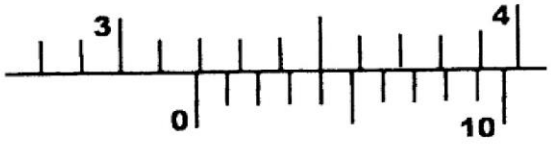
4.6 PHYSICS (232)

4.6.1 Physics Paper 1 (232/1)

SECTION A

1.



Correct reading √(1)

2. Volume = 21 - 19
= 2 cm^3 √

Volume of 1 drop = $\frac{2}{50} = 0.04\ cm^3$ √ 2

3. $Mg_e = Ke_e \therefore K = \frac{Mg_e}{e_e}$ √

$Mg_m = Ke_m$ (K is constant)

$Mg_m = \frac{Mg_e}{e_e} . e_m$ √

$g_m = \frac{g_e . e_m}{e_e} = \frac{10 \times 0.01}{0.06} = 1.67 NKg^{-1}$ √ (3)

4.
- depth √
- density of the liquid √
- gravitational field strength √ 2

5. The sharp heeled shoe exerts great pressure √ due to small surface area of contact √ 2

6. (a) - freezing √

(b) - The intermolecular forces are weaker √ 1

7. Both containers have a greater √ expansion compared to glass, but A expands faster than B √ 2

8. Sum of anti clockwise moments = sum of clockwise moments √

$4 \times 35 + T \times 50 = 8 \times 40$

$140 + 50\ T = 320$ √

$T = \frac{320 - 140}{50}$

$= 3.6\ N$ √ 3

9. The velocity of air above B is greater than that above A √ decreasing the pressure above B hence the water rises higher in B √ 2

10. As the balloon rises, the atmospheric pressure reduces √ hence the pressure due to the hydrogen gas pushes the walls of the balloon to expand √ 2

11. To maintain stability √ (1)

12. B √

- As the heating continues the hot water rises conventionally, due to the reduced density the hot water remains at the top. √ (2)

13. - Study of motion of bodies under the influence of forces. (1)

SECTION B

14. (a) (i) Measurement of length PQ = 3 cm √

$T = \frac{1}{50} = 0.02$ Sec √

$Vpq = \frac{3}{0.02} = 150 \text{ cm s}^{-1}$ √ 4

(ii) $Vxy = \frac{0.5}{0.02}$ √

25 cm s^{-1} √

(iii) $a = \frac{\text{final velocity} - \text{initial velocity}}{\text{time taken}}$ √

$= \frac{25 - 150}{5 \times 0.002}$ √

$= -1250 \text{ cm s}^{-2}$ √ 3

(b) Momentum before collision = Momentum after collision √

$M_1U_1 + M_2U_2 = V(M_1 + M_2)$ √

$5 \times 20 + 8 \times 15 = V(5 + 8)$ √

$220 = 13V$

$V = \frac{220}{13}$

16.92 ms^{-1} √

(4)

15. (a) K.E. = P.E. √

$\frac{1}{2}mV^2 = 00.027$

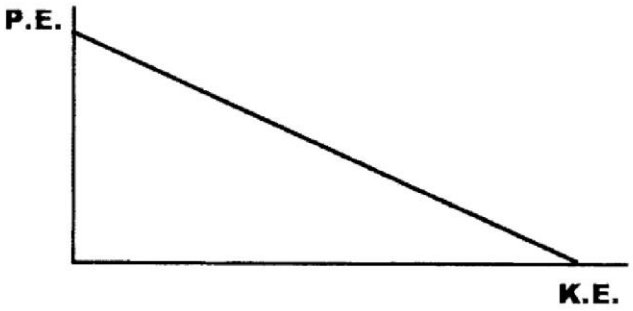
$\frac{1}{2} \times 0.2 \times V^2 = 0.027$

$V^2 = \frac{2 \times 0.27}{0.2}$ 4

$V = 5.196 \, MS^{-1}$

(b) Reduces the effort required to raise the √ load (increases the mechanical advantage.)
(1)

(c)



