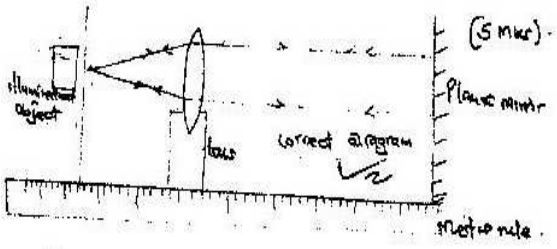
K.C.S.E 2005

PHYSICS PAPER 232/1

MARKING SCHEME

1.



Correct diagram

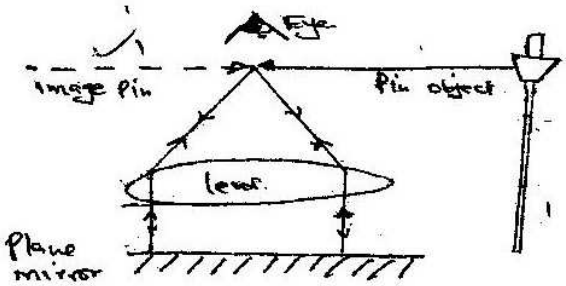
With distance between lens and object being greater than facal length f;

(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 mked

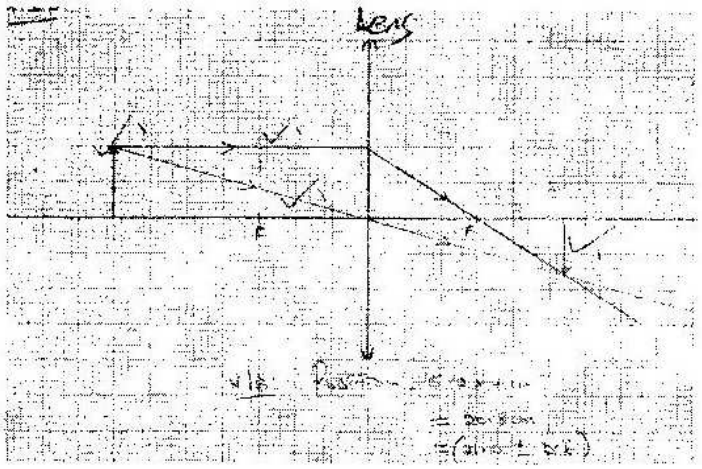


Correct rays 1 mark

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

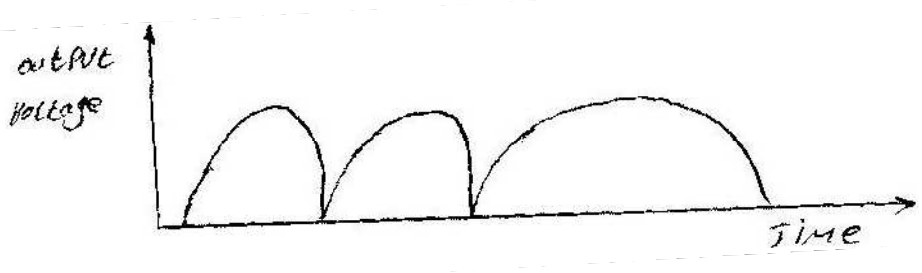
(iii) The fifth electron is left unpaired and so conducts

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 $\frac{\text{Ext}}{\quad} = 5 \quad = 0.025$

Original length 200

(c) ED and DC

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

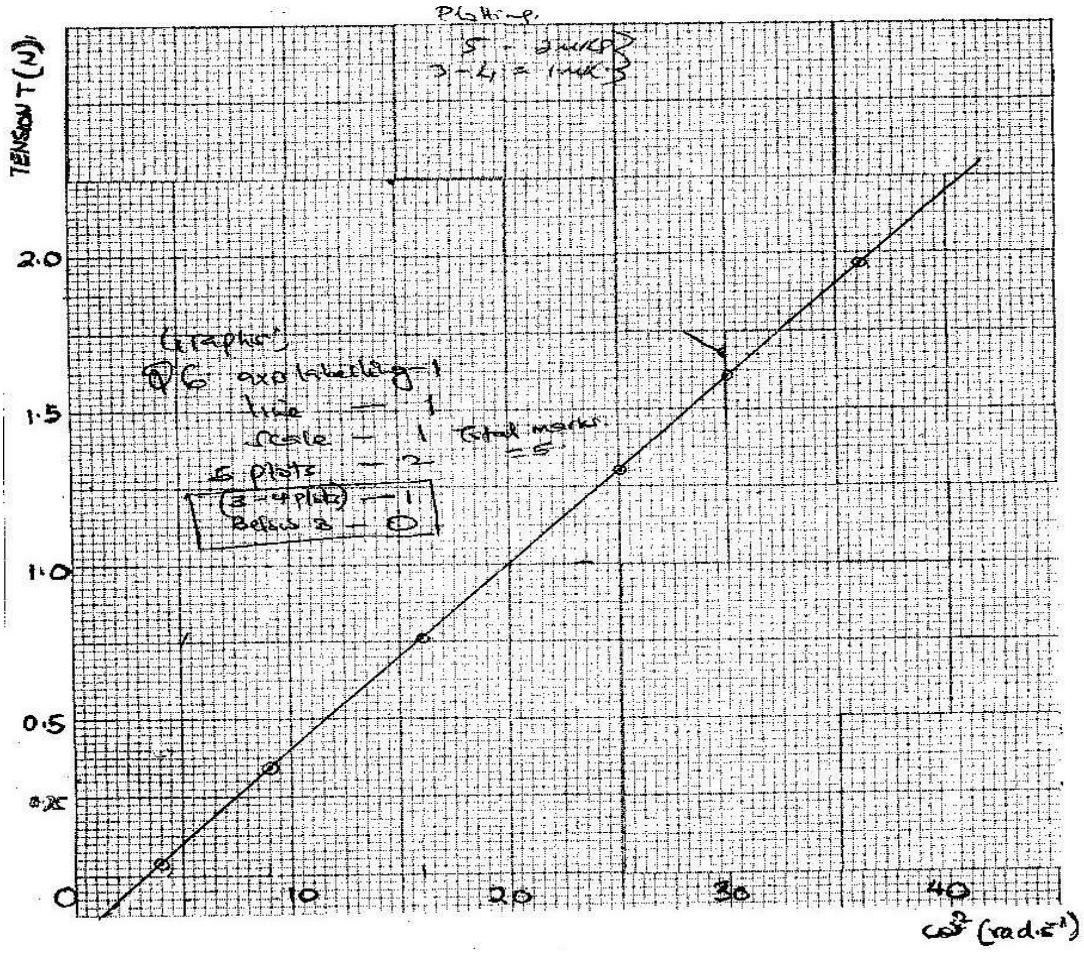
or $W = \frac{\theta_2 - \theta_1}{t_2 - t_1}$

(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

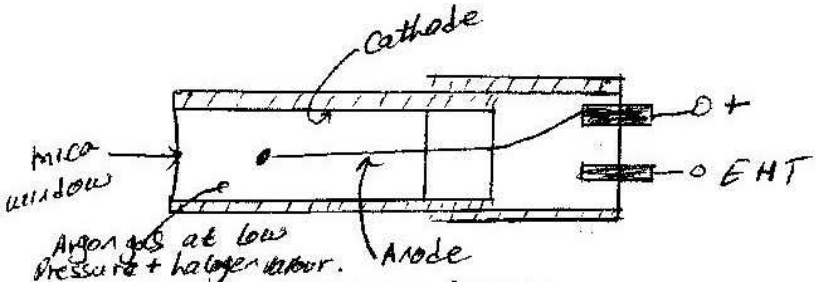


Diagram (3 label

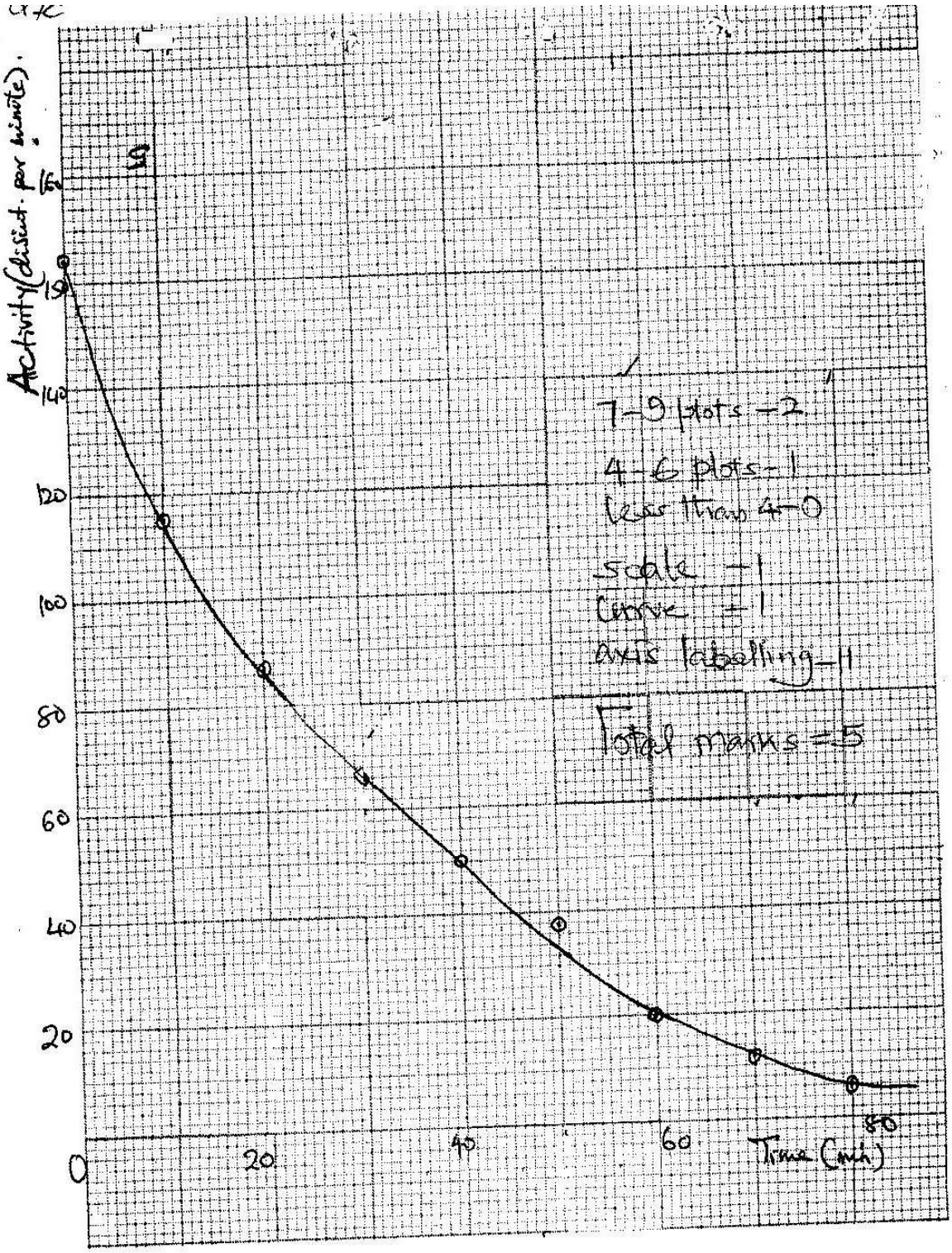
When radiation enters via mica windows, the argon gas is ionized; the electrons going to the anode and positive ions going to cathode; thus a discharge is suddenly obtained (PULSE) between anode and cathode and registered as a particle by counter. The discharge persists for a short time due to the quenching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

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

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

3 half – lives

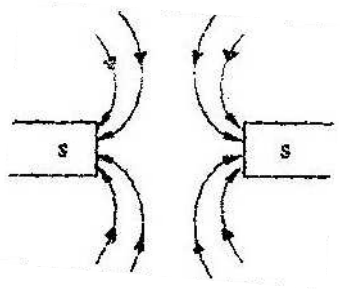
t = 4 min



K.C.S.E 2006

PHYSICS PAPER 232/2

MARKING SCHEME

1. 

