x 60J E = 60/1000 kW x 36hrs
In kWh = $\frac{60 \times 36 + 60 \times 60 \text{ J}}{1000 \times 60 \times 60}$ E = 0.06 x 36
= 2.16 Wh E = 2.16kWh

33. Pd across Anode – cathode Or anode potential (voltage)

34. r - β (Beta)or ie B = 82 C = 206

PHYSICS PAPER 232/2 K.C.S.E 2001. MARKING SCHEME

1. Let final temperature be T
Heating gained by melted ice MCT = 0.040 x 340,000J
Heat lost by water. = MCθ 0.040 x 4200 x (20-T) J
Heat gained = Heat lost
13600J + 168 TJ = 1680 (20-T)J $T = 10.8^0C$

2 a i) So as to have opposite polarity on the poles.
ii) since the current is varying with time; it causes the current in the solenoid to vary, with time causing the diaphragm to vibrate this vibration is at the frequency of speech; hence reproducing speech.
iii) No vibration/receiver does not work, steel core pieces would become permanent magnet/so force of attraction would not be affected by variation in speech current.

b) $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ $V_s = \frac{240}{400} \times 20 = 12v$

$V_s = V/R = 12/50 = 0.24$ A
I_s Peak = 0.24A x 2
=0.34A

3. a) Fill tray with water to the brim and level on bench; sprinkle lycopodium powder on the water surface either pick an oil drop with kinked wire; and measure the volume of a drop; put one drop at centre of the tray let oil spread and measure maximum diameter d of the patch; hence reproducing speech.
b) Hydrogen since its less dense it diffuses faster.
c) p= pgh; Or mass = D x V
= 1000 x 2x10 = 1000x 2x/1000
1-p△
$= 100x\ 10 \times 10 \times 2x2\ x1o^{-4}$ = 0.4kg
= 4N = 0.4 x 10 =4N

4. i) Filament heats up cathodes; causing electrons to boil off the cathode.
ii) Grid controls brightness of spot since it is negatively charged it repels the electrons reducing number of electrons
iii) A vertical line would appear/spot oscillates vertically
iv) Deflection in TV is by magnetic fields.
v) Magnetic field produces greater deflection on electrons beam allowing wider screen.

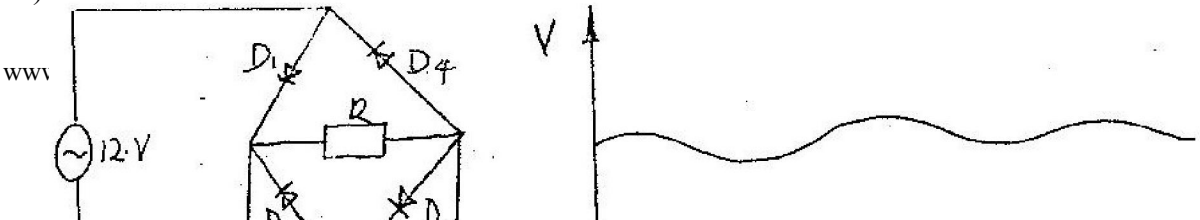
b) Energy released $\triangle E = E_f - E_i = 5.44 \times 10^{-19}j = 4.08^{-19}j$

$\triangle E = hf = h\frac{C}{\lambda}$

$$\lambda = \frac{6.63 \times 10^{-34} \times 3.0 \times 10^8 m}{4.08 \times 10^{-19}}$$

= 4.88 x 10-7 m (4.87 – 4.90)

5a)



bi) IE = IC + IB
100 + 0.5
= 100.5mA

(ii) $\beta = Ic / IB = \frac{100}{0.5} = 200$

SECTION II.

6 a i) A body at rest or in motion at constant velocity stays in that state unless acted on by an unbalanced force; the rate of change of momentum of a body is directly proportional to the force acting on the body(F = ma) for every action, there is and equal and opposite reaction: any one for;

(ii)

$V^2(M^2/s^2)$	0.04	0.16	0.36	0.64	1.00	1.44

Graph – see graph papers Axis – labels
Scale Plot – 5.56 point
Line - 4 point Slope = $\frac{1.24 - 0.100}{0.210 - 0.016} = 5.88 + 0.27$

b) $V2 + u2 = 2as$
When $\mu = 0$
$V2 = 2 \times 0.5 \times 100$
Momentum = mv = 200 x 1000 x (2x 0.5 x 100)
$2.0 \times 10^6 \text{ kgs}^{-1}$
OR $S = ½ at^2$
$T = 100 \times 2$
T = 20 sec Momentum p = Ft
F = ma
$- 200 \times 1000 \times 0.5 = 10^6$

7 a i) The pressure of a fixed mass of an ideal gas is directly proportional to the absolute temperature provided the volume is held constant.

ii)

$I/V(m^3)$	40.0	5	58.8	71.4	83.3	90.9

Graph – see graph paper Axis – labels
Scale Plot – 5 – 6 points
Line – 4 points

Slope $\frac{4.24 - 2.00}{86 - 40} \times 105$

$= 4.87 \times 10^3 \text{ paM}^3$

$= 4.94 \pm 0.65$

Slope $= 4.94 \pm 0.65$

Slope $= 2RT$

$R = \frac{4.87 \times 10^3}{2 \times 300}$

$= 8.12 \text{NM/K or JK}$

$= 8.23 \pm 0.11$

b) P1 = P2

T1 = T2

T1 = 12 + 272 = 285

T2 = 88 + 273 = 361

$P2 = \frac{1.0 \times 105 \times 361}{285}$

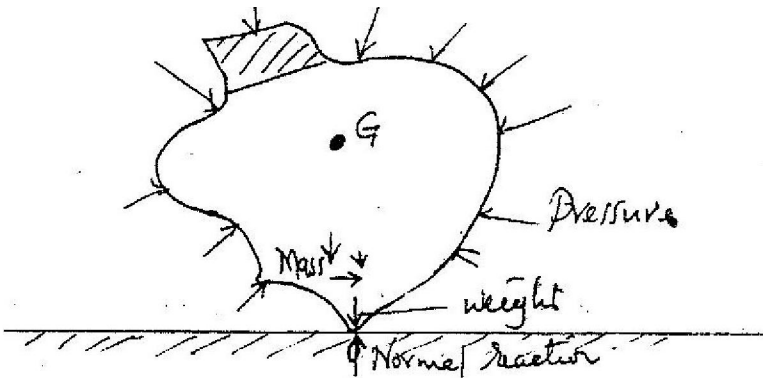
I/P x 10^5 (pa -1)	0.5	0.40	0.33	0.29	0.25	0.22

Y = intercept = 3.8 Log 600R

600r = 6309.57

R = 10.5 + 5.0

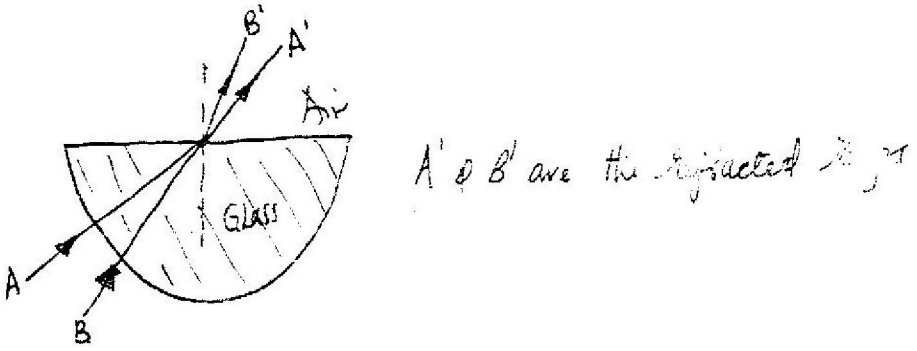
PHYSICS PAPER 232/1 K.C.S.E. 2002 MARKING SCHEME

1. 11.72/11.72 CM/0.01172M
2. 

3. g moves / shifts to the right / C.O.M. moves/ shifts/ more weight or mass of he right/ weight will have a clockwise movement about O/causing greater moment of force towards right than left.

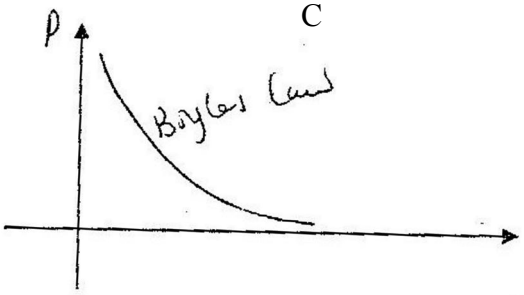
4. $R = V = 0.35 = 0.5\Omega$
$I \quad 0.70$
$P = RA = \frac{0.5 \times 8\ 10^{-3}}{C \qquad 0.5} = 8 \times 10^{-3}\Omega$ m.

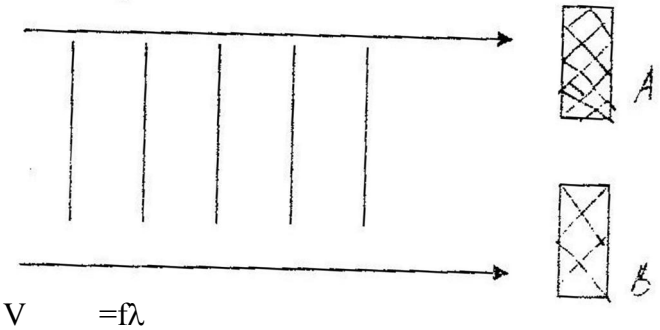
5. p = F $\qquad$ P = F/A
= 2500 $\qquad$ Total press = 2500/0.025 = 2,000N/m^2
425,000pg
=250,000PG

6. -Low temperature reduces K.E / velocity of molecules
- Hence lower rate of collision / less collision $\qquad$ -Reduction in pressure
7. Can B $\qquad$ Good absorber of radiation.
8. 

19. (Assume no heat losses)
Heat gained = heat lost $\qquad$ E = pt = mc$\triangle\theta$
2 x c x (30 – 20) = 90 x 15 x 60 $\qquad$ 90 x 15 x 60 = 2 x c 10
$C = \frac{90 \times 15 \times 60}{20}$ $\qquad$ 4050j / kgk = c
C = 4050j/kgk
20. Mattress increases stopping time/time of collision increased this reduces the rate of change of momentum.

21. $C = C_1 + C_2$ $Q = CV$
$CT = 3x2$ $5\mu F$ $V = \frac{Q}{C}$ $V=1 \times 10^{-4} = 20V$

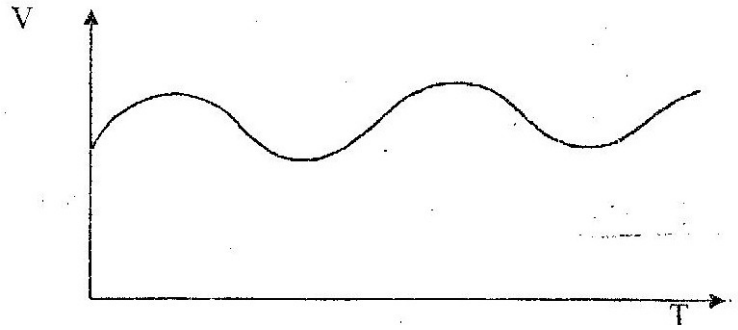
22. 

23. 

24. $V = f\lambda$
$\lambda = \frac{v}{F} = {}^{330}/_{30} = 11m$

25. Law of floatation – a floating body displaces its own weight
Weight of block = weight of mercury displaced
$0.250 \times g = 13.6g$
$\frac{0.25}{13.6 \times 10^3} = v$

$V = \frac{1.838 \times 10\text{-}5\ m^3}{1.839 \times 10\text{-}5 m^3} = 18.4cm^3$

29. 

30. $p = VI$

Kettle	Iron box	TV
$I = p/n = {}^{2500}/_{250} = 8A$	$750/250 = 3A$	${}^{300}/_{250} = 1.2A$
Total = 8 + 3 + 1.2 = 12.2A	= Appropriate fuse = 15A	

31. 107 – 42 = 65
32. Penetrating power

33. Downwards

34. Work function of metal / min energy required to eject e-1 for excess energy work function.

PHYSICS PAPER 232/2 K.C.S.E 2002 MARKING SCHEME

1a) (speed of light in vacuum e = 3.0×10^8 ms^{-1})
Refractive index = speed of light in vacuum
=3.0 x 102 m/s
1.88x102 m/s
= 1.596 = 1.60

b) $\sin C = \frac{1}{n}$

$\frac{1}{1,596}$

$C = 38.8^0 - 38.48$
$38.7 - 38.42$

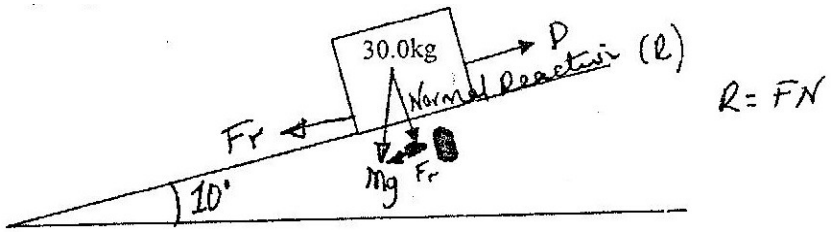
c) $\sin \theta = 1.596$
sin 21.1
$\sin \underline{\theta} = n$
Sin 21.1

$\theta = 35.25_0 - 35.15^1$
$35.35_0 - 35.21^1$

2. β - βeta radiation
Force is of the circle implying negatively charged (Fleming's left hand rule)
(bi) K= alpha (ii) X= 88 Y= 288

(ci) Increase in thickness
(ii) Increase in thickness reduces the radiation reaching the Geiger tube
(iii) Increase in pressure
(iv) Increase roller pressure squeezes metal sheet (possess more) reducing the thickness of foil coming out of them.
(v) Alpha particles have little penetration very few or none pass though foil.
(vi)

3.



a i) R- to pass through the c.o.g Forces not labeled. A ward half for each
(ii) = mg Sinθ = 30.0 x 10 sin 10^0 = 52.1 N (accept 52.08, 52.08, 52.09)
(ii) A = F Net force down = Mg sin θ - friction = 52.1- 20
= 32.1

$M = \frac{32.1}{3.0} = 1.07 M/S^2$

(iii) Acceleration increases with the increase in angle

4 a i) A ice absorbs latent heat without in temperature (or ice melting no change of temperature heat goes to latent heat fusion)
B Water molecules gain K.E (increase in K.E.)
C heat is used to change water into vapour.

ii) Water has anomalous expansion, where we have maximum density at 4^0C. Anomalous behaviour/explain.

iii) Frozen seawater has a lower temperature than frozen fresh water boiling point of sea water is higher than fresh water.

(b) (heat gained = ML + MCθ
= 3 x 336 x 10^3+ 3 x 4200x5
= 1.07 x 106J

5 a i) Transverse waves (accept elliptical)

ii) As waves move in the medium, the particles of medium do not move: they vibrate in positions so cork does not move.

iii) Period of wave T= 0.205

$f = \frac{1}{T} = 5Hz$

$V = fx$

$X = \frac{0.30}{5} = 0.60M$

iv) Velocity decreases when depth decreases hence the x decreases (since frequency is constant wavelength decreases)

b) 1st resonance $\frac{\lambda}{4}$ I_1fe $\lambda = I1_2-I_2$ OR $V= 2F (I_2-I_1)$

$\frac{\lambda}{2} = 129-77$

$f = \frac{V}{2(I_2-I_1)\ 129-77}$

2nd resonance $3\lambda = I_2+C$ $\lambda = 104$ cm $=340$

$V=f\lambda$

$340=fx\ 1.04 = 326.9$ Hz.

F= 327 Hz (326.9)

6. a) Charles law: for a fixed mass of a gas at a constant pressure the volume is directly proportional to the absolute temperature Kelvin thermodynamics.

bi) Volume of gas trapped by drop of cone sulphuric acid, water in heated (in both) and volume (height) of gas: in tube increase as temperature rises; values of height H and T are tabulated; a graph of volume V versus temperature T°C is plotted; graph is straight line cutting T at – 273°C (absolute Zero); so volume is directly proportional to absolute temperature.

ii) -Short temperature range - Keeping pressure constant is difficult

ci) When θ - θT – 273k Extrapolation on graph show:
Pressure read off β = 9.7×10^4 pa

ii) $p1 = 1.15 \times 10^5$ pa $\theta_1 = 52.0^oC$
$p2 = 1.25 \times 10^5$ pa $\theta_2 = 80.0^oC$

p1	p2
To + θ1	To + θ2
1.115 x 105	1.25 x 105
To + 52	To + 80.0
To 270	

- Rise in volume height - Rise in temperature
-Recording of tabulation - Graph
-Analysis of graph -Conclusion

Alternatives

P = mx + c
P = kθ + kto when K gradient.
K = Dv = (1.14 – 1) x 105
Dx 50 – 10
= $\frac{0.14 \times 10^5}{40}$
= $^{14000}/_{40}$ 350pac ()
KT = Constant
C = 9.6×10^4
350 T_o = 9.67×10^4
to = 274.3 (266-284)

7. ai) μV light removes electrons on zinc plate. This lowers the excess charge constant (negative) on leaf leading to collapse/ becomes less negative (more positive)

ii) Since μv light removes electrons positive charge re attracts the electrons thus keeps the charge constant and so leaf does not collapse.

bi) Frequency of incident light / energy of proton / energy of light work function of surface

ii) From Kemax = hf - θ
h is slope of graph
Slope = (10 – 20) x 10^{-19}
(2.6 – 1.4) x 10^{15}
H = 6.7×10^{-34} fs
At Kemax = θ hf = 0
Extrapolation shown or
Read off $f_o = 1.07 \times 10^{15}$ Hz
Θ =$1.07 \times 10^{15} \times 6.67 \times 10^{-34}$
= 7.4×10^{-19}

c) Kemax = hf θ
= $\frac{6.67 \times 1034 \times 5.5 \times 1014}{1.6 \times 10^{-19}}$
= 2.29 eV

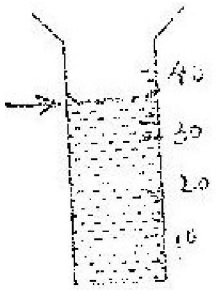
Since $hf < \theta$ no photo elective effect

$E = hf = 6.67 \times 10^{-34} \times 5.5 \times 10^{14}$

Or $\theta = 2.5 \times 1.6 \times 10^{-19}$

PHYSICS PAPER 232/1 K.C.S.E 2003 MARKING SCHEME.

1.



$39\ cm^3$
Dr

2. 30.0 + 0.5 = 30.5 (No mark if working not shown)

3. Low density / weight / mass lowers Cog Lower Cog increases stability. Or higher mass / weight / density raises Cog. Higher Cog. reduces stability.

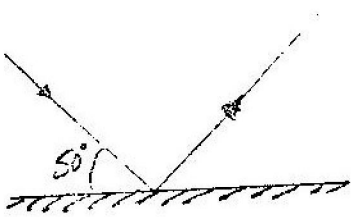
4. $P = \int hg$ / $p = dhg$
   $= 1.36 \times 10^4 \times 0.7$
   $= 9.52 \times 10^4$ or $95200\ Nm^{-2}$ Allow $g = 9.8 m/s^2$ (follow through working)

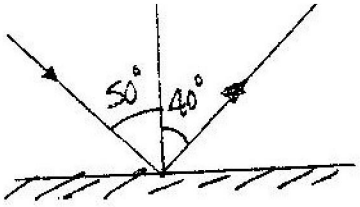
5 Air molecules are in continuous random motion. They bombard / knock / collide with smoke particles

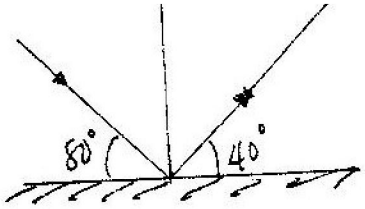
6. Glass flask initially expands / Heating increases the volume of the flask; hence the lignin level drops. Eventually water expands more than glass, leading to the level rising.

7. Initially the wire gauze conducts heat away so that the gas above does not reach the ignition temp/point. Finally the wire gauze becomes not raising the temp of the gas above ignition point.

8.







R = I = 90 = 40o

Or

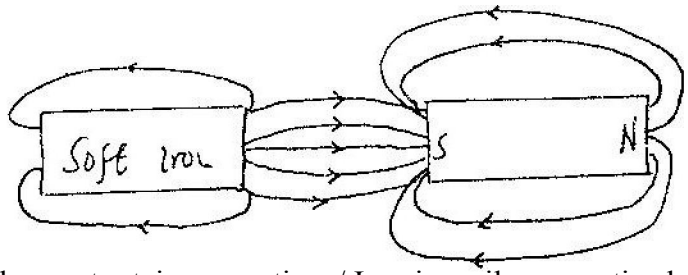
$R = \frac{180}{2} - 100 - \frac{80}{2} = 40^o$

9. The negative charges on the rod initially neutralize the positive charges on the leaf and the plate / A the road is moved towards the cap electrons are repelled to the leaf, making it to fall.
   As the road is brought nearer, the excess negative charges on the leaf and the plate.

10. Current for a longer (Do not accept cheaper)

11. Temperature

12.

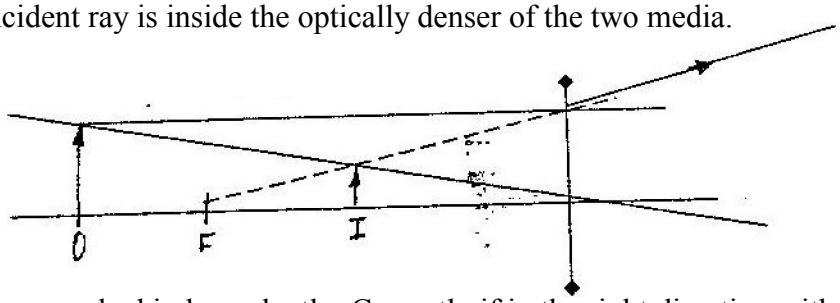


13. It does not retain magnetism / Iron is easily magnetized / demagnetized / Iron enhances / strengthens magnetism.

14. Clock wise moments about pivot = Anticlockwise moments about pivot.
F x 2.5 Sin 30 = 2.5 x 20 F = 40N
Acc. F cos 60o = 20.
F = 20
Cos 60 = 40N (Do not accept symbols for principle.)

15. Light travels from optically an optically denser to a less dense / rarer medium / the incident ray is inside the optically denser of the two media.

16.



Rays marked independently: Correctly if in the right direction with arrows. Object distance is 9.1cm + 0.2 (8.9 – 9.3). No arrow on the virtual. Any through optical centre.
Other rays to principal axis and dotted through F.

17. $P = V^2 / R$ $P = VI = I^2R$
$75 = \frac{240 \times 240}{R}$ or Do not accept p = VI alone without I^2R
$R = {}^{p}/_{1}{}^{2}$
$= 768\ \Omega$ $R = 75 \times {}^{240}/_{75} \times {}^{240}/_{75} = 168\ \Omega$

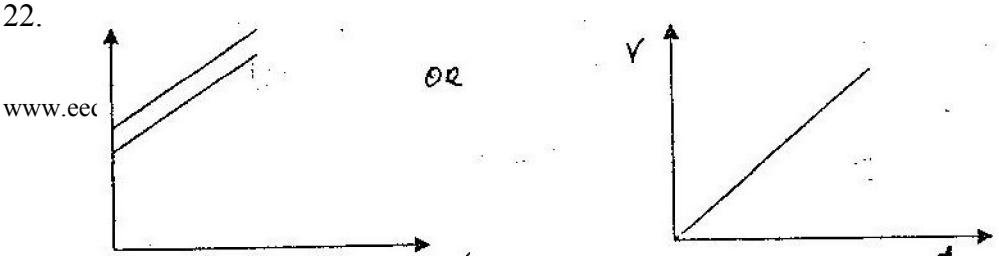
18. Beta particle β (Do not a ward for beta ray) Beta radiation Beta emission

19. Dope with group III element (e.g. Boron, Al, Ga). Three silicon electrons pair up with impurity atom electrons. One electron of silicon has no electron to pair up; hence a hole is created(For correct structure without explanation but showing a group three element.

20. Piece of metal does not displace own weight but the two together displace their own weight/ weight of water displaced is less than the weight of metal while weight of water displaced equals the weight of the tow/up thrust equal to combined weight.

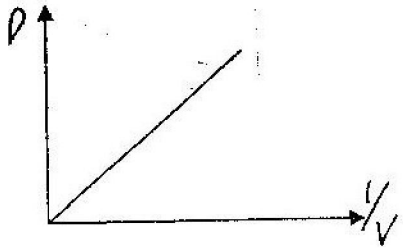
21. Speed = distance / time speed = 600m/s
= 1200 1.75
3.5 =343 m/s
= 343m/s (Range 342.8 - 343 m/s)

22.



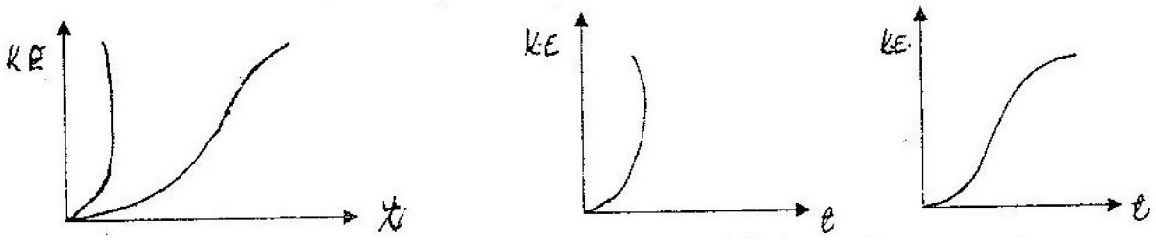
23. Circuit A
Current draw from each cell is less than in B / In A there is les internal resistance.

24.



25. To with stand high temperature / high melting point.

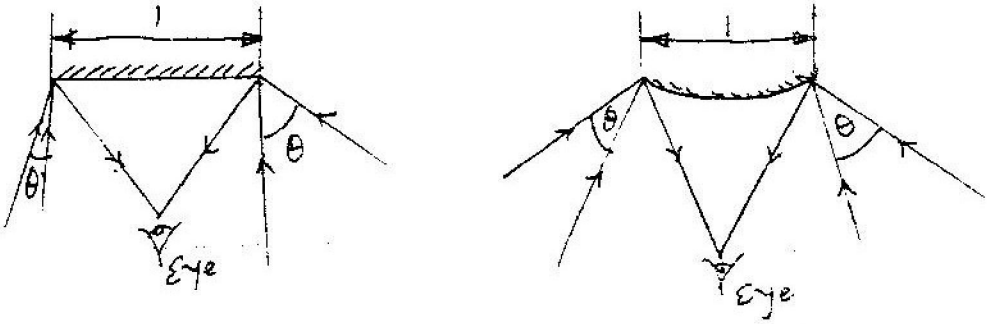
26.



27 Fringes will be closer together / more fringes of violet light has a shorter wavelength
Red light has longer wavelength.

28. Do not accept: Heat loss = heat gain
$Pt = mc\theta$ or $VIt = mc\triangle\theta$
$2500t = 3.0 \times 4200 \times 50$
T = 252s / 4.2min / 4 min 12s.

29.



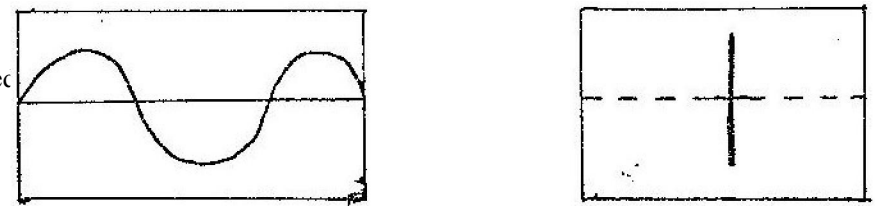
30. F = ma $a2 = \frac{a_1}{2}$ Accept F = ma for formula mark
$F = 2ma_2$ $a2 = \frac{a1m}{2m}$
$2ma_2 = maf$

31. Radio waves, Infrared, visible light, U.V light, X-rays (accept correct order)

32. Galvanometer deflects; Changing flux produced in p is linked to Q causing an e.m.f to be induced / by mutual inductance an emf / current is induced in Q.

33. Maximum deflection of G will be double; flux linkage doubles when the turns are doubled.

34.

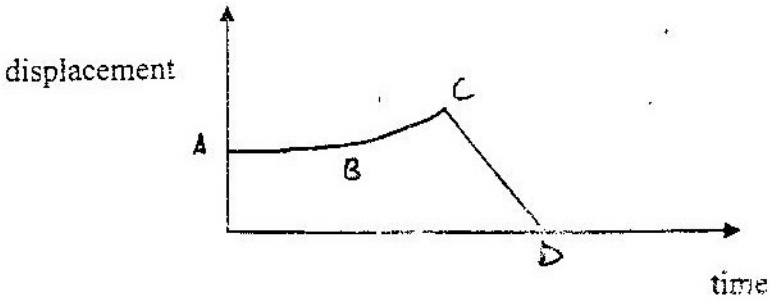


35. $Q = hf0 = W_o$ or $\& = hfco$
$= 6.63 \times 10^{-34} \times 9.06 \times 10^{14}$j
$= 6.01 \times 10^{-19}$ J or 6.0061×10^{-10} or 6.0×10^{-19} if working is shown.

36. Fast air causes low / - reduced pressure at the top. So there is net force upwards on pith ball / pressure difference pushes pith ball upwards.

37. Parallel $C = (1.3 + 0.7\ 0)\mu F = 2.0\ \mu F$ or 2×10^{-6}F
Series $1 = 1 + 1 = 1$
C_T 2.0 / 2.0
$C_T = 1.0\ \mu F$ // 1.0 x 10-6 F.

PHYSICS PAPER 232/2 K.C.S.E 2003 MARKING SCHEME.