(d) (i) $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ √

$\frac{90}{\pi.3^2} = \frac{F_2}{\pi.9^2}$ √

- Straight line with negative gradient √
- axis touched √

$F_2 = \frac{\pi.9^2.90}{\pi.3^2}$ √

= 810 N √ 3

(ii) Efficiency = $\frac{MA}{V.R} \times 100\%$

$MA = \frac{L}{E} = \frac{810}{90} = 9$ √

V.R = $\frac{81}{9} = 9$ √

Efficiency = $\frac{9}{9} \times 100\% = 100\%$ √ (3)

16. (a) (i) ammeter in series √
voltmeter in parallel √

(ii) - ammeter reading (current) √
- voltmeter reading (voltage) √
- time √ (3)

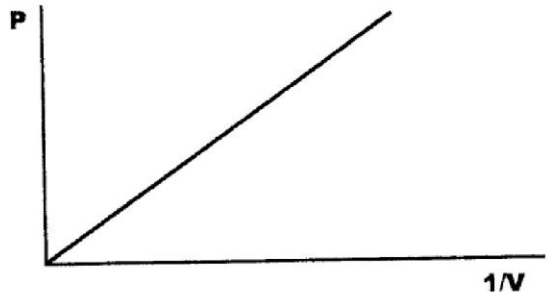
(iii) Electrical energy supplied = heat gained by solid √

Vit = mc (θ - Θ_1) √

or C = $\frac{\text{Vit}}{\text{mc}(\theta - \theta_1)}$ (2)

(b) - reduce the diameter of the bore √
- use a thin walled bulb √
- use a liquid with a high expansivity √ 3

17. (a)



- a straight line through the origin √ (1)

(b) $\frac{P}{T}$ = constant at constant volume √

- as temperature increases, the kinetic energy of the molecules increases √ causing more collisions hence increased pressure. √ 3

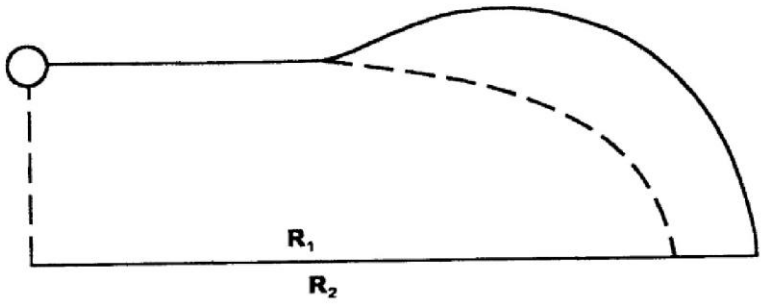
(c) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ √

$\frac{760 \times 20}{298} = \frac{900 \times 15}{T_2}$ √√

$T_2 = \frac{900 \times 15 \times 298}{760 \times 20}$

$= 264.67$ K √ 4

(d) (i)



(ii) Spinning causes high velocity of air above √ the ball hence reduced pressure √ which causes the ball to rise higher. 2

18. (a) (i) - Tension (T) √
- Weight (Mg) √ 2

(ii) Tension - increases √
Weight - remains constant √ 2

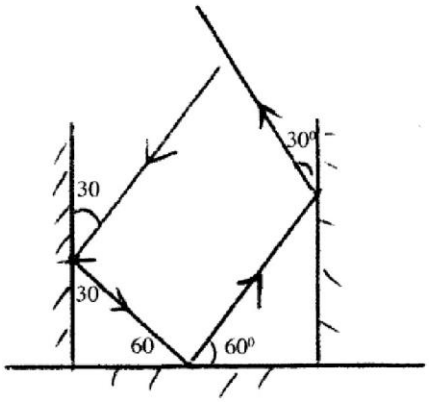
(iii) - Centrifuges √
- Speed governors √
- Merry-go-rounds

(any other relevant two correct) 2

(b) When heated the density of the water decreases √ hence block sinks further √ as it displaces more volume of water. 2

4.6.2 Physics Paper 2 (232/2)

1.



- Correct angle at every surface

Arrow on rays

(3 marks)

2. Positive charge (1 mark)

3. To maintain the relative density of the electrolyte. (1 mark)

4.
- The suspended magnet is repelled
- End B of the electromagnet attains a north pole when current flows.