2. Magnification =

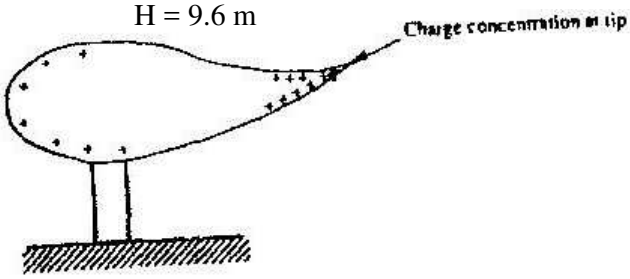
Im age dist = ht of image

Object dist height of object

10 = 16

600 h

H = 9.6 m

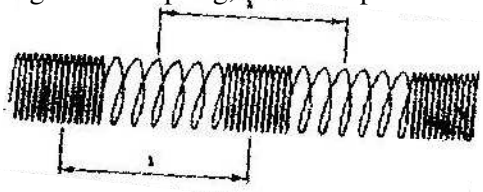
3. 

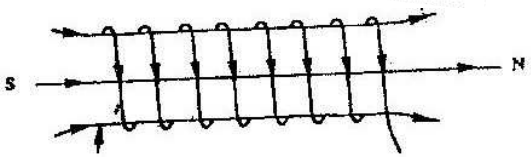
(3 mks)

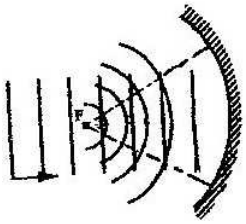
4. To allow escape of gases (H_2 and O_2) from battery

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 mks)

8. Distance moved by sound waves = 2x;
2x = speed x time

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

= 297m (3 mks)

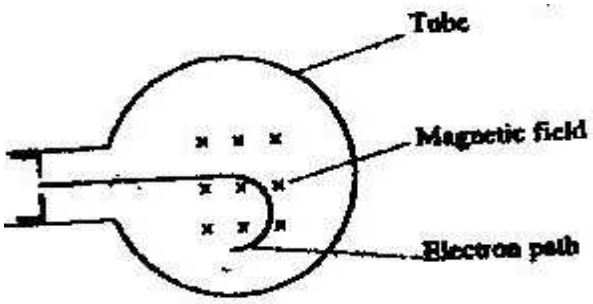
9.
- Constant temperature
- No mechanical strain (1 mk)

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

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 mks)

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

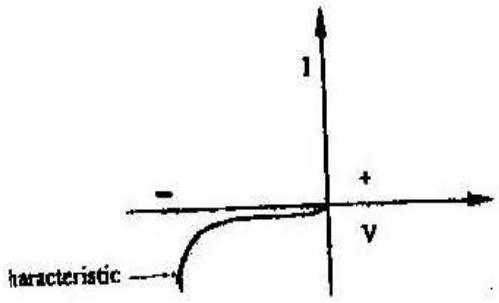
13.



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

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

16.



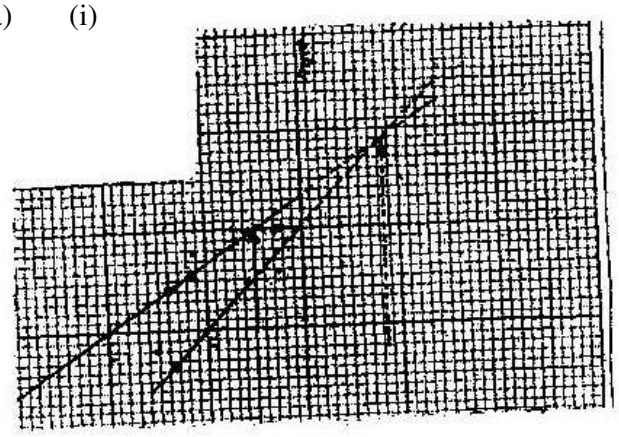
17. (a) Charge Q, on C_1 is given by
Charge $Q_1 = C_1 V$;
$= 0.3\ \mu F \times 4.5$;
$1.35\mu C$; (3 mks)

(b) $C_T = C_1 + C_2$;
$= (0.3 + 0.5)\ \mu F$
$= 0.8\ \mu F$ (2 mks)

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

(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 mks)
(iii) Magnification

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

OR

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

(b) (i) I

$$\frac{\text{Image distance}}{I} = \frac{I}{f} + \frac{I}{u}$$

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

$$v = 20 = 6.67\ cm$$

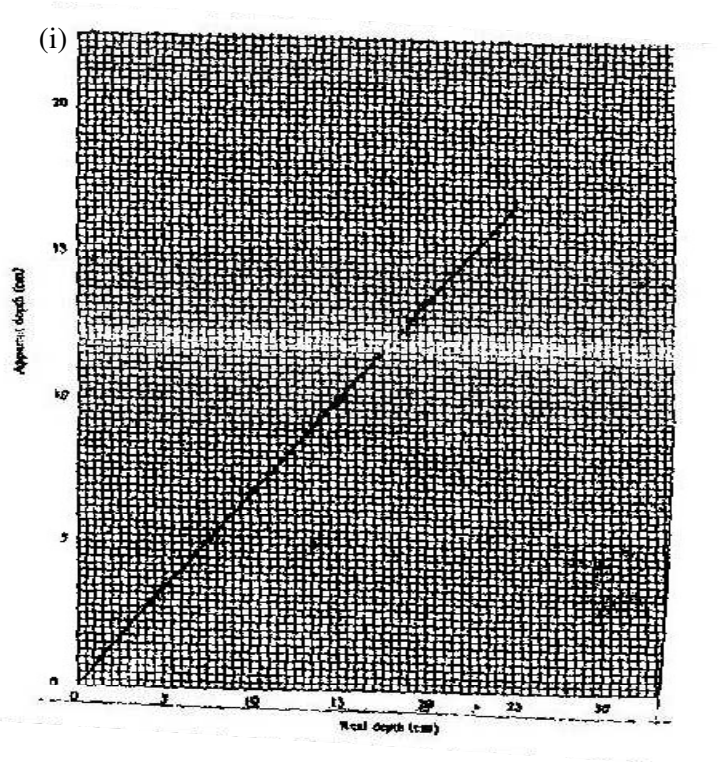
II Magnification
= v = 6.67 = 0.33; (2 mks)
u 20

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

19. (a) Refr. Index n = sin ivelocity in air
Sin r velocity in substance

OR
n = Real depth
Apparent depth (1 mk)

(b) (i)



(ii) Slope of graph = $^{16}/_{24}$ = 2/3
Refr. Index n = Real = I
Apparent *slope*

= 3 = 1.5 (4 mks)
2

(c) n= sin 90;⇒ sin θ = 1;⇒ θ = 38.7^0 = critical angle (3 mks)
Sin θ 16

20. (a) (i) P = slip rings

Q = Brushes (2 mks)

(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 mks)

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

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

$I_S = \frac{I_p V_p}{V_s} = \frac{0.5 \times 240}{12} = 10A$; (3 mks)

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

(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 mk)

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

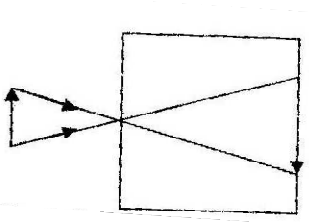
(b) Cost of electricity
1.5 kw x 30h x 8 Kshs = Kshs 360/=

K.C.S.E 2007

PHYSICS PAPER 232/2

MARKING SCHEME

1.

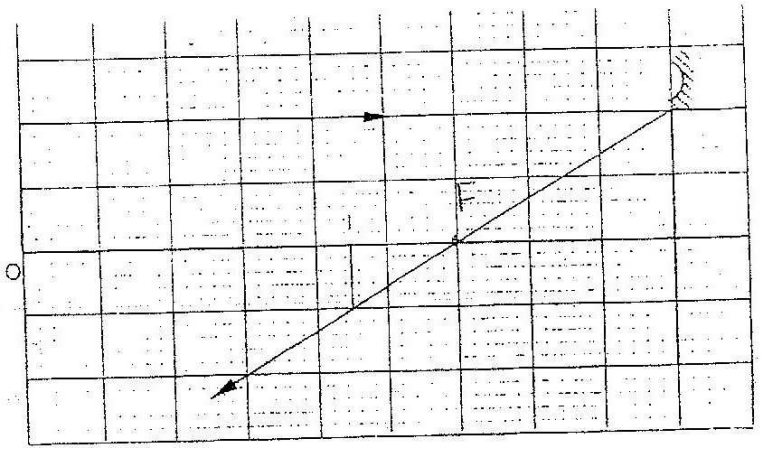


Rays
Image and object must be labeled
Image must be enlarged

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 mk)

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

4.



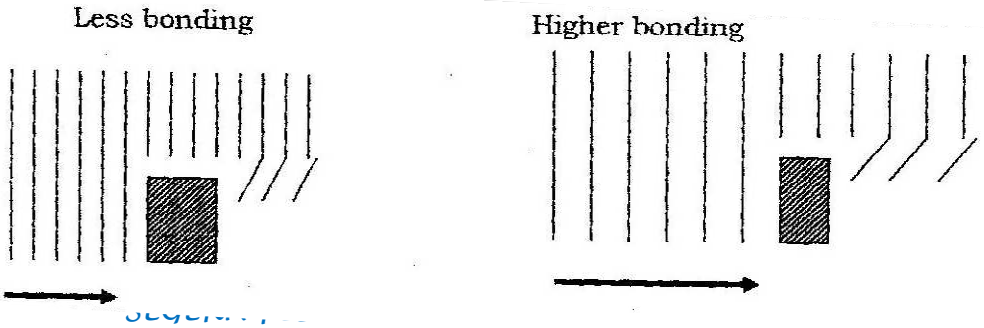
Correct rays
F marked

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

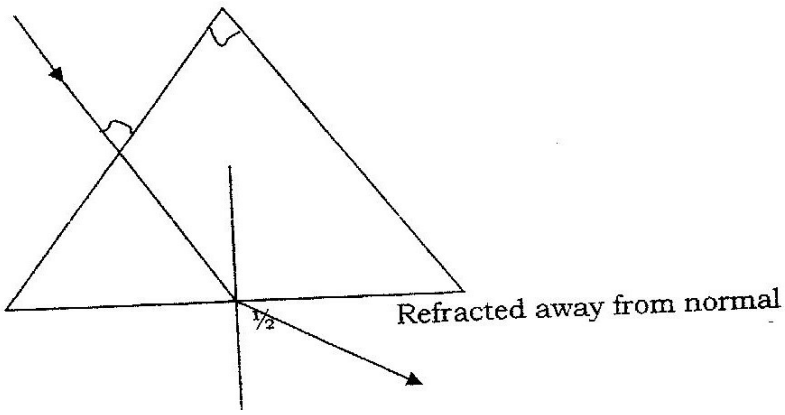
$F = {}^{1}/_{T} = 3/0.007$ (f)

$= 429H_z$ 428.57 – 434. $80H_2$ (3 mks)

6.