(i) Velocity equal zero; (ii) body is uniformly accelerated;
(iii) Body is uniformly decelerated to origin

(b i) S = ½ at 2 a = 10 ms -2
$45 = ½ \times 10 \times t^2$ t= 3 s; (3mks)

(ii) the initial horizontal velocity of the ball.
S –V at; 50 Va x 3; VA = 16.7 ms -1
(iii) V = U + at;
V = O + 10 x 3; = 30ms-1 (total 13 marks)

2ai) work= force x distance;
= 2000 x 3.0 x 10;
6000J;

ii) Power = $\frac{\text{work done}}{\text{time}}$

$= \frac{60000}{6}$

= 10000w;

iii) 12.5 kW
% efficiency = work output = power output
= work input = power input

= 12.5 x 103

iii) Force is centripetal $= \frac{mv^2}{r}$

$= \frac{20 \times 4.24}{4}$

= 89.9V Total 14 marks

3 a) Specific latent heat of vaporization is the quantity of heat required to change 1 kg of a liquid at boiling point completely to vapour at the same temperature and atmospheric pressure

B i) I Mass of condensed steam = 123- 120 =3g;

II Heat gained by water
= 0.070 x 4200 x 25J;
Heat gained by calorimeter
= 0.05mx 390 x 25; = 487.5J;
= 7837.5J;

ii) Q = mL;

II Q= 0.003 x L
0.003 x L = 7837.5;
L= 2.61 x 10^6 J kg -1

4. a i) I 4cm; II A= 2cm;

ii) I 0 to A- 9cm containing 2 ¼ waves
time for 1 wave = 0.04 s
f=$^1/_7$; = $^1/_{0.04}$ f= 25Hz;

II V = f; 15 x 0.04 = 1 ms^{-1}

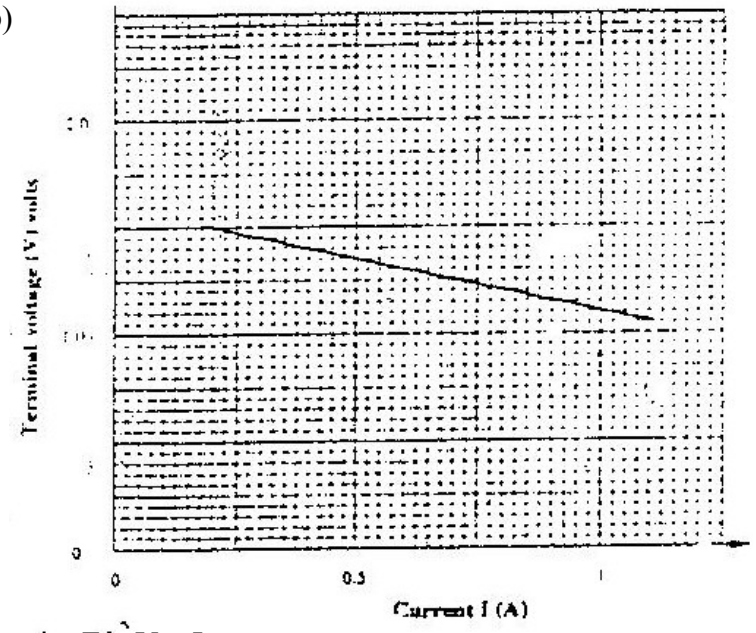
Ai to allow all radiations to penetrate;

(ii) On entry radiation ionizes argon gas
Avalanche of ions flows between terminal causing condition;
Pulse of current flows; Pulse registered as particle;

iii) Quenching the tube;

5. a) e.m.f is total work done in transferring unit charge from on terminal of battery to the other;

b)



(ii) i) $E = V + Ir$;

(iii) From the graph determine the; current (A)

I internal resistance = slope of graph

Slope = 1.2= 0.90
1.0-0.5
= 0.3

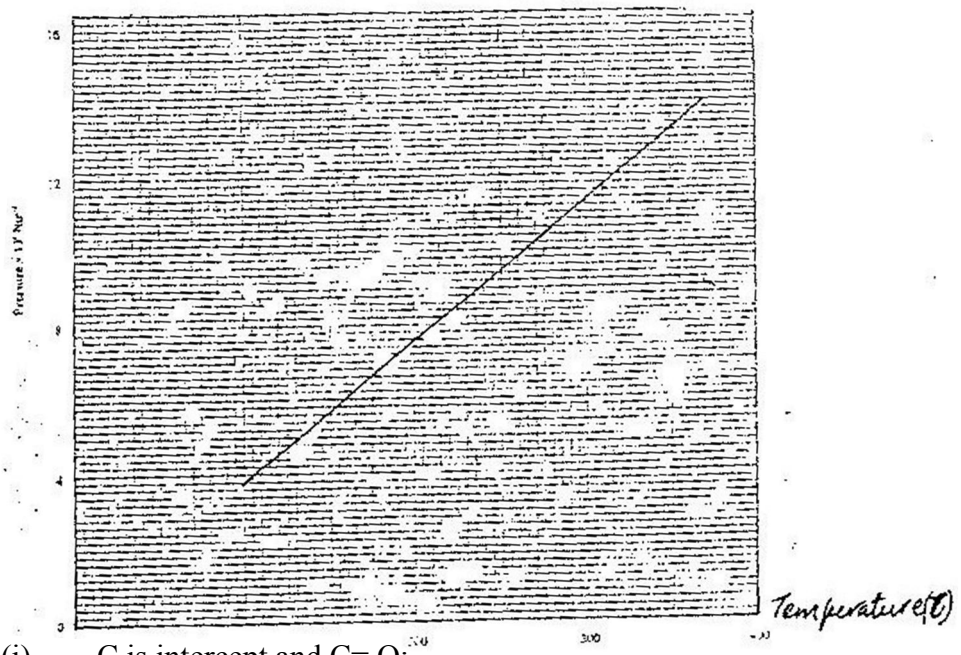
0.53
= 0.6Ω

(c) Current through shunt = 3.0 -0.03 = 2.97a;
Pd across g= Pd across shunt = 10x 0.03; 4 marks
Resistance of shunt Ir = 10 x 0.03
= 2.97 x r= 10 x 0.03
R = 0.101 Ω

SECTION II

6 a) Water is heated and gently stirred;
Values f pressures and temperature are recorded to intervals;
Temperature is converted to K and atmospheric pressure p added to P;
Graph of pressure p against (K)
Plotted giving straight line;

b)



(i) C is intercept and C= O;
K is gradient given by
Gradient = 15.2 x 10-4 x 10
400-105
= 11.2 x 103
295
= 37.97 pak-1

(ii) Gas would liquidify;

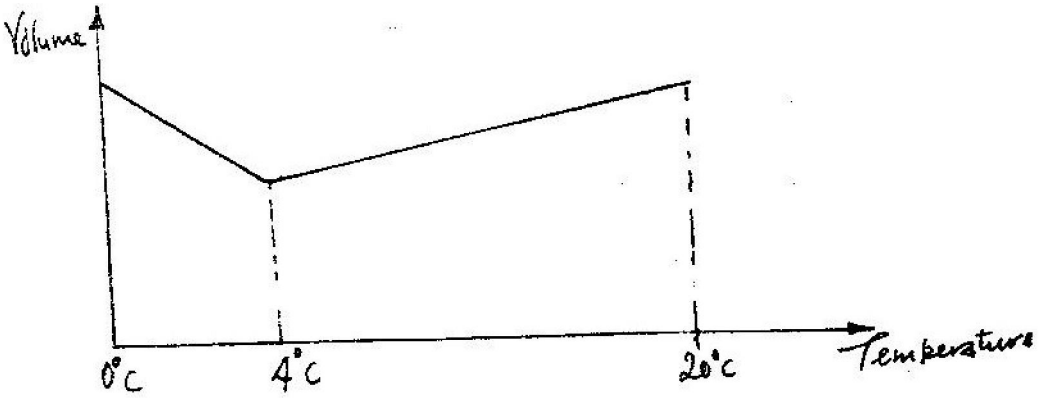
(c) 270C = 300k
3270C = 600k
P1=p2
T1=T2
2.1 x 105m= p2
300 600
P2 = 4.2 x 105 Pa

7. a) i) The candle is placed at a distance u from lens and screen position adjusted until sharp image is obtained; the distance v between lens and screen is measure; Process is repeated for other values of V;
For each set of u, v, f is found 1/f = 1/u + 1/v; average f determined;
(ii) Image is virtual and so not formed on screen

c) m = v= 2
$^{v}/_{15} + {}^{1}/_{30}$;

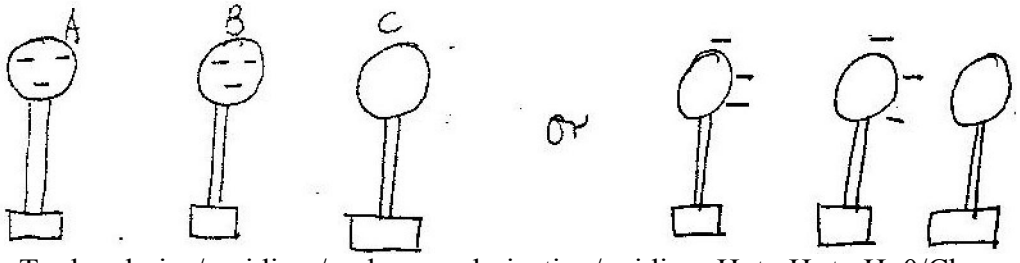
$={}^{1}/_{f} = {}^{1}/_{15} + {}^{1}/_{30}$
F= 10cm

PHYSICS PAPER 1 2004 MARKING SCHEME

1. 15.5 + 0.33 = 15.83mm/1.583cm
2. Air in the balloon expands/volume of balloon increases; displaces more air raising the up thrust of air;
3. i) Stability reduced/Lower /less stable
   -Upper section heavier/hollow section becomes heavy/more massive top
   - Raising the c.og of the block.
4. Density of water is low/It will result to a very log barometer/ very long tube
5. 

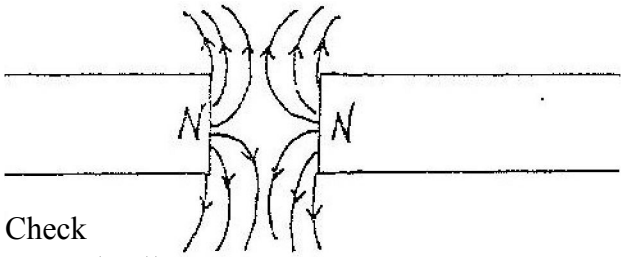
   NB at 4^0 c graph must be curved
   - 4^0 must be marked
   - If drawn using a ruler N0 mk
   - If 20^0 c is marked, it must be higher than 0^0c

6. Wooden Block
   Wooden block is a poor conductor of heat all the heat goes in melting the wax.

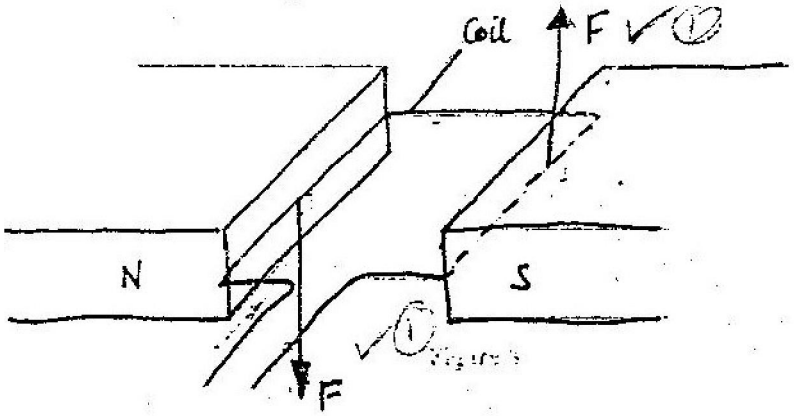
7. NB- Check correct rays with arrows.
   - at least one angle on each reflecting surfaces must be marked.
8. 

9. To depolarize/ oxidizer/ reduces polarization/oxidizes H_2 to H_2 to H_2 0/Changes H_2 to H_20/ removes H_2 (any give 1 mark)

10. Adding detergent/Impurities/increasing temp/heating (Any give 1mk)

11. 

Check
-correct pattern
- correct direction
NB- at least 4 lines of forces must be shown
- Lines of forces must start at the poles.

12. 

NB forces must be straight
Lines must touch a conduct

13. Increasing current/increasing no. of turns or length of coils/ increase strength of field same as moving magnet close to core & using U shaped winding coil on soft iron core/increasing the angle between conductor and the field. (give any 2mks)

14. Sum of clockwise moment=sum of anticlockwise moments
Wx20= 30x5
2w=15
Higher, reducing the current.

16. Either in (10b)current from each cell is less than in (10 a)
Or
Power supplied in 10(b) is less than in 10(a)

17. Distance= Area under graph
$= 2x\ ^1/_2\ x2x\ 20$
$= 40m$
Or $s = ut + 1/2at^2$
$S=2(20) + ½(-10)4$
$S= 20$
$S=2x20$
$40m$

18. W= Fd

Mg sin θ
= 60x 10x0.5x4
= 1200J

19.

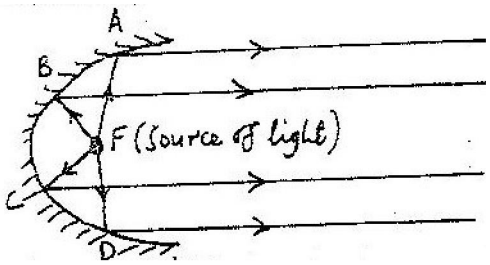
Electromagnetic	Mechanical
-can travel through vacuum	- Cannot travel through a vacuum
-Travel at speed of light	- Travel at varying speeds
-are faster	- are slower
- Does not necessarily Refuse a material media	- Refuse a material media

20. Either p=VI = V2/r
When V reduces power reduces
So rate of heating reduces
Or V=IR
P=I2 R (reducing IR reduces power so rate of heating reduces.

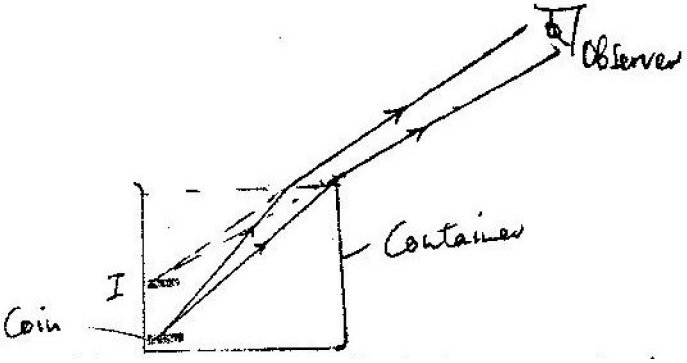
21. E=pt t=450- 150 =300s
E= 50x300
1= 150,000J

22. Q=ml
15000=0.1x1
1= 150,000J/kg

23.



24. -Correct rays must be refracted to the eye and should be diverging.
-Dotted lines should show image position. (-should not have arrows-must intersect within container)



25. Plasticine increases mass of body since momentum is conserve or weight of trolley/normal reaction increases so fiction forces increases or Mass of trolley increases, the driving force being constant.

26. Either on closing on closing s_1 while s_2 open
Q= CV = 3C
When s_1 is open s_2 closed charge is shared between the two capacitors

CT=C+C=2θ
Since q is the same equal to $3C_1$ the new pd=V_1
$Q=CTV_1$ =3C
V_1 =1.5V

Or
S_1 closed S_2 open lower capacitor charges to 3V
S_1 open S_2 closed lower capacitor charges the upper to same charge (p.d)
Final pld = $^3/_2$ V = 1.5V

Or
Q=CV=3C
S_2 closed charge is shared
CV= Q/2
V= $^{QC}/_{2C}$ = $^{3C}/_{2C}$= 1.5V

27. Either V1/T1=V2/T2
$^{200}/_{293}$=V2/353
V2=241ml

Or V= KT
200=293K
K=0.6828
V_2=0.6828 x 353
V_2= 240.96 ml
The other answers for
V_2 240.9/240.94ml

28.

X-rays	Gama Rays
-produced by fast moving electrons	-As a result of disintegration of nucleus
-Produced due to energy changes in Level of atoms	-due to energy changes with nucleus Of atoms
-Produced when energy changes in Electronic structure of atoms	-produced due to change in nucleus Of atoms.

(Any one comparison give 1mk)

29. T=Mv2/r or T sin θ -mv/r or tanθ =$^{V2}/_{rg}$
81=MV2/r θ=86.46 V^2=0.499x86.4

$81=\frac{5V2}{0.5}$ r=0.488 $V^2$80.63

V=9m/s $V^2=0.499x81 \times 0.9981/0.5$ V=8.979 m/s

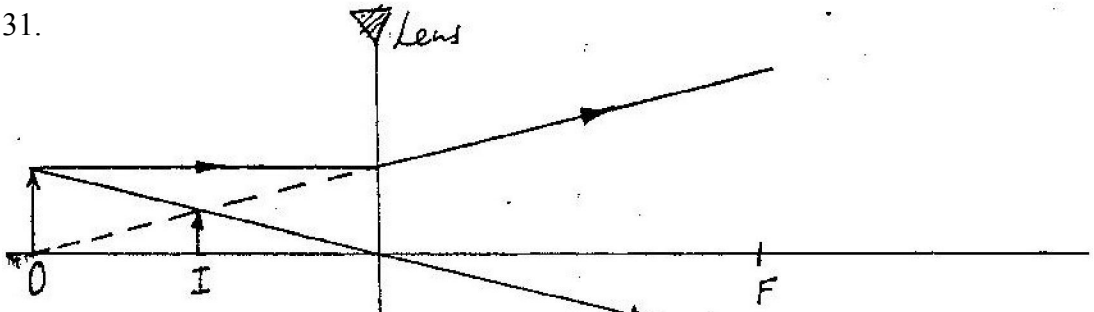
$V^2=80.70$

V=8.983m/s

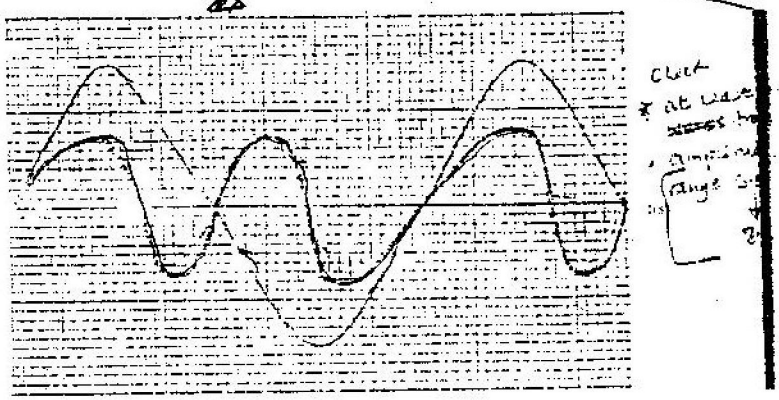
30

NB. At least three ware forms must be drawn.
Ware length (spacing) must be maintained

31.



32.



Check-at least Three complete troughs/Crest

- Amplitude range 6.5 squares

↓

8.5 squares

33.

X-rays (Hard)	Soft-rays
-Shorter Wavelength	-Longer wavelength
-More energetic	-Less penetrating
-High Frequency	-Low frequency
-Produced by high voltage	-Produced by low voltage.
-Produced by fast moving electrons	-Produced by slow moving e -electrons

34. $hf0=Wc=\theta$

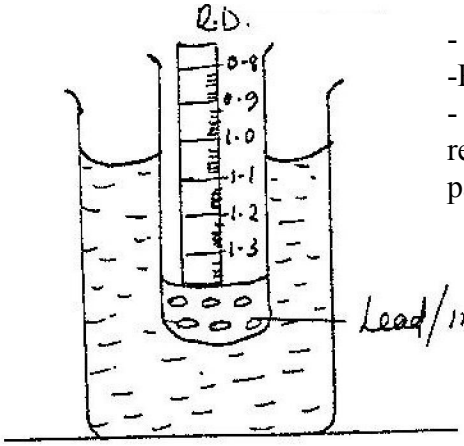
Fo = Wc/h=32x16 x10/6.62x10-34

= 7.73 x 10^{14} H2 or 7.732 x 10^{14} H2 or 7.734 x 10^{14} H2

= 7.73 x 10^{14}H2 or 7.732 x 10^{14}H2 or 7.734 x $10^{14}H_2$

PHYSICS PAPER 2 2004 MARKING SCHEME

1. a)



- Put in water and mark
-Put in liquid and Mark
- Space between the 2mks which represent the reciprocals of densities is divided into equal parts.

b)

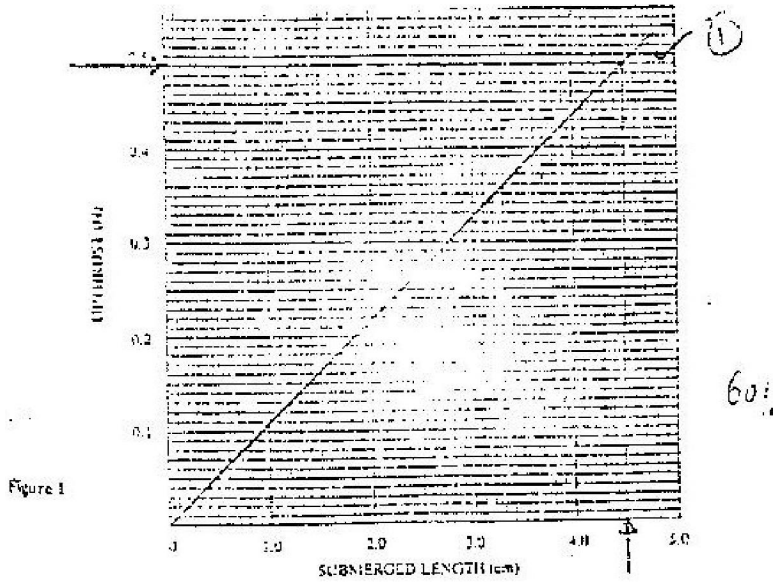


Figure 1

i) Up thrust=0.49N

ii) Up thrust=weight of liquid displaced (Archimedes Principle) = 0.4N
Mass of Liquid =0.049kg=49g(converting m to kg or g)
Volume of liquid = 6.2 x 4.5
= 27.9cm^3
Density = Mass/Volume = 4.9/27.9g/cm^3 = 1.760kg/m^3

2. a) i) Mass m_1 of melted ice/mass of water. Time t_1 take

ii) Q=m1 Vit=ml
P=$^{ml}/_t$ p=Vi=$^{m}l/_t$

iii) Part of heat produced by heater is wasted temperature of ice may be lower than zero.

b) i) When oil drop is placed at the centre of tray, oil spreads on water until it is one molecule thick producing patch (monolayer)

ii) Volume of drop=4/3Ωr^3 =$\Omega r^2 h$(r=radius of drop)
Volume of patch =$\Omega r^2 h$ (h=Thickness of molecule)
4/3 Ωr^3=$\Omega r^3/\Omega r^2 h$ (equating)

$H=4/3\Omega r3/\Omega r^2+2=4x(0.25)^3/3x(100)^2\ 2.1x10^{-6}mm$

Because oil does not necessary spread to a monolayer/ one molecule thick or Big errors in radius of oil drop and patch or errors in measurement of diameter/radius.

iii) Put oil in a burette and read level, let 100 drops fall and read new level, obtain radius using $^4/_3\Pi r^3$ = Volume

or

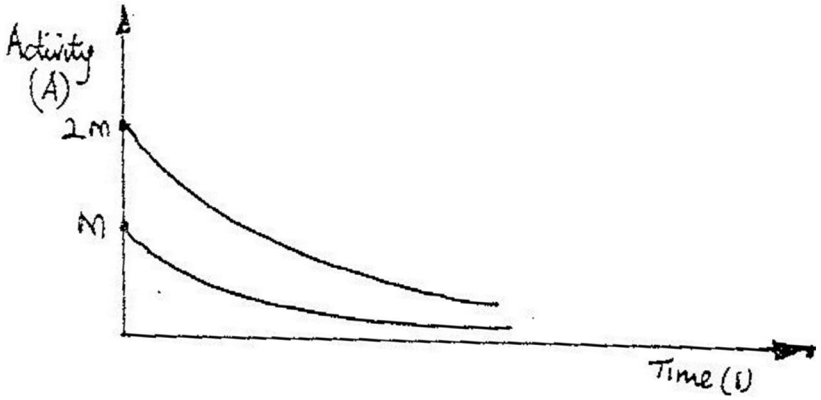
Obtain thin wire and make Kink; deep in oil and let drop form on kink use a milimetre scale to measure diameter of drop.

3. a) i) Produce alcohol vapour
Cools alcohol vapour below condensation temperature or cools air so that alcohol vapour condenses.

ii) Radiation from source ionizes air along its path; alcohol condenses around these ions; forming droplets or traces; nature of traces identifies radiation.

iii) Can detect,__ While electroscope on , can identify nature of radiations, is more sensitive.)

b)i)



ii) Delayed $1x10^{20}$_____ ½ x 10^{20} - _____ ¼ x 10^{20} _____ 1/8 x 10^{20}

= 0.125 x 10^{20} = 1.25 x 10^{20}

Left 1 x 1020 ---------- 1/8 = 0.875 x 1020

(Subtraction) = 8.75 x 1019 Atoms.

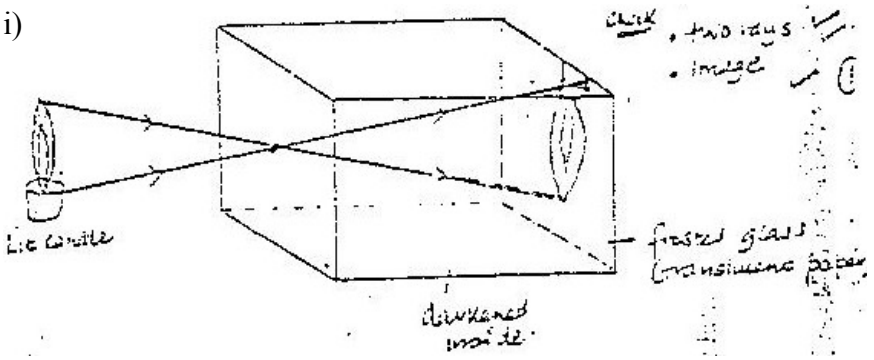
4. a) i) 0.30cm

ii) 0.65-0.25=0.4 Sec.

iii) $f=^1/_T = ^1/_{0.4\ 2.5}$ HZ

iv) $V= fx=^V/_x =^{200}/_{25}$ =80cm = 0.8m

b. i)



ii) m= ht of Image = distance of image
ht of object distance of object

$^{h0}/_{200}$ = 25/5 h0= 200x25/5 = 100m

5. a) i) -Increasing me of turns/coils
-Increasing speed (rate) of rotation

b) In a motion produces Eddy currents. These cause force to act on plate causing damping in B Eddy currents are reduced by slots

c) Rms = V peak/2
V peak = 12x14142=16.97v=17v

6 a) One turning fork is loaded with a small amount of plasticine sounding together again one can produce detectable beats.

b) i) $^{1}/_{f}$ x10^{-3} (H_3^{-1}) 3.91 3.5 2.9 2.3 2.1 2..0
12-11 0.65 0.57 0.48 0.39 0.34 0.32

ii) Slope (Gradient) = $^{V}/_{2}$ = (0.67-0.10)m/4.0-0.75)x $10^{-3}H3^{-1}$
V=340 $^{10m}/_{s}$

iii) Sound waves entering tube is reflected at water surface forming standing wares with incoming wares, when an antinode is at the mouth loud sound is heard. By adjusting length of air column this can be achieved.

7. i) Photoelectric effect- is the emission of electrons from a surface when radiated with radiations of sufficient frequency.
Correct circuit must work i.e cathode connected to (-ve) Emphasize on mA cell connected and v in parallel

ii) Slope = 1.28-0.10/(7.7-4.8) x 10 14
h= Slope x e
= 1.18 x 1.6x 10-19/29 x1014
= 6.51 x 10-34JS
(5.82 – 6.66) x 10-34 JSAlt – Selecting 2 pts from graph
- Substitution in simultaneous equs
-Value of h
-Value of ∅

Fs (Threshold Frequency) = 4.55 x1014 (where graph cuts the axis)
Range (4.4 – 4.6) x 20^{14}

Work function ∅ = 6.51 x 10^{-34} x 4.55 x 10^{14}

$= 2.96 \times 10^{-19} J$

Range $(2.56\text{-}3.06) \times 10^{-19} J$

c) $\frac{1}{2} mv^2 \text{ max} = hf - \varnothing$

$hf = 6.51 \times 10 \times 3 \times 10^{15}$

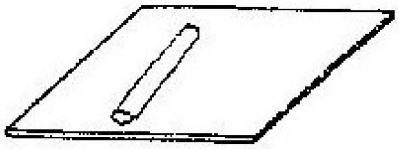
KE max $= 1.953 \times 10^{-18} - 6.4 \times 10^{-19}$

$= 1.31 \times 10^{-18}$

Range $(1.12 - 1.31) \times 10^{-18} J$

PHYSICS PAPER 232/1 K.C.S.E 2005 MARKING SCHEME

1. Volume of 55 drops =8ml accept cm^3
   Or Volume of one drop =8/55
   = 0.1454/0.1455/0.145/0.15cm^3

2. 

3. Water in A expands reducing/lowers density
   This reduces/lowers up-thrust on block causing tipping to side A
4. There is extra/ more/higher/ increased pressure in (b) due to the wooden block increasing distance d_2
5. Reduce/ minimize the transfer of heat by radiation OR Reduce the loss of heat OR gain of heat by radiation.

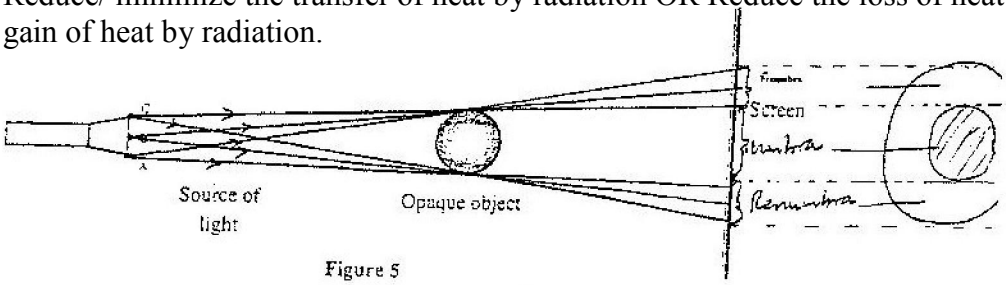


Figure 5

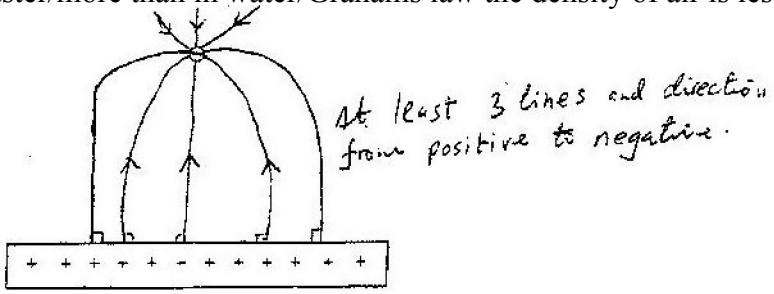
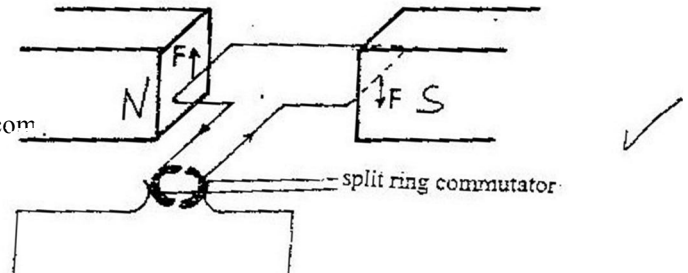
6. 2 sec of rays with arrows labeling of umbra (totally dark) and partly dark (Penumbra)
7. A or tube with air
   Gas molecules move faster/quicker than water molecules OR Diffusion of gases is faster/more than in water/Grahams law the density of air is less than that of water
8. 

Figure 6

9. A-Positive
   B-Negative
10. C- Ammonium jelly/chloride /paste/solution/NH_4Cl
    D-Mixture of carbon and manganese (iv) oxide/MnO_2
11. In (a) cohesive forces between water molecules are greater than adhesive forces between water and wax while in (b) adhesive forces between water and glass molecules are greater than cohesive forces between water molecules.

12. 

13. to make the rotation continuous by changing the direction in the coil every half cycle/turn also accept changing direction of the current every half cycle/turn/maintaining the direction of current in field.

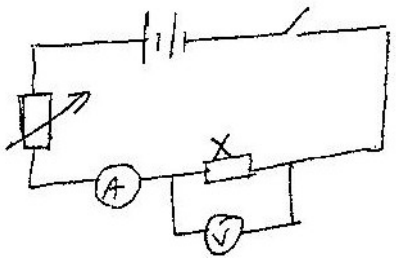
14. $S=nt+{}^{1}/_{2}\ st^2$ where t is the time to reach the ground
$15= 0 + ½\ St^2$ since the initial velocity is zero and t= 3 = 1.732
Horizontal distance= Horizontal speed x t = 300x 3 o 519.62m

15. Efficiency = Ma/VR OR Ma/VRx 100%
$0.75 = \frac{600/400}{V.R}$
V.R = 2

ACT
M.A ${}^{600}/_{400}= 1.5$
${}^{1.5}/_{V.R}= 0.75$
V.R=2

16. =4cm or 0.04m from the graph
V = fλ= 5 x 0.04
= 0.2ms-1 or 20cm/s

17 The pitch decreases as the siren falls
The higher the speed away from the observer, the lower the frequency heard and so the lower the pitch hard.

18. 

Accept cells in parallel and other symbols of rheostats

19 (i)

$= V^2/-R$
$2500= 240\ 2/R$
R=23.04 or (23.03)

(ii) P=IV
I P/V = 2500/240 =10.417A
V = V/I= 240/2500

$$= \frac{2500}{23.04R\ (23.03)}$$

(iii) $P = IV$ and $V = IR$ or $I^2 R$

$$R = \frac{240 \times 240}{2500}$$

$R = 23.04R$

20. The liquid is boiling

21.

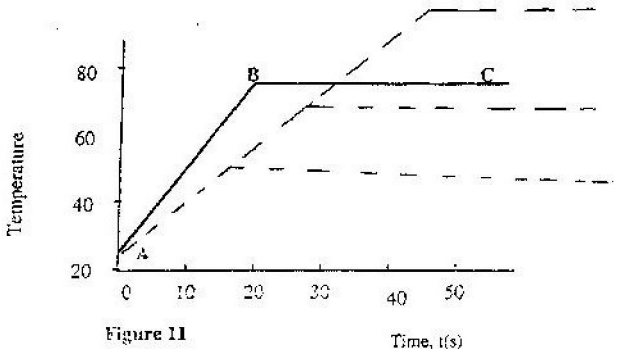


Figure 11

22.

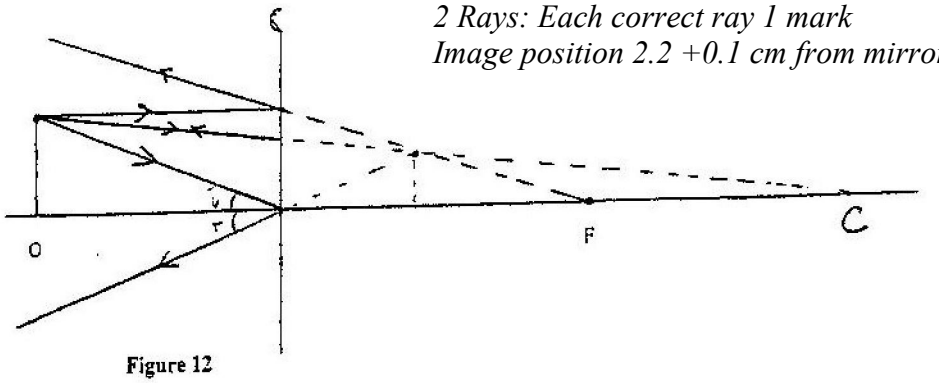


Figure 12

2 Rays: Each correct ray 1 mark
Image position 2.2 +0.1 cm from mirror.

23. $C = 47^0 - 10^0 = 37^0 + 7 = 37^0$

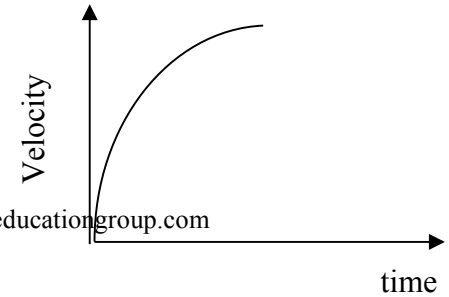
24. $n = \dfrac{i}{\text{Sin } C}$

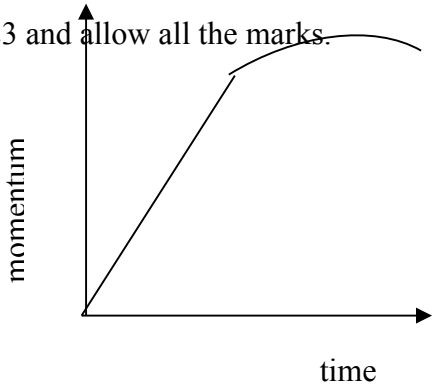
$$n = \frac{I}{\text{Sin } 37} = \frac{1}{0.6018}$$

$n = 1.66/1.551/1.662$

Allow TE from question 23 and allow all the marks.