(2 marks)

5. Has a wide field of view. (1 mark)

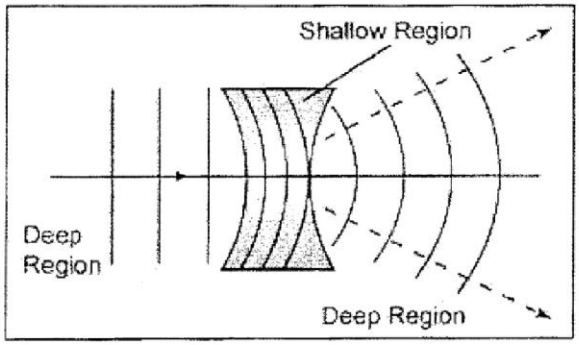
6.
- Increase the magnitude of current.
- Increase the number of turns per unit length.
- Increase cross sectional area.
- Use of soft iron core.

(2 marks)

7.
- Electromagnetic waves do not require a material medium while mechanical waves require a material medium for transmission.
- Electromagnetic waves travel at the speed of light while mechanical waves travel at slower speeds.

(2 marks)

8.



- decreased wavelength in shallow region
- diverging after refraction to the deep region.

(2 marks)

9. $V = \lambda f$

$V = \frac{7.5}{100} \times 20 \times 1000$

$\text{Depth} = \frac{7.5}{100} \times 20 \times 1000 \times \frac{3}{2}$

$= \quad 2250\text{m}$

(3 marks

10. $\eta = \frac{real\ depth}{apparent\ depth}$

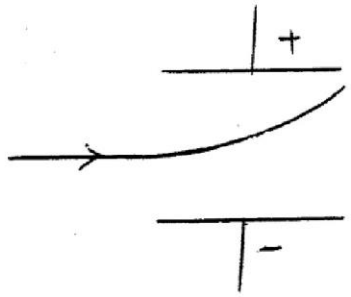
$1.47 = \frac{real\ depth}{6.8} = 9.996$

real depth = $\simeq$ 10 cm

(3 marks)

11. Production of cathode rays / x-rays. (1 mark)

12.



- deflection towards positive plate

(1 mark)

13. $V_p I_p = V_s I_s$

$200 = 24\ I_s$

$I_s = 8.33\text{A}$

(3 marks)

14. (a)
- Energy of incident radiation
- Work function of the metal
- Intensity of the radiation

Any 2 = 2 marks)

(b) (i)

$E = \frac{hc}{\lambda}$

$= \frac{6.63 \times 10^{-34} \times 3.0 \times 10^{8}}{4.3 \times 10^{-7}}$

$= 4.626 \times 10^{-19}\ J$

(3 marks)

(ii) - Potassium
- The work function of potassium is less than the energy of the incident radiation

(2 marks)

(iii)

$$E = Wo + K.E$$

$$4.626 \times 10^{-19} J = 3.68 \times 10^{-19} J + K.E$$

$$K.E = 9.4558 \times 10^{-20} J$$

$$\frac{1}{2} MV^2 = 9.4558 \times 10^{-20}$$

$$V^2 = \frac{9.4558 \times 10^{-20} \times 2}{9.1 \times 10^{-31}}$$

$$V = \sqrt{\frac{9.4558 \times 10^{-20} \times 2}{9.1 \times 10^{-31}}}$$

$$= 4.56 \times 10^5 \, ms^{-1}$$

(3 marks)

15. (a)
- length of conductor
- area of cross-section
- temperature
- resistivity of conductor

(Any 2 = 2 marks)

(b) When excessive currents flow through the circuit, the wire gets heated and melts hence breaking the circuit.

(2 marks)

(c) (i)

$$I = \frac{P}{V}$$

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

$$= 10.42 \, A$$

Fuse not suitable since current through the appliance is higher than the fuse rating.

(3 marks)

(ii) Cost = 0.8 x 3 x 2.5

= Ksh. 6.00

16. (a) Alpha particles are heavier and move at lower speeds hence less penetrating power than Beta particles which are lighter and move faster (2 marks)

(b) $100\% \xrightarrow{12} 50\% \xrightarrow{12} 25\% \xrightarrow{12} 12.5\%$

= 3 half-lifes
= 36 years (2 marks)

(c) (i) allows the radiations into the tube (1 mark)

(ii) absorbs kinetic energy of positive ions so that they do not cause secondary ionization in the tube (1 mark)

(d) (i)
- Short - They ionize heavily loosing most of the energy hence cannot travel far.
- Straight - They are massive compared to air molecules hence collision with air molecules cannot change their path.

