

4.5 PHYSICS (232)

4.5.1 Physics Paper 1 (232/1)
Ecolebooks.com

SECTION A

1.
$$L = \frac{18.6 + 18.5 + 18.6 + 18.5}{4} \quad : (1)$$

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

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.
$$\frac{F}{A} = p \quad : (1)$$

$$F = 5 \times 24 \quad : (1)$$

$$F = 120 \text{ N}$$

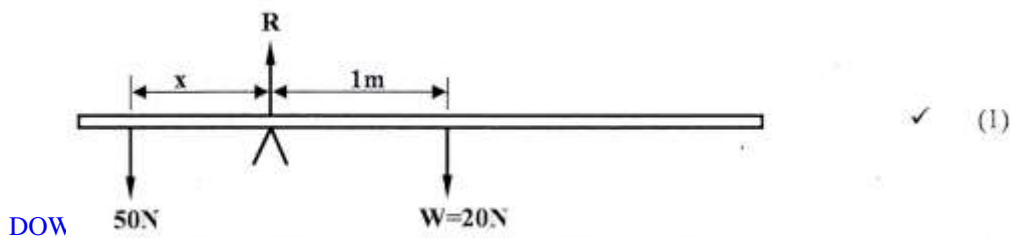
6. Volume of drop = Volume of patch : (1)

$$ad = V \quad : (1)$$

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

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.



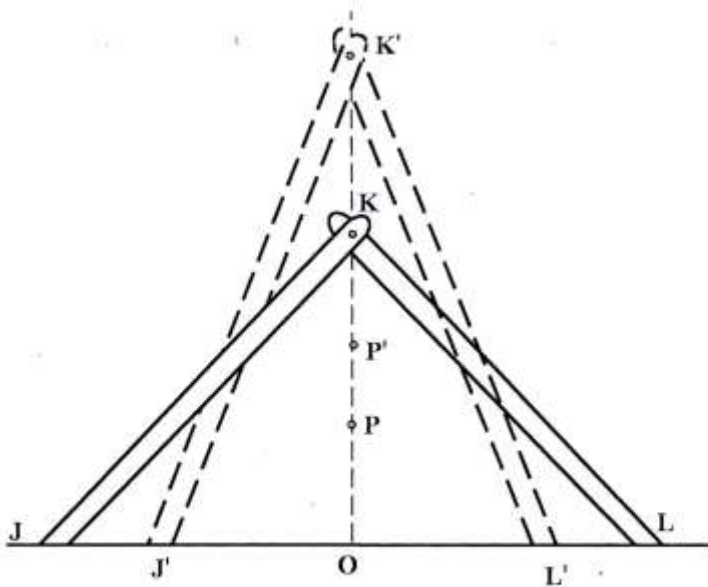
$$50x = 20 \quad \# \quad 1 \quad \text{: (1)}$$

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

$$\frac{20}{50} = 0.4 \text{ m} \quad \text{: (1)}$$



9.



-raised K to K' ✓ (1)

-P also raised to P' ✓ (1)

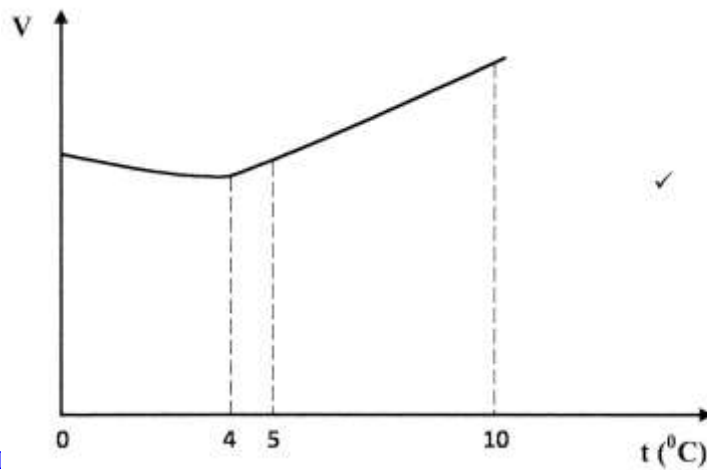
$$10. \quad \text{extension} = 4 \text{ mm} + 4 \text{ mm} \quad \text{: (1)}$$

$$= 8 \text{ mm} \quad \text{: (1)}$$

$$11. \quad a_1 V_1 = a_2 V_2 \quad \text{: (1)}$$

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

12.



