4.5 PHYSICS (232)

4.5.1 Physics Paper 1 (232/1)

SECTION A

1.

$$L = \frac{18.6 + 18.5 + 18.6 + 18.5}{4}$$ √(1)

$$L = \frac{74.2}{4} = 18.55$$

students should record 18.6 cm √(1)

2. 3.46 mm read from photograph. √(1)

3. Weight = Mass x gravity

OR (kilograms is the unit of measuring the mass and does not depict the force of gravity)

4. (a) BC = Constant √(1)

(b) CD - decreasing √(1)

5.

$$\frac{F}{A} = p$$ √(1)

F = 5 × 24 √(1)

F = 120 N

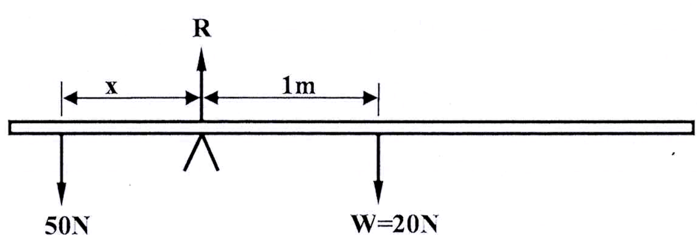
6. Volume of drop = Volume of patch √(1)

Ad = V √(1)

d = $\frac{V}{A}$

7. Flask painted black absorbs more heat;
causing more expansion of air above S than above T; √(1)
hence S is pushed downwards and T upwards; √(1)

8.



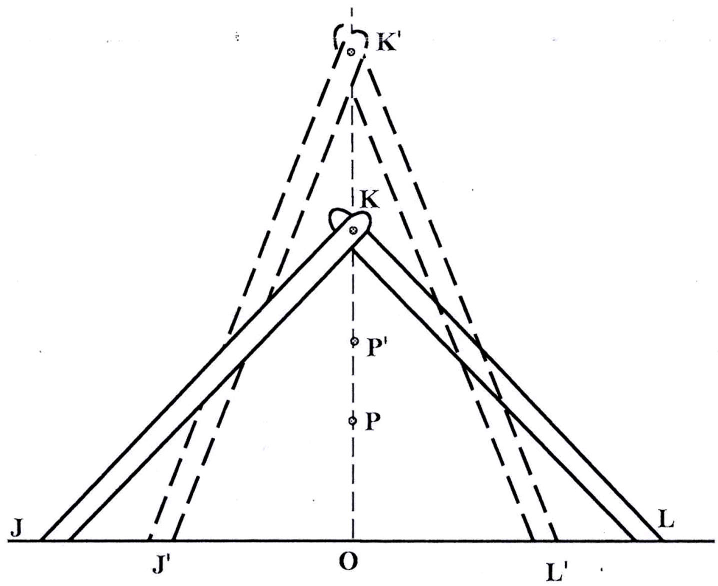
✓ (1)

$$50x = 20 \times 1 \quad \surd(1)$$

$$x = \frac{20}{50}$$

$$= 0.4 \text{ m} \quad \surd(1)$$

9.



-raised K to K' ✓ (1)

-P also raised to P' ✓ (1)

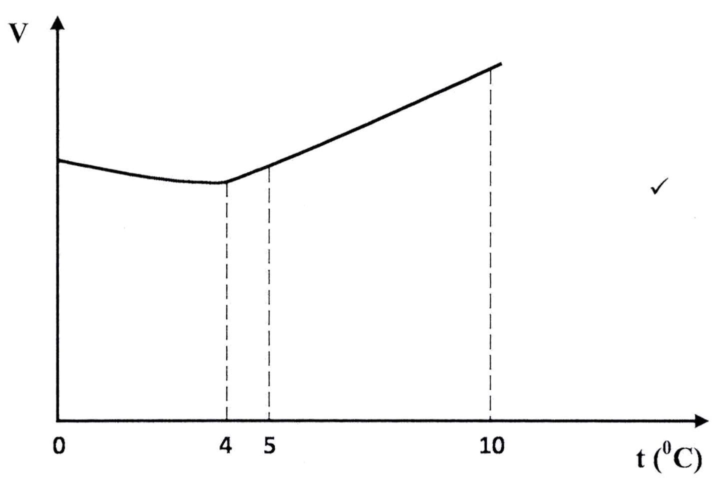
10. Extension = 4 mm + 4 mm $\surd(1)$

= 8 mm $\surd(1)$

11. $A_1V_1 = A_2V_2$ $\surd(1)$

$$\frac{V_2}{V_1} = \frac{A_1}{A_2} \quad \surd(1)$$

12.