7.



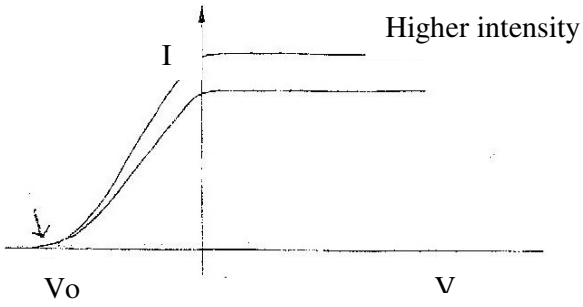
8. $I = 1.5$: or $I = E$
$R + r \qquad R + r$
$0.13 = \frac{1.5}{10 + r}$
$R + 1.5\Omega;$
$R = 1.5\ \Omega$ (3 mks)

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 mks)

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

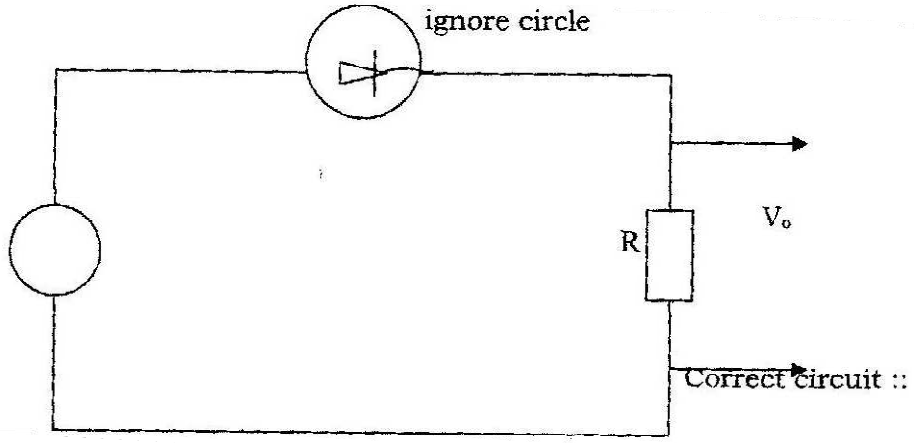
11.



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

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 mks)

(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 mks)

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

$R = 12\ \Omega$

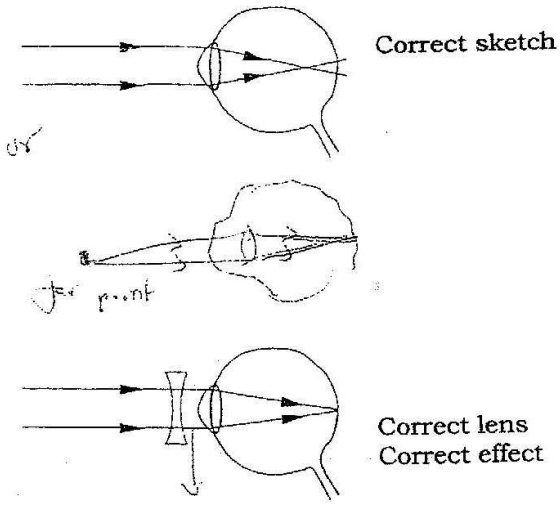
Total resistance = 10 + 12 = 22Ω (2 mks)

(ii) $I = {}^{V}/_{R} = {}^{2.1}/_{22} = 0.095A$ (1 mk)]

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

$= 0.95$

16.



Diverging effects should be seen (2 mks)

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

(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 mks)

(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 mks)

(ii) From above u = 20cm

$^1/_f = 1/v + 1/u = 1/60 + 1/20$ (2 mks)
F = 15cm (15 mks)

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 mk)

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

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

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

$Vs = 40V$

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

(iii) $Ps = P_p = 600W$
$l_s = {}^{600}/_{40} = 15A$ (1 mk)

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

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

(iii) Accelerating (1 mk)
Focusing

(iv) Across X - plates (1 mk)

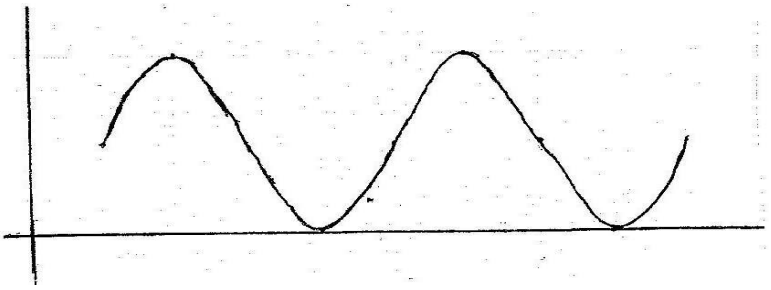
(v) To reduce collisions with air molecules that could lead to ionization

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

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

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

(iii)



K.C.S.E 2008

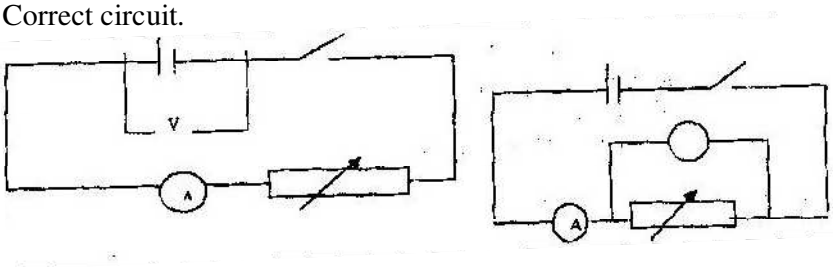
PHYSICS PAPER 232/2

MARKING SCHEME

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

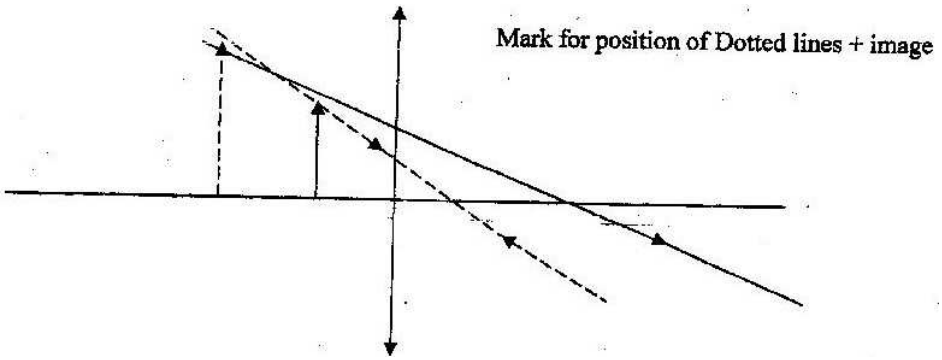
2. Leaf in A falls a bit while leaf in B rises a bit
   The two leaf electroscope share the charge

3. Correct circuit.



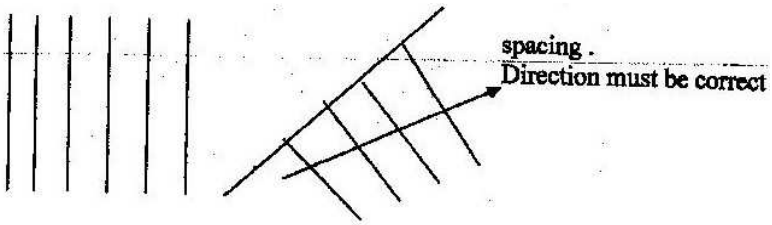
4. Hammering causes the domains or dipoles to vibrate when setting, some domains themselves in the N- S – direction due to the earth's magnetic field causing magnetisatioa.

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. $P = {}^{V2}/_{R}$ $P = {}^{220\wedge2}/_{240\wedge2/100}$

$R = \frac{240^2}{100}$
$= 84$ 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) $T = \frac{4x}{V}$
$V = \frac{4x}{}$ or slope = $\frac{4}{}$

t 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
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 = $\frac{\text{Sin }\theta}{\text{Sin 90}}$

$= \frac{I}{\text{Sin }\theta} \quad \frac{I}{n}$

$= {}^{1}/_{\sin\theta}$

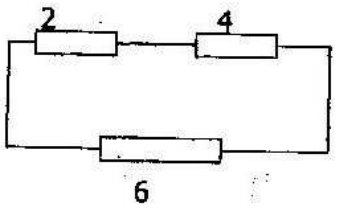
(c) (i) At greatest angle θ, the angle must be equal to critical θ angle of the medium

Sin θ = sin c
= ½
= 1/1.31 = 0.763 $\theta = 49.8^0$
Angle < 49.8^0

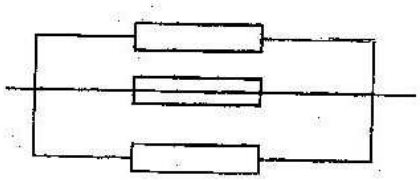
(ii) $X = 90^0 - \theta$
$= 40.2^0$

(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= 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 x 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) $VP = NP \quad P = I_sV_s$
$V_s \quad N_s \quad I_s = \frac{800}{40}$

$\frac{400}{Vs} = \frac{200}{200}$

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
6.02×10^{-3f}
$= 2.9 \times 10^{18}$Hz

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

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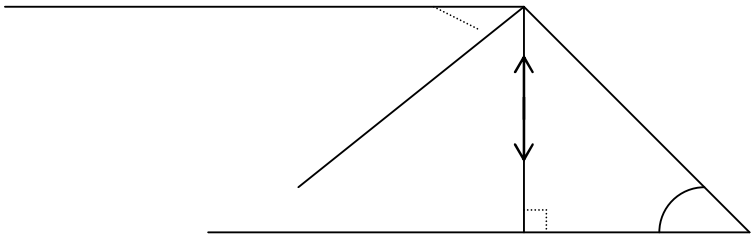
PHYSICS PAPER 232/2

MARKING SCHEME

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 MKS)

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 $Q_B = {}^{5}/_{8} \times 32$

$= \frac{32 \times 10^6}{8 \times 10^6}$ $= 20$ PC

$= 4$ V $V_B = \frac{20 \times 10^{-6}}{5 \times 10^{-6}}$

$= 4$V

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

(b) $R = v/l$

$\frac{2.5}{1.2}$

$= 2.1\ \Omega$

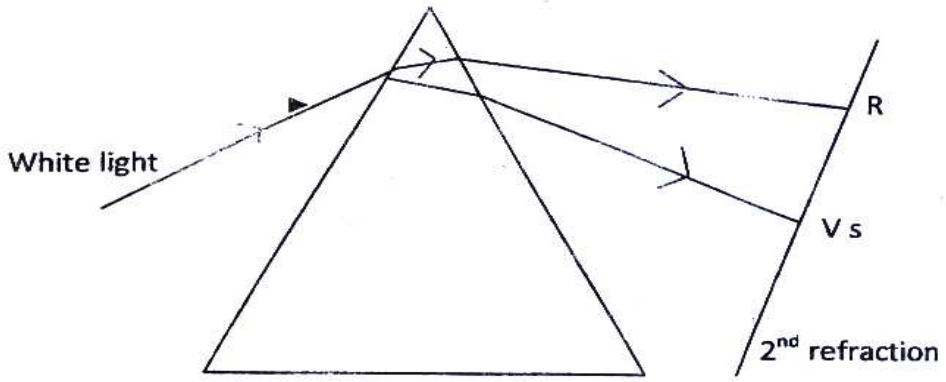
(c) Read off P d across Y = P.O.V from graph