25.



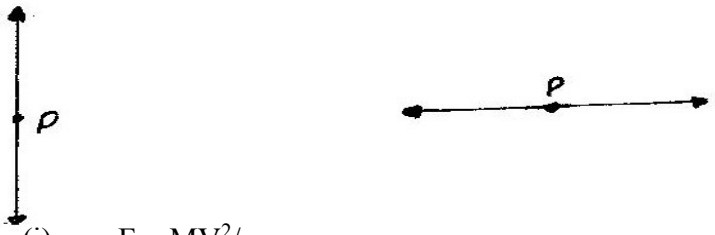


26. 1. At steady rate, the sum of pressure, the potential energy per unit volume and kinetic energy per Unit volume in fluid in a constant.
    2. Provided a finish is non-viscous, incompressible and its flow steamline and increase in its velocity produces a corresponding decrease in pressure
    3. When the speed of a fluid increases, the pressure in the fluid decreases and vice versa.

27. 273+ -281.3 = 8.3K (accept – 8.15 was use.)

28.

(i) (ii)



29. (i) $F = MV^2/r$

$$4800 = \frac{800 \times V^2}{20}$$

$V = 10.95$m (allow 10.09 of a slide is used)

Alternatives.

(ii) $V_{max} = \sqrt{Mrg}$ but $Fr = M\mu g$

$$M = \frac{Fr}{Mg} = \frac{4800}{800x10}$$

$= 0.6$

(iii) $F = Ma$

$4800 – 800 \times a$, $a = 6m/s^2$

$A = v^2/r$

OR

$6 = V^2/20$

$V = 10.95$

(iv) $F = MR$, $M = F/R = \frac{4800}{800} = 0.6$

$\text{Tan } \theta = 0.6$

$V^2 = rg \tan \theta$

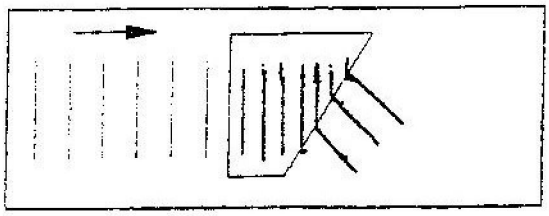
OR

$V^2 = 20 \times 10 \times 0.6$

$V = 10.95$

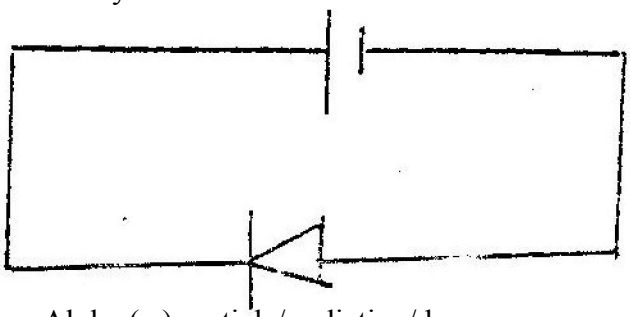
30. Image changes from real to virtual
Image changes from inverted to upright
Image changes from behind lens to the same side as object.

31. In excited state the electron is in a higher (outer) energy level. As it falls back it releases energy and may fall in steps releasing different energies (radiations) (proton) packets energy.

32. 

33. To withstand the high temperature (immerse heat) prevent the target from melting due to high temperature or immense heat.

34. Methylated spirit evaporates faster/highly volatile than water taking latent heat away faster from the hand.

35. 

36. m- Alpha ($\propto$) particle/ radiation/decay
n- Beta (β)
x- Polonium (P_o)

37. When the switch is closed and nails attracted.
When the switch is opened, the nail on the iron end drops first.

38. Conductor allows charge to be distributed/movement/spread.

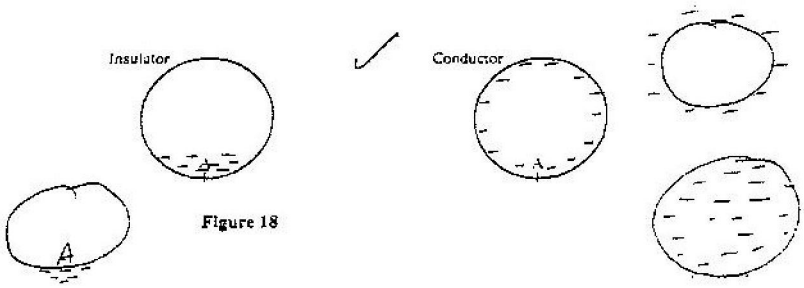
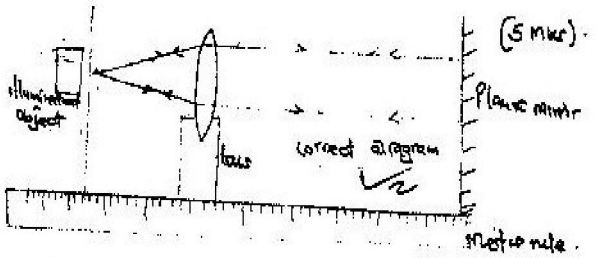


Figure 18

PHYSICS PAPER 232/2 K.C.S.E 2005 MARKING SCHEME

1.

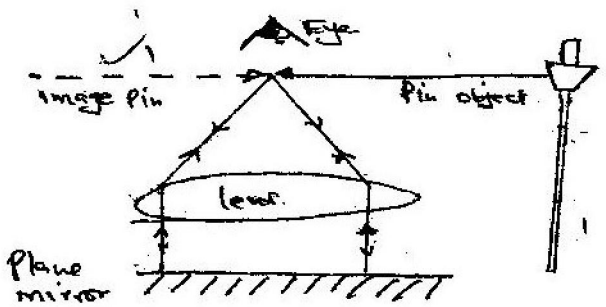


Correct diagram

With distance between lens and object being greater than facal length f;

(a) Adjust the lens distance until a sharp image of object is formed besides object
(b) Distance between the lens and the object is measured and repeated several times
(c) The average of the distance is the focal length of the lens

Alt Method: No parallax method is also marked

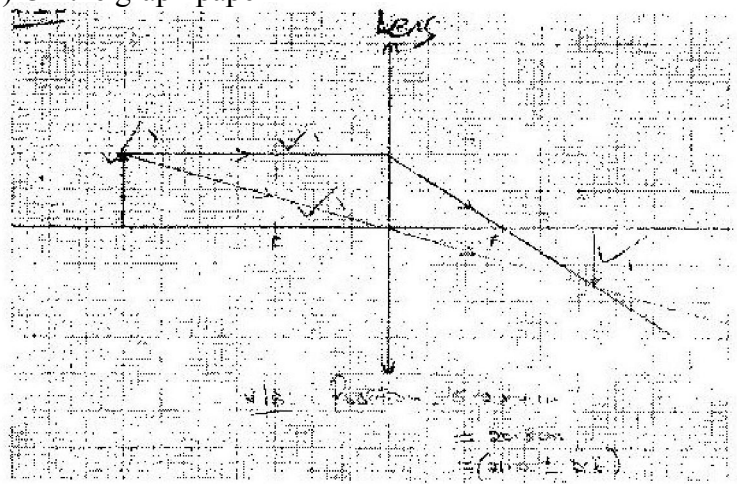


Correct rays 1 mark

Lens on plane mirror 1mark

The pin is adjusted until there is no parallax between the object pin and the pin image. The distance between the lens and pins is the focal length of the lens

(b) On the graph paper



NB: position = 5.2 x 4 cm
= 20.8 cm
= 21 ± 1 cm

(c) (i) Long sightedness/ hypermetropia/ presbiopia

(ii)

2. (i) Distance traveled by the effort in one revolution = $2\pi R$
Distance traveled by load = $2\pi r$
Velocity ratio (V.R) = $\frac{\text{effort distance}}{\text{Load distance}} = \frac{2\pi R}{2\pi r} = \frac{R}{r}$

Therefore V.R = $\frac{R}{r}$

(ii) V.R = $\frac{R}{R} = \frac{8cm}{5\ cm} = 1.6$

Efficiency = $\frac{M.A}{V.R} = \frac{80}{100}$
But M.A = $\frac{\text{Load}}{\text{Effort}} = \frac{20N}{E}$

Therefore $\frac{20N}{E} \div 1.6 = 0.8$

$\frac{20N}{E} \times \frac{1}{1.6} = 0.8$
Effort E = 20N
1.6 x 0.8 = 15.6 (3) N
= 15.6N

(iii) When the load is large, the effect of friction and weight of the moving parts is negligible
NB friction and weight of moving parts to be mentioned

3. Total resistance R = 6 Ω + 5 Ω + 1 Ω = 12 Ω
Total current $1 = {}^{V}/_{R}$ Check correct substitution

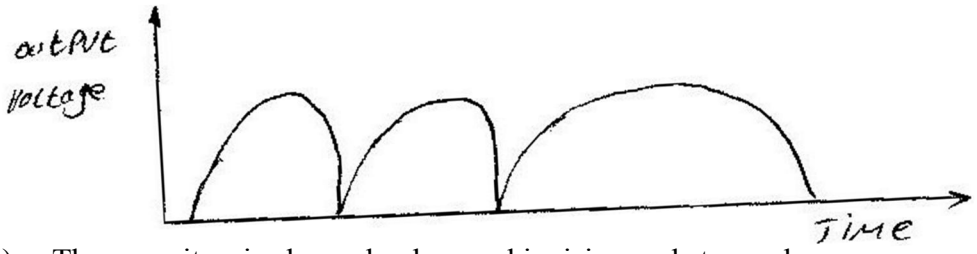
(ii) P.d across each capacitor = 1R
= 0.25 x 11
= 2.75v
Charge = CV = $1.4 \times 2.75 \times 10^{-6}$
= 3.85×10^{-6}C

4. (a) (i) Pure Silicon or germanium is doped with prevalent impurity i.e. phosphorous.

(ii) Four of the fire valence are paired with semi- conductor electrons
(iii) The fifth electron is left unpaired and so conducts
NB; Doping pairing and conducting must be mentioned

(b) (i) In the first half – cycle A is a positive making D_2 and D_3 to be forward biased, so current flows through D_2 R and D_3 to B.
In the second half – cycle, B is positive making D_4 and D_1 forward biased. The current flows through D_4 R and D_1 to A

(ii)



(iiii) The capacitor is charged when p.d is rising and stores charge
It discharges through the resistor when p.d is falling
This makes output smooth i.e reduces humps

(c) $hfe = \frac{\Delta Ic}{\Delta I_B}$

$120 = \frac{\Delta Ic}{20B/A}$

Therefore $\Delta Ic = 120 \times 20\ MA = 2.4mA$

Output p.d charge $= R_L \times \Delta IC$
$1000R \times 2.4\ mA$
$= 2.3v$

5. (a) Extension is directly proportional to the extending force provided the elastic limit is not exceeded.
(b) (i) 3.2 N or 3.3 N

(ii) At 5 cm F = 1.45N
Stress = F/A = 1.45
$0.25 \times 10^{-4} m^2$
$= 5.8 \times 10^4$ Pa

NB: can work with N/cm^2
Accept 5.6 – 5.8) x 104 pa

(iii) Strain $= \frac{\text{Ext}}{\text{Original length}} = \frac{5}{200} = 0.025$

(c) ED and DC

6. Angular velocity is the ratio of angle covered (angular displacement) to the time interval

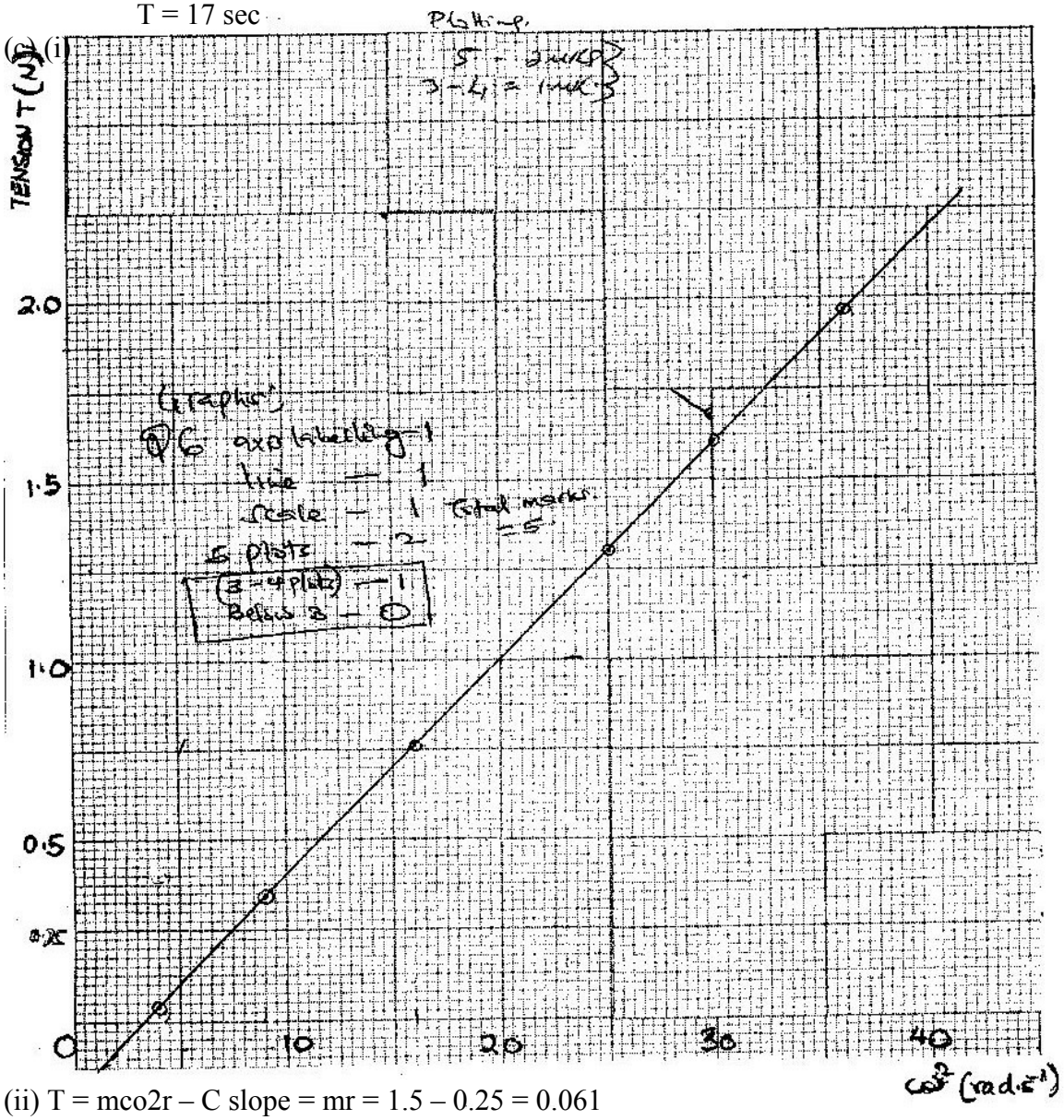
or $W = \frac{\theta_2 - \theta_1}{t_2 - t_1}$

(b) $w = \frac{300 - 170}{13} = 10 \text{ radis}^{-1}$

$10t = 170$

$T = 17$ sec

(c) (i)

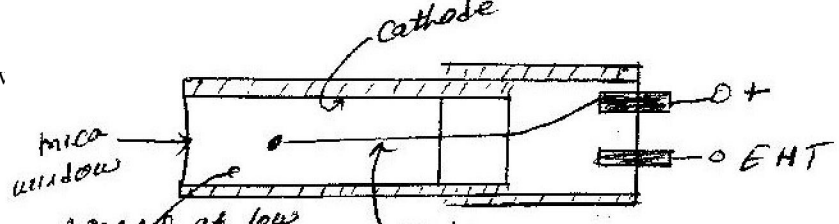


(ii) $T = mco2r - C$ slope $= mr = \frac{1.5 - 0.25}{28.5 - 8.0} = 0.061$

$M = \frac{0.061}{30 \times 10^{-2}} = 0.203$ Kg (0.2 kg)

iii) Extent graph (calculate) C= 0.2
It represents frictions between table and body

7. (a) Radioactivity is the spontaneous disintegration of unstable nuclei so as to stabilize



When radiation enters via mica windows, the argon gas is ionized; the electrons going to the anode and positive ions going to cathode; thus a discharge is suddenly obtained (PULSE) between anode and cathode and registered as a particle by counter. The discharge persists for a short time due to the quenching effect of halogen vapour.

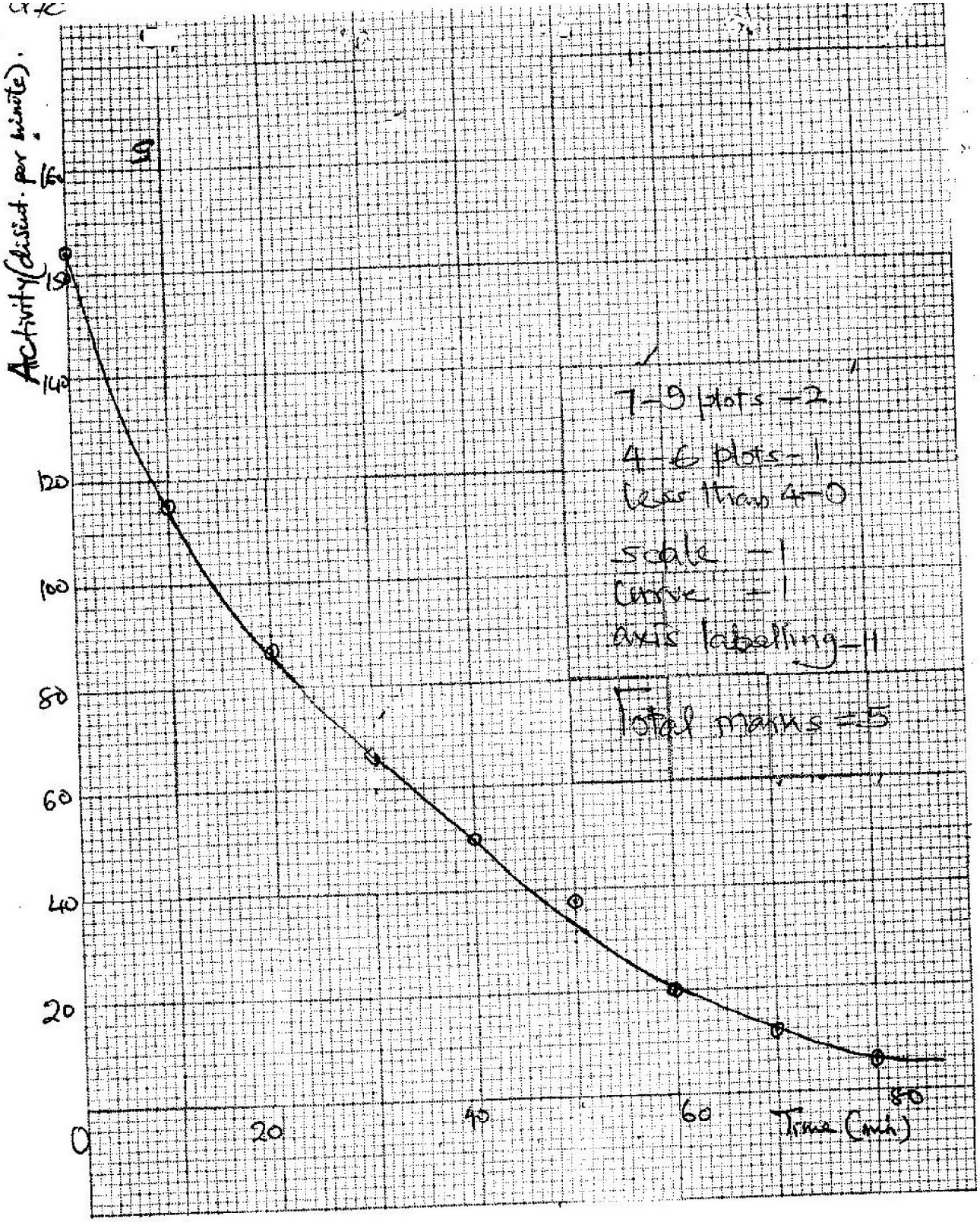
(c) Half life average t ½ = 24.5 min (error transfer)

(d)

t(min	40	28	16	4
		12	12	12
Activity	480	960	1920	3840

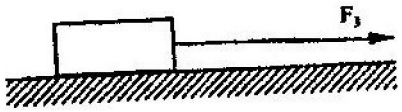
3 half – lives

t = 4 min


Activity (dissint. per minute).
160
140
120
100
80
60
40
20
0
20
40
60
80
Time (min)
7-9 plots - 2
4-6 plots - 1
less than 4 - 0
scale - 1
Curve - 1
axis labelling - 1
Total marks = 5

K.C.S.E 2006. MARKING SCHEME
PHYSICS PAPER 1

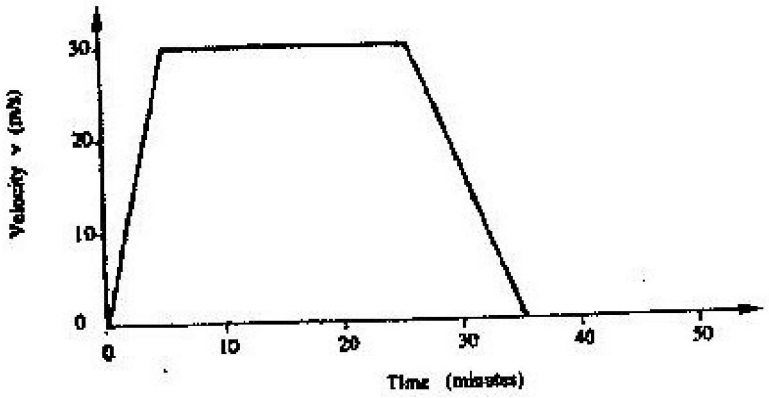
1. Volume = $68cm^3$
   Mass = 567g
   Density = $\frac{m}{V} = \frac{567}{68}$
   = $8.34\ gcm^{-3}$ (3 marks)

2. 

3. Pressure at a point in a fluid is transmitted equally to all points of the fluid and to the walls of the container. (1 mark)

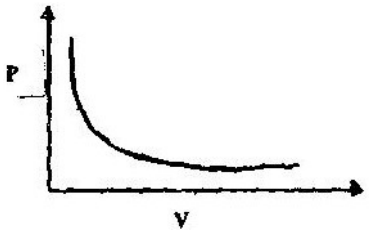
4. On heating, the bimetallic strip bends; This causes the position of the centre of gravity of the section to the left to shift to the right causing imbalance and so tips to the right (2 marks)

5. Lower spring extend by 15 cm;
   Upper springs extended by 10 cm;
   Total = 15 + 10 = 25 cm (3 marks)

6. 

7. Effect of weight of second pulley reduces efficiency of A. Load in B is larger and so effect of friction is less in B increasing efficiency. (1 mark)

8. In B some of the heat is used up in melting the ice, while in A all the heat goes to raise the temperature of the water to reach boiling point (2 marks)

9. 

10. At F, radius of curve is smallest and so greatest centripetal force is required to keep luggage on carrier; ($F = \frac{mv^2}{R}$) (2 marks)

11. $A_1V_1 = A_2V_2$;
$\pi \times 6^2 \times V_1 = \pi \times 9^2 \times 2$;
$= 4.5\ ms^{-1}$ (3 marks)

12. As the temperature changes the volumes of the gases in the balloons change differently. The change in volume and hence the change in upthrust will differ. (2 marks)

13. $Ft = \Delta mv$;
$720 \times 0.1 = 0.6 \times v$;
$= 120ms^{-1}$ (3 marks)

14. (a) In solids the molecules are held in position by intermolecular forces that are very large. In liquids the molecules are able to roll over one another since the forces are smaller (1 mark)

(b) (i) Volume $= 4/3\ \pi r^3$
$= 4/3\ \pi \times 0.025^3$
$= 6.54 \times 10^{-5}\ cm^3$ (2 marks)

(ii) Area $= \pi r^2$
$= \pi \times 10^2$
$= 314\ cm^2$ (2 marks)

(iii) A x diameter of molecule = volume;
$314 \times d = 6.54 \times 10^{-5}$
$d = 2.1 \times 10^{-7}$ cm (3 marks)

(c) (i) The oil is assumed to have spread to thickness of one molecule (1 mark)

(ii) Sources of errors:
- Getting the right oil
- Measuring drop diameter
- Measuring diameter of patch
- Getting drop of a right size (any 2 x 1 = 2 marks)

15. (a)

- Make diameter of springs different
- Make number of turns per unit length different
- Make lengths of springs different (any 2 x 1 = 2 marks)

(b) (i) 2.2 N ; 2.2 ± 0.1

(c) (ii) Spring constant = gradient

$= 2.1$

4.1×10^{-2}

$= 5/Nm^{-1}$

For each spring k= 102 Nm^{-1} (1 mark)

(iii) Work = Area under graph

$= \frac{0.75 + 1.65}{2} \times 1.7 \times 10^{-2}$

$= 2.04 \times 10^{-2}$ J (3 marks)

16. (a) A gas that obeys the gas laws perfectly (1 mark)

(b) (i) By changing pressure very slowly or by allowing gas to go to original temperature after each change (1 mark)

(ii) k is slope of graph

$K = (2.9 - 0) \times 10^5$

$(3.5 - 0) \times 10^6$

$K = 0.083$ NM

(iii) Work done on the gas (4 marks)

(iv) Use dry gas (1 mark)

Make very small changes in pressure (any 1 x 1 = marks)

(c) Since pressure is constant

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$T_1 = 273 + 37 = 310k$

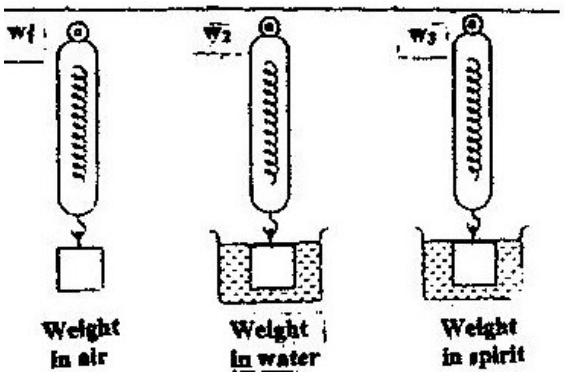
$T_2 = 273 + 67 = 340k$

$\frac{4000}{310} = \frac{V_2}{340}$

$V_2 = 4387$ litres (4 marks)

17. (a) A body fully or partially immersed in a fluid experiences an upthrust equal to the weight of the fluid displaced (1 mark)

(b) (i)



(ii) 100g: $U_w = 0.12N$ $U_s = 0.09N$

150g: $U_w = 0.18N$ $U_s = 0.14N$

200g: $U_W = 0.24N$ $U_s = 0.18N$ (2 marks)

(ii) Relative density = upthrust in spirit
Upthrust in water

$$= \text{average} \left(\frac{0.09}{0.12}, \frac{0.14}{0.18}, \frac{0.18}{0.24} \right)$$

$= 0.76$ (3 marks)

(c) Weight of air displaced $= \rho Vg$
$1.25 \times 1.2 \times 10N$
$=15N;$
= upthrust

Weight of helium $= \rho Vg$
$0.18 \times 1.2 \times 10N$
$= 2.18N;$
Weight of fabric $= 3N$
Forces downwards $= 2.16 + 3 = 5.16N;$
Tension $= 15 - 5.16$
$= 9.84$ N (4 marks)

18. (a) Specific latent heat of fusion of a substance is the quantity of heat required to melt completely one kilogram of the substance (at its normal melting point) to liquid without change of temperature. (1 mark)

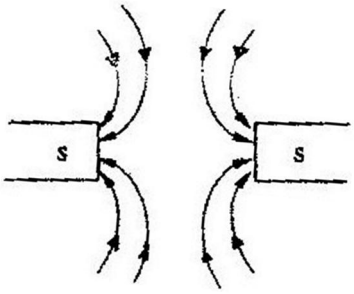
(b) (i) $Q = ml$
$= 0.02 \times 334000J$
$= 6680J$ (2 marks)

(ii) $Q = mc\theta$
$= 0.02 \times 4200 (T-0)$
$= 84$ TJ (2 marks)

(iii) Heat lost by warm water
$= mc\theta$
$= 0.2 \times 4200 (60- T)$
Heat lost by calorimeter $= mc\theta$
$0.08 \times 900 (600 - T)$ (2 marks)

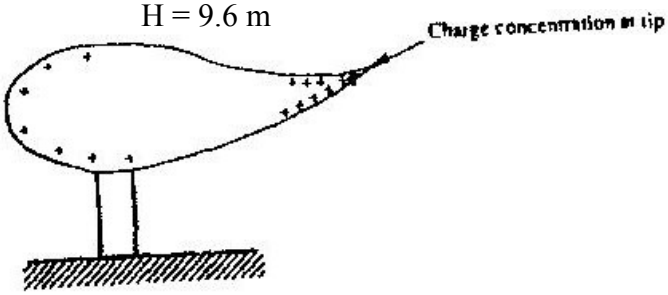
(iv) Heat gained = Heat lost
$6680 + 84T = 0.2 \times 4200 (60 - T) + 0.08 \times 900 (60-T)$
$6680 + 84T = 50400 - 84OT + 4320 - 72T$
$996T = 48040$
$T = 48.2^0C$ (4 marks)

K.C.S.E 2006: MARKING SCHEME
PHYSICS PAPER 2

1. 

2. Magnification =

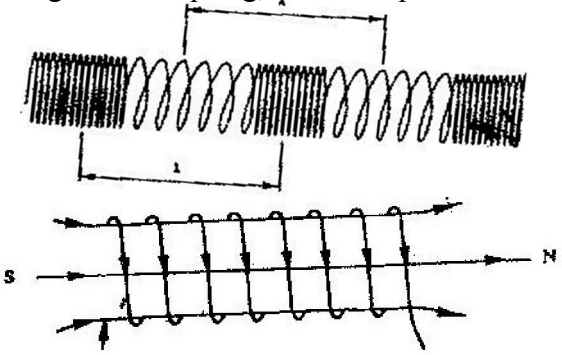
Im age dist = ht of image
Object dist height of object
10 = 16
600 h
H = 9.6 m

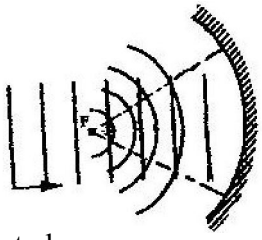
3. 

(3 marks)

4. To allow escape of gases (H_2 and O_2) from battery

5. (i) Longitudinal wave
(ii) Length of the spring, from one point to a similar point of vibration

6. 

7. 

Reflected waves are curved. Either converging circular reflected waves. Converging to F; OR two perpendicular lines from the surface of one of the curves meeting at F.
(2 marks)

8. Distance moved by sound waves = 2x;

2x = speed x time

$X = \frac{330 \times 1.8}{2}$

= 297m (3 marks)

9.

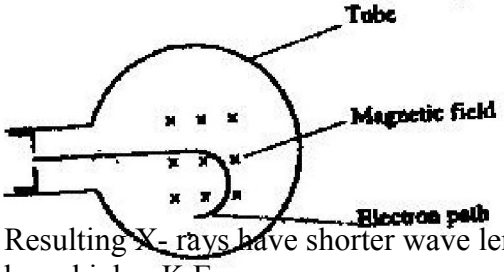
- Constant temperature
- No mechanical strain (1 mark)

10. Work function of a metal is the minimum energy required to set free (release) an electron from the surface of the metal (1 mark)

11. Threshold frequency K.E of electron = 0 hence velocity of the electron would be zero; (No motion) thus photo electric effect cannot be observed (2 marks)

12. Straight beam from gun to screen OR no gravitational effect on the beam. (1 mark)

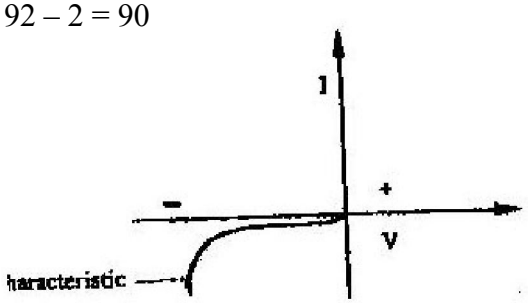
13.



14. Resulting X- rays have shorter wave length/ hard/ high frequency because electrons have higher K.E (2 marks)

15. a = 234 + 4 = 238
b = 92 – 2 = 90 (2 marks)

16.



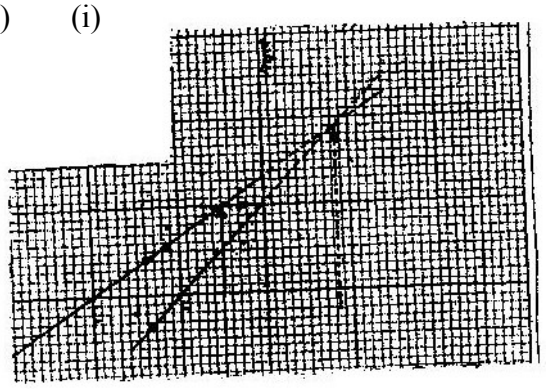
17. (a) Charge Q, on C_1 is given by
Charge $Q_1 = C_1 V$;
= 0.3 μ F x 4.5;
1.35μC; (3 marks)

(b) $C_T = C_1 + C_2$;
= (0.3 + 0.5) μ F
= 0.8 μ F (2 marks)

(c) (i) 4.5v (1 mark)
(ii) Observed on voltmeter p.d drops to less than 4.5 (1 mark)

(iii) The drop of p.d in C (ii) is because the charge on C_1 is distributed to C_2. Since values of C_1 and C_2 remain constant, when Q on C_1 reduces, then $Q = C_1V$ implies V must reduce also, hence voltmeter reading reduced.