✓ (1)

13. (a) BC - Solid changes to liquid √(1)

(b) DE - Liquid changes to vapour √(1)

14. - Collisions / bombardment of particles with air molecules which are in random motion. √(1)

SECTION B

15. (a) (i) Displacement = Area under graph

= 20×8 m

= 160 m

(3 marks)

(ii) After point B,

$$a = \frac{0 - 20}{4} \text{ ms}^{-2}$$

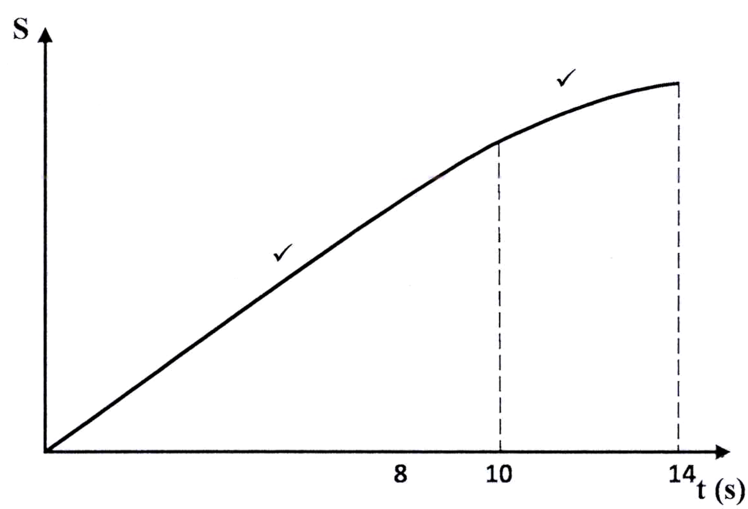
$$= -5 \text{ ms}^{-2}$$

(iii) F = ma = 2×-5 N

= -10 N

(3 marks)

(b)



(2)

16. (a) (i) Force $=$ 4 N √(1)

(ii) Since velocity is constant. (uniform speed) √(1)

Resultant force is zero $=$ Force downwards is equal to force upwards

$=$ 4N √(1)

(b) (i) M. A $= \frac{load}{Effort} = \frac{20}{4}$ √(1) √(1)

$= 5$ √(1)

(ii) V. R $= \frac{Effort\ distance}{Load\ distance}$; √(1)

$= \frac{40}{5}$; √(1)

$= 8$;

(iii) Efficiency $= \frac{M.\ A}{V.\ R}$ x 100% √(1)

$= \frac{5}{8} \times 100$ √(1)

$=$ 62.5% √(1)

17. (a) $l_1 = 142$, $T_1 = 290$ K, $T_2 = 298$ K, $l_2 = ?$

$\frac{l_1}{T_1} = \frac{l_2}{T_2}$ or $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ √(1)

$l_2 = 142 \times \frac{298}{290}$ √(1)

$=$ 145.9 mm √(1)

(b) In the hot sun the temperature of the air increases; therefore the speed of the air √(1) molecules increases hence the rate of collisions between the molecules and √(1) tyre increases; The rate of change of momentum (pressure) √(1) of the molecules also increases.

(c) (i) Heat lost = Heat gained

$mLv + M\Delta\theta C_{steam} = M\Delta\theta C_{water}$ √(1)

$0.01\,Lv + 0.01 \times 30 \times 4200 = 0.1 \times 4200 \times 50$ √(1)

$0.01\,Lv = 21000 - 1260$ √(1)

$Lv = \frac{19740}{0.01}$

$= 1.974 \times 10^{6}\ J\,Kg^{-1}K^{-1}$ √(1)

(ii) - All the heat lost by the steam is not absorbed by the water alone.

- Reading the thermometer at wrong meniscus resulting in wrong temperatures.

18. (a) Friction between road and tyre. √(1)

(b) Increases the centripetal force acting on the bus. √(1)

(c) (i) - Weight √(1)
- Tension √(1)

(ii) (I) f = 2 revolutions / sec

$T = \frac{2\pi}{\omega} = \frac{1}{f}$ √(1)

$f = \frac{\omega}{2\pi} = 2$ √(1)

$\omega = 2 \times 2\pi$

$= 4\pi\ rad\ S^{-1} = 12.56$

$\simeq 13\ rad\ S^{-1}$ √(1)

(II) $T + mg = mr\omega^2$ √(1)

$T = mr\omega^2 - mg$

$= 0.2 \times 0.4\ (16\pi^2) - 0.2 \times 10$ √(1)

$= 10.63$

$= 10.6N$ √(1)

19. (a) (i) (I) Volume of water displaced $= 2 \times 5$ $\surd$(1)

$= 10\ cm^3$ $\surd$(1)

(II) Mass $=$ Volume $\times$ density $\surd$(1)