✓ (1)

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13. (a) BC - Solid changes to liquid
 (b) Ecolebooks.com - 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,

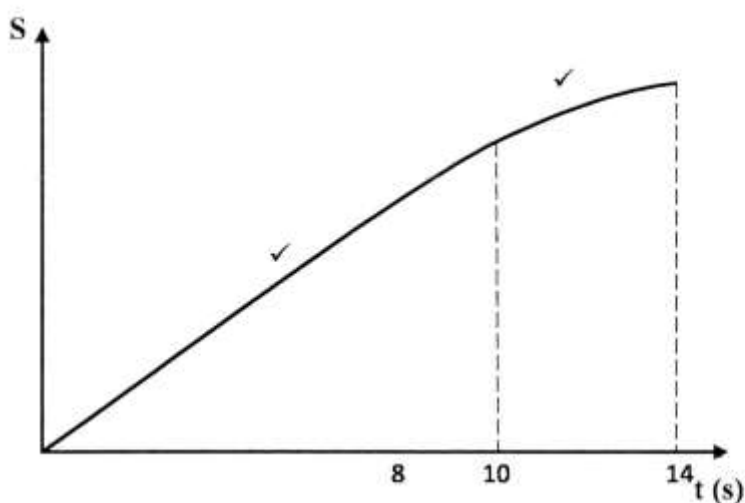
$$a = \frac{0 - 20}{4} \text{ ms}^{-2}$$

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

- (iii) $F = ma = 2 \times -5$ 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) $M. a = \frac{\text{load}}{\text{Effort}} = \frac{20}{4}$: (1)
- : (1)
- = 5 : (1)
- (ii) $V. r = \frac{\text{Effort distance}}{\text{Load distance}} ;$: (1)
- = $\frac{40}{5} ;$: (1)
- = 8 ;
- (iii) Efficiency = $\frac{M. A}{V. R} \times 100\%$: (1)
- = $\frac{5}{8} \times 100$: (1)
- = 62.5% : (1)
17. (a) $l_1 = 142, T_1 = 290 \text{ K}, T_2 = 298 \text{ K}, l_2 = ?$
- $\frac{l_1}{T_1} = \frac{l_2}{T_2}$ 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 molecules increases hence the rate of collisions between the molecules and tyre increases; The rate of change of momentum (pressure) of the molecules also increases. : (1)
- : (1)
- : (1)

(c) (i) Heat lost = Heat gained

Ecolebooks.com $mL_v + M \Delta\theta_{\text{steam}}$ = $M \Delta\theta_{\text{water}}$: (1)

$$0.01 L_v + 0.01 \times 30 \times 4200 = 0.1 \times 4200 \times 50 \quad : (1)$$

$$0.01 L_v = 21000 - 1260 \quad : (1)$$

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

$$= 1.974 \times 10^6 \text{ J Kg}^{-1}\text{K}^{-1} \quad : (1)$$

- (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) $f = 2 \text{ revolutions / sec}$

$$T = \frac{2r}{\sim} = \frac{1}{f} \quad : (1)$$

$$f = \frac{\sim}{2r} = 2 \quad : (1)$$

$$\omega = 2 \times 2\pi$$

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

$$= 13 \text{ rad S}^{-1} \quad : (1)$$

(II) $T + mg = m\omega^2$: (1)

$$T = m\omega^2 - mg$$

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

$$= 10.63$$

$$= 10.6\text{N} \quad : (1)$$

19. (a) (i) (i) Volume of water displaced = 2 # 5 : (1)