(d) Power P = IV

= 0.8 x 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 defect

(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) $W = hf_0$

$= 6.63 \times 10^{-34} \times 3.75 \times 10^{14}$

$= \frac{2.49 \times 10^{-19} J}{\times 10^{-19}} = 1.55$ e V

(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

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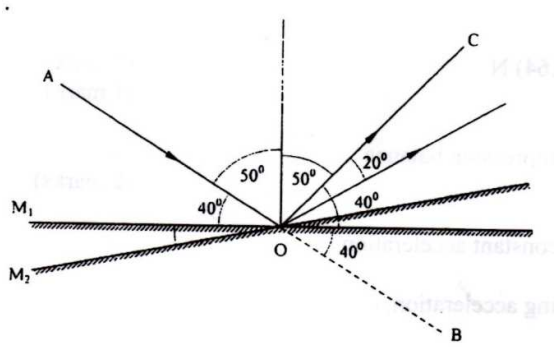
PHYSICS PAPER 232/2

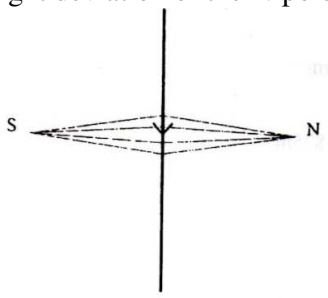
MARKING SCHEME

1.



Initial deviation = 80^0, Reflected ray rotates 2 x 20 = 20^0
Final deviation = 80 + 20 = 100^0

2. Any sight deviation of the N-pole to the right



3. Correct poles correct direction + pattern

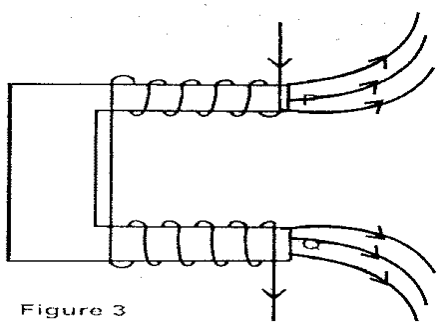


Figure 3

FIGURE 3

4. The conductor is initially attracted because of opposite charge. It is then neutralized and charged positive/negative, hence repelled

5. Distance = 2f = 2 x 25 ½ = 50cm ½

Alternative
Just 50cm
Or
2 x 25 = 50cm ½

6. High voltages imply low current so reduces heat /power losses

7. More practice / relationship between f and t displacement

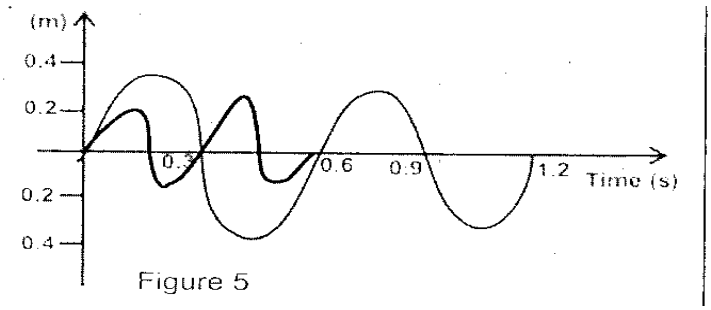


Figure 5

8. **Refractive index =** $\frac{V_1}{V_1} = \frac{f\lambda_1}{f\lambda_2} = \frac{18}{14.4} = 1.25$

9. $20g \xrightarrow{5} 10g \xrightarrow{5} 5g \xrightarrow{5} 2.5g \xrightarrow{5} 1.25g$ ✓2
Mass remaining

10. P α $I^2 = 7^2 = 49$

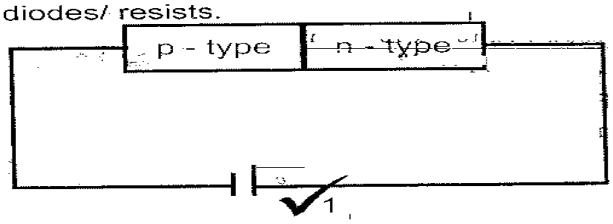
11. Motion out of paper /moves upwards√ 1
OR increases in p.d

12. Increasing the accelerating voltage, or increases in p.d increasing heating effect

13. $F = \frac{V}{\lambda} = \frac{C}{\lambda}$
$= \frac{3 \times 108}{1000}$ 13.0×10^5 HZ

14.

Look for biasing only. (any other device that doe not affect the working should be ignored) e.g diodes/ resists.



✓1

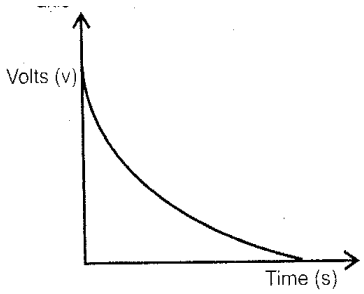
15.

(a) (i) Current falls off to zero / falling to zero / deflects to max. Then zero
Reducing gradually or after sometime.

(ii)Current flows when the capacitor is charging
When fully charged current stops (no current) and p.d is equal to charging voltage

(b) $V_C = 5V$

(c)



Touch both axis, award for no labeled 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

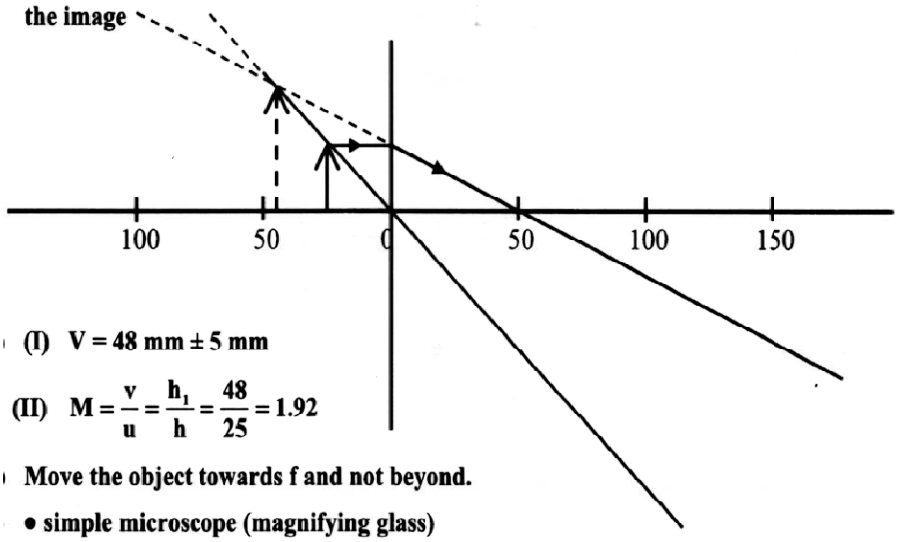
Q series = $Q_T - Q_{3\mu F}$✓1

= (5.22 – 3) x 10✓μC1

= 22.2✓μC1

Charge is the same on series section hence on 5.0μ F is 22.2 μ C

16. (i) The following should be clearly shown: 2 rays, dotted extensions and the image



(b) $\frac{1}{U}+\frac{1}{V}=\frac{1}{f} \Longrightarrow \frac{1}{50}+\frac{1}{80}=\frac{1}{400}$ v = $\frac{400}{3}$: U = 80 + 60 + 140

$\frac{1}{V}+\frac{1}{50}=\frac{1}{700} \Longrightarrow$ V = $\frac{700}{3}$ ∴ length of image = $\frac{400}{3}$ - $\frac{700}{3}$ = $55\frac{5}{9}$ mm

17.

a) - 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) (i) Q = McΔθ or Mcθ or McΔT
= 3 x 4200 x 80 = 1008000J

(ii)Q = cθ / cΔθ / cΔT = 450 x 80
= 36000J

(iii)PL = McΔθ / cΔθ t = 34.8J
3000t = 1008000 + 36000
3000t = 1044000

(iv) 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. Deflected towards the positive plate. E.m.f. increased deflection will be greater.

(I) Spot moves back and forth.
(II) there will be a horizontal line.
(III) Electrons are given off as a result of heat produced by the current.

P = VI - 100 x 1.5 x 10^{-3}J= 1.5 Js

19.

(a) the intensity of radiation

(b) (i) stopping potential is negative potential sufficient to just stop the movement of electrons

(ii) (I) gradient = $\frac{h}{e} = \frac{3-0}{(12-4.4)\times 10^{14} Hz} = 3.95 \times 10^{-15}$

H = 3.95 x 10^{-15} x 16 x 10^{-19} = 6.32 x 10^{-34} Js

(II) y-intercept = $-\frac{\omega_0}{e}$

$-\frac{\omega_0}{e}$ = -1.75V ω_0= 1.75eV

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PHYSICS PAPER 232/2

MARKING SCHEME

Section (2 5 marks)

Answer all the questions provided in this section in the space provided

1.

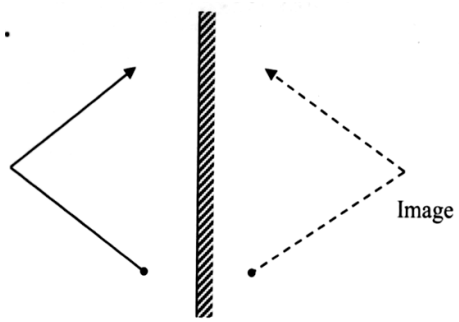


Figure 1

2.

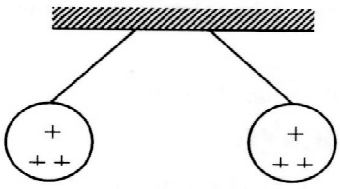


Figure 2.

3. *Mica has high permitivivity /diletric constant/ raises capacitance hence lower potential difference since V = Q/C but Q is constant*

4.