$= 10 \times 1$

$= 0.01$ kg $\surd$(1)

$\therefore$weight $= 0.01 \times 10$ $\surd$(1)

$= 0.1$ N $\surd$(1)

(ii) Combined weight $=$ upthrust

$= 0.1$ N $\surd$(1)

(iii) Weight of liquid displaced $=$ 0.1N

Mass of liquid displaced $=$ 0.01 kg $=$ 10 g $\surd$(1)

Volume of liquid displaced $= \frac{mass}{density} = \frac{10}{0.8}$

$= 12.5\ cm^3$ $\surd$(1)

$\therefore$ Length submerged $= 2\,l = 12.5$

(C.S A $\times$ l $=$ volume)

$0.8\,l = 10$ $\surd$(1)

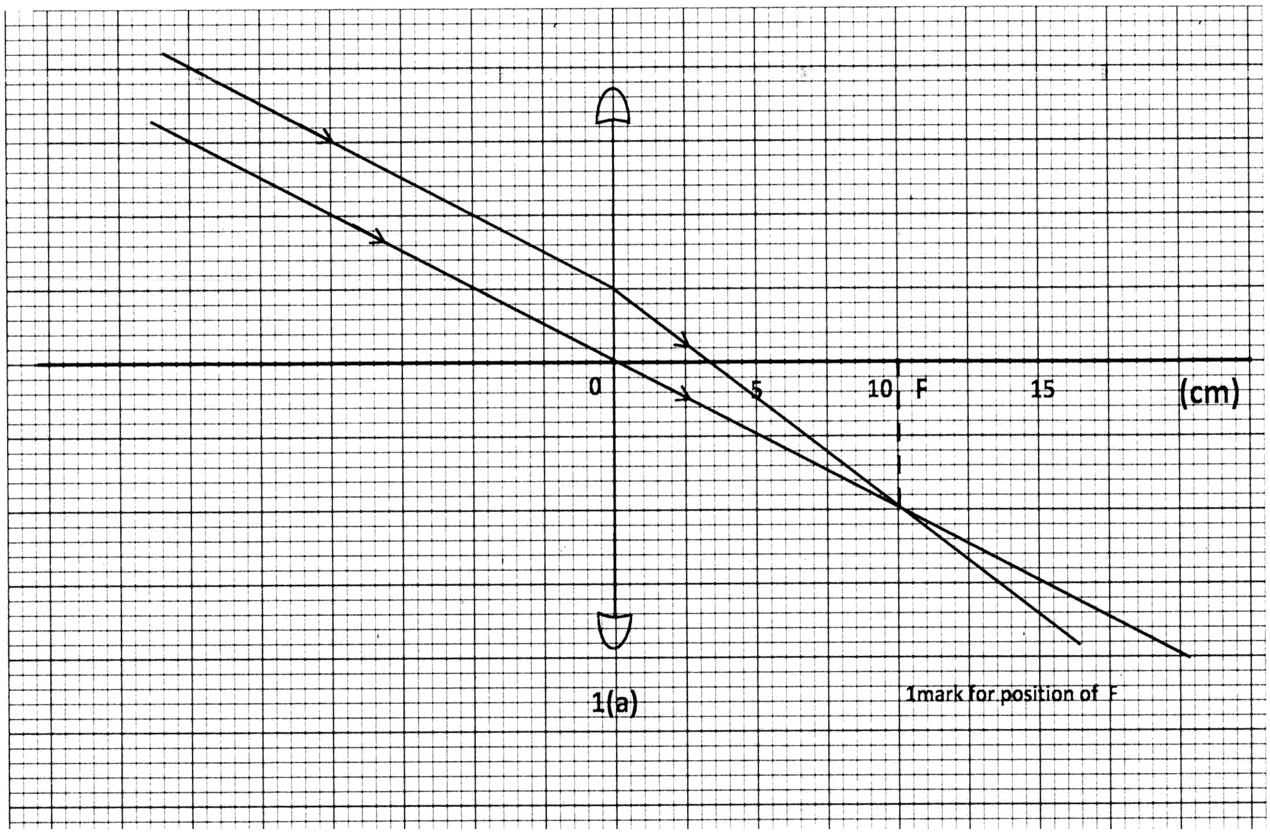
$l = \frac{10}{0.8}$

$= 6.25$ cm $\surd$(1)

(b) Use a narrower test tube. $\surd$(1)

4.5.2 Physics Paper 2 (232/2)

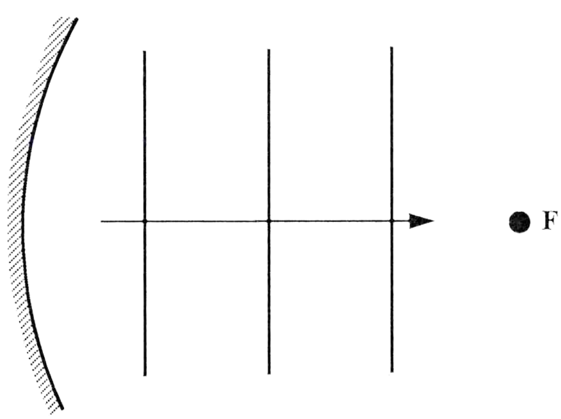
1. (a)



(b) Focal length = 10 cm. √1

2. The capacitance increases. (1 mark)

3.