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= 10 cm : (1)



(ii) Mass = Volume # density : (1)

= 10 # 1

= 0.01 kg : (1)

Weight = 0.01 # 10 : (1)

= 0.1 N : (1)

(ii) Combined weight = upthrust
= 0.1 N : (1)

(iii) Weight of liquid displaced = 0.1N

Mass of liquid displaced = 0.01 kg = 10 g : (1)

Volume of liquid displaced = $\frac{\text{mass}}{\text{density}}$ = $\frac{10}{0.8}$
= 12.5 cm³ : (1)

Length submerged = 2 l = 12.5

(C.S a # l = volume)

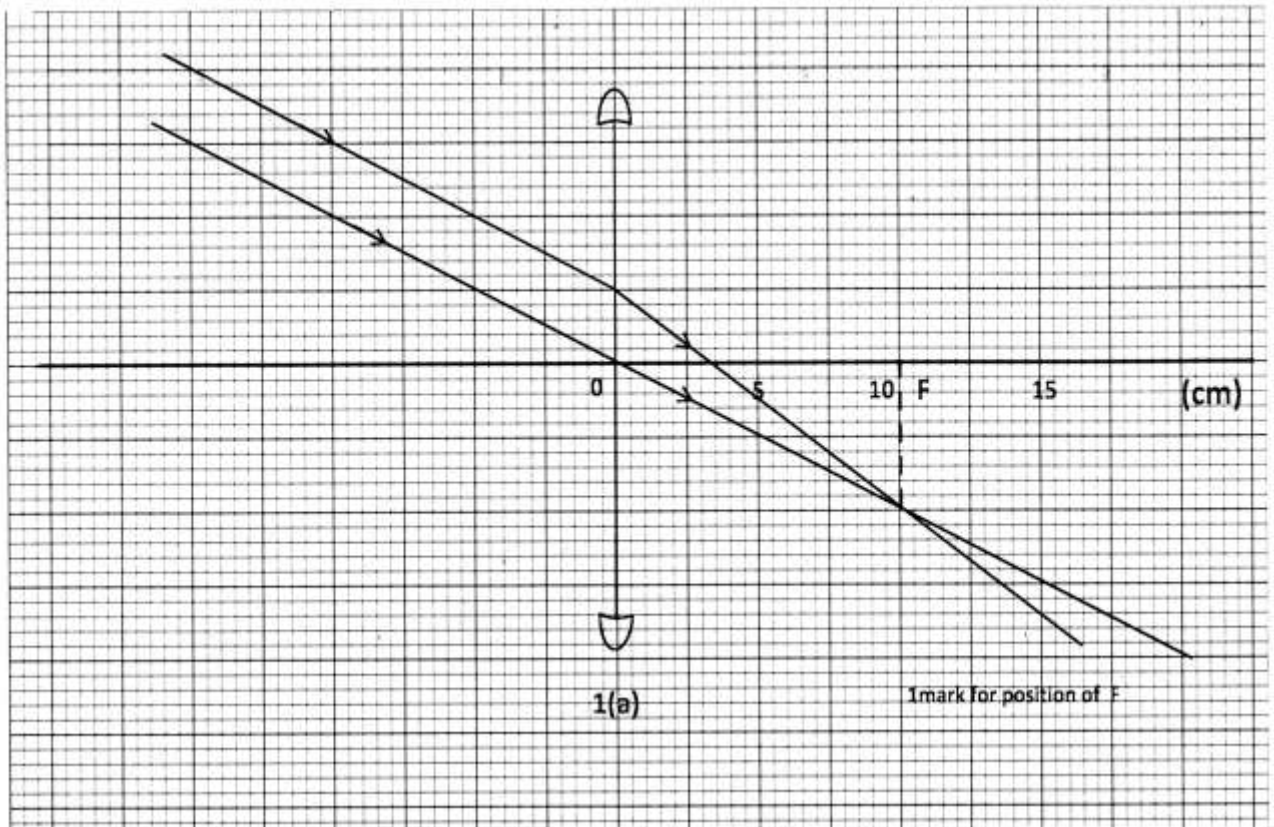
0.8 l = 10 : (1)