18. (a) (i)



(ii) Image at 10cm from mirror (using scale) (2 marks)

(iii) Magnification

$$\frac{\text{Size of image}}{\text{Size of object}} = \frac{4.0\text{ cm}}{2.0\text{ cm}} = 2$$

OR

$$\frac{\text{Image distance}}{\text{Object distance}} = \frac{2.0\text{ cm}}{1.0\text{ cm}} = 2$$

(b) (i) I Image distance

$$\frac{I}{f} = \frac{I}{v} + \frac{I}{u}$$

$$\frac{I}{v} = \frac{1}{5} - \frac{I}{20} = \frac{3}{20}$$

$$v = \frac{20}{3} = 6.67\text{ cm}$$

II Magnification

$$= \frac{v}{u} = \frac{6.67}{20} = 0.33;$$ (2 marks)

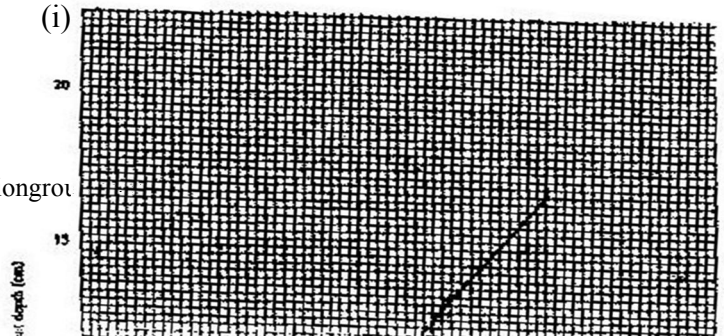
(ii) Image characteristics: real, inverted, diminished, less bright (2 marks)

19. (a) Refr. Index $n = \frac{\sin i}{\sin r} \quad \frac{\text{velocity in air}}{\text{velocity in substance}}$

OR

$$n = \frac{\text{Real depth}}{\text{Apparent depth}}$$ (1 mark)

(b) (i)



(ii) Slope of graph = $^{16}/_{24}$ = 2/3

Refr. Index n = $\frac{\text{Real}}{\textit{Apparent}}$ = $\frac{\text{I}}{\textit{slope}}$

= $\frac{3}{2}$ = 1.5 (4 marks)

(c) n= $\frac{\sin 90;}{\text{Sin } \theta}$ $\Rightarrow$ sin θ = $\frac{1;}{16}$ $\Rightarrow$ $\theta = 38.7^0$ = critical angle (3 marks)

20. (a) (i) P = slip rings
Q = Brushes (2 marks)

(ii) 0-90 magnetic flux cut changes from high to low. (decreasing);
90 – 180 magnetic flux change from low to high. (increasing)
At each peak 0 – 180 magnetic flux change is maximum though in different directions, (position of coil). (3 marks)

(b) (i) $\frac{€_s}{€_p} = \frac{N_s}{N_p}$; $\Rightarrow €_s = 240 \times \frac{60}{1200} = 12$ volts (2 marks)

(ii) $P_p = P_s$ (power) or $l_s V_s = l_p V_p$

$I_S = I_p \frac{V_p}{V_s} = 0.5 \times 240; = 10A;$ (3 marks)

21. (a) (i) P = Ring circuit (1 mark)
X = Neutral (point or terminal)
Y = Live (point or terminal) (2 marks)

(ii) I Purpose of R – or fuse; is a safety element in a circuit

against excess current

II R is connected to Y but not X to ensure that when it breaks a circuit any gadget/ appliance connected does not remain live. (1 mark)

(iii) Earthing is necessary in such a circuit to guard against electric shocks.

(b) Cost of electricity
1.5 kw x 30h x 8 Kshs = Kshs 360/=

KCSE 2007 PHYSICS MARKING SCHEME
PAPER 1

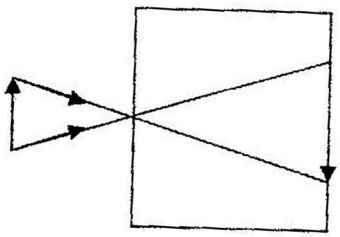
1.	0.562 – 0.012 = 0.550cm 5.62 – 0.12 = 0.55 cm 5.5 mm	Or 5.62 – 0.12 5.5	1 mk
2.	Density p= m/r D = m/v = 1.75g formula $(0.550)^3$cm substitution = 10.5g/cm^3 answer 10500kg/m^3 - accept g/mm^3 - allow transfer of error		3 mks
3.	V_2V_4 V_1 V_3 (correct order)		1 mk
4.	Sucking air reduces pressure inside the tube; so that atmosphere pressure forces the liquid up the tube		1 mk
5.	Look for symbols P_A gh_A = $Pagh_B$ formula or correct P_Ag x 24 = 1200 g x 16 substitute substitution P_a = 800 kgm^{-3} answer answer		3 mks
6.	Radiation		1 mk
7.	X_2 is made greater than X_1 / X_1 is made shon X_2 X_2 is made larger than X_1 Since B receives radiation at a higher rate, it must be moved Further from sources for rates to be equal: since A receives radiation at a lower rate than B. F_1 d_1 = f_2 d_2		2 mks
8.	Taking moments and equating clockwise movements = anticlock movements 0.6 N x 7cm = mg N x 30cm; W = mg = 1.4 N:		3 mks
9.	Distance = area under curve between 0 and 3. 0 second; = 120 x 3 x 0.2 = 72M: Trapezium Rule (3 trapeziua) Mid – ordinateral = 70.5		
10.	Acceleration = slope of graph at t = 4.0 s Or a= $\frac{\Delta V}{\Delta t}$ or trapezium rule (6 trapezia) = 72m = 16 x 3 = 14.11 m/S^2 17 x 0.2 (12 – 14.5) m/s^2 or trapezium (1) or 1 triangle = 76.5m		2 mks
11.	Pressure, impurities::		2 mks
12.	Kelvin (K) in words (one triangle used follow)		2 mks
13.	The pressure of a fixed mass of a gas is directly proportional to its absolute (Kelvin) temperature provided the volume is kept constant P & T volume constant		1 mk
14.	Since the quantity of water A is smaller, heat produces grater change of temperature in A; This causes greater expansion causing the cork of temperature in A; this cause greater expansion causing the cork to sink		

	further. Per unit volume/ greater decrease in density/ lower density in A	
	SECTION B	
15 (a)	**Smoke particles** Show the behavior or movement of air molecule Smoke particles are larger than air molecules/ visible and light enough to move when bombarded by air molecules **Lens** Focuses the light from the lamp on the smoke particle; causing them to be observable **Microscope** Enlarge the smoke particle So that they are visible/ magnifies smoke particles	2 mks) 2 mks) 2 mks)
(b)	Smoke particle move randomly / zigzag / haphazardly Air molecules bombard the smoke particles/ knock, hit Air molecules are in random motion	3 mks
(c)	The speed of motion of smoke particles will be observed to be higher smocking particles move faster, speed increases, increased random motion	1 mk
16(a)	A body at rest or motion at uniform velocity tends to stay in that state unless acted on by an unbalanced force/ compelled by some external force to act otherwise.	1 mk
(b) (i)	$S = \frac{\Delta u}{}$ Nd or $\frac{98.75 - 0 \text{ (m/s)}^2}{16 - 0}$ $= 6.17 ms^{-2}$	3 mks
ii	$20k = s = 6.09$ depend on (i) $K = \frac{6.09}{20}$ $= 0.304$	2 mks
iii	Increase in roughness increases k and vice versa Uniform speed in a straight line – uniform velocity	1 mk
(c)	Applying equation $V^2 - u^2 = 2as$ $V^2 - 0 = 2 \times 1.2 \times 400$ Momentum $p = mv$ $= 800 \times \sqrt{2 \times 1.2 \times 400}$ $= 24787.07$ $= 24790$	4 mks
17.(a)	Quantity of heat required to change completely into vapour 1 kg of a substance as its normal boiling point without change of temperature; Quantity of heat required to change a unit mass of a substance from liquid to vapour without change in temp	1 mk
(b) (i)	So that it vaporizes readily/ easily	1 mk
(ii)	In the freezing compartment the pressure in the volatile liquid lowered suddenly by increasing the diameter of the tube causing vaporization in the	

	cooling finns, the pressure is increased by the compression pump and heat lost to the outside causing condensation. Acquires heat of the surrounding causing the liquid to vaporize	
(iii)	When the volatile liquid evaporates, it takes away heat of vaporization to form the freezing compartment, reducing the temperature of the latter. This heat is carried away and disputed at the cooling finns where the vapour is compressed to condensation giving up heat of vaporization	
(iv)	Reduces rate of heat transfer to or from outside (insulates) Reduces / minimizes, rate Minimizes conduction/ convertion of heat transfer	1 mk
(c) (i)	Heat lost = $ml_v + mc\ \Delta\theta$ = formula Heat lost by steam = 0.003 x 2.26 x 106 = substitution Heat lost by steam water = 0.003 x 4200 (100-T) Total = 6780 + 126 (100 – T) = 8040 – 12.6T	3 mks
(ii)	Heat gained by water = MC θ = 0.4 x 4200 (T- 10) Or = 1680 T - 16800	1 mk
(iii)	Heat lost = heat gained OR correct substitute 1680 (T – 10) = 6780 12.6 (100-T); Allow transfer of error 1680T – 16800 = 6780 + 1260 – 12.6T 1692 .6 T = 24840 T = 14.7^0C 14.68	1 mk 15 mks
18.(a)	Rate of change of velocity towards the centre Acceleration directed towards the centre of the motion Acceleration towards the centre of orbit/ nature of surface	2 mks
(b) (i)	Roughness / smoothness of surface. Radius of path/ angular velocity/ speed (Any two)	2 mks
(ii)	II) $_A > (l)_B\ (l)_C$ (correct order)	1 mk
(c)	$F = m(l)^2 r$ $F = MV^2$ $V=rw$ For thread to cut r $w = \underline{3.049}$ F= 5.6 N $5.6 = 0.2 \times v^2$ 0.15 (l) = 13.7 radius $V^2 = 4.2$ = 13.66 13.66 v = 2.0494	4 mks
19 (a)	A floating body displaces its own weight of the fluid on which it floats	
(b)(i)	To enable the hydrometer float upright / vertically	1 mk
(ii)	Making the stem thinner/ narrower (reject bulb)	1 mk
(iii)	Float hydrometer on water and on liquid of known density in turn and marks levels; divide proportionally and extend on either side/ equal parts	2 mks
(c)i)	Tension; upthrust; weight	3 mks
(ii)	As water is added, upthrust and tension increase; reaching maximum when cork is covered and staying constant then after weight remains unchanged as water is added	3 mks 11mks

K.C.S.E 2007 PHYSICS MARKING SCHEME
PAPER 2

1.

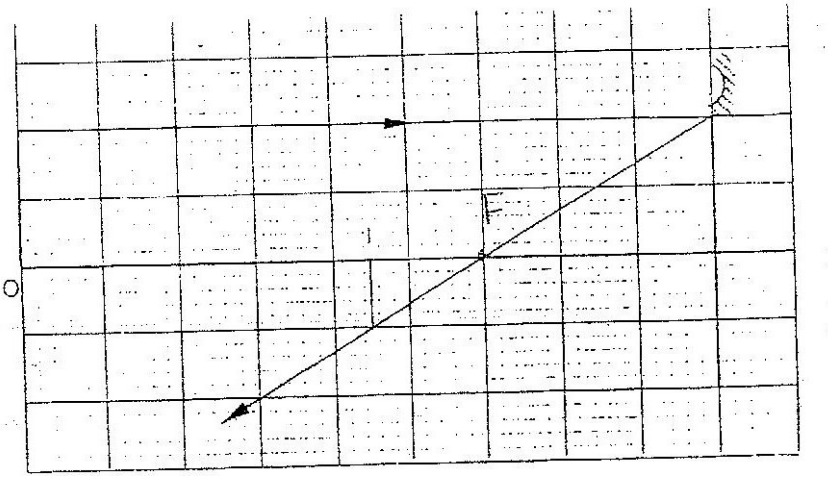


Rays
Image and object must be labeled
Image must be enlarged

2. Alkaline cell lasts longer than lead acid cell/ remain unchanged longer
Alkaline cell is more rugged than lead acid cell/ robust/ can withstand rough handling
Alkaline cell is lighter than lead – acid cell (any one (1 mark)

3. X is north (both correct)
Y is north (1 mark)

4.

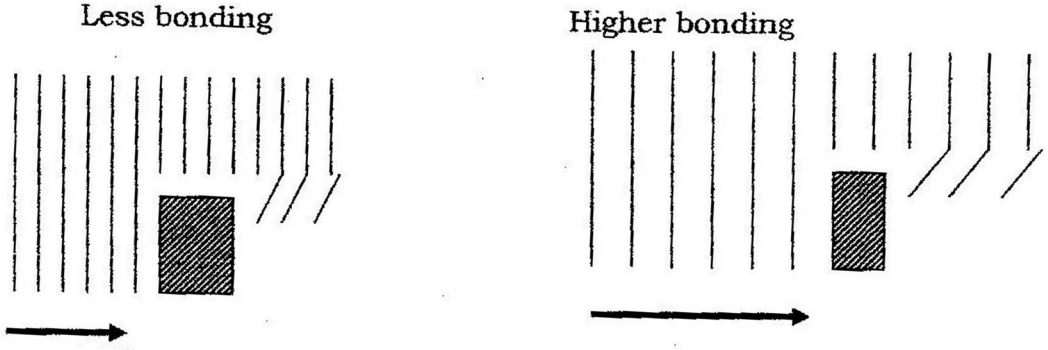


Correct rays
F marked

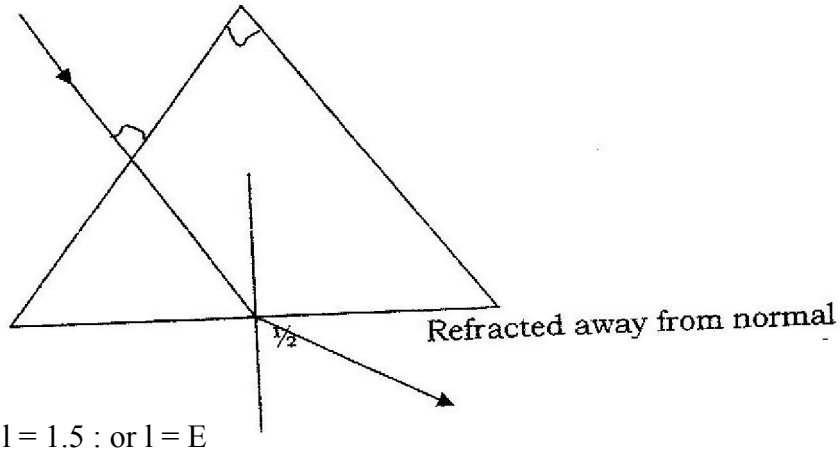
5. $T = \frac{0.007S}{3}$ (T)

$F = {}^{1}/_{T} = 3/0.007$ (f)
$= 429H_z$ 428.57 – 434. $80H_2$ (3 marks)

6.



7.



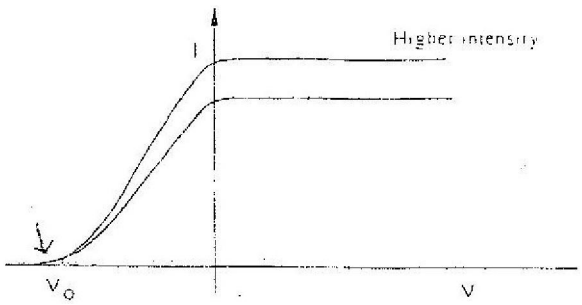
8. $l = 1.5$: or $l = E$
$R + r \qquad R + r$
$0.13 = \frac{1.5}{10 + r}$
$R + 1.5\Omega$;
$R = 1.5\ \Omega$ (3 marks)

9. $R_1 = \frac{V^2}{P} \qquad R_2 = V_2$;
$8P$

$\frac{R_1}{R_2} = \frac{V^2}{P} \times \frac{8P}{V^2}$
$= 8$ (3 marks)

10. The process of the eye lens being adjusted to focus objects at various distances (1 mark)

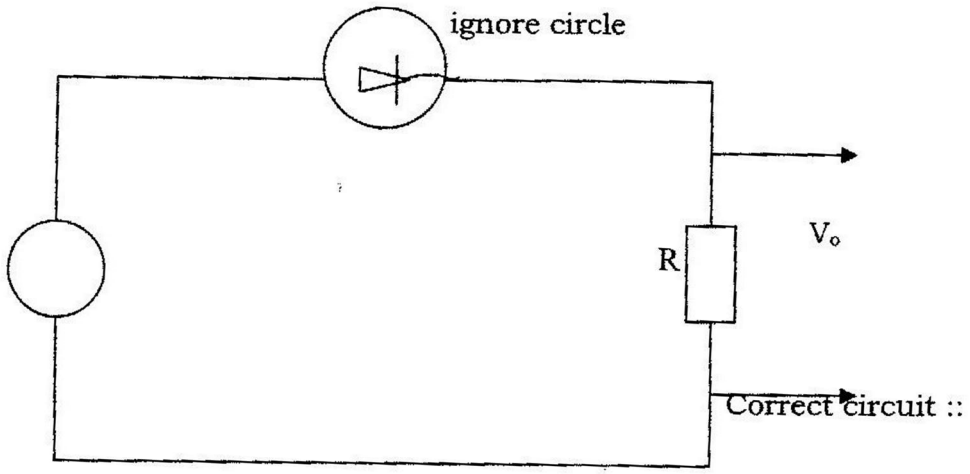
11.



12. The higher the intensity implies greater number of electrons and hence higher saturation current (1 mark)

13. a = 234
b= 82

14.



SECTION B

15 (a) The ratio of the pd across the ends of a metal conductor to the current passing through it is a constant (conditions must be given)
Also $V/I = R$

(b) (i) It does not obey Ohm's law; because the current – voltage graph is not linear through line origin / directly proportionate

(i) Resistance $= V/I$ = inverse of slope ; gradient $= \frac{\Delta I}{\Delta V}$

$= \frac{(0.74 - 0.70)\ V}{(80 - 50)\ mA}$

$= \frac{0.4V}{30 \times 10^{-3}\ A}$

$= 1.33\Omega$

$1.20 - 1.45\ \Omega$ (range) (3 marks)

(iii) From the graph current flowing when pd is 0.70 is 60.MA
Pd across R = 6.0 – 0.7 = 5.3v

$R = \frac{5.3\ V}{36mA}$

$= 147\Omega$

$= 139.5 - 151.4\Omega$ (3 marks)

(c) Parallel circuit $1/30 + 1/20 = 5/60$ or $60/50$

$R = 12\ \Omega$

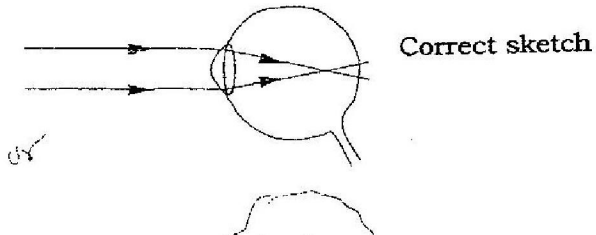
Total resistance = $10 + 12 = 22\Omega$ (2 marks)

(ii) $I = V/R = 2.1/22 = 0.095A$ (1 mark)]

(iii) $V = IR = 10 \times \frac{2.1}{22}$

$= 0.95$

16.



Diverging effects should be seen (2 marks)

(b) (i) A diaphragm
B Film (2 marks)

(ii) The distance between the lens and the film / object is adjusted; so that the image is formed on the film
Adjust the shutter space/ adjust the aperture (2 marks)

(iii) Shutter – opens for some given time to allow rays from the object to fall on the film creating the image impression/ exposure time is varied
A (diaphragm) controls intensity of light entering the camera (3mks)
B (film) – coated with light sensitive components which react with ight to crate the impression register/ recorded or where image is formed.

(c) (i) magnification = v/u = 3
Since v + u = 80
U = 80 – v

$$\frac{v}{80 - v} = 3$$

V= 240 – 3v
V= 60cm (3 marks)

(ii) From above u = 20cm

$^{1}/_{f} = 1/v + 1/u = 1/60 + 1/20$ (2 marks)
F = 15cm (15 marks

17. (a) The induced current flows in such a direction that its magnetic effect oppose the change producing it.

(b) As the diaphragm vibrates, it causes the oil to move back and forth in the magnetic cutting the filed lines, this causing a varying e.m.f to be induced in the coil which causes a varying current to flow. (1 mark)

(ii) Increasing number of turns in the coil – increasing of the coil
Increasing the strength of the magnet (any two correct) (2 marks)

$$\frac{Vp}{Vs} = \frac{Np}{Ns}$$

$\frac{400}{Vs} = \frac{1200}{120}$

$Vs = 40V$

(ii) $I_p = 600/400 = 1.5A$ (2 marks)

(iii) $Ps = P_p = 600W$

$l_s = {}^{600}/_{40} = 15A$ (1 mark)

18. (a) (i) A Grid
B Filament (2 marks)

(ii) Filament heats cathode
Electron boil off cathode (theremionic emission) (2 marks)

(iii) Accelerating (1 mark)
Focusing

(iv) Across X - plates (1 mark)

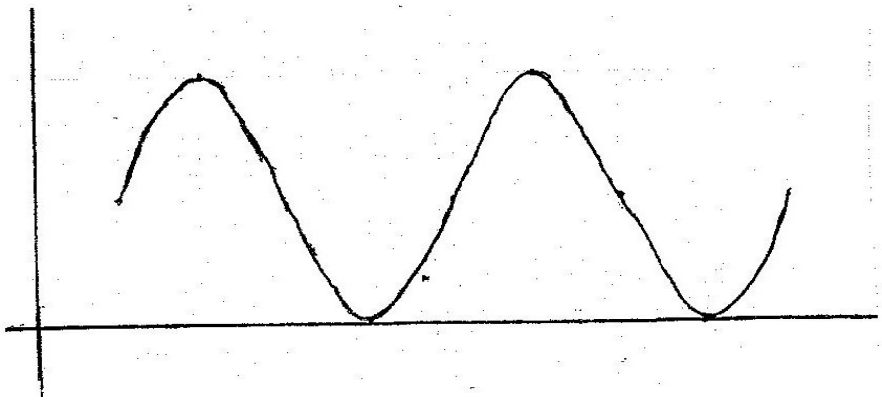
(v) To reduce collisions with air molecules that could lead to ionization

(b) Height = 4 cm
Peak value = 4 x 5
= 20V

(ii) $\frac{2 \text{ wavelength}}{T} = \frac{16 \text{ cm}}{8 \times 20 \times 10^{-3}}$
$= 0.16S$

$f = {}^{1}/_{T} = {}^{1}/_{0.16}$
$= 6.25H_z$

(iii)



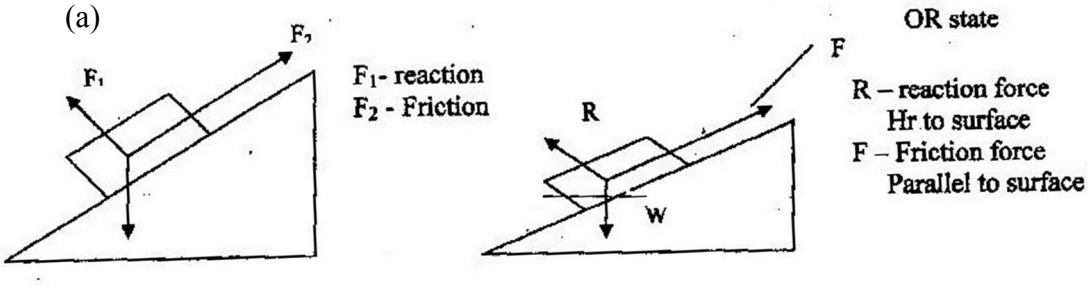
K.C.S.E 2008 EXAMINATIONS
PHYSICS PAPER 1
MARKING SCHEME.

Water $V = \frac{Mw}{I}$ or $MW = \frac{ML}{P}$ $RD = \frac{ML}{ML} = P$

2. For liquid $V = \frac{ML}{P}$ $P = \frac{ML}{MW}$ $P = \frac{ML}{MW}$

$P = \frac{ML}{MW}$

3. (a)



b) R – Increases OR R – Approaches W
F – Reduces F – Reduces

4. - Atmospheric pressure is higher than normal/ standard or boiling was below
- Pressure of impurities

5. When flask is cooled it contracts/ its volume reduces but due to poor conductivity of the glass/ materials of the flask water falls as it contraction is greater than that of glass. (3 mks are independent unless there is contradiction)

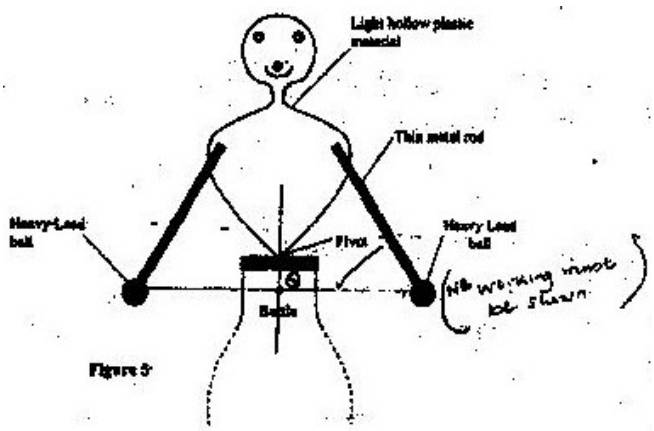
6. Heat conductivity/ rates of conduction/ thermal conductivity (NB: If heat conduction no mark)

7. X sectional area/diameter/thickness/radius

8. $P_1 = pgh$ or $Pr = PA + heg$
$= 1200 \times 10 \times 15 \times 10^{-2}$ $= 8 \times 10^{-4} + 15 \times 1200 \times 10^{-2} \times 10$
$= 1800$ pa $= 8.58 \times 10^4$ pa
Total pressure
$= 8.58 \times 10^4$ pa
(85800pa)

9. - Intermolecular distances are longer/ bigger/ in gas than in liquids
- Forces of attraction in liquids are stronger/ higher/ greater/ bigger/ than in gases

10. (In the diagram)



11. Stable equilibrium
When it is tilted slightly Q rises/ c.o.g is raised when released it turns to its original position

12. This reduces air pressure inside the tube, pressure from outside is greater than inside/ hence pressure difference between inside and outside causes it to collapse.

13. Diameter coils different/ wires have different thickness/ No. of turns per unit length different/ length of spring different.
(x- Larger diameter than Y
Or in one coils are closer than in the other

14. Heated water has lower density, hence lower up thrust

15. (a) Rate of change of momentum of a body is proportional to the applied force and takes in the direction of force.

(b) (i) $S = ut + \frac{1}{2} at^2$
$49 = 0 + \frac{1}{2} \times a \times 7^2$
$a = 2M/S^2$

(ii) $V = u + at$ or $v^2 = u^2 + 2as$
$= 0 + 2 \times 7 = 14m/s$ $v^2 = 02 + 2 + 2 \times 2 \times 49$
$V2 = 14m/s$

(c) (i) $S = ut + \frac{1}{2} gt^2$ either $V^2 = u^2 + 2gs$
$1.2 = 0 + \frac{1}{2} \times 10 \times t2$ $v = u + gt$
$V^2 = 0^2 + 2 \times 10 \times 1.2$

$T = \sqrt{\frac{1.2}{5}} =$ $v = \sqrt{24} = 4.899$

$4.899 = 0 + 10t$
$= 0.49s$ $T = 0.4899s$

(ii) $s = ut$
$u = \frac{8}{} = \frac{2.5}{}$ = 5.10215.103m/s

t 0.49

16. Heat energy required to raise the temperature of a body by 1 degree Celsius/ centigrade of Kelvin

Measurements or
Initial mass of water and calorimeter M_1
Final mass of water & calorimeter, M_2
Time taken to evaporate (M1 – M2), t
Heat given out by heater = heat of evaporation= ML
Pt = (m1 – m2)1
$L = \frac{pt}{M1 - M2}$

(c) (i) = CDT
= 40 x (34 – 25) = 40 x 9 = 360J

(ii) MWCWDT
$100 \times 10^{-2} \times 4.2 \times 10^{3} (34-25) = 3780J$

(iii) MmCMDT
$= 150 \times 10^{3} \times cm\ 6$
= 9.9 cmJ
or sum of (i) and (ii)
360 + 3780
= 4140J

(iv) $150 \times 10^{-3} \times cm \times 66 = 4140$ heat lost = heat gained + heat gained by water

$cm = \frac{4140}{150 \times 10^{-3} \times 60}$

418J/Kgk

9.9 cm = 360 + 3780

$cm = \frac{4140}{0.15 \times 60}$

418J/Kgk

17. (a) Lowest temperature theoretically possible or temperature at which/ volume of a gas/ pressure of gas/K.E (velocity) of a gas is assumed to be zero

(b) Mass/ mass of a gas
Pressure / pressure of a gas/ pressure of surrounding

(c) (i) $4 \times 10^{-5}\ m^3$ /$40 \times 10^{-6} m^3$ / $40 cm^3$

(ii) $-275^0C – 280^0C$

(i) a real gas
Liquefies/ solidifies

(d) $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ but $V_1 = V_2$ If $\frac{P}{T_1} = \frac{P_2}{T_2}$ is used max marks 3

$P_2 = \frac{P_1 T_2}{T_1} = 9.5 \times 104 \times \frac{283}{298}$ $P2 = \frac{P_1 T_2}{T_1}$

$= 9.02 \times 10^4$pa $= 9.5 \times 10^4 \times \frac{283}{298}$

= (90200pa) (90200 pa)
(90.2 x 10^3 pa) (90.2 x 10^3pa)

18. (a) VR = $\frac{\text{Effort distance}}{\text{Load distance}}$

(b) (i) Pressure in liquid is transmitted equally through out the liquid
NB; if term fluid is used term in compressive must be staled
Work done at RAM = work done on the plunger

(ii) P x A x d = P x a x d or vol of oil at plunger = at RAM

A x D = a x d a x d = A x D

$\frac{d}{D} = \frac{A}{a}$ $\frac{d}{D} = \frac{A}{a}$

$VR = \frac{A}{a}$ $VR = \frac{A}{a}$

(c) (i) MA = $\frac{\text{load}}{\text{Effort}}$

$\frac{4.5 \times 10^3}{135}$

= 33. 3 (33 $^1/_3$)

(ii) Efficiency = $\frac{MA}{VR} \times 100\%$ OR efficiency = $\frac{MA}{VR} = 33.3$

$= \frac{33.3}{45} \times 100\%$

= 74%

= 0.74

(iii) % work wasted = 100% - 74%

= 26%

19. (a) When an object is in equilibrium sum of anticlockwise moments about any point is equal to the sum of clockwise moments about that point

(b) (i) V= 100 x 3 x 0.6 = 180cm^3 W = Mg

M = VP
180 x 2.7 = 486 g

OR = Pvg
= $\frac{2.7 \times 3 \times 0.6 \times 100 \times 10}{100}$

W = Mg
$\frac{486}{1000}$ x 10
= 4.86 N

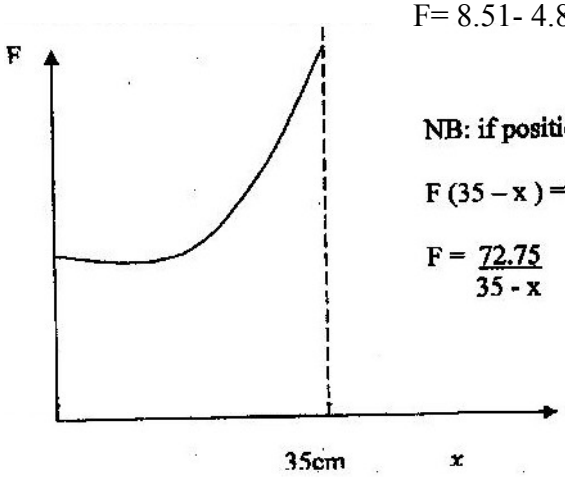
= 4.86N

(ii) Taking moments about F pivot; 20F = 15 x 4.86
F = $\frac{15 \times 4.86}{20}$ = 3.645

Or
F = taking moments about W, 15R = 35F – (i)
F + W = F = R – 4.86 – (ii) substitute
F = R – 4. 86 ---- 1
F = 3.645N

OR
Taking moments about F = 20R = 4.86 x 35
R = 8.51 and F = R – W
F= 8.51- 4.86 = 3.645N

(iii)



NB: if position of W is constant

F (35 – x) = 4.86 x 15

F = $\frac{72.75}{35 - x}$

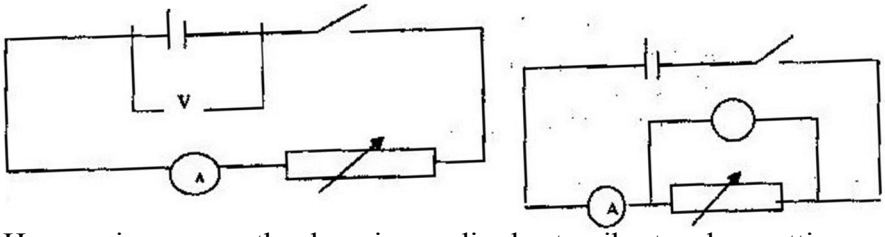
(iv) As x increase/ anticlockwise moments reduces/ moments to the left reduces/ distance between F and pivot reduces F has to increase to maintain equilibrium

K.C.S.E 2008 MARKING SCHEME
PHYSICS PAPER 2

1. BC - Total absence of light; umbra, completely dark
   - Total darkness
   Rays are completed blocked from this region by the object

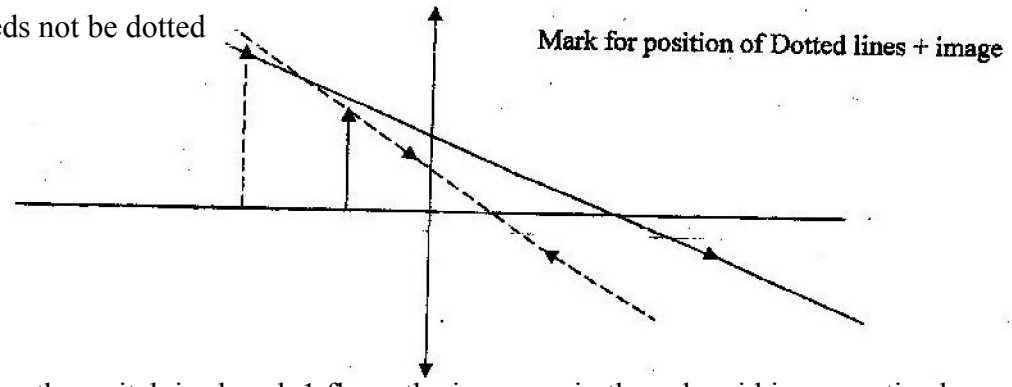
2. Leaf in A falls a bit while leaf in B rises a bit
   The two leaf electroscope share the charge

3. Correct circuit.



4. Hammering causes the domains or dipoles to vibrate when setting, some domains themselves in the N- S – direction due to the earth's magnetic field causing magnetisatioa.