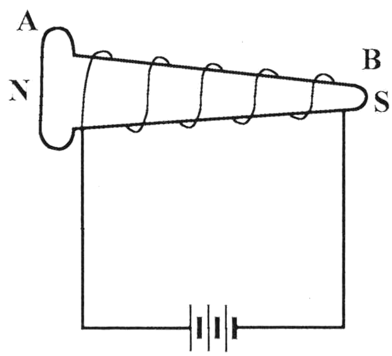
Approximately equally spaced lines √ 1

4. (a) $V = f\lambda$ √ 1

$\lambda = \dfrac{3.0 \times 10^8}{4 \times 10^6}$ √ 1

75 m√ 1

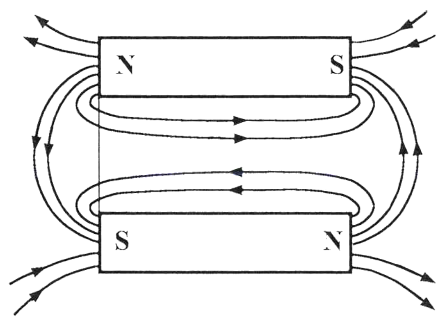
5.



✓ -correct winding (1)

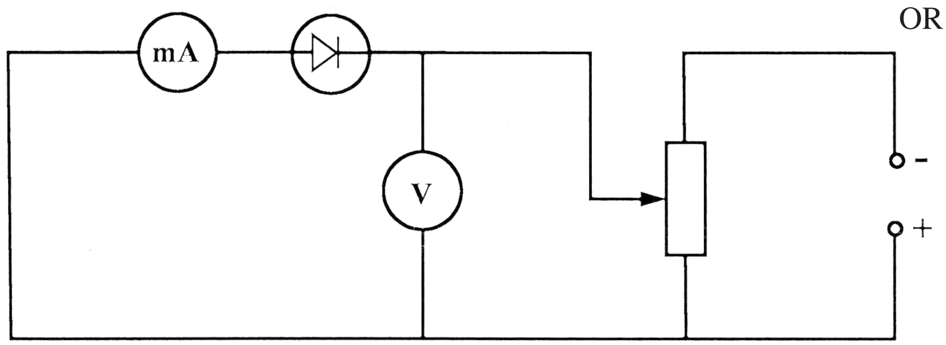
6. (a) Electrons arbsorb enough energy and are ejected√ leaving the electroscope positively charged √ the leaf is repelled by the stem. √

7.



Correct polarity on each magnet

8.



OR equivalent

1 mark for correct bias
1 mark for both ammeter and voltmeter
1 mark for means of varying the p.d. across the diode.

9. $^{226}_{88}Ra \longrightarrow {}^{4}_{2}He + {}^{x}_{y}Q$

(a) $4 + x = 226$
$x = 222\surd$ 1

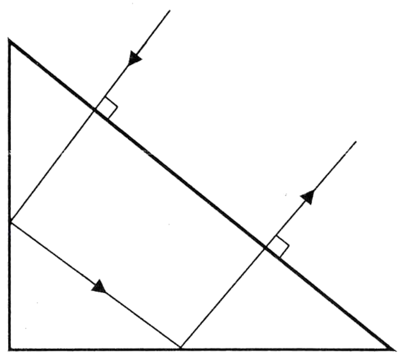
(b) $2 + y = 88$
$y = 86\surd$ 1

10.
- estimate the quantity of charge √1
- test for insulating properties √1
- test for the sign of charge √1
- test for presence of charge √1

(any two correct)

11. It stops the fast moving electrons √ whose kinetic energy is converted to heat.

12.