(ii)
- GM is easily portable than a cloud chamber. (1 mark)
- GM is more sensitive.
- GM tube detects radiation at very low intensity and cloud chamber cannot detect radiation at very low intensity. (1 mark)

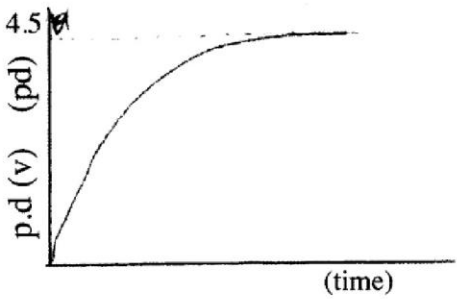
17. (a)
- distance of separation between plates
- area of overlap of plates
- type of dielectric between plates (3 marks)

(b) (i) (I) Current rises to maximum and then drops to zero (1 mark)
(II) Potential difference between the plates increases to a maximum (1 mark)

(ii) Negative charges flow from the negative terminal of the battery to one plate (√) of the capacitor. Negative charges flow from the other plate (√) of the capacitor to the positive terminal of the cell hence equal positive and negative charges gather on the plates, opposing further flow of electrons when fully charged (√) (3 marks)

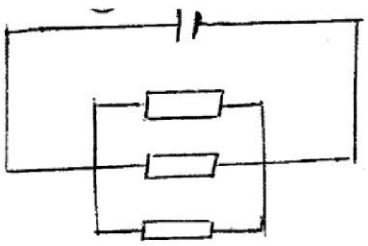
(iii) Resistor - to slow down the charging process so that current and voltage are is observed. (1 mark)

(iv)



- Parallel arrangement
- Circuit symbols

18. (a) (i)



(ii)

$$\frac{1}{R}=\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$$

$$R=\frac{12}{13}$$

$$=0.923\Omega$$

(b) (i) (I)

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

$$v=-100\,mm$$

$$\frac{1}{50}-\frac{1}{100}=\frac{1}{f}$$

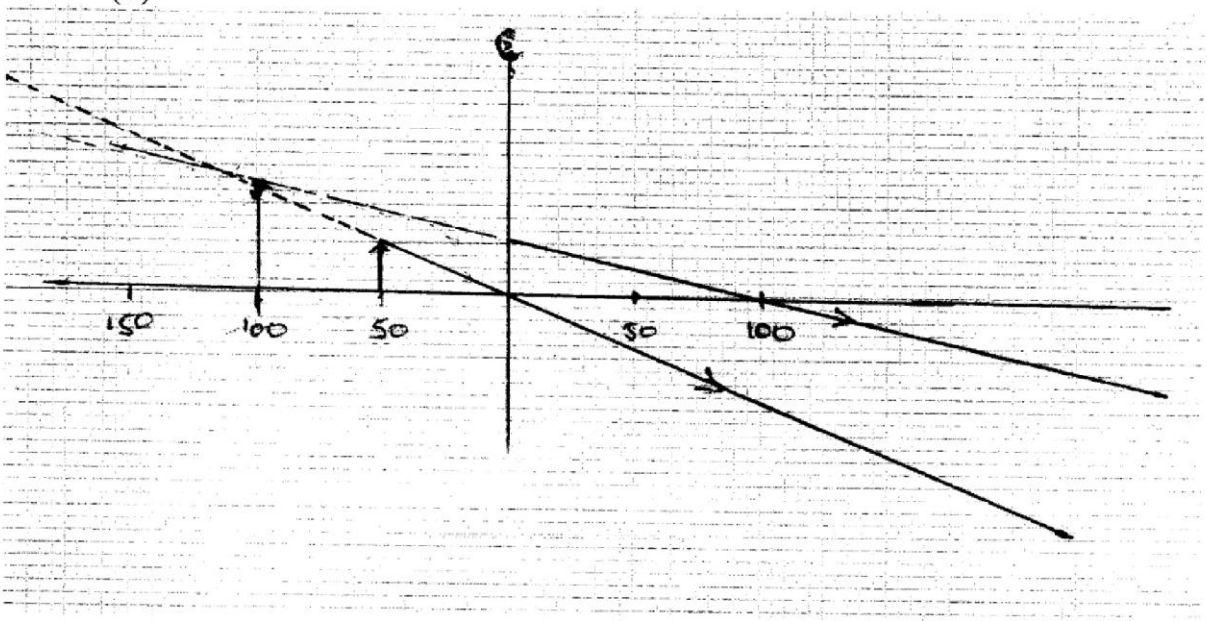
$$\frac{1}{f}=\frac{1}{100} \qquad f=100\,mm$$