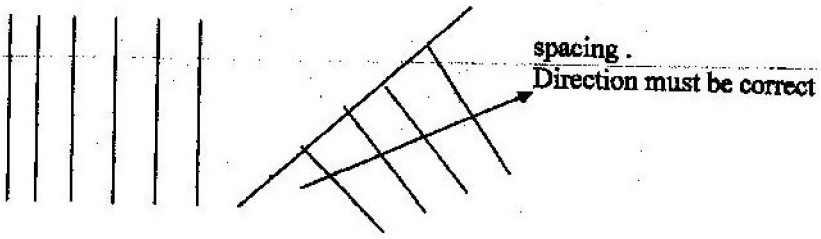
5. Needs not be dotted



6. When the switch is closed, 1 flows the iron core in the solenoid is magnetized attracting the flat spring this causes a break in contact disconnecting current.
   Magnetism is lost releasing the spring
   - Process is repeated (make and break circuit)

7. Movement equals 1.75 oscillations
   $T = {}^{0.7}/_{1.75}$
   = 0.4 sec
   $F = {}^{I}/_{T}$
   $= {}^{1}/_{0.4}$ = 2.5 HZ.

8.



9. (i) V = O volts

Reason No current

(ii) V = 3 volts
Current flows in the resistors

10. $P = V^2/R$ $P = 220\wedge2/240\wedge2/100$

$R = \frac{240^2}{100}$
$= 84$ J/S

11. Short sightedness/ myopia
Extended eyeball/ lens has short focal length/ eye ball too long any two

12. Spot moves up and down

13. Frequency increases
Accept Becomes hard
Wavelength decreases
Strength / quality

14. Beta particle
Gain of an electron OR
Mass number has not changed but atomic number has increased by 1
Atomic number has increased by one
Nature will not affect the speed

15. (a) Temperature
Density
(b) Graph
(i) 46.5 m accept 46 m to 47 m

(ii) $T = \frac{4x}{V}$
$V = \frac{4x}{t}$ or slope $= \frac{4}{v}$

$= \left(\frac{0.51}{43}\right)^{-1}$

$= V = 43 \times 4/0.51 = 337$ m/s

(iii) For max internal observer is at one end and so the distance = 2L
337 x 4.7 = 2L
L= 792 M
(c) (i) Distance moved by sound from sea bed = 98 x 2 m
V= 98 x 2

$\frac{0.14}{}$
= 1400M/S

(ii) Distance = v x t
1400 x 0.10/2
= 70m

16. (a) Light must travel from dense to less dense medium
Critical angle must be exceeded (< i > c)

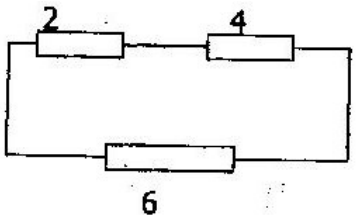
(b) 1 n 2 = $\frac{\text{Sin i}}{\text{Sin r}} = \frac{\text{Sin I}}{\text{Sin r}}$
= $\frac{\text{Sin 90}}{\text{Sin }\theta}$ OR = $\frac{\text{Sin }\theta}{\text{Sin 90}}$
= $\frac{\text{I}}{\text{Sin }\theta} \quad \frac{\text{I}}{\text{n}}$
= $^{1}/_{\sin\theta}$

(c) (i) At greatest angle θ, the angle must be equal to critical θ angle of the medium
Sin θ = sin c
= ½
= 1/1.31 = 0.763 $\theta = 49.8^0$
Angle < 49.8^0

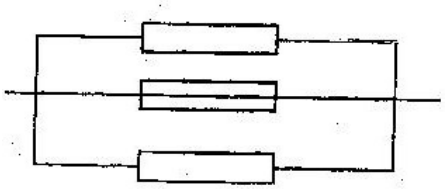
(ii) $X = 90^0 - \theta$
$= 40.2^0$

(iii) Sin θ/ sin X = 1.31
Sin θ = 1.31 sin 40.2^0
$= 0.846^0$
$= \theta = 57.8^0$

17. (a) (i)



(ii)



(b) (i) Open circuit p.d = 2.1 v

(ii) Different in p.d = p.d across

$2.1 - 0.8 = 0.1\ r$
$0.3 = 0.1\ r$
$r = \frac{0.3}{0.1}$
$= 3n$

(iii) When I is being drawn from the cell, the p.d across the external circuit is the one measured
$01 \times R = 18$
$R = {}^{1.8}/_{0.1}$
$= 18\ n$

18. (a) Flux growing/ linking
No flux change
Flux collapsing

Switch closed: Flux in the coil grows and links the other coil inducing an E.M.F
Current steady: No flux change hence induced E.M.F
Switch opened: Flux collapses in the R.H.S coil inducing current in opposite direction

(b) (i) Reduces losses due to hystesis (or magnetic losses)
Because the domain in soft- iron respond quickly to change in magnetic (or have low reluctance) i.e easily magnetized and demagnetized.

(ii) Reduces losses due to eddy current
Because laminating cuts off the loops of each current
Reducing them considerably

(c) (i) $\frac{V_P}{V_s} = \frac{N_P}{N_s}$ $P = I_s V_s$
$I_s = \frac{800}{40}$
$\frac{400}{Vs} = \frac{200}{200}$
$Vs = 40$ Volts $= 20A$

(ii) $P_p \quad P_s$
$800 = 400\ I_p$
$I_p = \frac{800}{400}$
$= 2A$

19. (a) (i) Hard X – Rays
(ii) They are more penetrating or energetic

(b) (i) A cathode rays/ electrons/ electron beam

B Anode/ copper Anode

(ii) Change in P.d across PQ cause change in filament current
OR temperature of cathode increases
This changes the number of electrons released by the cathode hence intensity of X- rays

(iii) Most of K.E is converted to heat

(iv) High density

(c) Energy of electrons is = QV= ev
$= 1.6 \times 10^{-19} \times 12000$

Energy of X- rays = Hf
$= 6.62 \times 10^{-34} xf$

$6.62 \times 10^{-34} \times f = 1.6 \times 10^{-19} \times 12000$

F = 1.6 x 10- 19 x 12000
6.02 x 10^{-3f}

$= 2.9 \times 10^{18}$Hz

Accept ev = Gf
$F = {}^{ev}/_{g}$

K.C.S.E PHYSICS YEAR 2009

1. Volume run out= 46.6 cm^3

   Density = $^m/_v$ = 54.5 / 46.6 = 1.16953

   = 1.17g/ cm^3

2. $T^2 = 4 \Pi \, ^{2L}/g$

   $= 1.7^2 = \frac{4 \Pi^2 \times 0.705}{g}$

   $g = 9.63 m/s^2$

3. Needle floats due to the surface tension force

   Detergents reduces surface tension, so the needle sinks

4. When equal forces applied, pressure on B is greater than on A due to smaller area./ pressure differences is transmitted through to liquid causing rise upward. Force on A is greater than hence upward tension.

5. Molecules inside warm water move faster than in cold water. For Kinetic energy in warm water is higher than in cold water/ move with greater speed/ molecules vibrate faster in warm water.

6. Prevents/ holds, traps breaks mercury thread/ stops return of mercury to bulb when thermometer is removed from a particular body of the surrounding

7. Dull surface radiate faster than bright surface

   P- Looses more of the heat supplied by burner than Q OR

   Q shinny surface is a poorer radiator/ emitter of heat thus retains more heat absorbed

   Or

P- Dull surface is a better radiator/ emitter i.e. retains less of the heat absorbed. (there must be a comparison between P & Q)

8. Heat travels from container to test tube by radiation so the dull surface P, gives more heat to the test tube.

9. Center of gravity located at the intersection of diagonals

10. Parallel

F= 2 ke

40= 2 x ke

$E_1 = {}^{40}/_{2k} = {}^{20}/_{k}$

Single = $f= ke_2$

$20 = ke_2$

$E_2 = 20/k$

$E_T = e_1 + e_2$

$20 = 20 /k + 20/k$

$20 k = 40$

$K= {}^{40}/_{20} = 2N/cm$

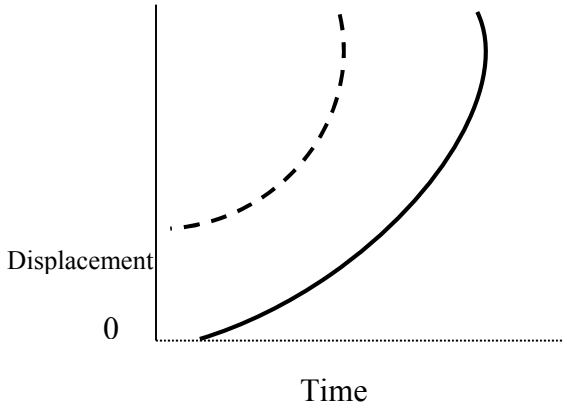
OR Extension of each spring = 10

K = 20N/ 10 cm

- 2N/ cm

11. Air between balloon is faster that than outside so there is pressure reduction between.

12.



13. The lowest temperature possible/ Temp at which ideal gas has zero volume (Zero pressure) or molecules have zero / minimum energy OR

Temperature at which a gas has min internal energy/ zero volume

14. V= r x 21 OR T = 1/33 = 0.030303

= 0.08 x 21 V 33m/s T = 2V / w =

= 16.6m/s w = 2v/0.0303 = 207.525

V= rw

0.08 x 207. 5292

= 16.5876m/s

SECTION B (55 MARKS)

15. (a) - Pressure

- Dissolved impurities

(b)

(i) BPt = 78^0C

(ii) (I) Δt = 4.5 min

Q = pt = 50 x 4.5 x 60J

= 13500J

(II) Q = 70 - 16 = 54^0C *(accept 54 alone or from correct working)*

(III) Q = MC $\Delta\theta$

C= $\frac{13500J}{0.1kg \times 54k}$

= 2500J/ kj

(iii) Δ t = (7.3 – 6.8) min = 30s

Q = pt = ml = 30x 50J

L= $\frac{30 \times 50}{0.18}$ = 83.33 x 10^5J/kg

16. (a) Efficiency = $\frac{\text{work output}}{\text{Work input}}$ x 100% (equivalent)

OR Ratio of work output to work input expressed as a percentage

(b) (i) work effort = F x S

= 420 N x 5.2 N

2184J

(ii) Distance raised = 5.2 sin 25 = 2.2 m (2.1976)

Work done = 900N x 2.2 m

= 1980J

(iii) Efficiency = work output x 100% = $\frac{1980}{2184}$ x 100
Work input

= 90.7%

17. (a) A floating body displaces its own weight of the fluid on which it floats

(b) (l) w = T + U

(ii) Vol = 0.3 x 0.2 x 0.2m^3

Weight = mg = 0.3 x 0.2 x 0.2 x 10500 kg/m^3 x 10

= 1260N

(iii) Vol of liquid = vol of block

Weight of liquid displaced = Vpg

0.3 x 0.2 x 0.2 x 1200 x 10N

= 144N

(iv) T = w - u

1260 – 144N

1116N

(c) Weight of solid = weight of kerosene displaced

= 800 x 10 x 10^{-6} x 10 = 0.08 N

Mass = 0.008 kg

Vol = 50 cm^3 Density $^{m}/_{v} = {}^{0.008}/_{50 \text{ x } 106 \text{ m}^3}$

18. (a) The pressure of a fixed mass of an ideal gas is directly proportional to the Absolute temperature if the volume is kept constant.

(b)

(i) Volume increases as bubble rises because the pressure due to liquid column is lowered; therefore the pressure inside bubbles exceeds that of outside thus expansion.

(ii) (I) Corresponding pressure = 1.88×10^5 Pa

(II) $I/v = 1/1.15 = 0.87\ cm^{-3}$

(iii) $\Delta P = (1.88 - 0.8) \times 10^5$ pa = 1.08 x 105 Pa

$\Delta P = \ell gh = \ell \times 0.80 \times 10$

$$P = \frac{1.08 \times 10^5\ kg/m^3}{0.80 \times 10}$$

$= 13500\ kg/m^3$

(iv) Pressure at top = atmospheric

0.8×10^5 pa

c. $p_1v_1/T_1 = p_2v_2/T_2$ $= \frac{2.7 \times 10^5 \times 3800}{298} = \frac{2.5 \times 10^5 \times v_2}{288}$

$25^0C = 298$ k $= 3966\ cm^3$

$15^0c = 288k$

19. (a) Rate of change of angular displacement with time
Acc. Without (rate)

(b)

(i) Mass, friction, radius (any two)

(ii) Oil will reduce friction since frictions provide centripetal force; the frequency for sliding off is lowered.

(c) $v^2 = u^2 + 2$ as

$= 0 + 2\ (0.28)h$

$V = \sqrt{0.56 \times 1.26}$

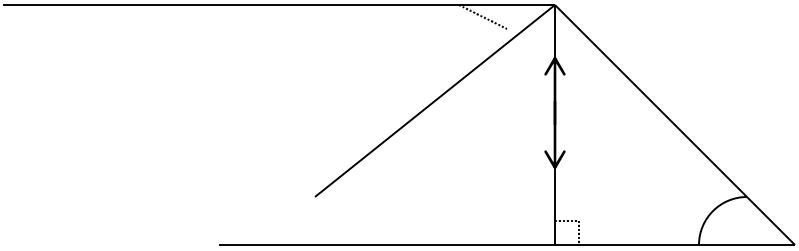
$= rw$

$= 0.84 = 0.14 \times w = \frac{0.84 = 6}{0.14}$ rad s

PHYSICS PAPER 2 YEAR 2009

SECTION A

1. Infinite (very many, uncountable, several

2. 

3. Negative change

4. Allow gassing/ release of gases

   OR, release H_2 and O_2 produced at the electrodes

5. Increase the magnitude of l

   Increase the number of turns per unit length

   Use of U shaped iron core

6. F = 0.5 sec

   F = 1/T

   = 1/0.5

   = 2 Hz

7. $1.33 = 3/v \times 10^5$

   $V= 3 \times 10^5$

   1.33

   $= 2.26 \times 10^8$ m/s

8. T = lA

9. (L-q) cm

10. (i) Movement of magnet causes flux linkage to change

E.M.F is produced in the cell.

(ii) When 1 flow from Q to P, a N. pole is created which opposes the approaching pole (long's law).

11. Increases in P d increases 1 in filament OR. Increase in P d increases heating effect this produces more electrons by Thermionic Emission.

Hence results on more intense x - rays

12. $^{2d}/_{05} = {}^{2d}/_{0.6} + 34$ OR $V = {}^{d}/_{t}$

$D = 17/0.2 = 85$ m $= \frac{17 \times 2}{0.1}$

Speed $= \frac{2 \times 86}{0.5}$ $= 340$ m/s

$= 340$m/s

13. Diode in (a) is forward biased while in 6 (b) is reversed biased Or Battery in 6 (a) enhances flow of e. across the barriers while in 6 (b) barriers potential is increased.

SECTION B (55 MARKS)

14. (a) Capacitances decreases

Area of the overlap decreases

(b)

(i) Parallel, $Cp = 5 + 3 = 8$ pf

Whole circuit ¼ + 1/8

$C = {}^{32}/_{12} = 2.6 +$ Pf

(ii) $Q = CV$

$= 8/3 \times 12$ PC

$= 32$ PC

(iii) $B = Q/C$ OR $Q_B = {}^{5}/_{8} \times 32$

$= \frac{32 \times 10^6}{8 \times 10^6}$

$= 4$ V

$= 20$ PC

$V_B = \frac{20 \times 10^{-6}}{5 \times 10^{-6}}$

$= 4$V

15. (a) Increase in 1 causes rise in temp

Rise in temp causes rise in R

(b) R = v/l

$\frac{2.5}{1.2}$

$= 2.1\ \Omega$

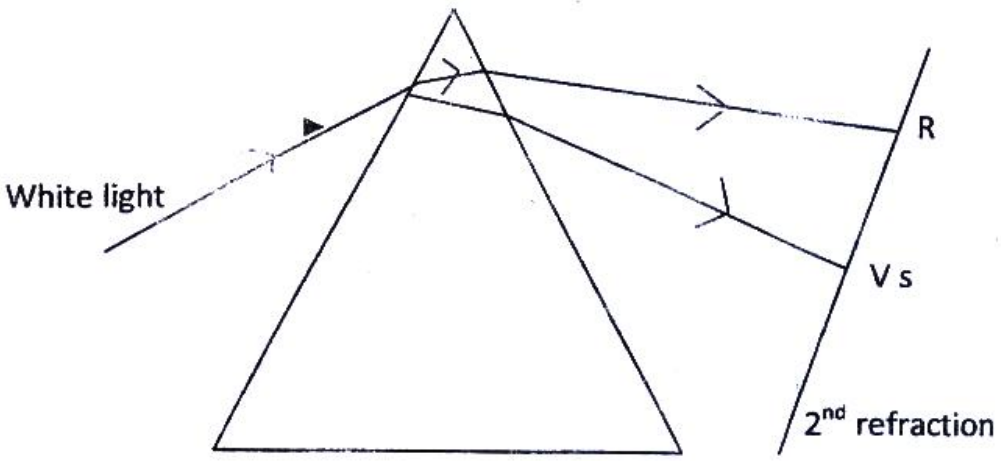
(c) Read off P d across Y = P.O.V from graph

(d) Power P = IV

$= 0.8 \times 3$

2.4 watts

16. (a) (i)



(ii) Highest reading near red light

Red light has more heat than violet OR

Red light is close to ultra red which has more heat energy

(b) Depth = 11.5 – 3.5 = 8.0 cm

$= \frac{11.5}{8} = 1.4375$

17. (a) β = particle

(b) (i) Ionizes attracted towards electrodes

Collusions with other molecules cause avalanche of ions which on attraction to the electrodes causes the discharge.

(ii) are attracted towards electrodes

Collusion with other molecules causes avalanche are of ions which on attraction to the electrodes causes

(c) (i) x = 36

Y = 92

(ii) Small, decreases in mass

Loss of mass

Mass defec

(iii) Each of the neutrons produced at each collision further collision with Uranium atom causing chain reaction.

18. (a) (l) Electrons are emitted from Zn plate

Reduced of charge on the leaf

(ii) Any electron emitted is attracted back to the electroscope

(iii) Photons of infra red have to lower f than U – V have energy to eject to the electrons.

(b) (i) Number of electrons emitted will increases

(ii) Max K.E of the emitted electrons will increase

(c) (i) $V = \lambda f_0$

$F_0 = \frac{3.0 \times 10^8}{8.0 \times 10^{-7}}$

$= 3.75 \times 10^{14}$ Hz

(ii) $W = hf_0$

$= 6.63 \times 10^{-34} \times 3.75 \times 10^{14}$
$= \underline{2.49 \times 10^{-19}}J = 1.55$ e V
$\times 10^{-19}$

(iii) $KE_{MAX} = hf - hf_0$

$= h (8.5 - 3.75) \times 10^{14}$

$= 6.63 \times 4.75 \times 10^{14}$

$= 3.149 \times 10^{-19}$ joules

$= 1.96828$ e

19. (a)

(i) Attach two identical dippers to the same vibrator, switch on and the circular waves produced OR

Use one straight vibrator with two identical slits to produce coherent waves.

(ii) Constructive - Bright

Destructive – Dar

(b) C I –Two waves arrive at a point in phase

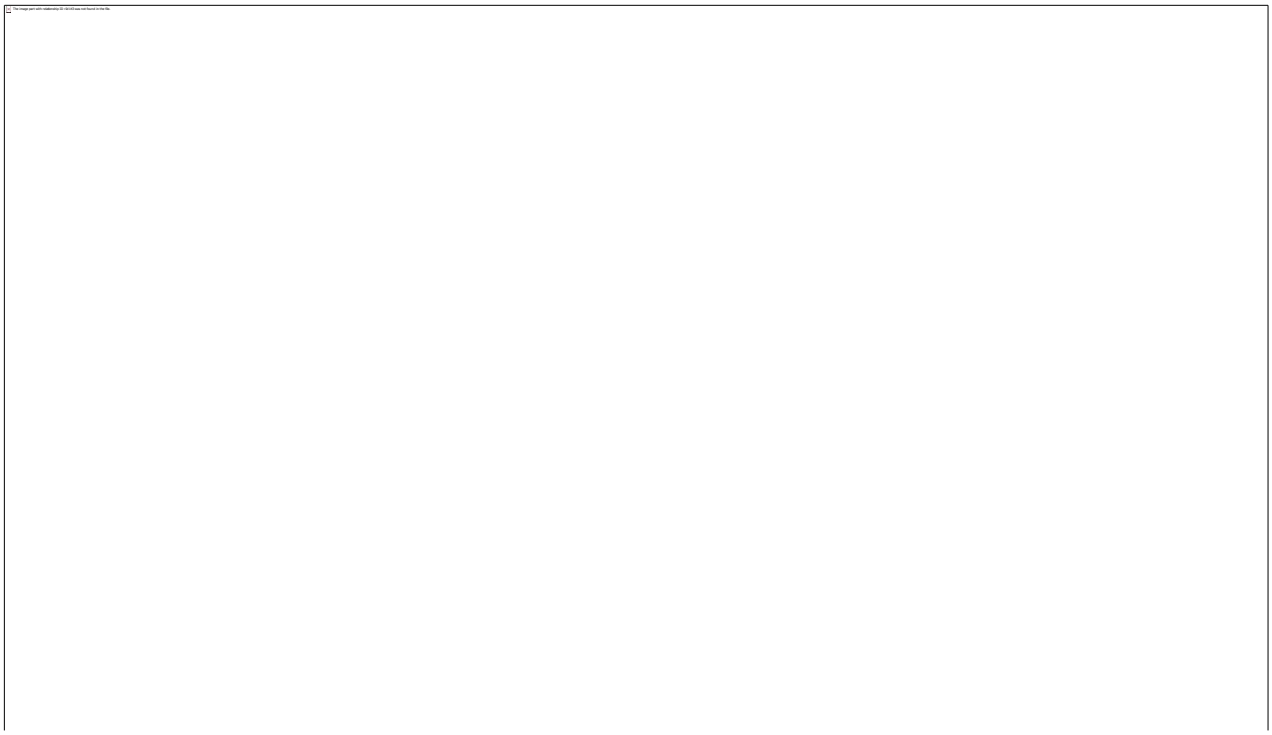
DI – Crest meets a trough and gives a zero intensity

- Path diff is ½ odd number of λ

PHYSICS YEAR 2010 PAPER 1
SECTION A (25 MARKS)

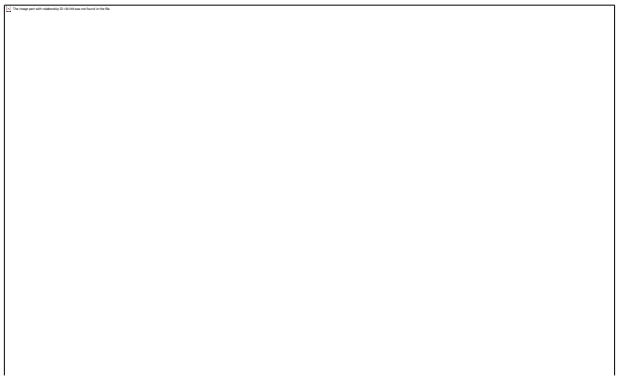
Answer all the questions in this section in the spaces provided.

1. Figure 1 shows a vernier callipers being used to measure the internal diameter of a tube



Record the diameter of the tube. (1 mk)
1.62cm / 1.62

2. A stopwatch started 0.50s after the start button was pressed. The time recorded using the stopwatch for a ball bearing falling through a liquid was 2.53s. Determine the time of fall. (1 mk)
   - 2.53 + 0.5 = (working must be shown)
3. Some water in a tin can was boiled for some time. The tin was then sealed and cooled. After sometime it collapsed. Explain the observation. (2 mks)
   - Air (molecules) expelled by heating
   - Pressure inside is less that atmospheric pressure
4. A paper windmill in a horizontal axis was paled above a candle as shown in figure 2.



When the candle was lit the paper windmill begun to rotate. Explain this observation (2 mks)
- Flame heats air which/becomes less dense (expands) /and move upwards expand

- This will push the blade upwards/creates convection currents hence rotate.

5. When liquid is heated in a glass flask, its level at first falls, then rises. Explain this observation.(2 mks)
   - Flask which is in intact with heat expands first
   - Liquid expands more than glass.

6. Figure 3 shows a uniform metre rule pivoted at the 30cm mark. It is balanced by a weight of 20 suspended at the 5cm mark.

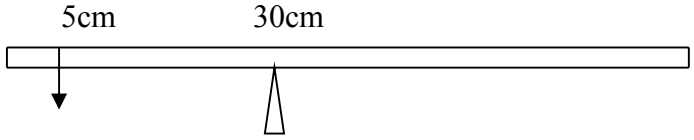


Figure 3

Determine the weight of the metre rule

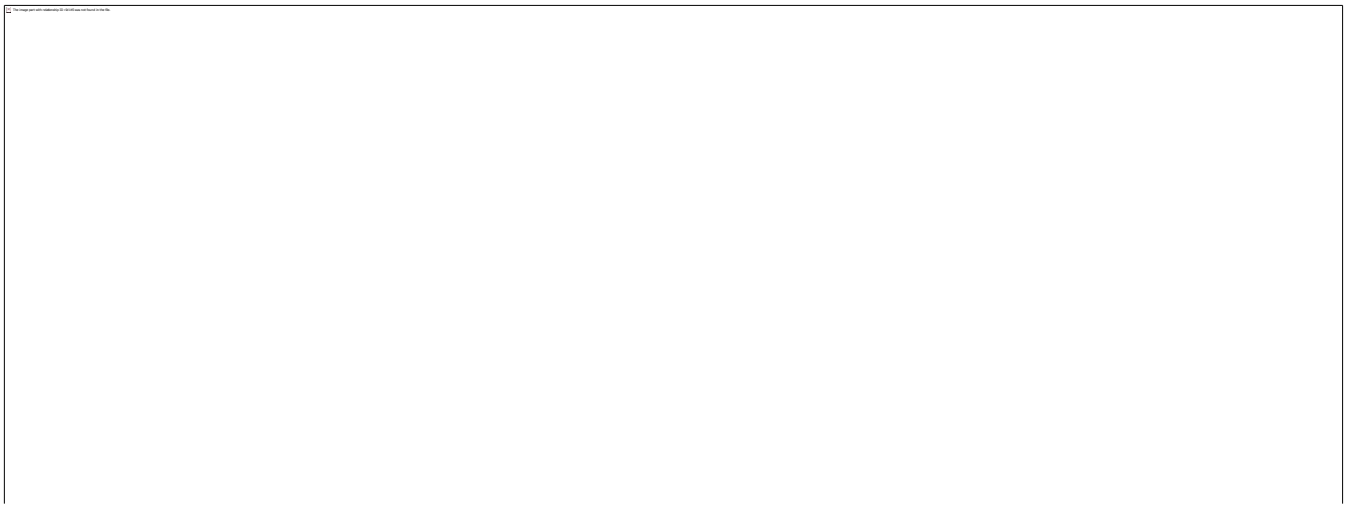
Clockwise moments = anticlockwise moments } either

OR $W_1d_1 = w_2d_2$ / $f_1d_1 = F_2d_2$

W x 0.2 = 2 x 0.25

W = 2.5N

7. Figure 4 shows a horizontal tube with two vertical tubes x and y. Water flows through the horizontal tube from right to left. The water travel in tube x is higher than water level in tube y.



Explain this observation

- Water flows faster in Y than X hence pressure is lower at Y than X

(i.e 1st mark - compare velocity)

2nd - compare pressure

8. A cart of mass 30kg is pushed along a horizontal path by a horizontal force of 8N and moves with constant velocity. The force is then increased to 14N. Determine

   a) The resistance to the motion of the cart. (1 mark)

- 8N

b) The acceleration of the cart. (2 mks)

14 - 8 = 30n or F = ma

$a = {}^{6}/_{30} = 0.2m/s^2$

9. When a drop of aloeic acid of known volume is dropped on the surface of water in a large trough, it spreads out to form a large circular patch. State one assumption made when the size of the molecule of aloeic acid is estimated by determining the area of the patch. (1 mark)

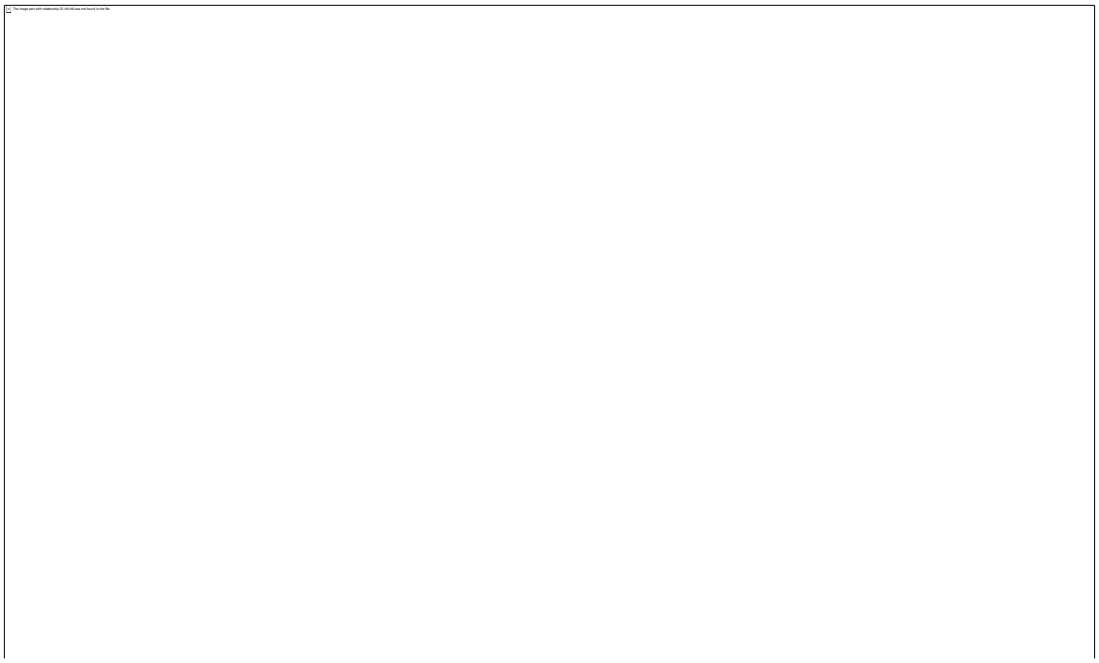
   - Patch is one molecule thick or monolayer

10. The weight of a solid air is 50N. When it is fully immersed in a liquid of density 800Kg m^3 its weight is 4.04N.
    Determine:
    i) The upthrust in the liquid (1mk)
       u - 5.0 - 4.0 (working must be shown)
       u = 0.96N

    b) The volume of the solid. (2 mks)
       Weight of liquid displaced = 0.96N
       Mass of liquid displaced = 0.096kg
       $V = {}^{M}/_{P} = {}^{0.096}/_{800} = 1.2 \times 10^{-1}m^3$
       $1.2 \times 10^{2}cm^3$
       $120cm^3$

11. When a bicycle pump was sealed at the nozzle and the handle slowly pushed towards the nozzle, the pressure of the air inside increased.
    Explain this observation. (1 mk)
    - Volume decreases so more collisions per second.

12. Figure 5 shows a mass of 200g connected by a string through a hollow tube to a mass of 0.5kg. Teh 0.5kg mass is kept stationary in the air by whirling the 200g mass round in a horizontal circle of radius 1.0 metre.