1 mark for ray incident on hypotenuse

1 mark for showing two internal reflections

13. $\left.\begin{array}{l} Q = 1t \\ n = \dfrac{Q}{e} \end{array}\right\}$ 1 mark for either formula

$= \dfrac{2.0 \times 10^{-4} \times 1}{1.6 \times 10^{-19}}$ 1 mark for substitution

$= 1.25 \times 10^{15}$ electrons 1 mark for answer

SECTION B

14.	(a)	(i)	I	D	- soft iron armature √	1
			II	E	- contacts √	1
		(ii)	I.	Soft iron core is magnetised √ and attracts the armature √ the hammer hits the gong.		1 1
			II.	Contact is broken √ when armature is attracted by the core. The core then loses magnetism. √ The armature loses magnetism and √ springs back making contact again and the process is repeated.		1 1
	(b)	(i)	$I = \frac{P}{V}$ √			1
			$= \frac{60}{240}$ √			1
			$= 0.25A$ √			1
		(ii)	$R = \frac{V}{I}$ √			1
			$R = \frac{240 \times 240}{60}$ √ OR $\frac{240}{0.25}$			1
			$R = 960\,\Omega$ √			1

15. (a) (i) resistance in the coils. √ 1

(ii) use of thicker copper wires. √ 1

(b) (i) $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ √ 1

$= \frac{240}{12}$ √ 1

$= \frac{20}{1}$ √ 1

(ii) Power input $= V_p I_p$ √ 1

$= 240 \times 0.36$ √ 1

$= 86.4W$ √ 1

(iii) Power output = 80W √ 1

(iv) Efficiency $\frac{power\ output}{power\ input}$ √ 1

$= \frac{80}{86.4}$

$= 92.59\%$ √ 1

16. (a) (i) (I) $I_1 = \frac{V}{R_1}$ √ 1

(II) $I_2 = \frac{V}{R_2}$ √ 1

(III) $I_T = I_1 + I_2$

$I_T = \frac{V}{R_1} + \frac{V}{R_2}$ √ 1

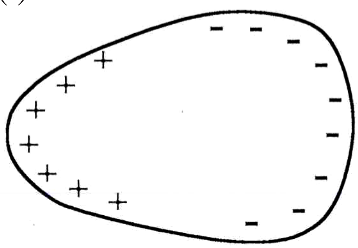
(iii) $I_T = \frac{V}{R_T}$ √ 1

$\frac{V}{R_T} = \frac{V}{R_1} + \frac{V}{R_2}$ √ 1

divide through by V

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$, hence $R_T = \frac{R_1 R_2}{R_1 + R_2}$

(b) (i)



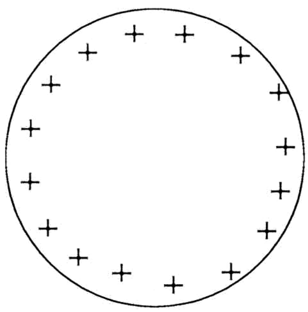
✓ - concentration of positive charges at sharp end 1

✓ **+ve & -ve charges in correct position** 1

(ii) (I) The conductor loses the negative charges to earth. √ 1

(II) The conductor acquires a net √ positive charge/which redistributes itself.

(iii)



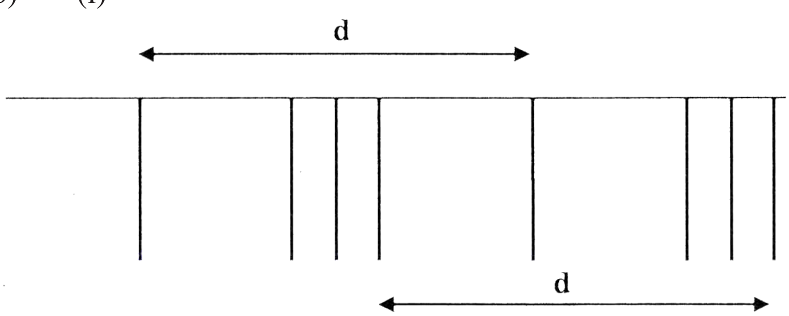
✓ **+ve charges uniformly distributed** 1

17. (a) (i) (I) sound is soft when the waves arrive out of phase; √ 1
such waves undergo destructive interference. 1

(ii) same sound - loud. √ 1

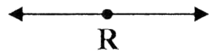
Along PQ the waves undergo 1
constructive intereference as they arrive in phase. √ 1

(b) (i)