A-carbon rod /graphite

B- manganese (iv) oxide + powered carbon

5. *Manganese (iv) oxide is a depolarizer / oxidizing agent / oxidizes hydrogen to water /reacts with hydrogen to form water .*

6. *Hammering causes domains / dip lets to vibrate/ disturbsAs they settle , some face north –south due to earth 's magnetic field.*

7. 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. *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. a)

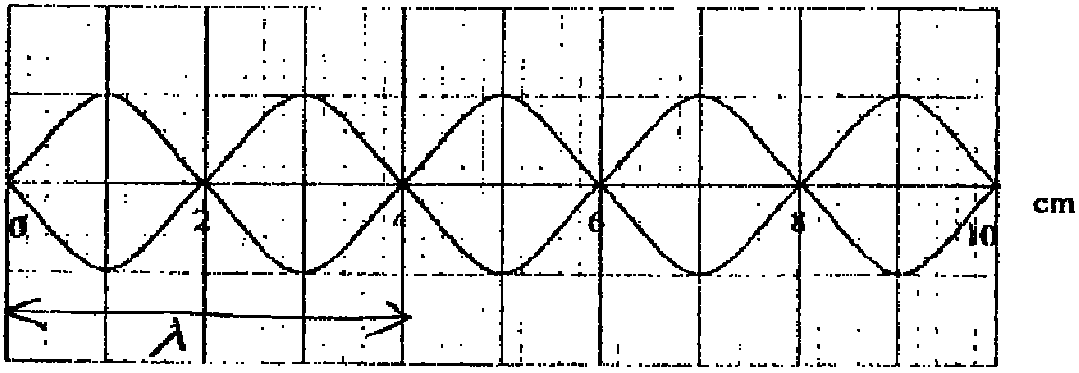


Figure 6

b) ***25A = 10 X 5***
= 20Cm/ O.2m

10. **Figure** 7, shows two rays of l i g h t incident n orm a lly on face PQ of a glass prism, whose critical angle is 42°.

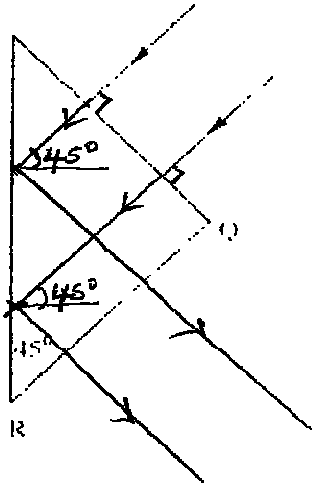


Figure 7

11.

$$P = \frac{V^2}{R} \qquad = \frac{36}{4} = 9w$$
$$= \frac{6 \times 6}{4}$$

12. *Radio waves* *microwaves* *yellow light* *gamma rays*

13. *High voltage leads to low current hence low power (RR)losses energy loss*

14. *The minimum frequency of an incident adiation to cause emission of photo electrons/photo emission/ to eject/ to dislodge/ remove electrons,*

15. (i) *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) *Resistance decreases as the current increases*

(iv) *change (increase) in temperature / temperature is constant*

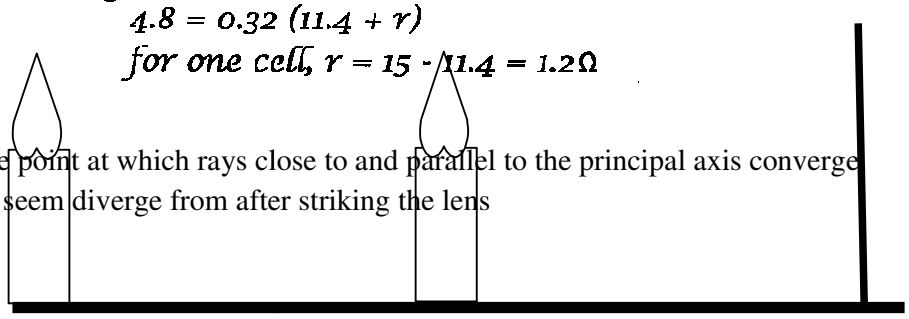
(b) (i) *V total* $= 1.6 + 1.6 + 1.6 = 4.8\ v = E$

(ii)

let r to be the combined internal resistance
using $E = 19R + r)$
$4.8 = 0.32\ (11.4 + r)$
for one cell, $r = 15 - 11.4 = 1.2\Omega$

16. (a) the point at which rays close to and parallel to the principal axis converge or seem diverge from after striking the lens

(a) i)



Candle Len Screen

(ii) *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) *The distance of candle from lens (u) is measured.*
The distance of screen from lens (v) is also measured.

(iv)

$\frac{1}{4}=\frac{1}{u}=\frac{1}{v}$

Graphical method
Draw a graph against $^1/_2$

(c) An object is placed 30cm in front of a concave lens of local length 20cm. Determine the magnification o f the image produced.(4 mks)

$\frac{1}{v}=\frac{1}{f}-\frac{1}{u}$

$\frac{1}{v}=\frac{1}{20}-\frac{1}{30}$

$\frac{1}{v}=\frac{-3-2}{60}$

$\frac{1}{v}=\frac{-5}{60}$

$v=\frac{60}{-5}$

$=-12$

$m=\frac{v}{u}$

$=\frac{-12}{30}$

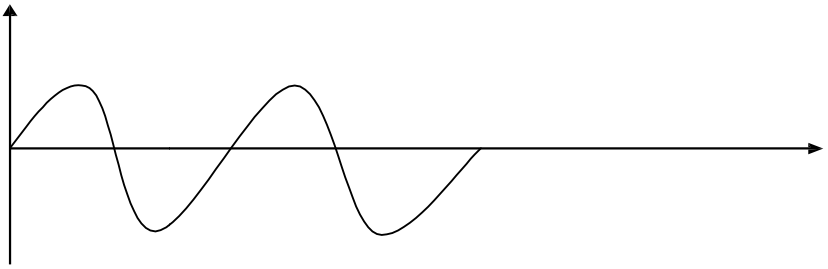
$=0.9$

17. a) *The production of induced emf when the magnate flux linking a circuit is changed.*

b) **i)** *P* *brushes /carbon /graphite*

Q *slip rings*

ii)



iii) *Increasing number of turns/ coils*
Increasing speed of rotation/ rate of rotation
Winding coil on soft iron cord

Increasing area/ size

(c) (i) Vs = 200 x 0.5
= 100v

(ii) $\frac{N_P}{V_P} = \frac{V_P}{V_S}$

Vs = 200 X 0.5

= 100v

$$V_P = \frac{I_S}{I_S} \times 1 = 10V$$

$\frac{V_P}{V_S} = \frac{I_S}{I_S}$

$\frac{10}{100} = \frac{0.5}{I_P}$

$I_p = \frac{0.5 \times 100}{10}$

$I_P = 5A$

(iii) the primary current.

$\underline{VP} = \underline{IS}$ $\quad$ $I P = \underline{0.5 \quad X\ 100}$

$VS = IP$ $\quad$ 10

18. (a)

- 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) (i)

M - *grid*

N - *accerelating anode / anode*

N - *vacuum space / evacuated space*

(ii)

Cathode is heated by filament; electrons are released from cathode; by thermionic emission/ hot filament emits electrons

(iii)

I) *across y - plates / horizontal plates.* (1mks)

II) *Across x plates / vertical plates*

(iv) *to reduce collisions, (hence ionization) with air molecules in the tube.*

(c)

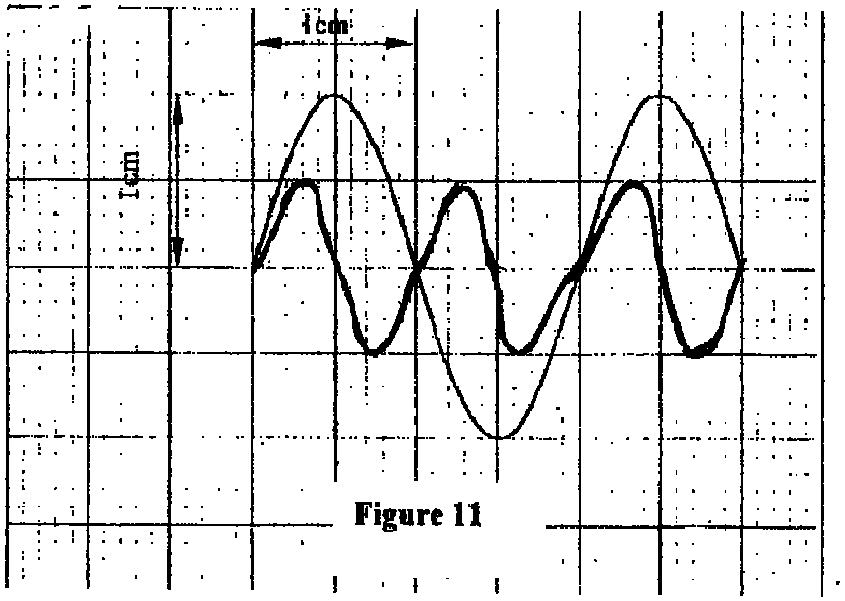


Figure 11

Amplitude ✓

frequency ✓

(i) *Peak - to - peak voltage = 5 x 2*

= 10v

(ii) *x - radiation / Alpha 4He2+*

short range with intense ionization hence tracks / massive /high ionization .

19. a) α – radiation;

short range with intense ionization hence thick tracks

b) no. of half – lifes = $\frac{19.15}{3.83} = 5$

(c) *A semiconductor in which impurities have been added to change conductivity/ improve/ enhance conductivity. pure semi-conductor which has been doped Impure semi-conductor*

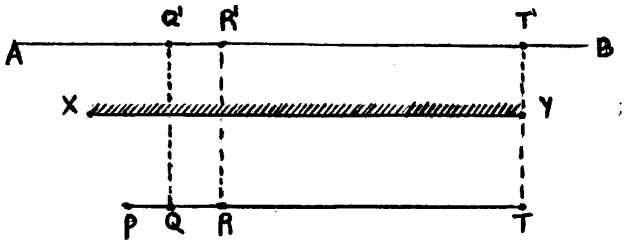
(d) *By connecting it in forward broad mode (ie p to + and n to -)*

K.C.S.E 2012

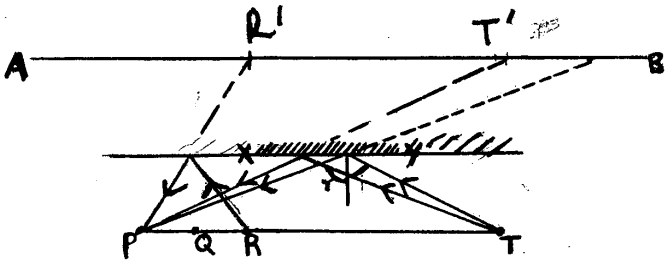
PHYSICS PAPER 232/2

MARKING SCHEME

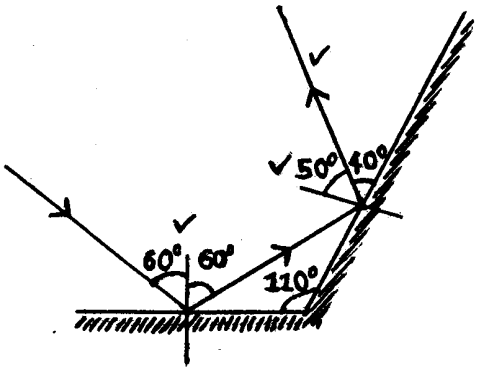
1) a)



b) T and R



Reflected ray from T moves towards P;



✓- 1st reflection
✓- 2nd reflection
✓- 50° (correct angle)