(II)

$$m=\frac{v}{u}=\frac{100}{50}$$

$$=2$$

(ii)



4.6.3 Physics Paper 3 (232/3)

QUESTION ONE

PART A

(a) $\underset{\sim}{d}$ = 0.35 ± 0.02 mm (1 mark)

$\underset{\sim}{d}$ = 0.00035 m $(3.5 \pm 0.2) \times 10^{-4}$ m

(d) D = 0.75 ± 0.05 cm 0.80 ± 0.02 cm (1 mark)

D = $(8.0 \pm 0.2) \times 10^{-3}$ m

(e) N = 26 ± 1 turns (1 mark)

(f) X = 3.0 ± 0.2 cm (1 mark)

X = $(3.0 \pm 0.2) \times 10^{-2}$ m

(g) c = $\frac{0.4}{x}$

= $\frac{0.4}{0.03}$

= 13.00 ± 2 Nm^{-1}

(1 mark)

(h) n = $\frac{c8ND^3}{d^4}$

= $\frac{13.33 \times 8 \times 26 \times (8.0 \times 10^{-3})^3}{(3.5 \times 10^{-4})^4}$

= $(9.2 \pm 0.2) \times 10^{-10}$ Nm^{-2}

(2 marks)

(i) t = $9.85s \pm 1.00$ (1 mark)

T = 0.44s (1 mark)

(j) Z = $\frac{4\pi^2 m}{T^2}$

Z = 18.00 ± 2

(2 marks)

PART B

(m)

Distance U cm	12	16	20
Distance V cm	5.2	4.8	4.5
Constant $y = \frac{uv}{u+v}$	3.6	3.7	3.7

(4 marks)

(n) $m = \frac{y_1 + y_2 + y_3}{3} \simeq 3.7$ (1 mark)

(o) (i) $h = 5.0 \pm 0.1$ cm (1 mark)

(ii) $P = 2.2 \pm 0.1$ cm (1 mark)

(iii) $f = 1.30 \pm 0.03$ (2 marks)

QUESTION TWO

(a) $d = 3.0 \pm 0.1 \times 10^{-4}$ m (1 mark)

$3.0 \pm 0.1 \times 10^{-1}$ mm

(b) $E_0 = 3.1 \pm 0.1$V

(1 mark)

(d) (i) $I = 0.35 \pm 0.05$ A (1 mark)

Table 1

Length RN (m)	0.1	0.2	0.3	0.4	0.5	0.6
P.d (V)	0.45	0.80	1.20	1.60	1.90	2.25
Resistance $\left(\frac{V}{I}\right)(\Omega)$	1.3	2.3	3.4	4.6	5.4	6.4

(4 marks)

(e)

Plotting of points	2
Axis labelled with units	1
Scale suitability	1
Straight line	1
	5 marks