✓ **-any correct d** 1

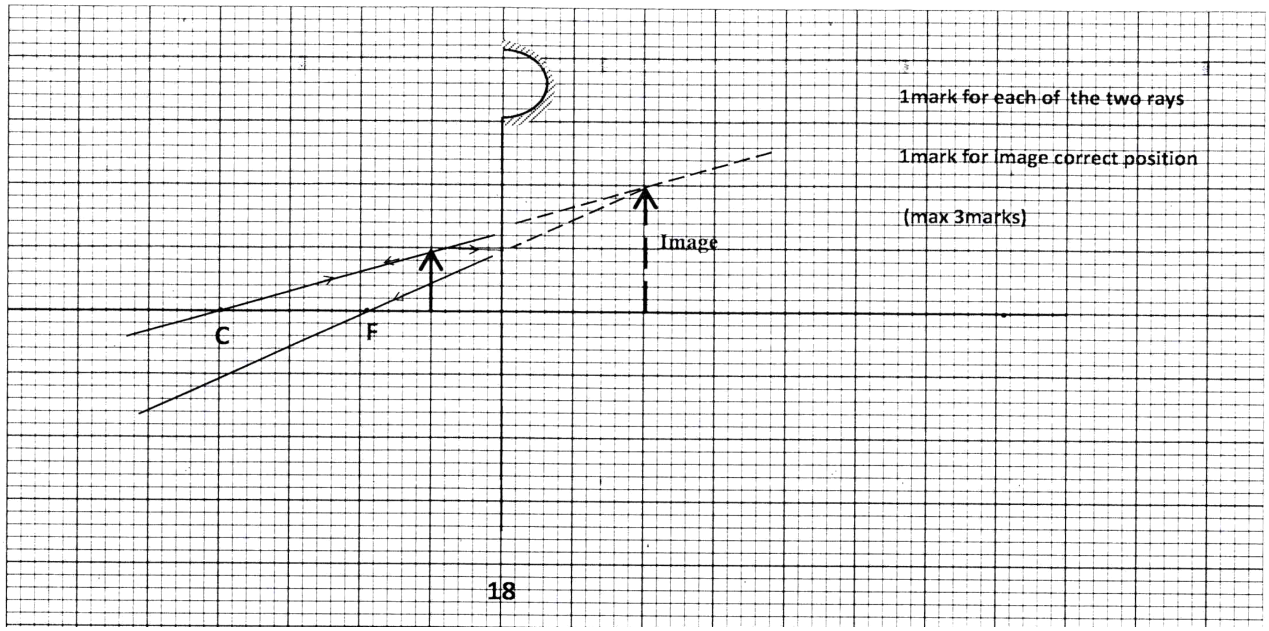
(ii)



√ 1

(iii) As the longitudinal waves pass √ molecule R moves along to either side. For a crest, R moves away from source. 1

18.



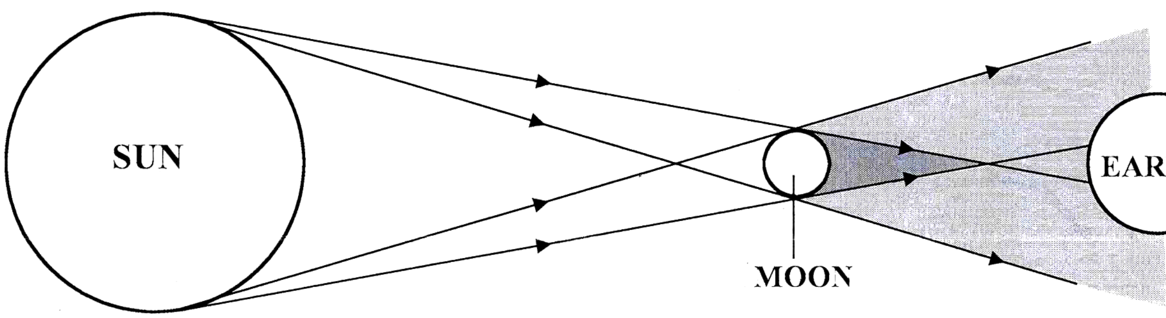
(ii) (I) image distance = 20 cm ± 2 cm √ 1

(II) magnification $= \dfrac{Image\ distance}{Object\ distance}$ √ 1

$= \dfrac{20}{10}$ √ 1

$= 2 \pm 0.2$ √ 1

(iii) Infinity. √ 1



- Outer pair of rays √
- Inner pair of rays √
- proper labelling of umbra and penumbra √

4.5.3 Physics Paper 3 (232/3)

QUESTION ONE PART A

(a) (i) D = 0.38 mm ± 0.02 (1 mark)

(ii) d = 0.28 mm ± 0.05 (1 mark)

(b) $C_1 = \frac{D}{d} = \frac{0.38}{0.28} = 1.357$

(1 mark)

(c) l_1 = 38.5 cm (1 mark)

l_2 = 61.5 cm (1 mark)

$(l_1 < l_2)$

$$\frac{R_p}{9} = \frac{38.5}{61.5}$$

$$\therefore R_p = 5.63\Omega$$

(2 marks)

$$C_2 = \sqrt{\frac{9}{5.63}}$$

= 1.264 (2 marks)

(ii) C_1 and C_2 are nearly equal (to the nearest whole number).