Determine the angular velocity of the 200g mass. (3 marks)

$F = mw^2r = mg$ **Or** $F = {}^{mv2}/_{v}$ but $V = wr$

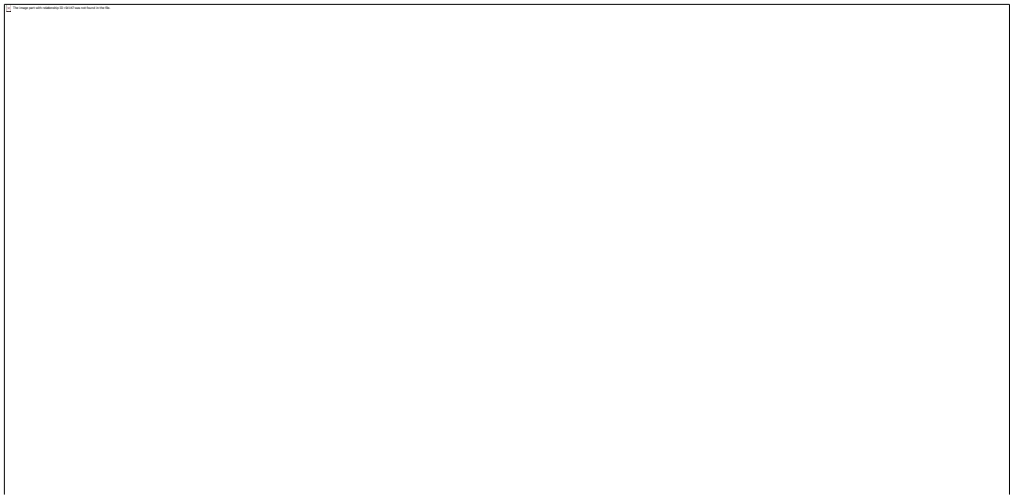
$0.2 \times 1 \times w^2 = 0.5 \times 10$ $w^2 = {}^{f}/_{mr} = {}^{0.5 \times 10}/_{0.2 \times 1}$

$w^2 = {}^{5}/_{0.2}$ $w = 5$ rad/s

$w = \sqrt{2.5} = 5$ rad/s

13. State the SI unit of a spring constant (NB in words) (1 mk)
    - Newton per mete

14. Figure 6 shows an athlete lifting weights while standing with the feet apart.



Explain why standing with the feet apart improves an athlete's stability. (1 mk)

- Increases the base area or lowers the centre of gravity

SECTION B(Marks)

Answer all the questions in their section in the spaces provided

15. a) A cyclist initially at rest moved down a hill without pedalling. He applied brakes and eventually stopped. State the energy changes as the cyclist moved down the hill. (1 mk)

Potential energy - Kinetic energy - heat + sound (sound not a must)

b) Figure 7 shows a mass of 30kg being pulled from point P to point Q with a force of 200N parallel to an inclined place. Teh distance between P and Q is 22.5m. In being moved from P to Q the mass is raised through a vertical height of 7.5m.

i) Determine the work done:

I by the force (2mks)

work done by force = fd = 200 x 22.5

= 4500J

II on the mass (2 mks)

= mgh = 30 x 10 x 7.5

= 2250J

III to overcome friction (2 mks)

Work done by force - work done on mass = 4500 - 2250

= 2250J

ii) Determine the efficiency of the inclined plane. (2 mks)

eff = work output x 100% **OR** eff = work output

work input work input

$^{2250}/_{4500}$ x 100% = 50% $^{2250}/_{4500}$ = 0.5

i.e eff - $^{MA}/_{VR}$ x 100% = $^{1.5}/_{22.5}/_{7.5}$ x 100% = 50

c) Suggest one method of improving the efficiency of an inclined plane. (1 mk)

- Reduce friction by use of rollers/smoothening (polishing/oiling surface
- Method of reducing friction must be stated.

16. In an experiment to determine the density of sand using a density bottle, the following measurements were recorded:
Mass of empty density bottle - 43.2g
Mass of density bottle full of water = 66.4g
Mass of density bottle with some sand = 67.5g
Filled up with water = 82.3g

Use the above data to determine the:

a) Mass of the water that completely filled the bottle: (2 mks)
= 66.4 - 43.2
= 23.2g

b) Volume of water that completely filled the bottle: (1 mk)
$^{23.2g}/_{1gcm^3} = 23.2cm^3$
(Nb: working must be shown)

c) Volume of the density bottle: (1 mk)
$23.2cm^3$

d) Mass of sand
(67.5 - 43.2) g - 24.3g (working must be shown)

e) Mass of water that filled the space above the sand. (1mk)
82.3 - 67.5 = 14.8g (working a must)

f) Volume of teh sand:
Volume of the sand = volume of bottle - volume of added water
= 23.2 - 14.8
= 8.4cm3

g) Density of the sand (2 mks)
P = M/V = 24.3g = 2.893cm3
8.4cm3
(NB: at least 2 dec places)

17. a) Explain why it is advisable to use the pressure cooker for cooking at high attitudes(2 mks)
- At high attitudes pressure is low so boiling point is low
- So pressure cooker pressure inside it which raises boiling point
- Pressure inside the cooker is higher raising the boiling point.

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 100^0C. (Take specific heat capacity of water $4200jkg^1K^{-1}$. Heat capacity of the kettle = 450JK-1, Specific latent heat of vaporization of water = 2.3mjkg-1)

Determine

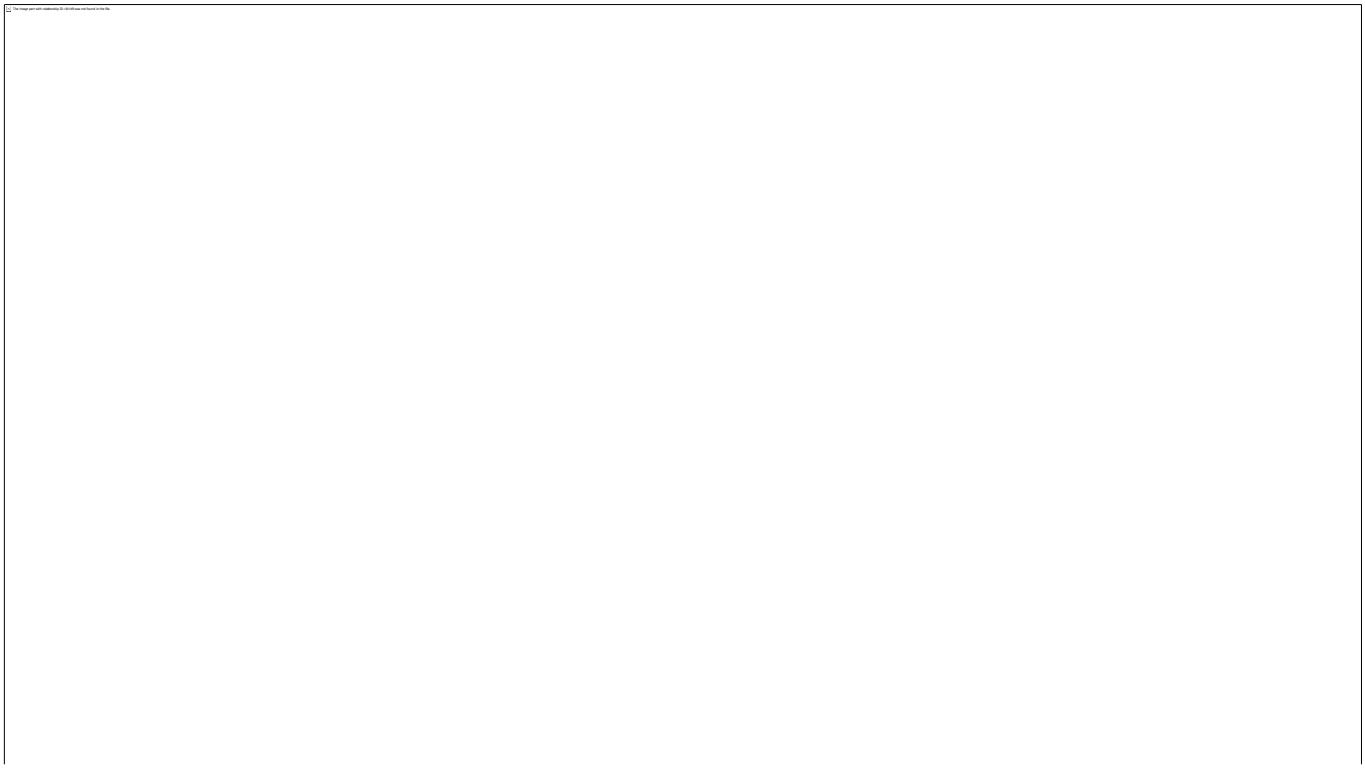
i) The heat absorbed by the water. (1 mk)
Q = McΔθ or Mcθ or McΔT
= 3 x 4200 x 80 = 1008000J

ii) Heat absorbed by the electric kettle (2 mks)
Q = cθ / cΔθ / cΔT = 450 x 80
= 36000J

iiii) The time taken for teh water to boil (2 mks)
PL = McΔθ / cΔθ t = 34.8J
3000t = 1008000 + 36000
3000t = 1044000

iv) How much longer it will take to oil away all the water. (2 mks)
Mlv = Pt **OR** Mlv = Pt
3 x 2.3 x 10^6 = 3000t 3 x 2.3 x 10-3 = 3000t
t = 2300s t = 2.3 x 10^{-6}s
(38.3 minutes)

18. Figure 8 shows a stone of mass 4.0kg immersed in water and suspended from a spring balanced with a string. The beaker was placed on a compression balance whose reading was 85N. The density of the stone was 3000kg-3 while the density of the liquid was 800kg^{-3}.



Determine the:

a) Volume of the liquid displaced. (2 mks)
V = m/p or V = 4/3000
$V = 1.33 \times 10^{-3} m^3$
(at least 2 dec places)

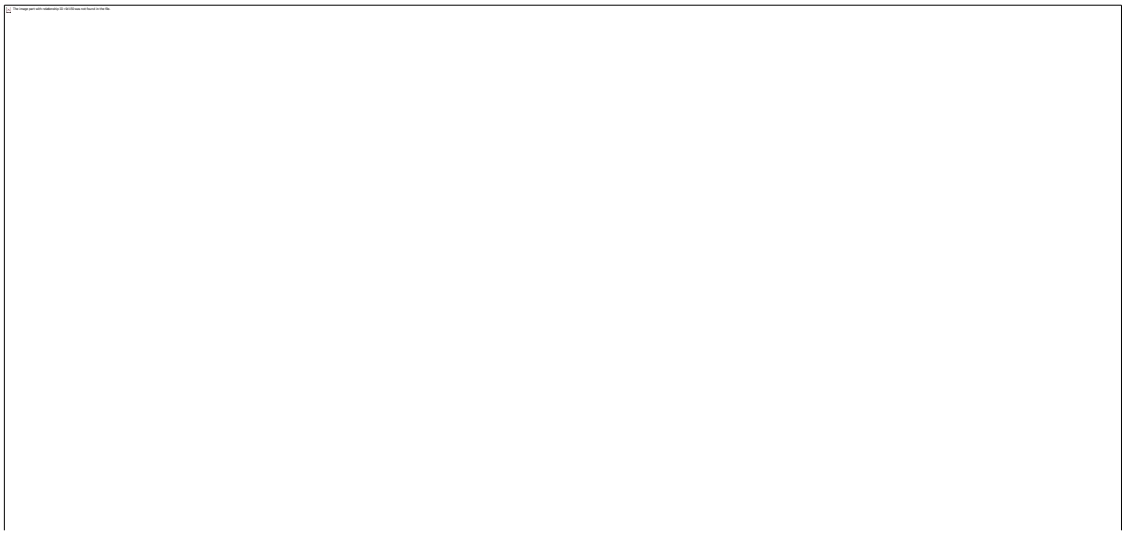
b) Upthrust on the tone (4 mks)
Upthrust = weight of liquid disp = vpg
$= 800 \times 1.33 \times 10^{-3} \times 10$
= 10.64N

upthrust = weight of liquid displaced = vpg
$= 1000 \times 1.33 \times 10^{-3} \times 10$
= 13.33N

c) Reading of the spring balance: (2 mks)
Weight of stone air = 4 x 10 = 40N
Reading of spring balance = 40 - 10 64 = 29.36N
40 - 13.33 = 26.67N

d) Reading of the compression balance when the stone was removed from the water. (2mks)
85 - 10.64 = 74.36N or 85 - 13.33 = 71.76N

19. a) Figure 9 shows a velocity-time graph for the motion of a certain body.



Describe the motion of the body in the region.

i) **OA** (1 mk)
Body moves with constant acceleration
Increasing velocity
or velocity increasing uniformly with time.

i) **AB** (1 mk)

Bodies moving with / decreasing or reducing /acceleration

iii) **BC** (1 mk)
Constant (uniform) velocity / zero acceleration

b) A car moving initially at $10ms^{-1}$ decelerates at $2.5ms^{-2}$
i) Determine
I its velocity after 1.5s:
$V = u + at$ } either
$V = 10 - 2.5 \times 1.5$ }
$V = 6.25m/s$

II the distance travelled in 1.5s (2 mks)
$S = ut + {}^1/_2at^2$
$S = 10(1.5) - {}^1/_2(2.5)(1.5)^2 = 12.1875m$
$= 12.19m$

III the time taken for the car to stop (2 mks)
$V = u + at$
$0 = 10 - 2.5t$
$t = {}^{10}/_{12} = 4s$

ii) Sketch the velocity-time graph for the motion of the car up to the time the car stopped. (1 mk)

iii) From the graph, determine the distance the car travelled before stopping. (2 mks)
Distance = Area of triangle
$= {}^1/_2 \times 4 \times 10 = 20M$
or
$S = ut + {}^1/_2 at^2$ a = gradient = -2.5m/s
$S = 10 \times 4 - {}^1/_2 \times 2.5 \times 4^2$
$S = 40 - 20$
$S = 20m$

or
S = average velocity x time
$= \frac{(10 + 0)}{2} 4$
$= 20m$

K.C.S.E YEAR 2010 PAPER 2 MARKING SCHEME

1. - Reflected ray rotates 2 x 20 = 20°. ✓1
   - Find deviation = (80° + 20°) = 100°✓1
2. - Any slight deviation of the N-pole to the right✓1

3. - Correct poles. ✓1 Correct direction + pattern✓1

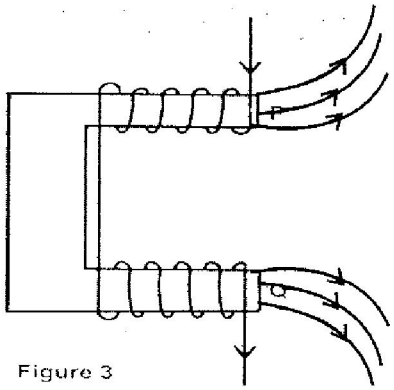


Figure 3

4. Initially attracted because of opposite charge. ✓1 (+ve or –ve)
   Then neutralised and charged positive and hence repel✓1.
   Charging by contact and law of electrostatics. ✓1

5. - Distance = 2f = 2 x 25✓½ = 50cm. ✓½
   Alternative
   Just 50cm✓1
   Or
   2 x 25 = 50cm✓½
   Or

6. Implies low current✓1 So reduces✓1 heat losses/ power loss. Or
   I^2R loss reduced.
   $P = I^2R$ should be accompanied by power loss
   NB: Heat losses/ Power Loss

7. - More practice/ relationship between f and t.

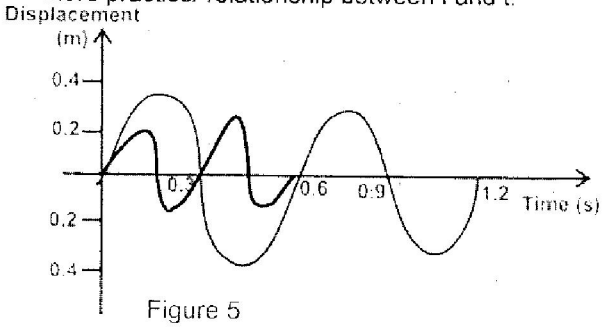


Figure 5

8. $V_1 = fT_1$ or $\eta = \frac{T_1}{T_1}$ ✓1
   $V_2 = fT_2$ $\eta = \frac{18}{14.4}$ ✓1 = 1.25✓
   Accept all expression.

9. $20g \xrightarrow{5} 10g \xrightarrow{5} 5g \xrightarrow{5} 2.5g \xrightarrow{5} 1.25g$ ✓2
   Mass remaining

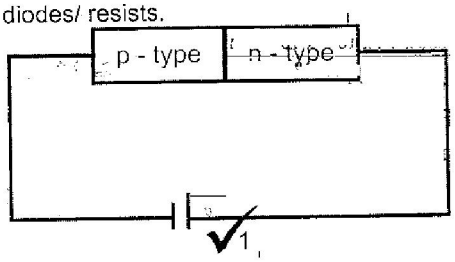
10. I_O – Initial current $I_2 = 7I_O$
    $P = I^2R = I_O^2R$✓1 $P = (7I_O)^2R = 49I_O^2R$ ✓1
    Power is 49 times the initial value✓1
    Apply the power formula.

11. Motion out of paper/ moves upwards. ✓1
    Or Increases in p.d increases heating effect.

12. Increasing the accelerating voltage✓1 OR
    Increase the P.d between anode and cathode.
    Accept extra high tension increased.

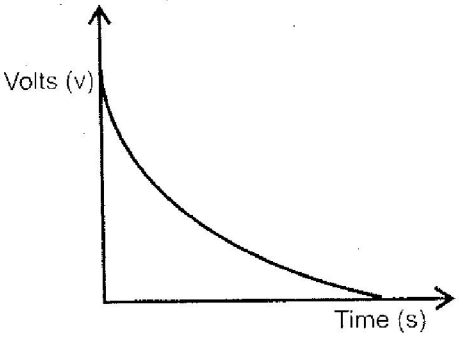
13. $f = \frac{V}{\lambda} = \frac{C}{\lambda}$
    $= \frac{3.0 \times 10^8}{1000}$ ✓1 $3.0 \times 10^5 Hz$

14. Look for biasing only. (any other device that does not affect the working should be ignored) e.g diodes/ resists.



✓1

15. (a) (i) Current falls off to zero✓1/ falling to zero/ deflects to max. then zero.
    Reducing gradually or after sometime.
    (ii) Current flows when the capacitor is charging✓1
    When fully charged current stops (No current) and P.d is equal to charging voltage✓1.
    (b) $V_C = 5V$✓1
    (c) Touch both axis, Award for no labelled axis



(d) (i) $\frac{1}{C_s} = \frac{1}{4} + \frac{1}{5} = \frac{5+4}{20} = {}^{9}/_{20}$

$C_S = \frac{20}{9}$✓1

$C_1 = \frac{20}{9} + 3$✓1 = 5.22 μF✓1

Accept 5.22μF only

(ii) Change on series section = Q = Cv✓1

$= \frac{20}{9}$ x 10✓1μC

= 22.2μC or

Q series = $Q_T - Q_3$μF✓1

= (5.22 – 3) x 10✓μC1

= 22.2✓μC1

Charge is the same on series section

hence charge on 5.0μF is 22.2μC✓1

Accept 22.2μC only.

16. (a) (i) Each ray ½mk (Indipendent) 1mk for dotted extrapelation

1mk for dotted image

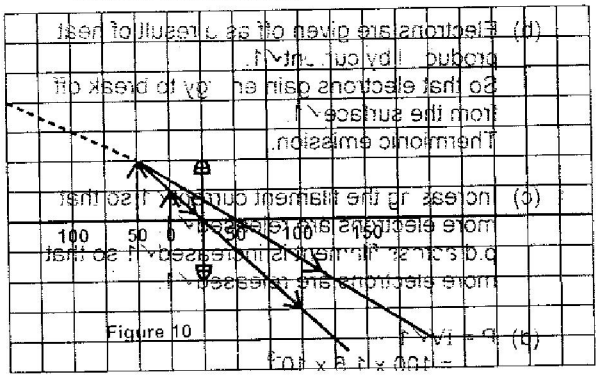


Figure 10

(ii) I. 50mm✓1 ±5mm

II. $M = \frac{v}{h} = \frac{h_1}{h_o}$✓1 $= \frac{50}{25}$ = 2mm✓1±0.2

(iii) Move the object towards F but not beyond✓1

Move object away from lens.

(iv) No answer

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

$\frac{1}{50} = \frac{1}{80} + \frac{1}{V}$✓1

V = 400/3✓1

17. (a) (i) L_2 (ii) Brighter

(iii) Total resistance is less/ reduced✓1

(b) (i) 1.5V✓1

(ii) Ir = 1.5 – 1.2 = 0.3✓1

0.4r = 0.3

V = 0.75R✓1

P.d and E.M.F/ more practice and practical approach.

(c) $R_T = 3 + 0.75 + R$✓1, $0.15(R+3.75) = 1.5$✓1

$R_T = R + 3.75$ $R + 3.75 = \frac{1.5}{0.15} = 10$

$E = IR_T$ $R = 10 - 3.75$

$1.5 = I(R + 3.75)$ $= 6.25\Omega$✓1

Or

$R = \frac{E}{I} = \frac{1.5}{0.15} = 10$✓1

$R = R_T - (V + 3)$ ✓1 + 3.75

$R = 6.25\Omega$✓1

$1.5 - 0.75 \times 0.15 = I(3 + R)$ ✓1

$1.5 - 0.1125 = 0.15(3 + R)$

$\frac{1.3875}{0.15}$✓1 $= 3 + R$

$R = 6.25\Omega$✓1

18. (a)

(i) Deflected towards +ve plate (N)✓1

(ii) Deflection will be greater. ✓1

(iii) I. Spot moves back and forth✓1.

To and fro (Not along across)

II. There will be a horizontal line✓1.

(b) Electrons are given off as a result of heat produced by current✓1.

So that electrons gain energy to break off from the surface✓1.

Thermionic emission.

(c) Increasing the filament current✓1 so that more electrons are released✓1.

p.d across filament is increased✓1 so that more electrons are released✓1.

(d) P = IV✓1

$= 100 \times 1.5 \times 10^{-3}$

= 1.5J/s✓1

Accept J, W, J/s

19. (a) Intensitty of radiation✓1.

(b) (i) (Min p.d)

Negative potential sufficient to just stop the movement of electrons.

(ii) I. Gradient = $\frac{h}{e}$✓1

$h = \frac{3.0-0\checkmark1}{(12-4.4)\,x\ 7.6\,x\,10^{14}} = \frac{3}{7.6\,x\,10^{14}}$

Gradient = 0.3947 x 10^{-14}

h = 0.3947 x 10^{-14} x 1.6 x 10^{-19}

= 0.6316 x 10^{-33} = 6.316 x 10^{-34}

II. $\frac{w}{e}$ = 1.75✓1,

W_O = Y intercept x e

$= \frac{1.75\,x\,1.6\,x\,10^{-19}}{1.6\,x\,10^{-19}J}$✓1

= 1.75ev✓1

Alternative

$W_O = hf_O$✓1

$= \frac{6.32\,x\,4.4\,x\,10^{14}\,x\,10^{-34}\checkmark1}{1.6\,x\,10^{-19}}$

= 1.74ev✓1

OR

Range 1.7 ⟶ 1.8ev $\frac{W_o}{e}$ = Y intercept

$\frac{W_o}{e}$ = 1.75 $\frac{-W_o}{e}$ = -1.75 or $\frac{W_o}{e}$ = 1.75

W_O = 1.75ev OR W_O = 1.75v x e

OR = 1.75ev

$\frac{-W_o}{e}$ = -1.75ev

OR

W_O = 1.75✓2½ ⟶ Reject 1.75v = W_O

Penalise –ve and units in

W_O = Y intercept

= -1.75

PHYSICS P 1
2011

SECTION A (25 marks)

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

1. Figure 1 shows a lorry moving on an inclined section of a straight road. At the back is a chain hanging from a point on a horizontal axis through the centre of gravity of the lorry.

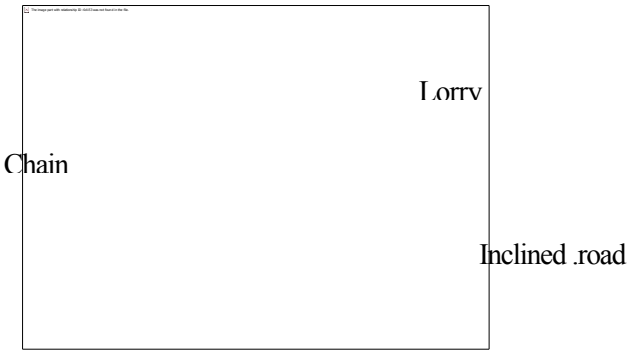


Figure 1

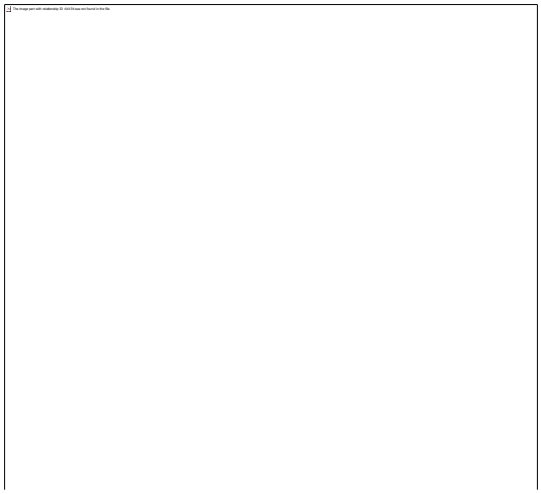
State with a reason whether the lorry is stable or not stable.

Stable *-center of gravity is within base of lorry . or* (1 mark)
Line of action of weight is within the base

2. State the constant force that opposes the motion of a stone initially at rest, as it falls through air from a tall building . (1 mark)

upthrust

3. Figure 2 shows a spring balance. It's spring constant is $125Nm^{-1}$. The scale spreads over a distance of 20cm.

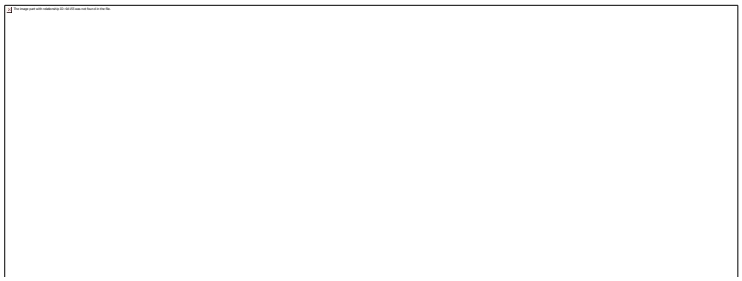


Determine the maximum weight that can be measured using this spring. (3 marks

F= Ke
=125 X0.2
= 25 N

OR F=Ke
$\frac{125 \times 20}{100}$
=25N

4. **Figure 3** shows an aluminum tube tightly stuck in a steel tube .



5 Explain how the two tubes can be separated by applying a temperature change at the junction given that aluminium expands more than steel for the same temperature rise.

Cooling / reduced temp

(2 marks)

Aluminium contracts more /faster than steel

Figure 4 shows two identical beakers P and Q full of water at 90°C. Two similar cold wet clothes are wrapped, one around the top of P and the other around the bottom of Q.

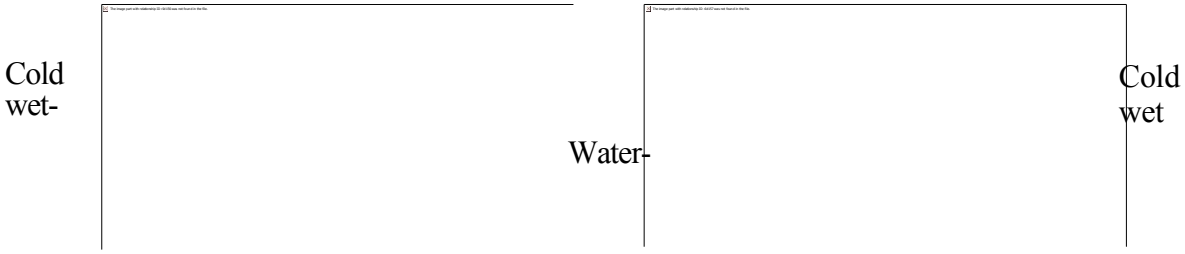


Figure 4

State with a reason, the,beaker in which the water cools faster. (2 marks)

P - *cool layers from top descend and are replaced*
By hot layers OR
There is complete convection currents in p

6. **Figure 5** is a graph of net force on a body against it's, velocity as it falls through a liquid.

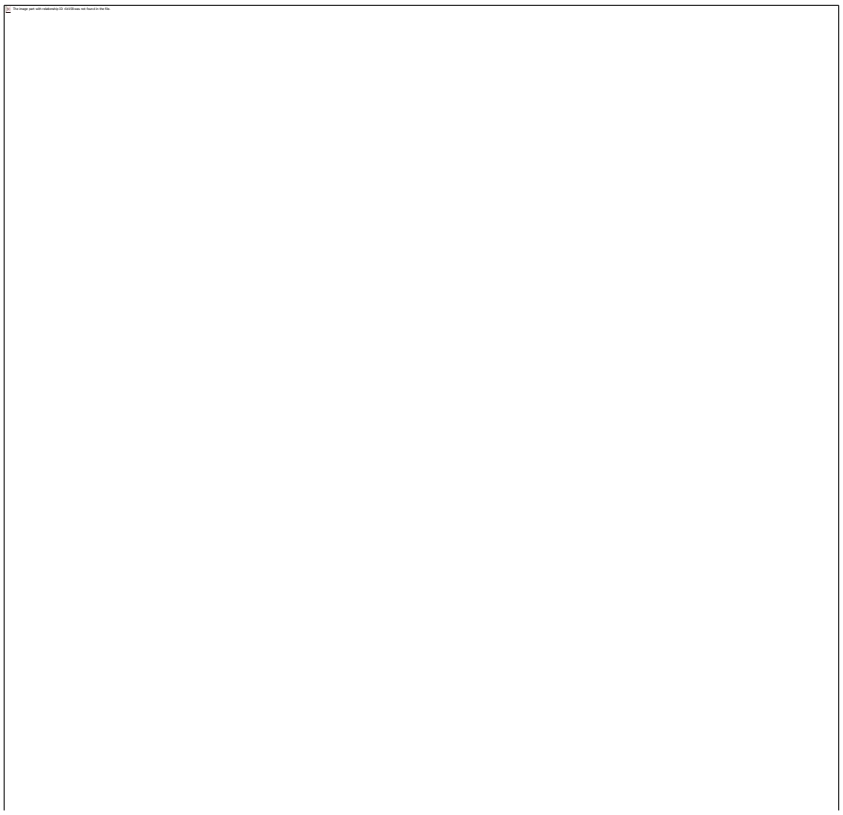


Figure 5

Determine the terminal velocity of the body. (1 mark)

80m/s

7. Figure 6 shows a small toy boat floating on water in a basin. X and Y are-two points near the toy.

Water

Figure 6

When a hot metal rod is dipped into the water at point X, the toy is observed to move towards Y. Explain this observation. (2 marks)

Surface tension at x is reduced / weakened / broken

Higher surface tension at y pulls the boat.

8. When the temperature of a gas in a closed container is raised, the pressure of the gas increases. Explain how the molecules of the gas cause the increase in pressure.

(2 marks)

-speed of molecules increases / k.e increases / molecules move faster

-Molecules hit walls more frequently /with greater momentum /more collision per unit time

9. Figure 7 shows part of a petrol engine, in which air flowing under atmospheric pressure passes into a constriction, where it mixes with petrol. The mixture then flows into a combustion cylinder.

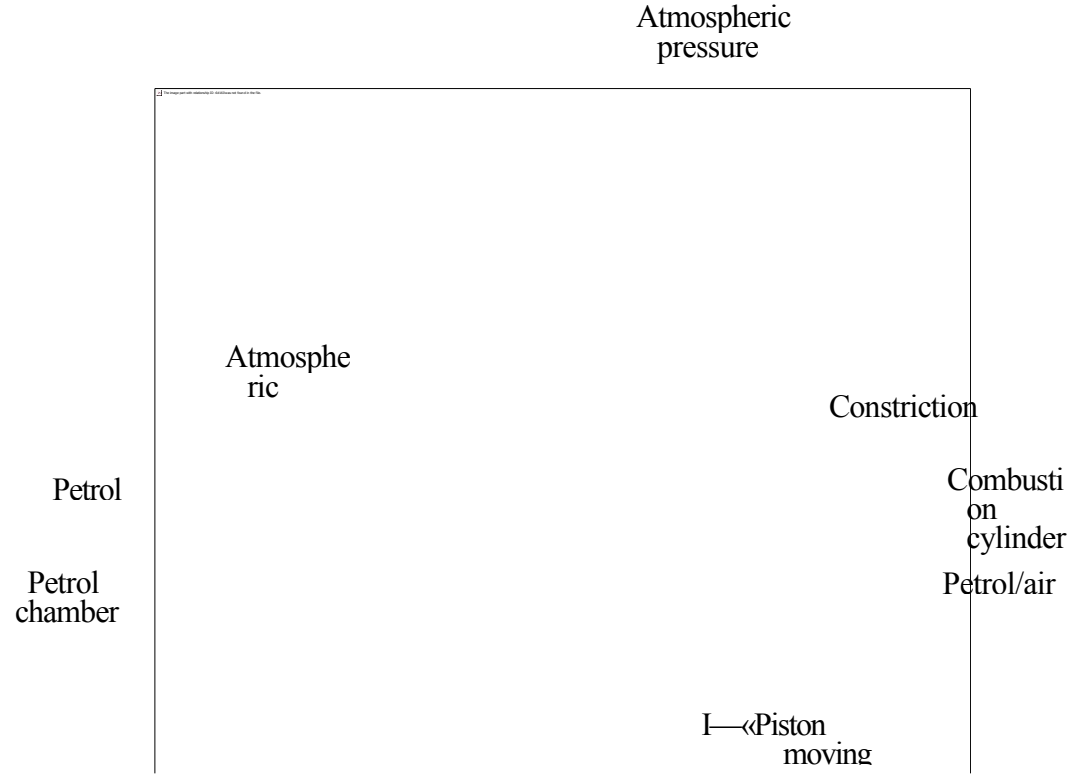


Figure 7

Explain what causes the petrol to move from the petrol chamber to the air stream in the constriction when the piston is moved downwards. (2 marks

Air speed /verocity is higher at contraction

Pressure drops, higher pa pushes the petro *either*

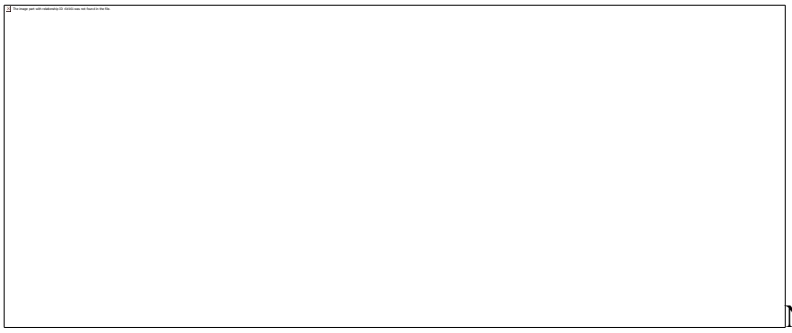
Pressure drops or (atmospheric pressure) pushes the petro

10. State the reason why it is easier to separate water into drops than to separate a solid into smaller pieces. (1 mark

smaller /weaker intermolecular forces in liquids than solids *or*

smaller cohesive in liquids than in solids

Figure 8 shows a unifonn wooden block of mass 2kg and length 25cm lying on a bench. It hangs over the edge of the bench by 10cm. Use the figure to answer questions 11 and 12.