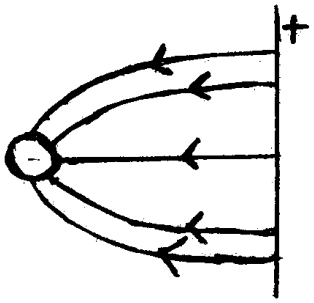
3. $V + V + \frac{V}{2} = \frac{5V}{2}$

$5V = 15V$

$V = 6V$

$\therefore \frac{V}{2} = \frac{6}{2} = 3V$

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

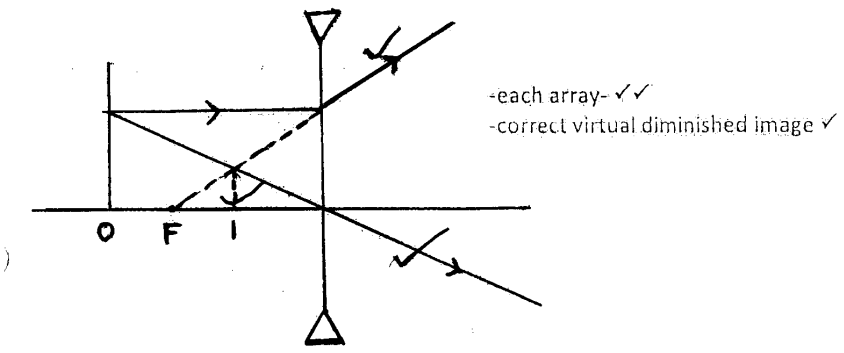
= 1.33 at least 2.dp

6. β and λrays;

7. L – south pole;

8. UV light ejects electrons by photo electric;
Emission reducing the negative charges;/ electrons are repelled

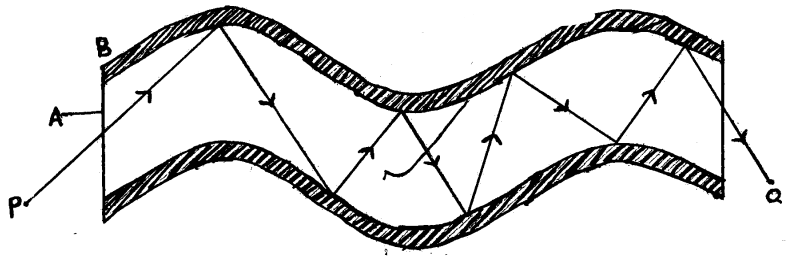
9.



-each array- ✓✓
-correct virtual diminished image ✓

10. i)

(i)

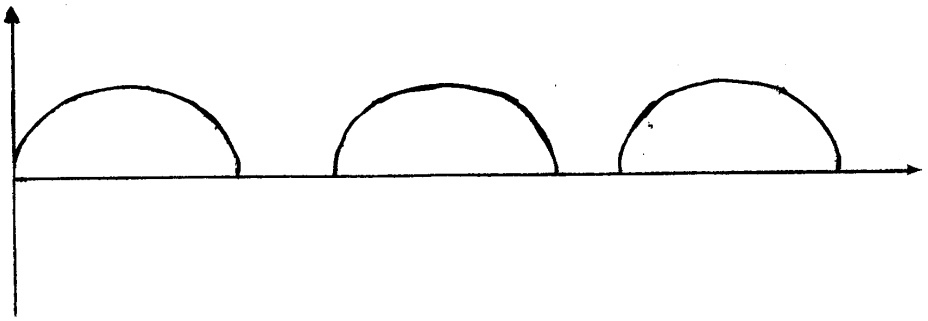


ii) Rectilinear propagation . Total internal reflection occurs.
F; correct direction

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√

$f = {}^{1}/_{T}\surd$

$f = {}^{1}/_{20} = 0.05HZ\surd$

iii) $V = f\surd$

$\lambda = \frac{20\ \surd}{0.05}$

$= 400m\surd$

b) i) Waves at Q are in phase √so there is constructive interferences.√ (2mks)

ii) Waves are out of phase hence destructive interference.√ (1mk)

iii) Interference pattern would disappear.√ (1mk)

5. a) i) $V = IR\surd$

$101 = 1.5$

$I = 0.15A$

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; (2mks)

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) $u = 25$

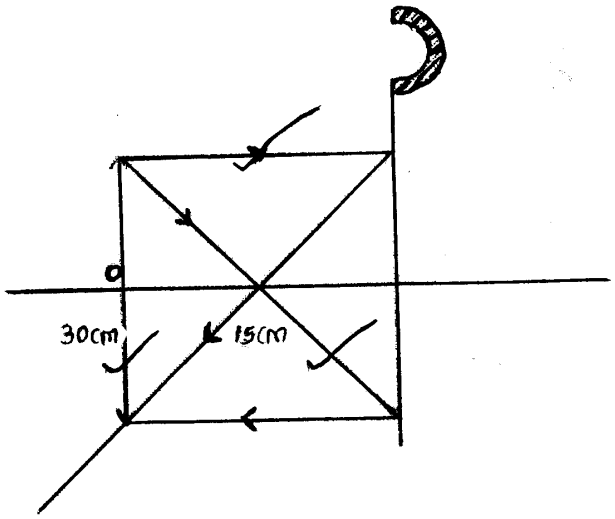
$m = 3.5$ or $m = 3.6$

$m = \frac{v}{u}$ $m = \frac{v}{u}$

$\frac{v}{25} = 3.5$ $\frac{v}{25} = 3.6$

$V = 87.5cm$ $\therefore v = 90cm$

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

K.C.S.E 2013

PHYSICS PAPER 232/2

MARKING SCHEME

SECTION A

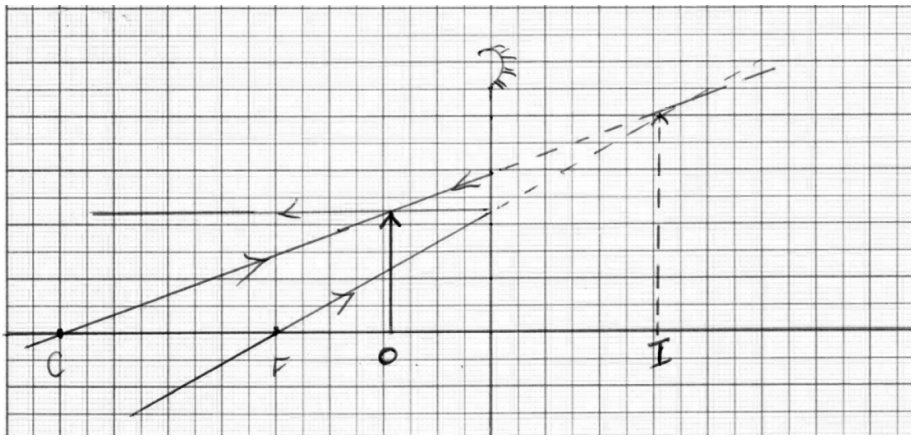
1. angle of incidence = angle of reflection = 0 (1 mk)

2. larger hole acts as many small holes (1 mk)
   many overlapping images of same object (1 mk)

3. Within the magnet, N and S poles of the dipoles cancel out but at the end of the poles they don't. (1 mk)

4. (a) 2V (1 mk)
   (b) 1.6V (1 mk)

5.



Object at the intersection of incident ray; (1 mk)
Incident rays; (2 mks)

6. Ray totally reflected by face AC (1 mk)
   i = hence r = (1 mk)
7. a = 1 and b = 0 (1 mk)
   x = neutron (1 mk)

8.

$\frac{Ns}{Np} = \frac{Vs}{Vp}$ (1 mk)

$\frac{5}{10} = \frac{Vs}{12}$ (1 mk)

Vs = 6V (1 mk)

9. Each lamp on full voltage (1 mk)
Failure of one lamp does not affect the others (1 mk)

10. X rays ionise air molecules between plates (1 mk)
Ions move to plates of opposite sign (1 mk)

11. Sun being hotter produces short wavelength infrared waves which penetrate glass; burning wood produces long wavelength infrared waves which do not penetrate glass. (1 mk)

12. K = E - T (1 mk)

13. Arsenic shares 4 of its 5 electrons with germanium. (1 mk)
the extra electron is free for conduction. (1 mk)

SECTION B

14. (a) $f_A = 10\ cm$ (1 mk)

(b) (i) to produce a magnified real image (1 mk)
(ii) to produce a magnified virtual image of the 1st image. (1 mk)

(c) (i) move A so that the object is slightly outside f_A (1 mk)
(ii) move B so that the real image is within f_B . (1 mk)

(d) (i) $m = {}^{24}/_{16}$
$= {}^{3}/_{2}$ (2 mks)
(ii) $m = {}^{28}/_{4}$
$= 7$ (2 mks)

15. (a) – Negative charges flow from earth to cap. (1 mk)
– Negative charge neutralizes the positive. (1 mk)

(b) (i) $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$ (1 mark)

$= \frac{1}{3} + \frac{1}{6}$ (1 mark)

$= \frac{1}{2}$

$C = 2\mu F$ (1 mark)

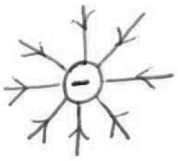
(ii) Q = CV

= 2 x 4

= $8\mu C$

Q = $8Mc$

(c)



- radical field;
- Correct dirrection; (2 mks)

16. (a) (i) Energy = QV (1 mark)

(ii) Power = $\frac{E}{t} = \frac{Qv}{t}$ (1 mark)

(iii) $I = \frac{Q}{t}$ (rate of flow of charge) (1 mark)

$\therefore P = \frac{Q}{t}.V$

$P = I.V$ (1 mark)

(b) Power = VI = 20 x 60 (1 mark)

240 x I = 1200 W (1 mark)

$I = \frac{1200}{240}$

= 5A (1 mark)

$4A < 5A$ hence fuse will blow. (1 mark)

17. (a) (i) Thermionically by cathode (1 mk)

(ii) causing fluorescence on screen (1 mk)

(iii) (i) control brightness of fluorescence (1 mk)

(ii) to focus the electron beam (1 mk)

(b) 1 *wavelength* = 2 *cm* (1 mark)

period = $2 \times 2 \times 10^{-3} s$ (1 mark)

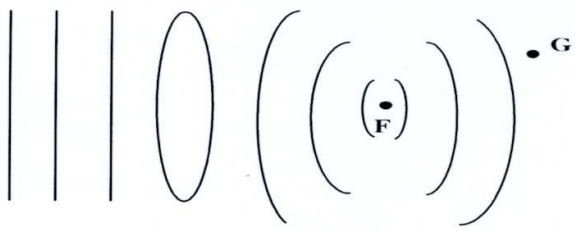
$= 4 \times 10^{-3} s$ (1 mark)

$f = \frac{1}{T}$ (1 mark)

$= \frac{1}{4 \times 10^{-3}}$ (1 mark)

$= 250\ HZ$ (1 mark)

18. (a)



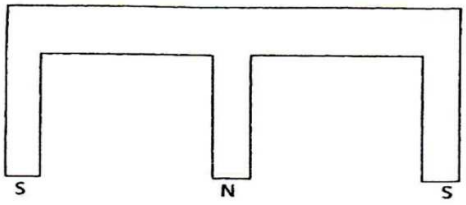
- curved waves - converging before focus (1 mk)
- diverging after focus. (1 mk)

(b) (i) O cm - trough and crest interference (2 mks)
(ii) +10 - crest and crest interference (2 mks)

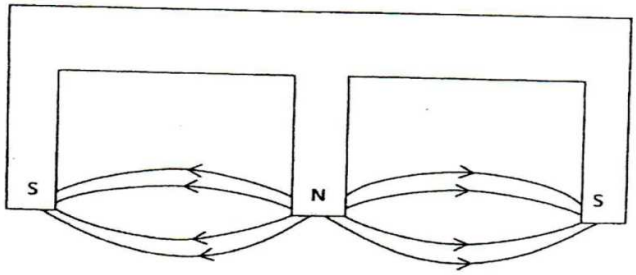
(c) (i) Waves produced are reflected at the fixed ends. (1 mk)
Incident and reflected waves interfer constructively at antinodes. (1 mk)
and destructively at nodes. (1 mk)