(1 mark)

QUESTION ONE PART B

V = 3.1 volts ± 0.1

$$I_0 = \frac{V}{R} = \frac{3.1}{4.7 \times 10^3} \quad A$$

= 0.659 mA

(3 marks)

I_1 = 0.63 mA

For $\frac{I_1}{2}$

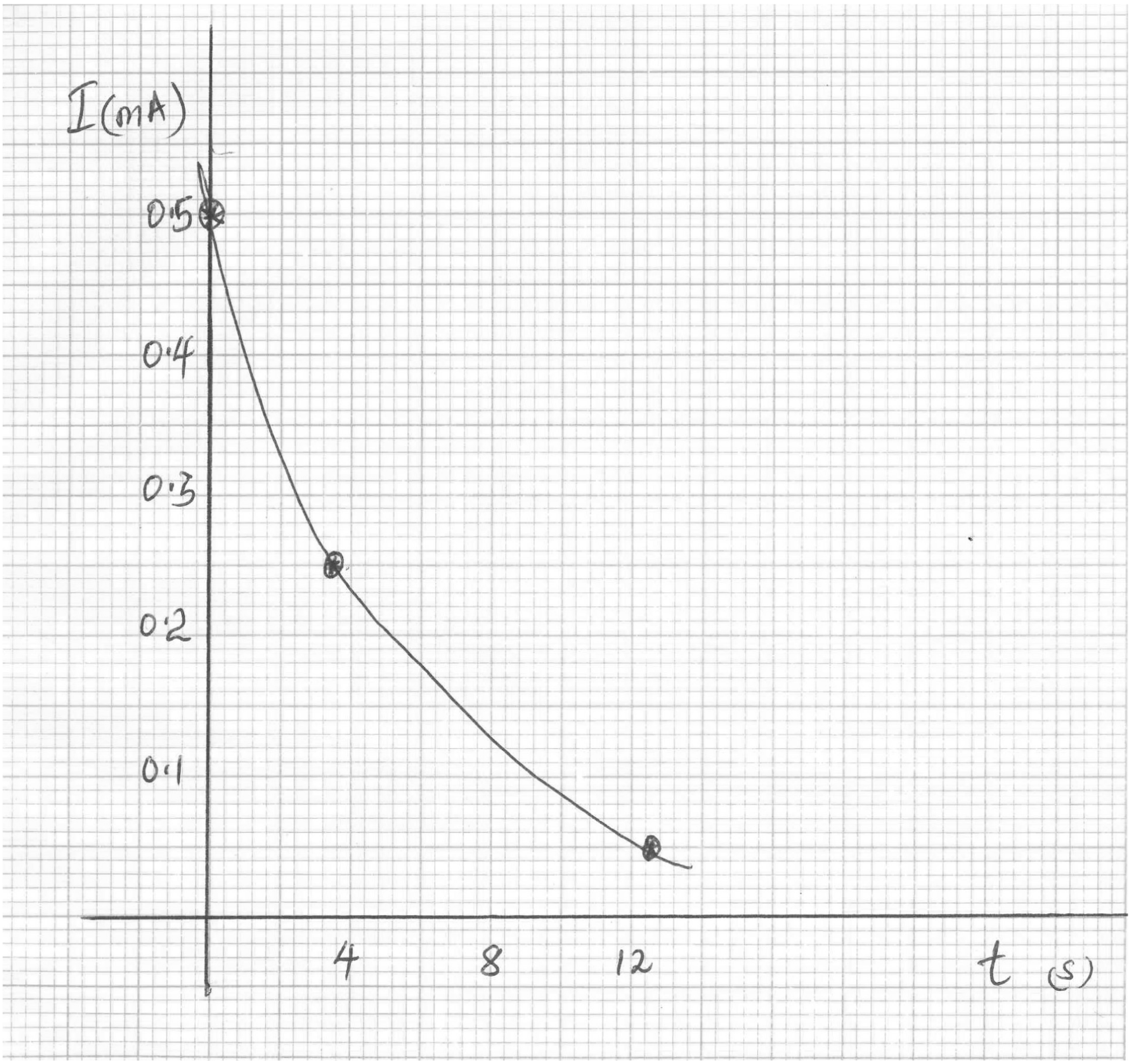
t_1 = 3.9 s

(1 mark)

For $\frac{I_1}{10}$

t_2 = 13.5 s (1 mark)

I	0.5	0.25	0.05
t	0	3.6	12.5



(3 marks)

