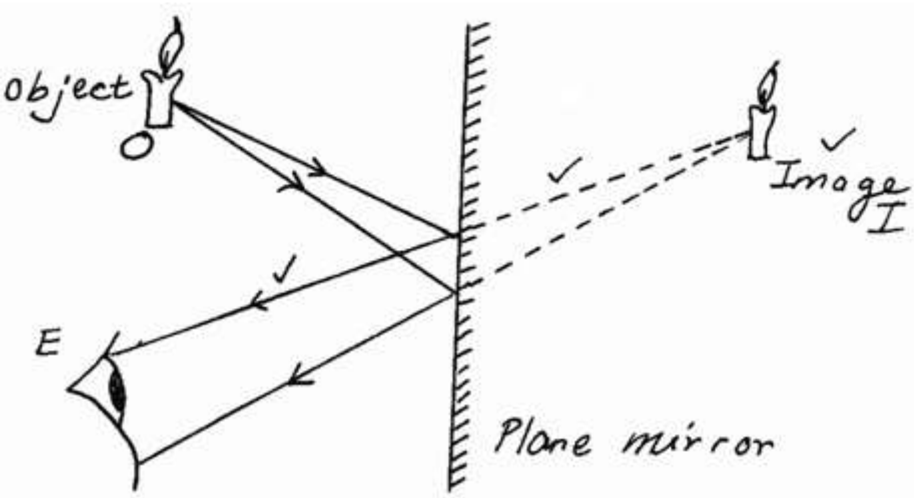
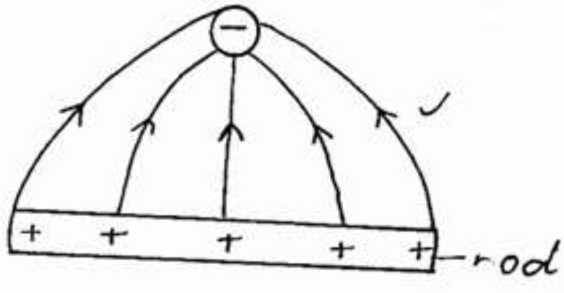
232/2 - PHYSICS PAPER 2 - MARKING SCHEME

1.



2.



Curve ✓
Direction ✓

3. (a) Gradually the cell become polarized✓ reducing the size of electric current delivered to the bulbs.

   (b) When left for sometime, the manganese (iv) oxide oxidizes ✓the hydrogen gas to ✓ water / depolarizes the cell.

4. Keeper become magnetized thus neutralizing the poles, ✓ this reduces repulsion ✓at the poles and helps in retention of magnetism / increase attraction / forms continuous loops that link the poles of the magnet.

5. The soft iron rods roll apart ✓ (separate); the ends of the rods become magnetized with the same (like) poles ✓ hence they repel each other.

6. Work function Wo = hfo

   $2.5 \times 1.6 \times 10^{-19} = 6.63 \times 10^{-34} fo$

   $fo = \dfrac{2.5 \times 1.6 \times 10^{-19}}{6.63 \times 10^{-34}}$ Hz ✓ ✓

   $fo = 6.03 \times 10^{14}$ Hz ✓

   Frequency of incident radiation is less than fo; ✓ hence no photoelectric effect occurs.

   OR; Energy of incident radiation

   $E = hf$

   $E = 6.63 \times 10^{-34} \times 5.5 \times 10^{14}$ J ✓

$E = 6.63 \times 10^{-34} \times \frac{5.5 \times 10^{14}}{1.6 \times 10^{-19}}$ Ev

$E = 2.28$Ev, ✓ this is less than the work function (2.5eV) ✓ hence no photoelectric emission occurs.

7. Speed $V = \frac{\text{Distance}}{\text{Time}}$ ✓

$= \frac{2 \times 85\text{m}}{0.5\text{sec}}$

$V = \underline{340\text{m/s}}$ ✓

8. (a) Amplitude = 0.2m ✓

(b) Wavelength x = 0.4m

$V = fx$

$= \frac{1}{0.25} \times 0.4$

$V = 1.6$m/s ✓

9. Initially the divide is forward biased and conducts; when the cell terminals are reversed, the diode is reverse-biased and does not conduct electric current.

10. $80g \xrightarrow{(i)} 40g \xrightarrow{(ii)} 2og \xrightarrow{(iii)} 10g \xrightarrow{(iv)} 5g$ ✓

⇨ 4 half-lives = 20 years

Therefore 1 half life $= \frac{20}{4}$ years

$= \underline{5\text{ years}}$ ✓

OR

$N = No (½)^n$

$5 = 80 (½)^n$

$(½)^4 = (½)n$

n = 4 half-lives = 20 years

Therefore 1 half life $= \frac{20}{4}$ years

$= \underline{5\text{ years}}$

SECTION B (55 MARKS)

11. (a) (i) Convex (converging) lens; image formed is real; ✓ a concave (diverging) lens does not form real images.