(ii)
$\lambda_o = {}^2/_3 \times 1.5$
$= 1\ m$ (1 mk)

19. (a) (i)



All must be correct (1)



Correct field direction (1)

(b) coil moves to and fro (1 mk)
force on coil varies direction as current varies in direction. (1 mk)

(c) (i) dilute sulphuric acid (1 mk)
(ii) (I) Zinc ions go into acid leaving electrons on the plate (1 mk)
(II) Give up electrons to discharge hydrogen Ions. (1 mk)

(iii) Electrons flow from zinc plate to the copper plate. (1 mk)

K.C.S.E 2014

PHYSICS PAPER 232/2

MARKING SCHEME

SECTION A 25 mks

1. **Figure 1** shows two parallel rays from a distant object passing through a convex lens:

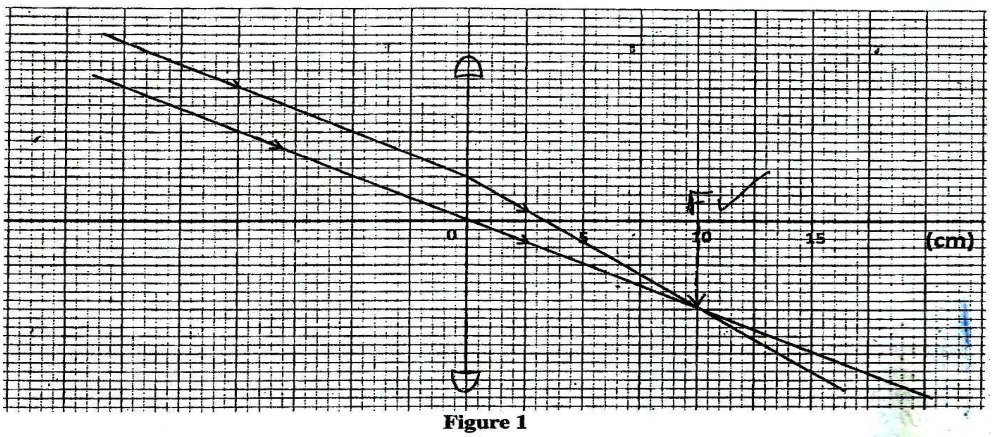


Figure 1

a) Indicate on the diagram, the position of the principal focus of the lens (1 mk)

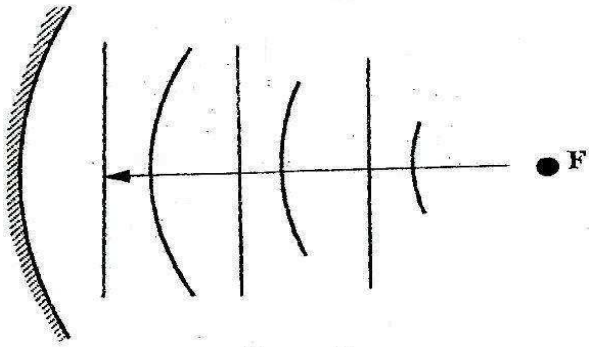
b) Determine the focal length of the lens (1 mk)

10±0.5cm

2 state the effect of decreasing the distance between the plates of a parallel plate capacitor on the capacitance. (1 mk)

The capacitance increase

3. **figure 2** shows circular waves originating from the principal focus F of a concave mirror and moving towards the mirror.



- Straight equally spaced lines
- Minimum of 3 straight lines
- Accept dotted lines

Figure 2

Complete the diagram to show the reflected waves. (1 mk)

4. the frequency of an electromagnetic wave is 4.0 X 10^6 Hz. determine its wavelength. *(take speed of light as 3.0 x 10^8 ms^{-1}).* (3 mks)

V=fλ

$\lambda = \frac{3.0 \times 10^8}{4 \times 10^6}$

=75m.

5. **Figure 3** shows a nail on which a wire is to be wound to make an electromagnet.

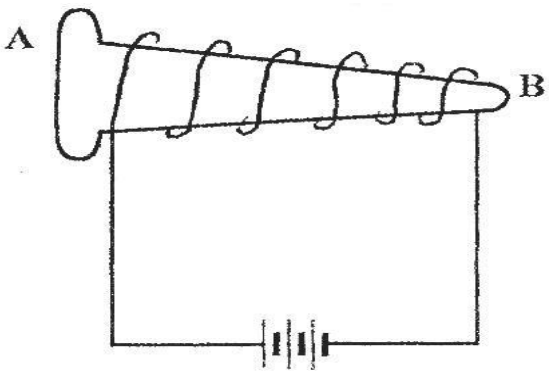


Figure 3

≥ 2 turns
Ignore direction of current i.e use windings
Look for contradiction of labeling the poles

By drawing, show how the wire should be wound around the nail so that end A becomes a north pole and end B a south pole.

6 it is observed that when the cap of an uncharged electroscope is irradiated with light of high frequency, the leaf of the electroscope rises. Explain this observation. (3mk)

Electrons absorb enough energy

Electrons are affected from zinc plate

Learning electroscope positively charges the leaf is repelled by the stem

7 **figures 4** shows the magnetic field pattern around two bar magnets placed side by side.

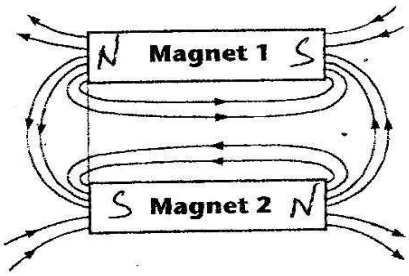


Figure 4

Indicate on the diagram the poles of each magnet. (1 mk)

8. **figure 5** shows a graph of current against voltage for a semiconductor diode.

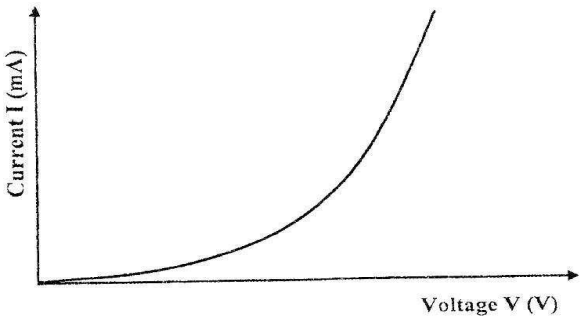
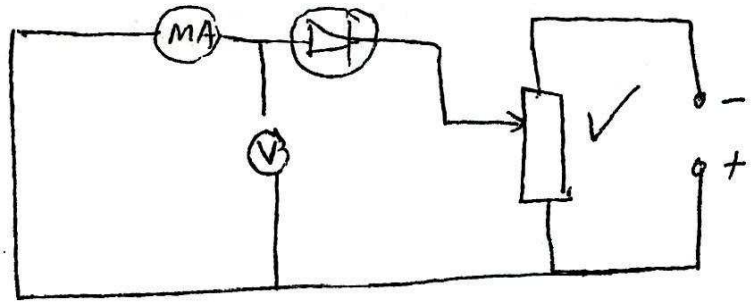


Figure 5

In the pace provided, draw a circuit diagram the may be obtain values needed to draw the graph in **figure 5**



1 mk for correct bias
1 mk for both ammeter & voltage
1 mk for Rheostat varying p.d across diode

9. Radium undergoes radioactive decay by emitting an alpha particle to form a daughter nuclide Q as in the reaction:

$^{226}_{88}Ra \longrightarrow$ Alpha particle + $^{X}_{Y}Q$

Determine the values of:

a) X **222** (1 mk)

b) Y **86** (1 mk)

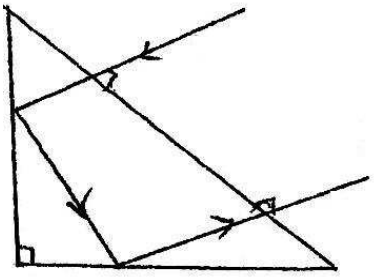
10. state two uses of charge gold leaf electroscope. (1 mk)

- **Estimate the quantity of charge**
- **Test for insulating properties**
- **Test for sign of charge**
- **Test for presence of the charge**

11. the anode of an x-ray tube becomes hot when the tube is in use. State the reason for this. (1 mk)

It stops fast moving electrons whose k.e is concerted to heat/energy of electrons are converted into heat

12. draw a ray diagram to show how a ray of light may be totally internally reflected two times in an isosceles right-angled glass prism. (*Assume that the critical angle of glass is* 42^0)



(2 mks)

Prism triangle must be right
Two total internal reflections
Rays must have ≥ 1 arrow
Rays must be $\simeq 90^0$

13. The current of electrons hitting the screen of a cathode ray oscilloscope is 2.0×10^{-4} A.

determine the number of electrons that strike the screen each second. *(take charge of an electron as 1.6 x 10 $^{-19}$ C)* (3 mks)

Q = It

n= $\frac{Q}{C}$

=$\frac{20 \times 10^{4}}{1.6 \times 10^{-19}}$

=1.25 x 10^{15} (electrons optimal e is not a unit)

SECTION B (55mks)

14 a) **figures 6** show a simple electric bell circuit.

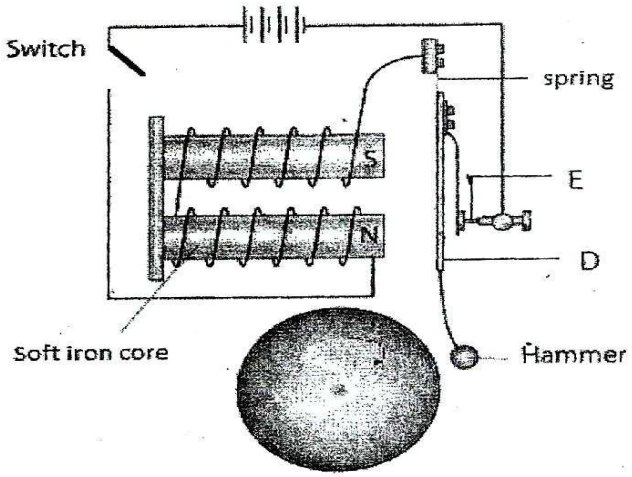


Figure 6

i) Name the parts labeled:

(I) **D** **soft iron armature** (1 mk)

(II) **E** **contact screw** (1 mk)

ii) When the switch is closed, the hammer hits the gong repeatedly. Explain why:

i) The hammer hits the gong. 2mks

Soft iron core is magnetized

It attracts the armature

ii) The hammer hits the gong repeatedly. 3mks

Contact is broken (circuit is broken)

The core then loses magnetism

Armature spring back making contact again

b)An electric bulb is rated 60W, 240 V. Determine

i) The current that flows through it when it is connected to a 240 V supply (3mks)

1 = P/V

=$60/240$

=0.25 A

ii)The resistance of the bulb 3mks

$R = V/I$ **or R =** $\frac{v^2}{p}$

$240/0.25 = \frac{(240)^2}{60}$

= 960 Ω = 960Ω

15a) One of the causes of energy loss in a transformer is heating in the coils when current flows. State;

i) The reason why the current causes heating. 1mk

Resistance in the core

ii) How the heating can be minimized 1mk

Using thick copper wires

b) The input voltage of a transformer is 240 V and its output is 12 V. When an 80 W bulb is connected across the secondary coil, the current in the primary coil is 0.36A.