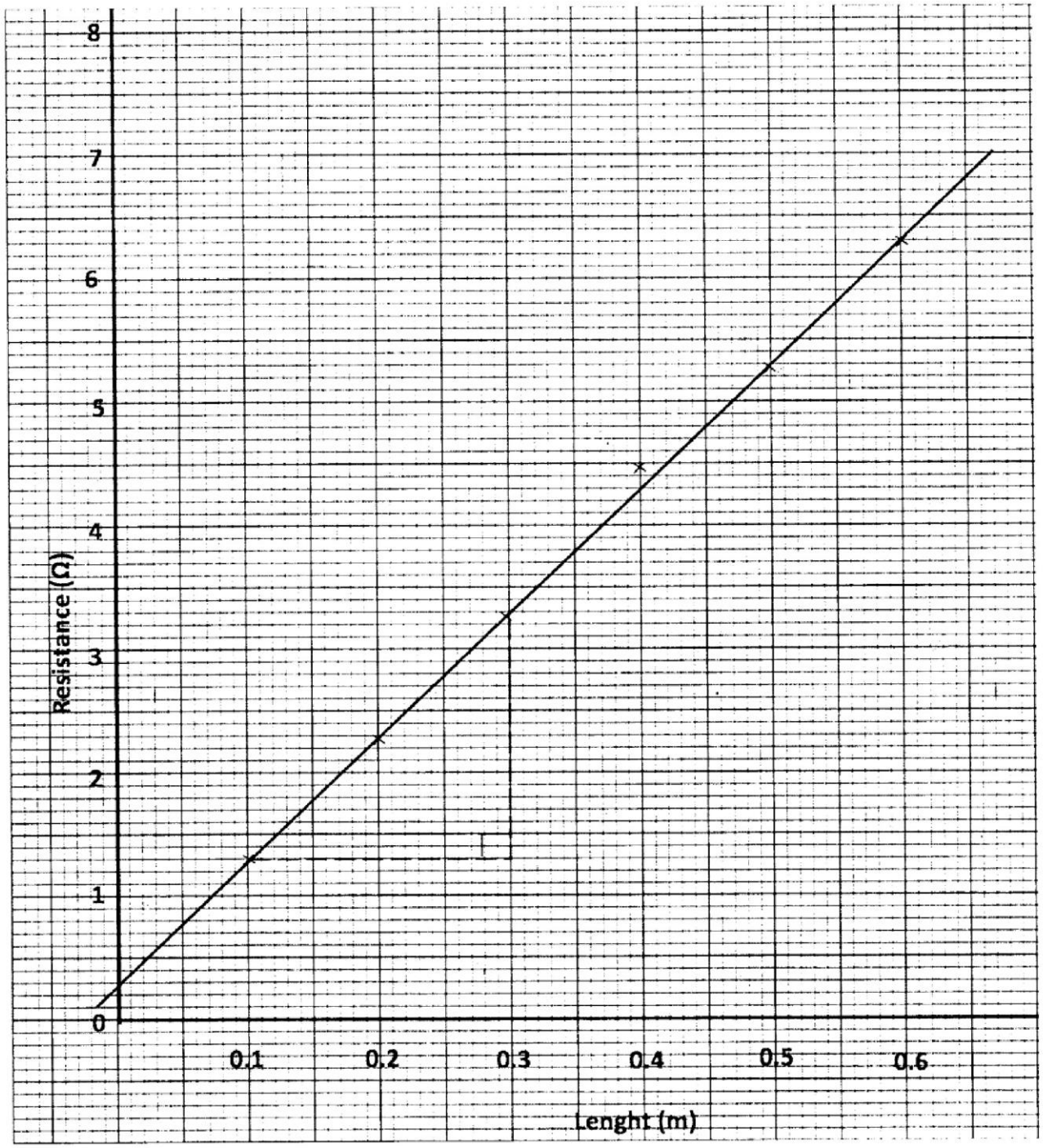
(f) (i) Slope $= \frac{\Delta R}{\Delta l}$ correct intervals (1 mark)

$= \frac{3.4 - 1.3}{0.3 - 0.1}$

$= \frac{2.1}{0.2}$

S $= 10.5 \pm 0.2\ \Omega m^{-1}$ (1 mark)

correct unit (1 mark)



(f) (ii) $S = \frac{4K}{\pi d^2}$ correct evaluation (1 mark)

correct value (1 mark)

$k = \frac{\pi d^2 s}{4}$

$= \frac{\pi \times (3.0 \times 10^{-4})^2 \times 10.5}{4}$

$= 74.22 \times 10^{-8}$

$= 7.422 \pm 0.2 \times 10^{-7}\ \Omega\,m$

OR

$= 7.422 \pm 0.2 \times 10^{-4}\ \Omega\,mm$

(g) t $= \frac{E_0 - Vn}{I}$ correct evaluation (1 mark)

$= \frac{3.0 - 2.25}{0.35}$ correct value (1 mark)

$= 2.0 \pm 0.5\ \Omega$ ignore unit