NB; *R&w must be drawn a small distance from edge straight line with A*

11. Indicate on the figure two forces acting on the wooden block.

12. Determine the minimum force that can be applied on the wooden block to make it turn about the edge of the bench. (2 marks)

sum of clockwise moments = sum of antclockwise moments
OR $F_1d_1 = F_2d_2$

20 x2.5 = F x 10 *or* *F x15 = 20 x 2.5*
F= 5N *F =3.33N (must be I three sig. fig*

13. A particle starts from rest and accelerates uniformly in a straight line. After 3 seconds it is 9m from the starting point. Determine the acceleration of the particle. (3 marks)

$S=ut + ½ at^3$ *OR $v =u+ at$* *OR $v = u+at$* *OR $S = 1/2 (u+v)t$*

$9 =0 + ½ \times a \times 3^2$ *$s = ½(u +v)t$* *$v = 3a$* *$9= ½ \times 3v$*

$V= 6m/s$ *$v^2= u^2 + 2as$* *$v =6 m/s$*

$A = 2m/s^2$ *$a = \frac{v - u}{t}$* *$9a^2= 0+2a9$* *$v =u +at$*

$a^2 =2a$ *$6= 0 +a \times 3$*

$= \frac{6- 0}{3}$ *$a = 0$ or 2* *$a = 2 m/s^2$*

$a = 2m/s^2$

$= 2 m/s^2$

14. Figure 9 shows a syringe full of water. It has two identical holes A and B drilled along it's cylinder. The cylinder nozzle is closed.

State with a reason how the speeds of the jets of water from **A** and **B** compare when the piston is pushed into the cylinder.

Identical jets / same speed

Pressure at sama level is equal / pressure is transmitted equally throughout the liquid

SECTION B: (55 marks)

Answer all questions in this section

15. **Figure 10** shows a simple pendulum of length 80cm. The pendulum bob whose mass is 50g oscillates between points **A** and **B**, through its rest position **C. A** and are both 10cm higher than **C.**

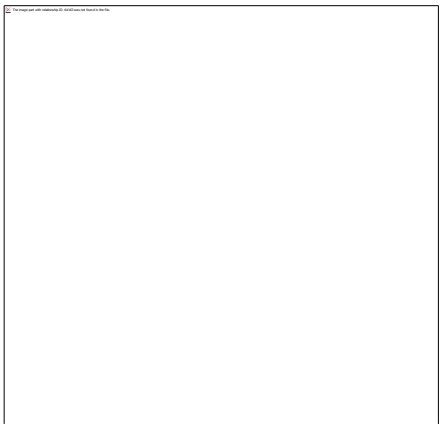


Figure 10

Arrow ,horizontal line and straight line

(a) (i) Indicate with an arrow, on the path ACB, the direction of the greatest velocity of the bob as it moves from A to B. (1 mark

(ii) State the form of energy possessed by the pendulum bob at point A.

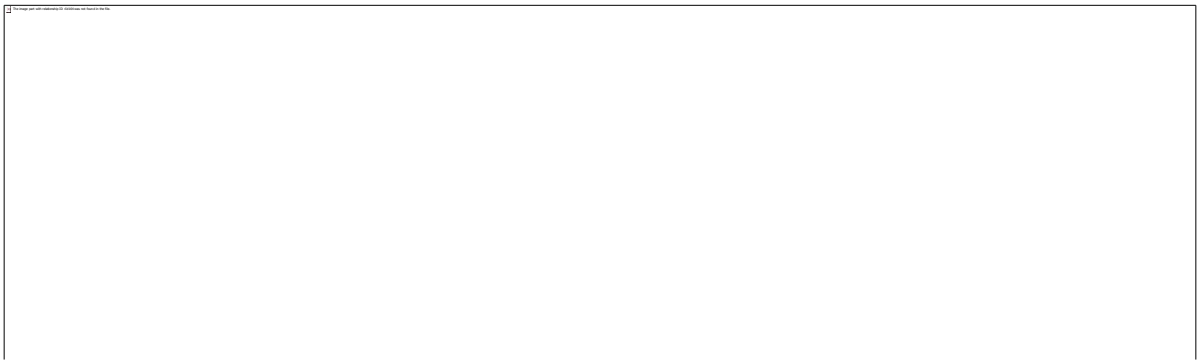
1mark)

Potential energy / potential/ P. E

(3 marks)

(b)Determine:

(i) the velocity of the bob at point **C**



(ii) the tension in the string as the bob passes point **C**
(take acceleration due to gravity g - 10 m/s2)

$$T = \frac{mv^2}{R} + mg$$
$$= \frac{0.005 \times 2}{8} + 0.005 \times 10$$
$$= 0.0625N$$

c) After some time, the pendulum comes to rest at point **C**. State what happens to the
energy it initially possessed.
(1 mark)

used to do work against / air resistance /viscous drag / air friction
or converted to heat energy

16. Figure 11 shows a stone attached to the end of a string moving in a horizontal circle with a uniform speed of $2ms^{-1}$. When the stone reaches point X on the circle, the string breaks.

Figure 11

NB: *tangent can be drawn facing the other side /must be straight* (ruler used) *and if extended should not cut the circle*

(i) Indicate on the diagram with an arrow, the direction of the motion of the stone when the string breaks. (1 mark)

(1 mark)

(ii) State the magnitude of the velocity after the string breaks.

2m/s

(iii)Give a reason for your answers in (i) and (ii) (1mark

Obeys Newtons first law of motion / due to its inertial /no external force act on it /centripetal force is zero (does not act on it

(b) **Figure 12** shows a lorry towing a trailer using a rope.

The lorry exerts a force N on the trailer and the trailer exerts an equal but opposite force M on the lorry. The frictional force between the trailer and the road is F.

Explain how the forces N, M and F enable the trailer to move. (2 marks

N > F

M does not act on the trailer

(**c**) **Figure 13** shows a frictionless trolley of mass 2kg moving with uniform velocity towards a wall. At the front of the trolley is a spring whose spring constant is $25Nm^{-1}$. The trolley comes to rest momentarily after compressing the spring by 3cm and then rebounds from the wall.

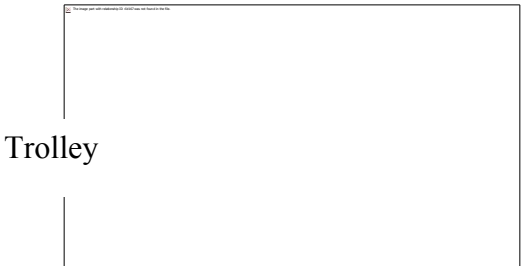


Figure 13

(i) Determine

(I) the force exerted on the wall by the spring. (3 marks)

$F = ke$

$= 25 \times \frac{30}{100} = 0.75\ N$

(II) the maximum acceleration of the trolley as it rebounds from the wall. (3 marks)

$F = ma$

$0.75 = 2a$

$A = 0.375 m/s^2$

(ii) State the reason why the trolley acquires a constant velocity after it rebounds. (2 marks)

Force is the spring decreases as it recovers its original length
No force on the trolley after contact with wall b lost

17. **(a)** When the temperature of water reaches the boiling point, bubbles rise to the surface.

(i) State what is contained in the bubbles. (1 mark)

Water vapour / steam

(ii) State the reason why bubbles rise to the surface only at the boiling point. (1 mark)

Vapour pressure at boiling point exceeds prevailing / external pressure

(b) Figure 14 shows a graph of vapour pressure against the temperature of water vapour, in a laboratory where a mercury barometer indicates a height of 61.8 cm.

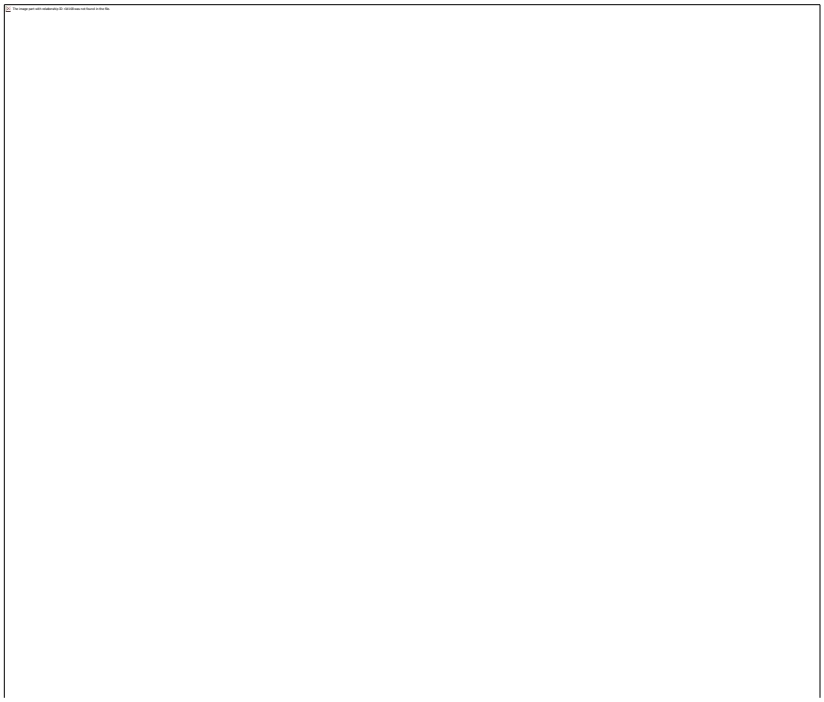


Figure 14

(b) (i) Determine the atmospheric pressure in the laboratory in Nm^{-2}

(Take g - $10m/S^2$ and density of mercury - 13600 kg/m^3). (3 marks)

$P = pgh$

$= 13600 \times 10 \times \frac{61.8}{100}$

$= 840 \times 10^3 N/m^3$ or $84040 N/m^2$

(ii) Use the graph to determine the boiling point of water in the laboratory. (1mark)

Reading of BP at $p = 84 \times 10^3$ *is* $96 \pm 1^0 c$

(c) In an experiment to determine the specific heat capacity of a metal, a100g of the

metal was transferred from boiling water to a lagged copper calorimeter containing cold water. The water was stirred and a final steady temperature was realized. The following data was recorded.

Initial temperature of cold water and calorimeter = 20°C.
Temperature of boiling water = 99°C.
Final temperature of water, calorimeter and the metal = 27.7°C.
Mass of cold water and calorimeter = 130g.
Mass of calorimeter = 50g.
(Take specific heat capacity of water as 4200Jkg^{-1}K^{-1}) (Specific heat capacity of copper as 400Jkg^{-1}K^{-1}).

Use the data to determine:

(i) the heat gained by the water and the calorimeter; (3 marks)

$M_wC_wD0 + Mcccdo =$
$0.08 \times 4200 \times (27.7 - 20) + 0.05 \times 400 \times (27.7 - 20)$
$= 2741.2\ j$

(ii) the specific heat capacity of the metal. (3 marks)

Heat lost by metal = heat gained by water + calorimeter
$0.1x \ 71.3 \times c = 2741.2$
$c = \frac{2741.2}{7.13} = 384.46 J/kgk$
(384J/kgk)

(d) State one possible source of error in the value of the specific heat capacity obtained in the experiment. (1 mark)

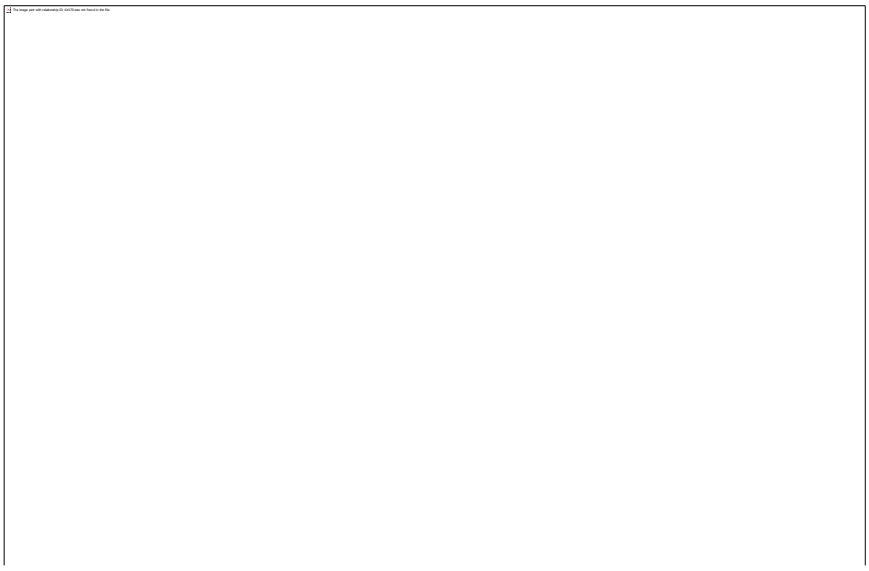
metal cooling is the process of transferring or
metal carrying some hot water into the cold water

18. (a) Figure 15 shows a metal bolt which is threaded.

Explain how a metre rule can be used to measure The pitch (distance between adjacent peaks) of the threading. (2 marks)

- *Measure the length of threaded part*
- *Divide the length by number of threads /pitches divide by number of peaks – 1*

(b) Figure 16 shows a screw jack whose screw has a pitch of .limn, and has a handle of 25 cm long.



Determine the velocity ratio of the jack. (3marks)

$$VR = \frac{2\Pi r}{Pitch}$$

$$= \frac{2 \times 3.142 \times 0.25}{0.001} = 1571.43$$

(c) A bullet of mass 60g travelling at $800ms^{-1}$ hits a tree and penetrates a depth of 15 cm before coming.to rest

(i) Explain how the energy of the bullet changes as it penetrates the tree. (1 mark)

K.E =heat + sound OR K.E ⟶ heat , sound OR K.E ⟶ heat ,sound(light)

(ii) determine the average retarding force on the bullet.

K.E = work done against friction

$\frac{1}{2} mv^2 = fd$

$\frac{1}{2} \times 0.006 \times 800^2 = f \times 0.15$

$F = 12800N$

OR $f = ma$

$v^2 = u^2 + 2as$

$o = 800^2 + 2 \times 0.15a$

$a = \frac{640000}{0.3} = 2.133333.3(2.13 \times 10^6)$

$F = ma = 2.133 \times 10^{64} \times \frac{60}{1000}$

19. (a) State the condition necessary for a body to float in a fluid . (1 mark)

Upthrust = weight or
Weight of fluid displaced = weight of the body or
Its density is less than that of the fluid .

(b) A ship made of steel is observed to float on water yet the density of steel is approximately eight times that of water. Explain this observation. (2 marks)

ship has a large air space / hollow or
Average density of the ship is less than density of water
Upthrust of ship is equal to weight of the ship

(c) Figure 17 shows three stages of an experiment to determine relative density of cork which normally floats on water. To make it sink, a sinker is hung below the cork.

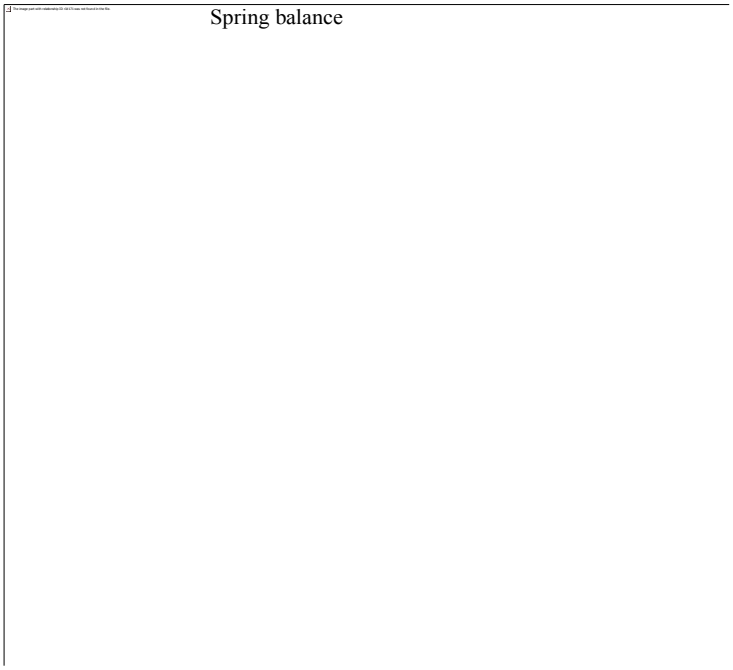


Figure 17

In (I) a spring balance is used to measure the weight W of the cork in air.
In (II) the spring balance is used to measure the apparent weight W_1, when only the sinker is submerged in water.
In (III) the spring balance is used to measure the apparent weight W_2 when both the cork and the sinker are submerged.
The following observations were made.

W = 0.08 N
W_1 = 0.060 N
W_2 = 0.28 N

Use this information to determine the:

(i) upthrust on cork. (3marks)

Upthrust = w1 - w2
= 0.60-0.28
= 0.32 N

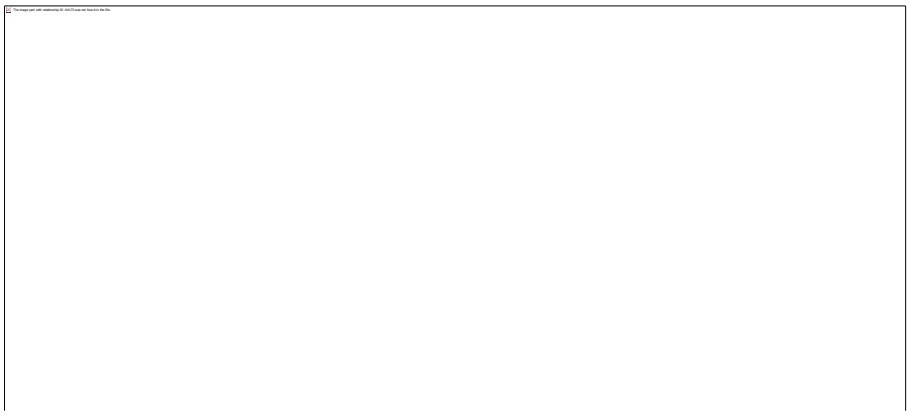
(ii) relative density of cork. (3 marks

RD = $\frac{\text{weight of substance}}{\text{Weight of equal volume}}$ = $\frac{\text{wt of cork}}{\text{upthrust}}$

= $\frac{0.08}{0.32}$

= 0.25

(d) **Figure 18** shows parts of a simple submarine, a ship that can travel both on water and under water.
To do this water is pumped in or out of the ballast tanks.



Explain how the tanks are used to change the depth of the submarine. 2 marks)

To sink , water is allowed into ballast tanks

To float , pumps are used to expel water from ballast tanks

PHYSICS 2011 PAPER 2
MARKIKNG SCHEMES

PHYSICS PAPER 2

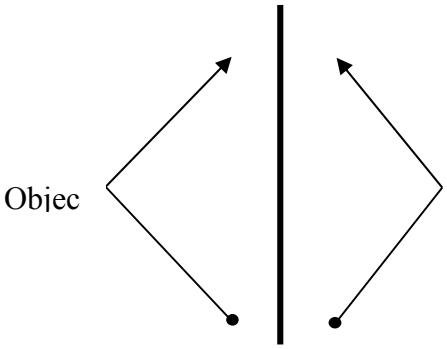
MARKING SCHEMES

Section1 (25 marks)

Answer all the questions provided in this section in the space provides

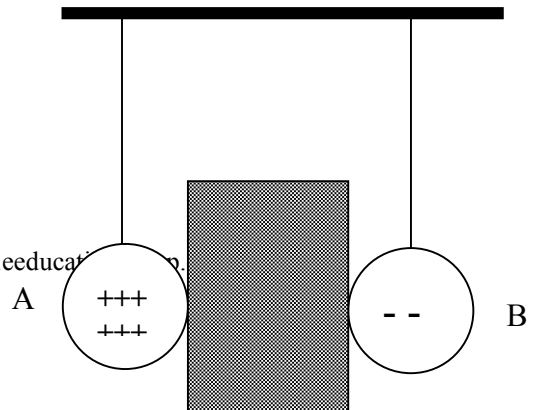
1. **Figure 1**, shows an object placed in front of a plane mirror.

Figure 1,



Sketch the image of the object as seen in the mirror.

2. **Figure** 2, shows two identical pithballs A and B suspended with insulated threads. They are separated by an insulator X. A is positively charged while B is negatively charged, The quantity of charge on A is three the quantity of charge on B.



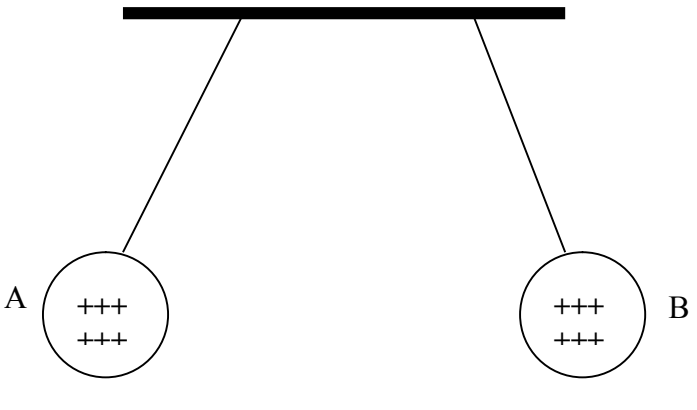
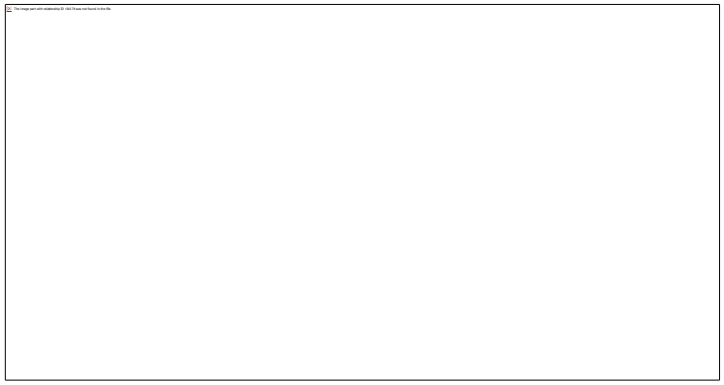


Figure 2.

Sketch on the space beside the figure.t he final position of the pithballs after the insulator is removed. {1 mark)

3. **Figure** 3, shows a voltmeter connected across two charged parallel plates.



When a thin sheet of mica is inserted between the planes, the voltmeter reading is observed to reduce. explain (his observation. (3 marks')

Mica hashigh permitivivity /diletric constant/ raises capacitance hence lower potential difference since V = Q/C but Q is constant

Figure 4, shows the cross-section of a dry cell. Use the information on the figure to answer questions 4 and 5.

4. Name the parts labeled A and B. (2 marks)
   A-carbon rod /graphite
   B- manganese (iv) oxide + powered carbon
5. State the use of the manganese (IV) oxide in the cell. (1 mark)
   Manganese (iv) oxide is a depolarizer / oxidizing agent / oxidizes hydrogen to water /reacts with hydrogen to form water .

6. 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)

   Hammering causes domains / dip lets to vibrate/ disturbs
   As they settle , some face north –south due to earth 's magnetic field.

   Figure 5, 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 7 and 8.

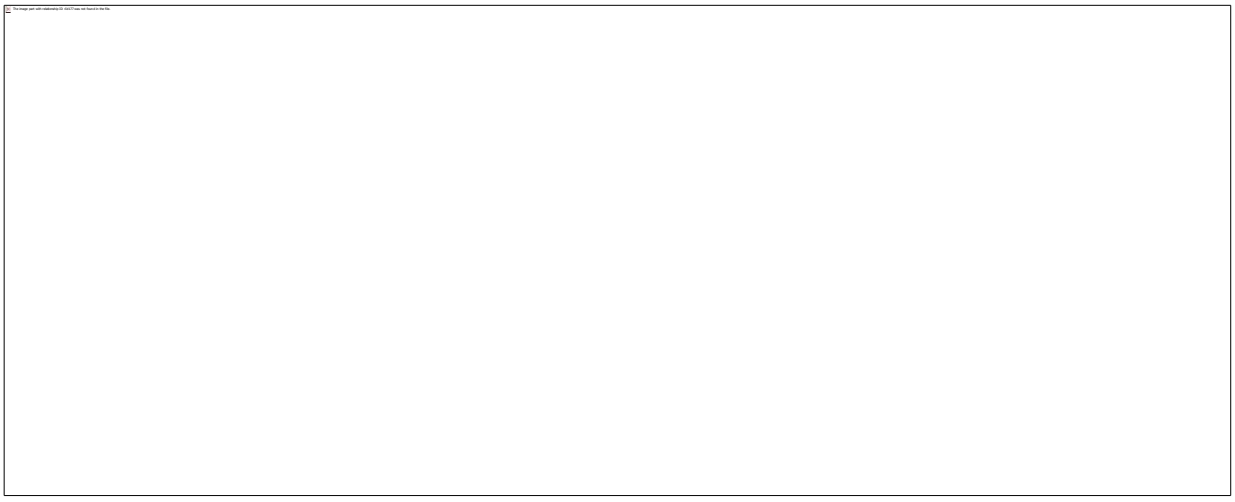
7. Explain how the relay switches on the motor when S_1 is closed. (3 marks)

When S is closed , current flows in solenoid magnetizing the iron , this attracts the iron armature closing the contacts this causes current to flow in the motor circuit / contact closes / switches on the motor / motor keep running continuously

8. 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)

Steel would remain permanently magnetized causing current in motor circuit to remain on when S is open.
Reason: *'Takes a Conger time to start; once switched on motor runs continoulsly*
Not easily magnetisedanddemagnetised
Hard magnetic material/permanent magnet.

9. **Figure 6,** shows standing waves on a string, It is drawn !o a scale of 1:5

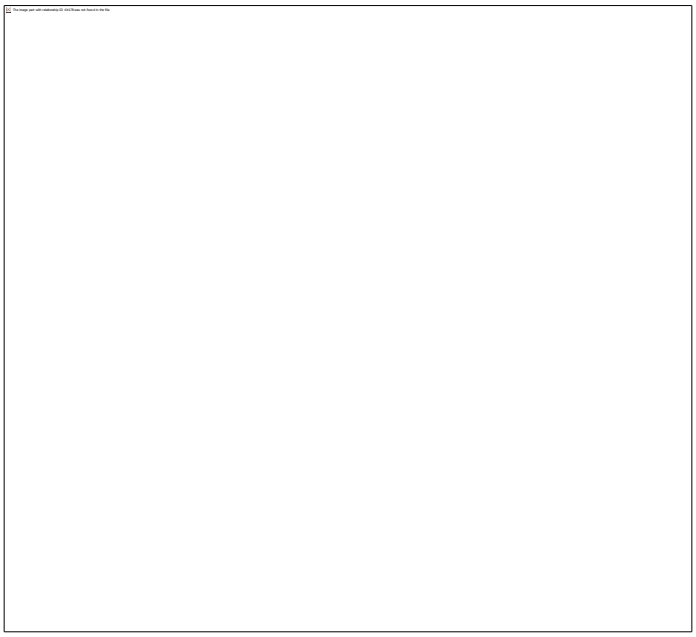


a) Indicate on the diagram the wavelength of the standing wave.

b) Determine the wavelength of the wave.

25A = 1O X 5
= 2OCm/ O.2m

10. **Figure** 7, shows two rays of light incident normally on face PQ of a glass prism, whose critical angle is 42°.

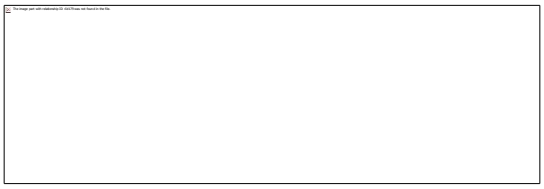


2nd&3rd mark tied)

Complete the diagram to show the paths of the two rays as they pass through the prism.

(3 marks)

11. A 4Ω resistor is connected in series to a battery of e.m.f 6V and negligible internal resistance. Determine the power dissipated by the resistor. (2 marks)



12. Table 1 shows radiations and their respective frequencies.

Table I

Type of radiation	**Yellow light**	**Gamma rays**	**Radio waves**	**Micro waves**
Frequency (Hz)	**1 x 10^{15}**	**1 x 10^{22}**	**I x 10^{6}**	**I x 10^{11}**

Arrange the radiations in the order of increasing energy. (l mark)

Radio waves ⟶ *microwaves* ⟶ *yellow light* ⟶ *gamma rays*

13. State the reason why electrical power is transmitted over long distances at very high voltages. (1 mark)

High voltage leads to low current hence low power (RR)losses
energy loss

14. State the meaning of the term "threshold frequency" as used in photoelectric emission. (1 mark)

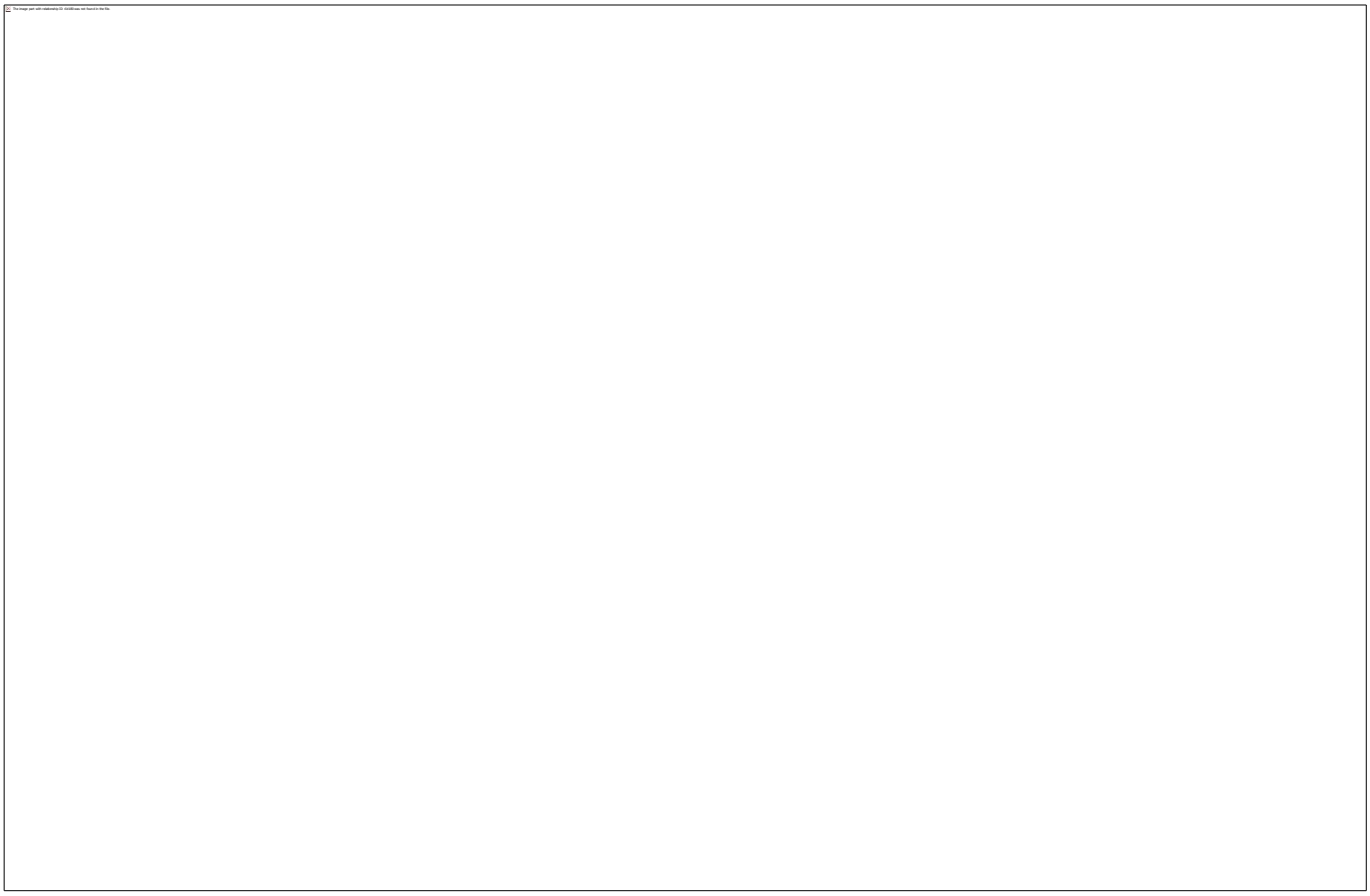
The minimum frequency of an incident adiation to cause emission of photo electrons/photo emission/ to eject/ to dislodge/ remove electrons,

SECTION B (55 marks)

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

15.

a) **Figure 8**, shows graph of potential difference V (volts) against a current (ampere) for a certain device.