Determine

i)The ratio $\frac{Np}{Ns}$ of the transformer, (*where Np is the number of turns in the primary coil and Ns is the number of turns in the secondary coil*) 3mks

$NP/NS = VP/VS$ **OR** $NS/NP = 12/240 = 1/20$

$240/12 = 20/1$ **OR 20: 1** **NS: NP = 20: 1**

ii) The power input of the transformer 3mks

P = VPIP

=240 x 0.36

86.4 W

iii)The power output of the transformer 1mk

80 W

iv)The efficiency of the transformer 2mks

eff = $\frac{\text{P Output}}{\text{P. Import}}$ **or Eff –** $\frac{\text{Part x q}}{\text{p up}}$

$\frac{80 \times 100}{86.4}$ $\frac{80 \times w}{56.4}$

92.6% **92.59%**

16a) Figure 7 shows resistors R_1 and R_2 connected in parallel. Their ends are connected to a battery of potential difference V volts.

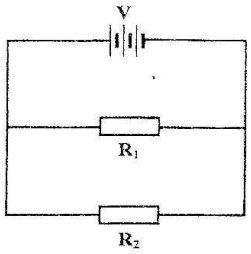


Figure 7

i) In terms of V_1, R_1 and R_2, write an expression for

I) Current 11through R1 1mk

$\mathbf{I_1 = {}^{V}/_{R1}}$ **or** $\mathbf{{}^{V1}/_{R1}}$

II. Current L_2 through R_2. 1mk

$\mathbf{I_2 = {}^{V2}/_{R2}}$ **or** $\mathbf{{}^{V2}/_{R2}}$ **or** $\mathbf{{}^{V2}/_{R2}}$

III total current I in the circuit. 1 mk

$\mathbf{I_1 = {}^{V}/_{R1} + {}^{V}/_{R2}}$ **OR** $\mathbf{{}^{V1}/_{R1} + {}^{V2}/_{R2}}$

ii. show that the total resistance RT is given by $RT = \frac{R_1R_2}{R_1+R_2}$

$\mathbf{IT = {}^{V}/_{RT}}$

$\mathbf{{}^{V}/_{RT} = {}^{V}/_{R1}\ n + {}^{V}/_{R2}}$

$\mathbf{{}^{1}/_{RT} = {}^{1}/_{R1} + {}^{1}/_{R2}}$ **hence RT =** $RT = \frac{R_1R_2}{R_1+R_2}$

b) Figure 8 shows a negatively charged rod placed near an uncharged conductor resting on an insulating support

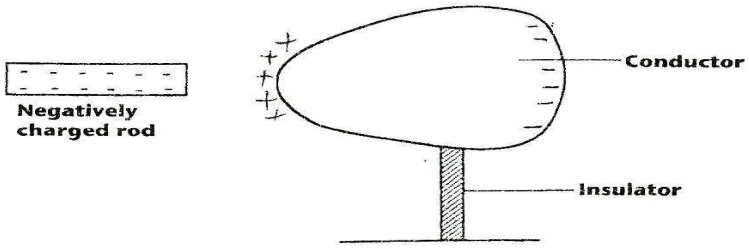


Figure 8

Concentration at sharp end
+ve & -ve charges in correct position
Can be inside or outside

i)Show the charge distribution on the conductor 2mks

ii) State the effect

I) Of momentarily touching the conductor with a finger while the charged rod is still near the conductor 1mk

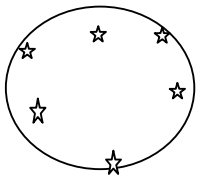
Conductor loses negative charges to earth

II) On the charge distribution of withdrawing the negatively charged rod after momentarily touching the conductor 1 mks

The conductor acquires an net positive charge which redistributes itself

III) In the space provided, sketch a diagram to show how the charge in ii (II) would have been distributed if the conductor was a sphere 1mk

+ve charge uniformly distributed



17.a)Figure 9 shows two speakers S_1 and S_2 which produce sound of the same frequency. They are placed equidistant from a lien AB and a line PQ. (PQ is perpendicular to line AB)

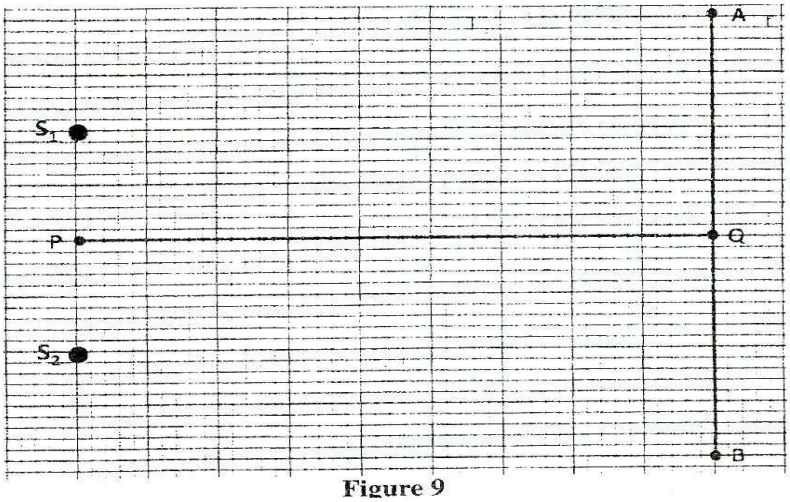


Figure 9

i)A student walking from A to B hears alternating loud and soft sounds. Explain why at some point the sound heard is soft 2mks

Sound is soft when the wave arrives out of phase path difference = odd no 1,3,5 – compression meets rarefaction such wave undergo destructive interference.

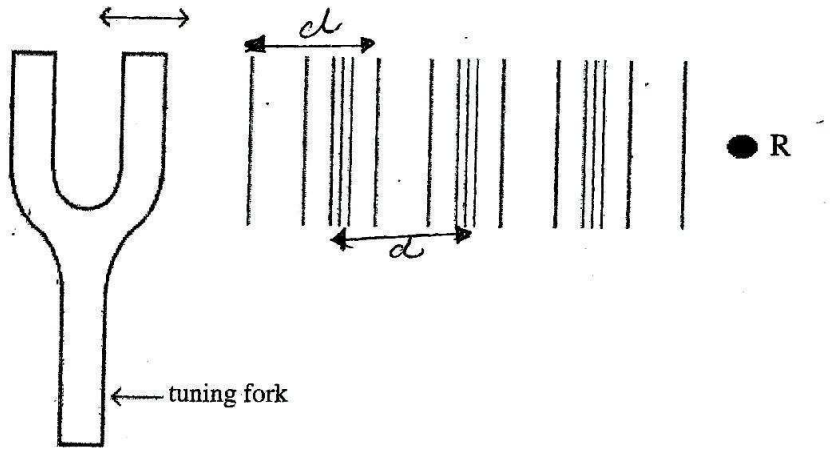
ii)The student now walks along line PQ. State with reason the nature of the sound the student hears 3mks

Same sound – loud

Along PQ the wave undergo constructive interference as they arrive in phase (path different = 0)

b) Figure 10 shows sound waves in air produced by a vibrating tuning fork. R is an air molecule on the path of the wave

Oscillation



Two consecutive points in phase 5 spaces in between, 4 lines in between

i) Using a line, indicate on the diagram a distance d equal ton one wavelength of the wave. 1 mk

ii)In the spaces provided, show with an arrow the direction of motion of the air molecule R as the waves pass. 1mk

R

iii)Explain the reason for the answer in (ii) 2mks

As longitudinal waves pass, molecules R moves along either side for a crest R moves away, the source / rarefaction towards the source / compression away from the source

18. Figure 11 shows an object placed 10 c infront of a concave mirror whose radius of curvature is 40 cm.

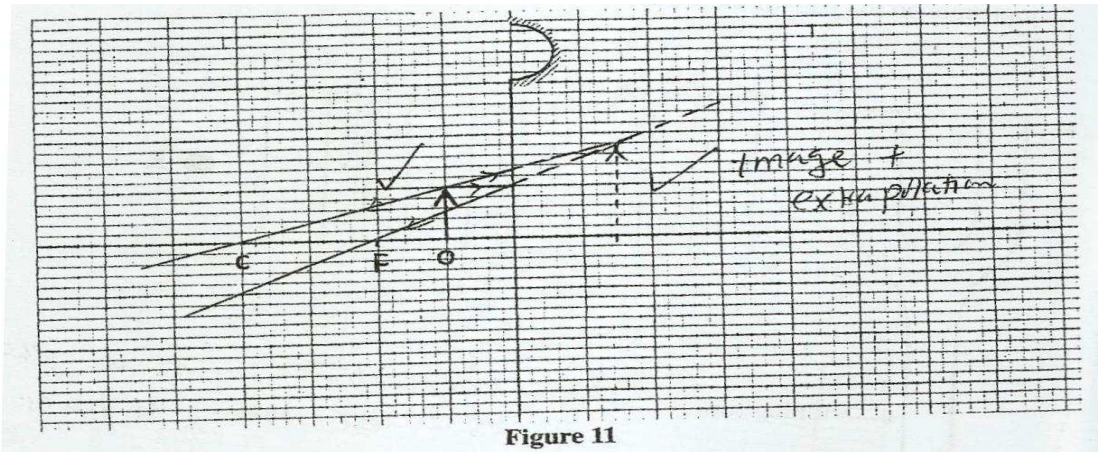


Figure 11

Ai)On the same figure, draw a ray diagram to show the position of the image formed 3mks

ii)Use the ray diagram to determine

I)the image distance 1mk

20cm ± 2 E.T (Error transfer)

III)The magnification 3mks

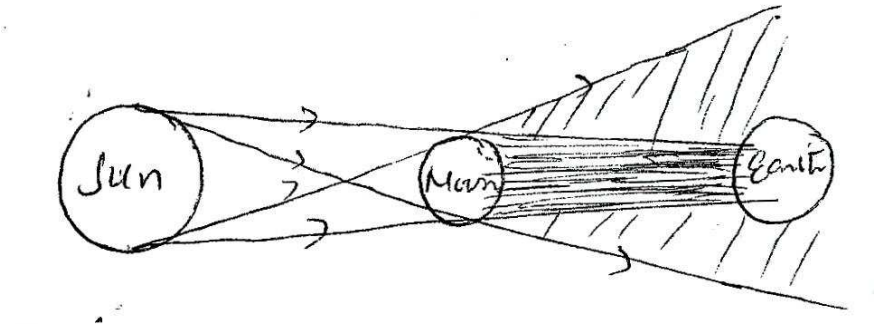
Magnification = image distance
object distance

$\frac{20}{10} = 2$

iii) State where the position of the image would be if the object had been placed at the principal focus 1mk

Infinity

b) Draw a ray diagram show the formation f a partially dark shadow and a totally darks shadow during the eclipse of the sun



Outer pair of rays
Inner pair of rays
Proper labeling of umbra and penumbra
Hints: Size of the sun and size of the earth
Moon should be close to the earth
Rays must have arrows and must be tangent to the sun and moon