(ii) (I) $m = {}^V/_U$ ✓

$4 = {}^V/_U$

$4u = v$; $U + V = 60$cm

$U + 4U = 60$cm (2mks)

$5U = 60$

$U = \underline{12\text{cm}}$, ✓ object distance

(II) $V = 4U$ ✓ $= 4 \times 12 = \underline{\underline{48\text{cm}}}$ ✓

Or $V = (60 – 12)$cm $= 48$cm

(b) (i) A: Shutter ✓

B: Diaphragm. ✓

(ii) A (shutter) – Allows light to reach the film for a precise period of time when the camera is in operation. ✓
B (Diaphragm) – Controls / regulates ✓ the amount of light entering the camera.

12. (a) The ratio of the sine of angle of incidence to the sine of angle of refraction is a constant for a given pair or media. ✓

(b) (i)

$$\eta = \frac{\Delta \text{ Real depth}}{\Delta \text{ Apparent depth}} ✓$$

$$= \frac{(30-15)\text{cm}}{(20-10)\text{cm}} ✓$$

$$= \frac{15}{10}$$

$$\eta = 1.5 ✓$$

(ii)

$$\eta = \frac{Vn}{V\chi} ✓$$

$$1.5 = \frac{3.0 \times 10^8 \text{m/s}}{Vx}$$

$$Vx = \underline{2.0 \times 10^8 \text{m/s}} ✓$$

(c) (i) Angle of incidence in optically dense medium must exceed the critical angle for the pair of media.
(ii) Light must be travelling from optically dense medium into optically less dense medium

(d)

$$an = \frac{Sin\ i}{Sin\ r} ✓$$

$$\frac{1}{1.48} = \frac{Sin\ 90}{Sin\ \theta}$$

$$\text{Sin } \theta = \frac{1}{1.48}$$

Sin = 0.6757; θ = 42.4° ≈ 43° ✓

13. (a) (i) A: Cathode ✓
B: Grid ✓
(ii) B (Grid) – controls the brightness of the spot on the screen. ✓
When the grid is more negative it repels electrons allowing only a few to reach ✓ (2mks) the screen hence the spot becomes less bright.

(iii) To <u>ACCELERATE</u> ✓ and <u>FOCUS</u> ✓ the electron beam to the screen.

(b) (i) Peak voltage Vo = 3cm x 10V/cm✓
= <u>30V</u>

(ii) Period T = 8cm x 5ms/cm
= 40ms
T = 0.040S
Therefore frequency $f = \frac{1}{T}$ ✓

$$= \frac{1}{0.040}\text{Hz} ✓$$

f = 25Hz ✓

14. (a) (i) e.m.f. E = $(1.4 + \frac{6}{10} \times 0.2)$ Volts.

= 1.52Volts; ✓ graph line must be produced to cut the voltage axis.

(ii) Internal resistance

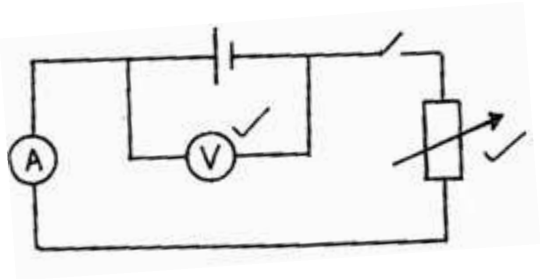
$$r = \left| \frac{\Delta V}{\Delta I} \right| \checkmark$$

$$= \frac{(1.4 - 0.8)}{(0.2 - 1.26)} \checkmark$$

$$= \left| \frac{0.6}{1.06} \right|$$

r = 0.57Ω, internal resistance. ✓ (3mks)

(b)



Voltmeter across cell
Rheostat for adjusting current.

(c) With the switch closed, adjust the rheostat so that current is at its minimum. Increase ✓ the current in steps using / adjusting the rheostat and for each current I note and record the corresponding value of p.d. (V) across the cell. ✓ (2mks)

15. (a) High charge density at the pointed edge cause <u>ionization of the surrounding</u> ✓ <u>air, positive ions are attracted towards the point neutralizing the charges /</u> ✓ this discharges the body. (2mks)

(b) (i) Move the plate Y away (but while still parallel to x) so as to increase the separation distance d; ✓
Divergence of the leaf of electroscope increase (rise in potential) hence capacitance = Q/V decreases. ✓ (2mks)

(ii) Slide plate Y sideways so as to reduce the effective area ✓ between the plates; divergence of the leaf of electroscope increases ✓ (rise in potential) hence capacitance = Q/V decreases. ✓ (3mks)

16. (a) $\frac{N_S}{N_P} = \frac{V_S}{V_P}$ ✓

$$\frac{200}{8000} = \frac{V_S}{240}$$

V_S = <u>6V</u> (2mks)

(b) Efficiency = $\frac{Power\ output}{Power\ input} \times 100\%$

$$= \frac{V_S I_S}{V_P I_P} \times 100\% \checkmark$$

$$= \frac{6 \times 100}{240 \times 3} \times 100\% \checkmark$$

Efficiency = <u>83.33%</u> ✓ (3mks)

(c) There is power loss due to:

(i) Resistance in the copper coils. ✓
(ii) Hysteresis loss / magnetizing and ✓demagnetizing of the core causing heating.
(iii) Poor magnetic flux linkage (magnetic flux leakage).
(iv) Eddy currents in the core. (Accept any 2) (2mks)