From the graph:

(i) state with a reason whether or not the device obeys ohms law (2 marks)

Does not obey ohm Is law

The graph is not a straight line through the origin (non-linear not acceptable) current is not directly proportional to p.d.

(ii) determine the resistance of the device at

I) 1 = 1.5A

R=gradient at I/ showing the tangent

$= \frac{9.2-4.8}{36-c}$

II) I = 3.5A

R = gradient of tangent at I showing the tangent

$$= \frac{9.4 - 7.2}{5.4 - 1.5}$$

$$= \frac{2.2}{3.9} = 0.56 = 0.1(0.46 - 0.66)$$

(iii) From the results obtained in (ii) slate how the resistance of (the device varies as the current increases. (1 mark)

Resistance decreases as the current increases

(iv) State the cause of this variation in resistance. (1 mark)

Change (increase) in temperature/ temperature is constant.

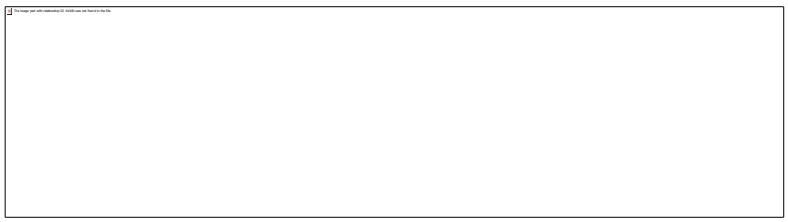
(b) Three identical dry cells each of e.m.f. 1.6V are connected in series to a resistor of 11.4Q. A current of 0.32A flows in the circuit.

Determine:

(i) the total e.m.f. of the cells; (1 mark)

$V_{total} = 1.6 + 1.6 + 1.6 = 4.8\,v = E$

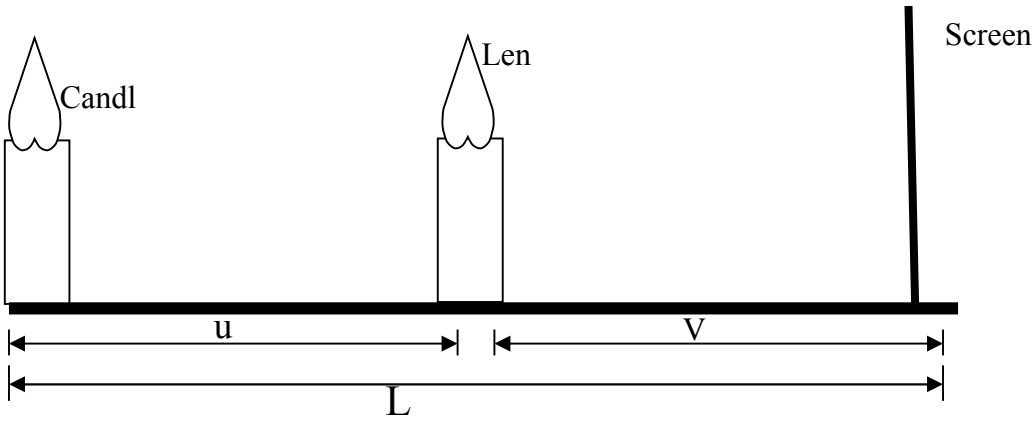
(ii) the internal resistance of each cell; . (3 mark)



16. (a) State the meaning of the term "principal focus" as applied in lenses. (1 mark)

- a biconvex lens and lens holder.
- a lit candle.
- a white screen.
- a metre rule

(i) Draw a diagram to show how you would arrange the above apparatus to determine the focal length of the lens



(b) You are provided with the following apparatus to determine the focal length of a lens:
(1 mark)

(ii) Describe the procedure you would follow.

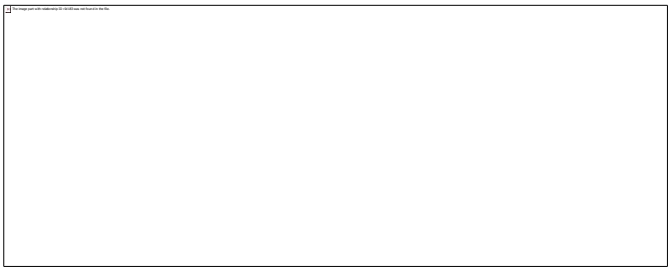
candle is placed at a certain distance from the lens. The distance Between tile screen/ and the lens is adjusted until a sharp image is focused on screen/ clear image.

(iii) State two measurements that you would take. (2 marks)

The distance of candle from lens (u) is measured.
The distance of screen from lens (v) is also measured.

(iv) Explain how the measurements in (iii) would be used to determine (the focal length.

(c) An object is placed 30cm in front of a concave lens of local length 20cm. Determine the magnification of the image produced.(4 marks)

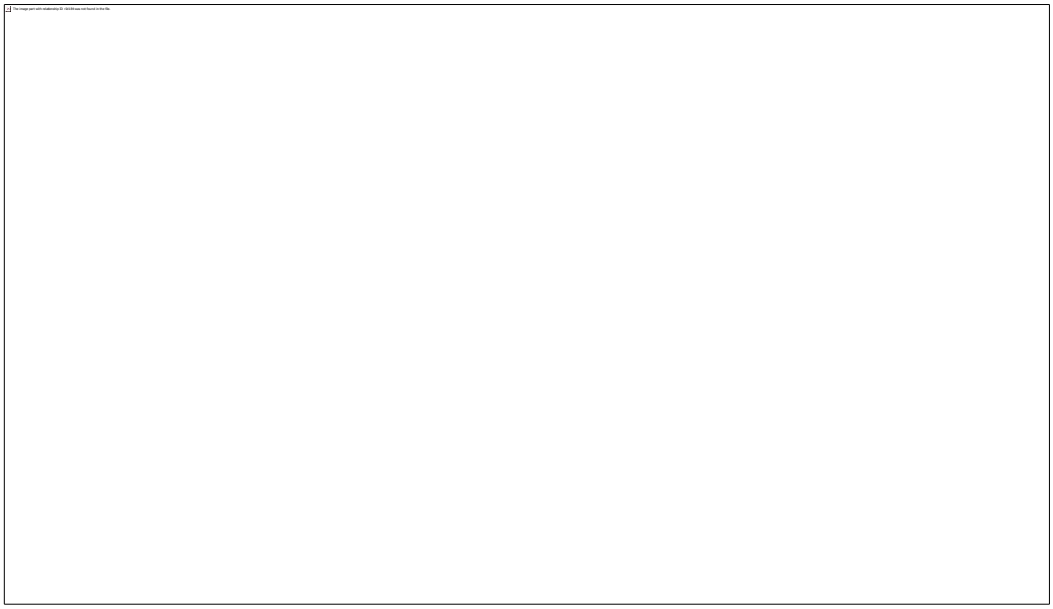


17.

a) State what is meant by "electromagnetic induction" (1 mark)

The production of induced emf when the magnate flux linking a circuit is changed.

b) **Figure** 9, shows a simple electric generator

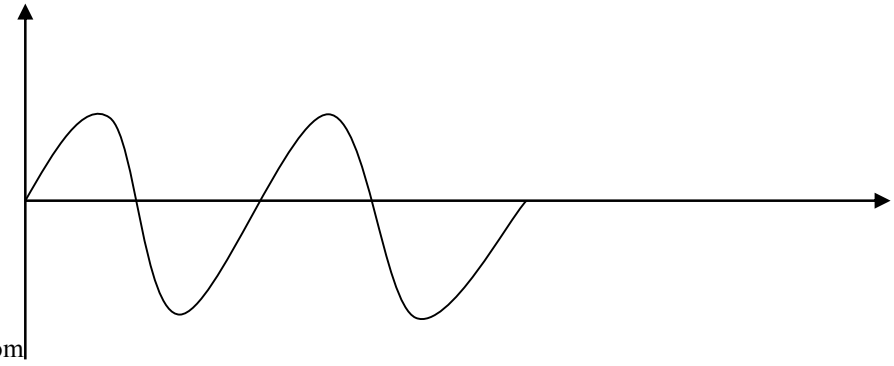


i) Name the parts labeled P and Q. *(2* marks)

P *brushes /carbon /graphite*

Q *slip rings*

ii) Sketch on the axes provided, a graph lo show how the magnitude of the potential difference across R, changes with the lime I (1 mark)



iii) State two ways in which the potential difference produced by such a generator can he increased. *(2 marks)*

Increasing number of turns/ coils
Increasing speed of rotation/ rate of rotation
Winding coil on soft iron cord
Increasing area/ size

(c) In a transformer, the ratio of primary turns to the secondary turns is 1:10. A current of 500mA flows through a 200Q resistor in the secondary circuit. Assuming that the transformer is 100% efficient, determine:

(i) the secondary voltage; (1 mark)

$Vs = 200 \ X \ 0.5$

$= 100v$

(ii) the primary voltage: (2 marks)

$\frac{NP}{NS} = \frac{VP}{VS}$

$VP = \frac{100}{10} \times 1 = 10v$

(iii) the primary current. (2 marks)

$\frac{VP}{VS} = \frac{IS}{IP}$ $\qquad IP = \frac{0.5 \ X \ 100}{10}$

$I = 5A$

18. (a) State two differences between cathode rays and electromagnetic radiations. (2marks)

- cathode rays are deflected By magnetic or electric field EM can not be deflected.
- cathode rays are produced By thermometric emission while E.M originate from the changes in nucleus.
- Cathode rays have charge but e.m radiations don't have charge
- Cathode rays are particles and have a mass but cm radiations are waves
- Cathode rays trave lat a speed depending on the accelerating voltage e.m radiations travel at the speed of light vacution.

(b) Figure 10, shows the main features of a cathode ray oscilloscope (CRO).

(i) Name the parts labelled M and N (2marks)

M - *grid*
N - *accerelating anode / anode*
N - *vacuum space / evacuated space*

(ii) Explain how electrons are produced in the tube. (2marks)
Cathode is heated by filament; electrons are released from cathode; by thermionic emission/ hot filament emits electrons

(iii When using the CRO to display waveforms of voltages, stale where the following should be connected:

I) the voltage to be displayed on the screen; (1marks)
across y - plates / horizontal plates.

II) The time base voltage (1marks)
Across x plates / vertical plates

(iv) state why the tube is highly evacuated.
(1marks)
to reduce collisions, (hence ionization) with air molecules in the tube.

(c) **Figure 11,** shows the waveform of a voltage displayed on the screen of a CRO. The Y-gain calibration was 5V per cm.


The image part with relationship ID rId38 was not found in the file.

(i) Determine the peak-to-peak voltage of the Y-input. (1mark)

Peak - to - peak voltage = 5 x 2

= 10v

(ii) Sketch on the same figure the appearance of the waveform after the voltage of the input signal is halved and it's frequency is doubled. (2 marks)

x - radiation / Alpha $^{4}_{2}$ He^{2+}

short range with intense ionization hence tracks / massive /high ionization .

19. When a radiation was released into a diffusion cloud chamber, short thick tracks were observed. State with a reason, the type of radiation that was detected. *(2* marks)

(b) The half-life of an element X is 3.83 days. A sample of this element is found to have an activity rate of 1.6 x 101 disintegrations per second at a particular time.

Determine its activity rate after 19.15 days. (2 marks)

(c) State what is meant by an extrinsic semiconductor. (1 mark)

A semiconductor in which impurities have been added to change conductivity/ improve/ enhance conductivity.

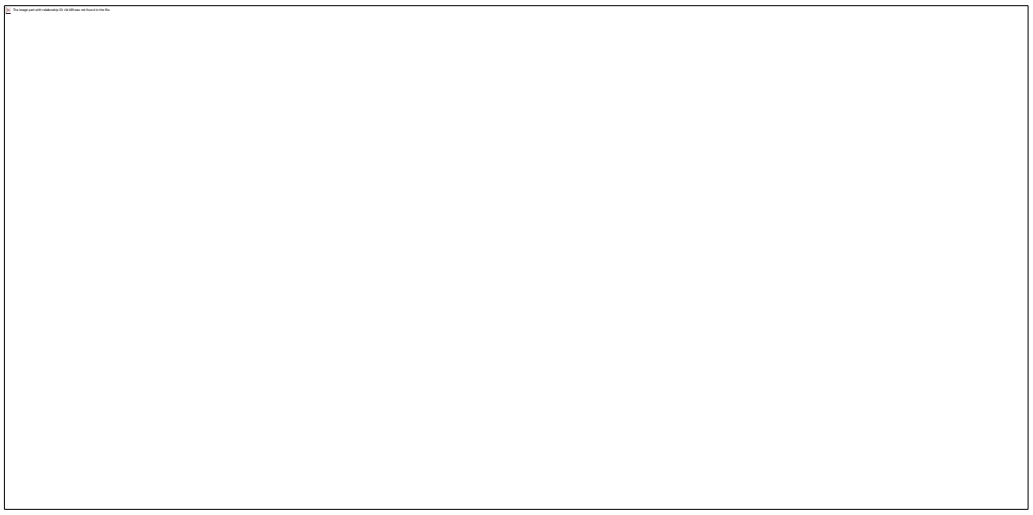
pure semi-conductor which has been doped Impure semi-conductor

(d) **Figure 12,** shows n depletion layer in an unbiased **p-n** junction.

State how a battery can be used to make the depletion layer narrower. (1 mark)

By connecting it in forward broad mode (ie p to + and n to -)

(e) Figure 13, shows an incomplete circuit of a full wave rectifier.



(i) Draw in the figure two more diodes to complete the circuit. (2 marks)

(ii) Show on the figure the points across which the output of the rectifier should he obtained. (1 mark)

PHYSICS PAPER 1
MARKING SCHEME 2012

1. Total volume = 0.6 x 3
= 1.8cm^3
Working for 1.8 must be shown.

Reading = 7.6
+ 1.8
9.4cm^3

2. Frictional force is equal to the applied force (out in the opposite direction), hence the net/ resultant force applied is zero.

3. $m = \frac{w;}{g}$
$= \frac{16.5}{1.7}$
= 9.71kg;

Accept 9.7 sin 4 values in the question are given to an accurately of 1 decimal place.

Accept calculator value of 9.70538235

Accept trumcated values eg 9.705

4. The gas diffuse/ from the region of higher concentration to a region of low concentration.

5. Glass is apoor conductors; un equal expansion/uneven expansion non-uniform expansion leads to cracking.

6. - Oil film spreads over a large surface of the sea reducing inflow of ain/ oxygen needed by the aquatic life.
- Causes death of aquatic animals and plants/ suffocation.
- Beaches become dirty/causes pollution (of water)
- Poisons marine animals when taken in
- Contaminates sea water.

7. When upthrust is equal to the weight of the balloon (and its contents)

8. Mass must be constant/fixed/for a given mass/ for a particular mass for a specific mass.

9. The height of its centre of gravity (above the surface is) constant/position of centre of gravity is constant.

Accept initials c.o.g

10. Yes it is within the elastic limit; because
The values of $\frac{F}{e}$ = constant / in all the cases $\frac{F}{e} = 5$

OR.
- **Extension is proportional to the force applied**
- **Spring constant remains the same.**

- **It obeys Hooke's law.**
- **A graph of force against extension is straight line (through the origin)**
  Conclusion from graph;

11. The body's velocity decreases uniformly from 20m/s and becomes zero after 5 seconds; the velocity then starts increasing in the opposite direction to a maximum value of 20m/s./ velocity increases to -20m/s.

12. Friction between the moving points of the pulley system
Work done lifting the moving parts of the pulley system;
OR
Some/part of the effort is used to overcome friction/work done against friction;

13. i) OA – Heat gained is used in breaking intermolecular forces of the molecules/melt the ice (without change in temperature)
OR Latent heat of fusion is absorbed;/ changing solid to liquid overcoming intermolecular forces.

ii) Temperature (of the water formed) starts to rise until it starts to boil.

14. a) Air above the plane moves faster than air below it (because of it's shape) creating a region of low pressure above the plane hence the plane experiences alift; due to the pressure difference.

b) At B/ narrowest part /smallest cross-section; Because the cross-sectional area is smaller hence the air moves faster in that region.

15. a) Graph

Extraction of graph to cut the temperature axis.

Continues of dash line is accepted.

Absolute zero = -278 ± 2°c (-272°c to - 280°c)

b) When the tube is horizontal pressure of air is equal to atmospheric pressure. i.e 76cmHg/103360N/m2/0.76mHg/atmosphere/ standard pressure/normal pressure.

I When the verticals; pressure of air = pressure due to mercury + atmospheric pressure
= (24 + 76)cmHg
= 100cmHg. Or 136000N/M^2.

II. Pv = constant ✓
76 x 15 = (76 + 24)L ✓
L = 76 x 15 ✓

$P_1V_1 = P_2V_2$ (don't allow $P_1L_1=P_2L_2$)

100
= 11.4cm ✓

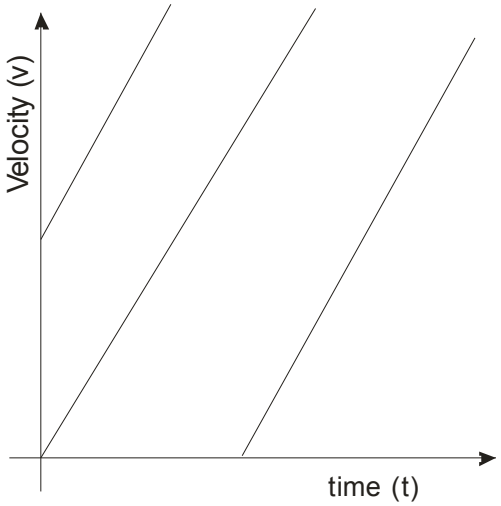
c) i) To expel air/ to remove air/ push air out/ drive air out.

ii) Pressure of air outside the bottle is greater than pressure inside;/ atmospheric pressure outside is greater than pressure inside.

iii) Cooling causes condensation of vapour; creating a partial vacuum;/ creating fewer vapour and air molecules inside or lowering (reducing) pressure inside; falling pressure.

16.

i) Acceleration;
Constant acceleration



ii) Net force on the parachute becomes zero; (sum of downward forces on it should be equal to sum of upward forces.)

b) i) Net force = mg + F
= 2 + 0.4
= 2.4N
Resultant force is -2.4N

W + F = 2.4N

ii) F = ma
-2.4 = 0.2a
a = $\frac{2.4}{0.2}$
= -12m/s^2

Or F = ma
2.4 = 0.2a
a = $\frac{2.4}{0.2}$
= -12 (negative is a must)

Allow T.E from (i)

iii) $V^2 = u^2 + 2as$; OR $s = \frac{u^2}{2a}$ Or $V = u + at$ $S = 4t + \frac{1}{2} a t^2$

$S = \frac{0.52}{-2 \times 12}$ $= 1.04m$

$t = {}^{5}/_{12} = \frac{25}{2 \times 12} = 1.04$

$s = 5({}^{5}/_{12}) + \frac{1}{2}(12)({}^{5}/_{12})^2 = 1.04m$

i) Weight of object; gravitional force
Tension in the string.

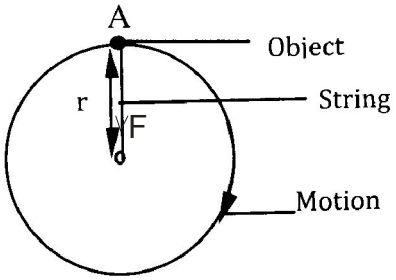
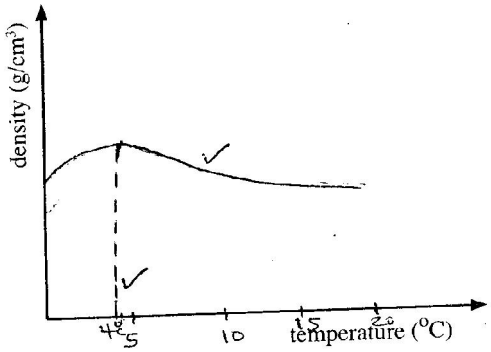


Figure 10

- **Weight of objects; / gravitational force.**
- **Tension in the string.**

17. - Fire heats air around region C which expands and becomes less dense
- The less dense air/smoke rises up the vent and emerges at A.
- **Cool (more dense) air moves down the vent at B introducing fresh air into the room.**

b) - The flask has double walls which are silvery / shining surface) on both sides
- The shiny surface is a good reflector of heat;



d) i) Heat gained by water = power x time
$= 2.5 \times 103 \times 4 \times 60$
$= 6.0 \times 105J$

ii) $E = mc\Delta\vartheta/H$ mc $\Delta\vartheta/\vartheta$ or mc ϑ or mc ΔT.
$\Delta\vartheta = \frac{2.5 \times 10^3 \times 4 \times 60}{}$

$\frac{2 \times 4.2 \times 10^3}{}$

$= 71.43^oc$/ calculator value = 71.42857148 (accept truncation)

18. a) i) Lengths BC and CD

ii) $100 \times BC = S \times CD$

$S = \frac{100BC}{CD}$

OR $1 \times BC = 105 \times CD$

$S = \frac{BC}{10CD}$

Reject use of (g)/ mass.

b) i) Volume of 10g = $\frac{m}{e}$ $= 2.5 \times 10^{-2}m^3$;

$= \frac{20}{800}$

ii) U = weight of water displaced = eVg or density x volume x gravity

$= \frac{20}{800} \times 1000 \times 10$

= 250N.

iii) Tension = u - mg;

= 250 – 200

= 50N;

19. a) Valve B rests/ closes/ fall under its own weight (and pressure/ weight above pressure in the cylinder decreases/lowers/ reduces the water rises in cylinder pushing valve A open (opening valve A) / pressure in the cylinder decreases (water pushed by) atmospheric/pressure opens valve A.

ii) Valve A rests/ closes its own weight / the weight of the water/ both pressure and weight of water above it. Increased / higher/ high pressure is created in region between valve A and valve B forcing valve b to open or water (pressure) opens valve B.

b) The water is upstroke/ lifted up by the piston and comes out through the spout;/ pulling up piston/ moving up piston.

c) $\ell_w g h_w = \ell_p g h_p$

$= 12.5m$

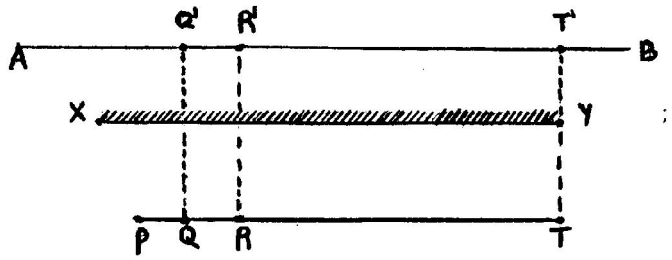
$hp = \frac{1000 \times 10}{800}$

d) Force applied on piston. or

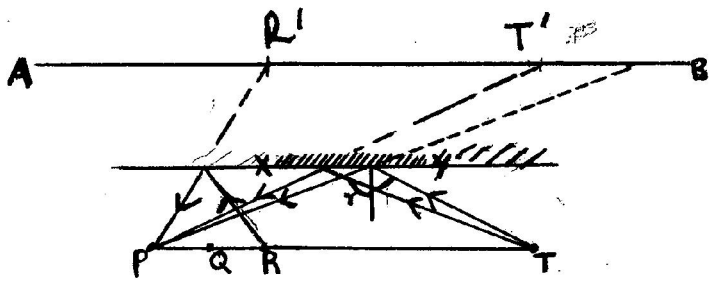
Ability of the parts of the pump to withstand the pressure of the liquid column.

PHYSICS PAPER 2 2012
MARKING SCHEME

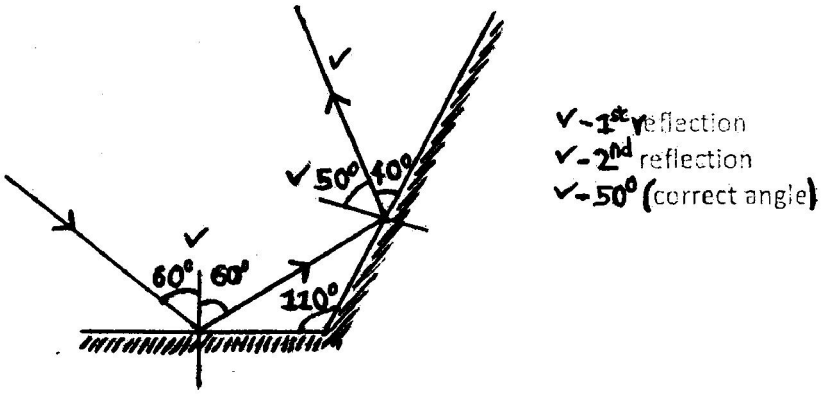
1) a)



b) T and R



Reflected ray from T moves towards P;



3. $V + V + \frac{V}{2} = \frac{5V}{2}$

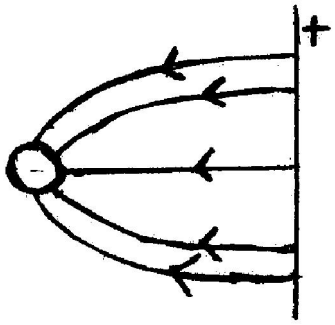
$5V = 15V$

$V = 6V$

$\therefore \quad \frac{V}{} = \frac{6}{} = 3V$

2 2

4.



Correct pattern at least three field lines drawn
Correct arrows

Check correct direction of field lines.

5. Refractive index = real depth
Apparent depth

= 40
30

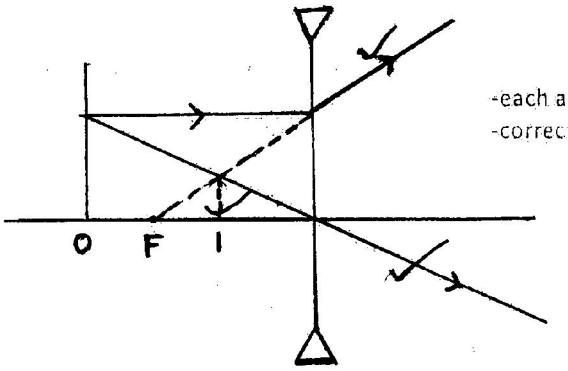
= 1.33 at least 2.dp

6. β and λrays;

7. L – south pole;

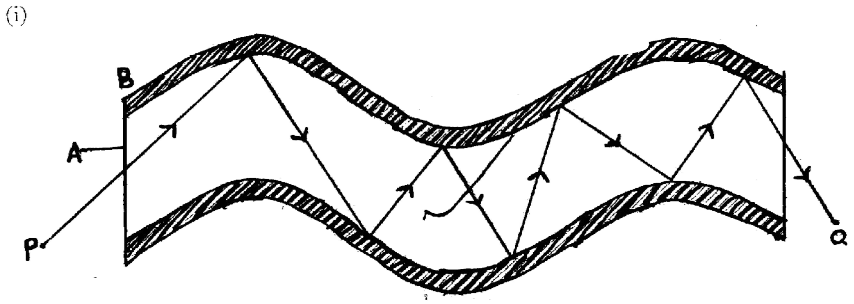
8. UV light ejects electrons by photo electric;
Emission reducing the negative charges;/ electrons are repelled

9.



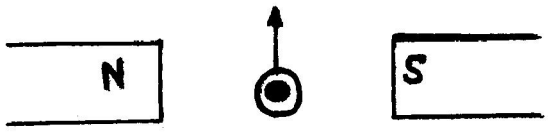
-each array- ✓✓
-correct virtual diminished image ✓

10. i)



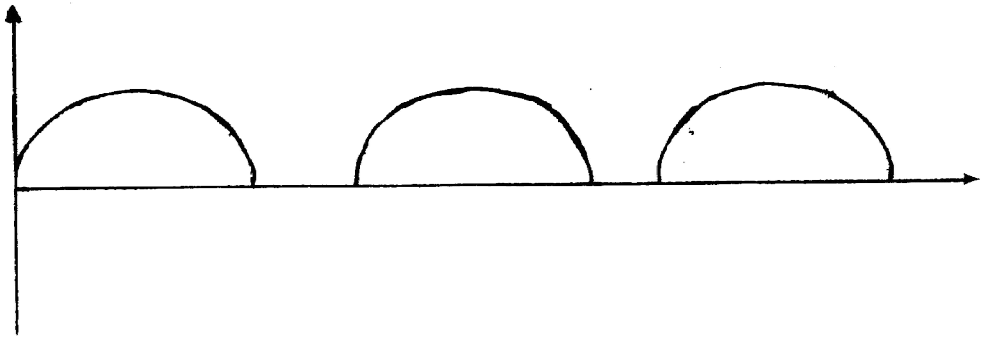
ii) Rectilinear propagation . Total internal reflection occurs.
F; correct direction

11.



12. Alternating voltage can be stepped up, or enhances reduced power losses;

13.



Minimum of 2 arcs should be shown
(above / below x – axis)

Curves should be symmetrical.

SECTION B

14. a) i) amplitude = 5cm√

ii) T = 20s√

$f = {}^{1}/_{T}$√

$f = {}^{1}/_{20} = 0.05HZ$√

iii) V = f√

$\lambda = \frac{20\ \surd}{0.05}$

= 400m√

b) i) Waves at Q are in phase √so there is constructive interferences.√ (2marks)

ii) Waves are out of phase hence destructive interference.√ (1mark)

iii) Interference pattern would disappear.√ (1mark)

5. a) i) V = IR√

101 = 1.5

I = 0.15A

ii) bulb = 0.1A√

R x 0.1 = 1.5√

R = 15Ω√

b) i) the resistance of the bulb would increase;

ii) current is higher hence increases; temperature increased temperature results in increased resistance;

c) number of units = (0.1 x 70 + 0.06 x 70 + 0.03 x 70) = 17.5kwh
= 1.9 units;

Cost = 1.9 x 40 x 7; 17.5 x 0.4 = sh. 7
= ksh 5.32;

16. a) i) Pointer deflects upto a certain; maximum value and then returns to zero; (point shows a momentarily deflected)

ii) There is deflection in the opposite direction then back to zero; As Flux in A falls; flux in B also falls and causes induced e.m.f in the opposite directions;

b) i) Current in the primary is constantly changing its direction;/magnitude so that the resulting flux (which link coils) is constantly changing its direction. Therefore alternating e.m.f is induced in the secondary coil; (2marks)

ii) $\frac{Vs}{Vp} = \frac{Ns}{Np}\surd$

$\frac{Vs}{240} = \frac{200}{1000}\surd$

$Vs = 48V;\surd$

iii) Efficiency = $\frac{\text{power output}}{\text{power input}} \times 100\%$

$= \frac{IsVs}{Ip\ Vp} \times 100$

$= \frac{0.8 \times 48}{0.2 \times 240} \times 100\%$

= 80%
Or 0.8

17. a) i) The image diminishes (becomes smaller);

ii) $m = 1 \Rightarrow \frac{V}{u} = 1$

V = u = 40cm;

iii) u = 25

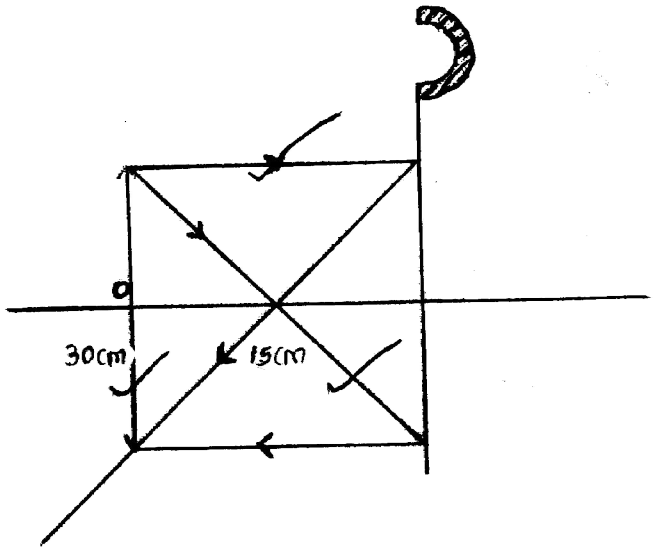
m = 3.5 or m = 3.6

$m = \frac{v}{u}$ $m = \frac{v}{u}$

$\frac{v}{25} = 3.5$ $\frac{v}{25} = 3.6$

V = 87.5cm $\therefore$ v = 90cm

b)



c) A bulb/lamp placed at principal focus will give a wide parallel beam;

18.a) i) To produce electrons; by thermionic emission;

ii) To accelerate the electrons to give them enough K.E to produce X-rays at the anode;

iii) To absorb stray X-rays; thus protecting the operator from those rays;

b) Increases K.E of electrons and hence causes X –rays of higher frequency;
OR
- **X – ray are more penetrative**
- **X – rays of shorter wavelength.**

c) E = hf
= 6.63 x 10-34 x 7.5 x 1014
= 4.97 x 10-19J;

K.E = $4.97 \times 10^{-19} - 4.0 \times 10^{-19}$
= 0.97×10^{-19}J; or 9.7×10^{-20}J