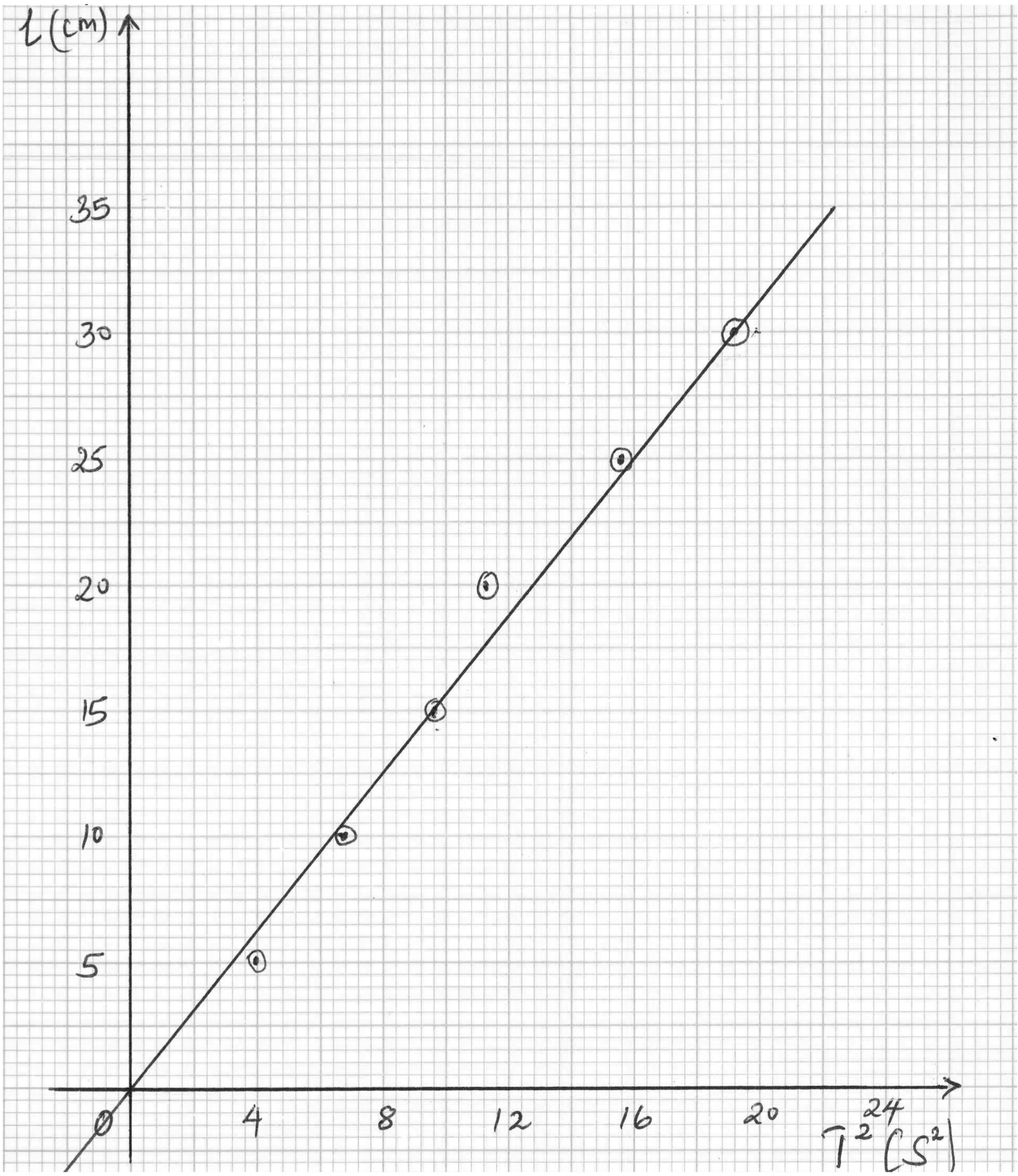
QUESTION TWO

(d)

l (cm)	5	10	15	20	25	30
t (s)	20.1	26.3	31.2	33.0	39.6	43.4
T (s)	2.01	2.63	3.12	3.3	3.96	4.34
T^2 (S^2)	4.04	6.92	9.73	10.89	15.68	19.84

(6 marks)

(e) Graph. (5 marks)



(f) Gradient $= \frac{20}{16}\ cm/s^2$

$= \frac{0.20}{16}\ cm/s^2$

$= 0.015625\ ms^{-2}$

(3 marks)

(g) $l_N = 20\ cm = 0.2\ m$

(i) $t_N = 52.0$

(ii) $T_N = 5.2$

(iii) $T_N^{\ 2} = 27.04$

(1 mark)

$H = \frac{0.2}{27.04} = 0.007396$ (1 mark)

(iv) $\frac{H}{S} = \frac{0.007396}{0.015625}$

$= 0.4737$

(2 marks)