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

= 6.25 cm : (1)

(b) Use a narrower test tube. : (1)

1. (a) Ecolebooks.com



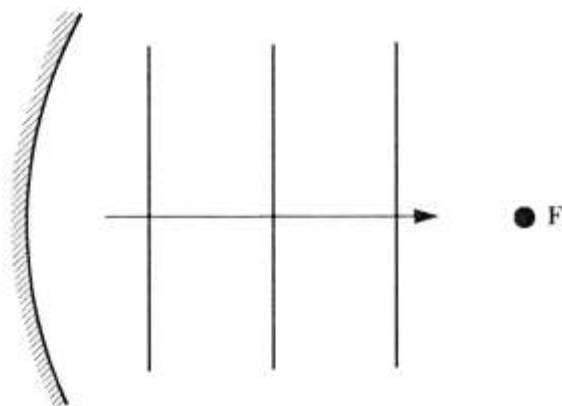
(b) Focal length = 10 cm.

√1

2. The capacitance increases.

(1 mark)

3.



approximately equally spaced lines √ 1

4. (a) $V = f\lambda \sqrt{\quad}$

$\frac{30 \times 10^8}{4 \times 10^6} \sqrt{\quad}$

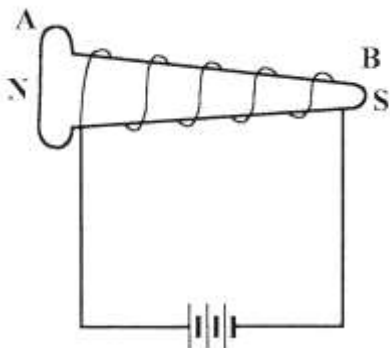
75 mV

1

1

1

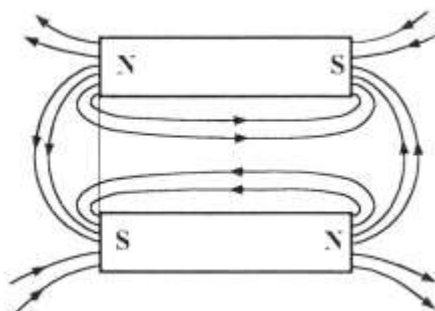
5.



✓ -correct winding (1)

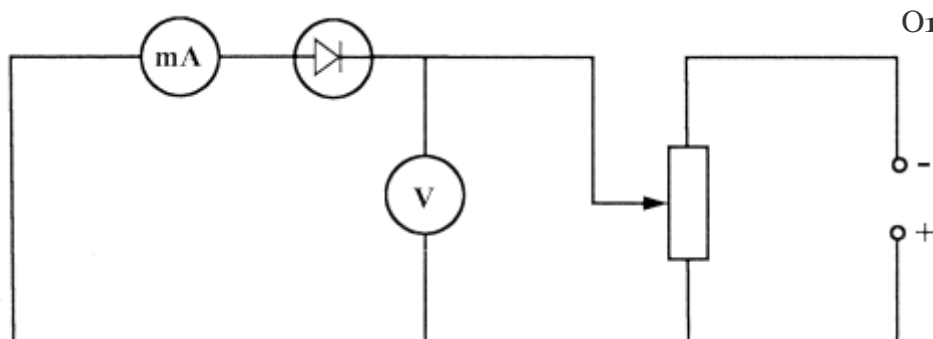
6. (a) Electrons absorb enough energy and are ejected leaving the electroscope positively charged ✓ the leaf is repelled by the stem. ✓

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.

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(a) $x = 222$ ✓
 $y = 86$ ✓

1

(b) $2 + y = 88$
 $y = 86$ ✓

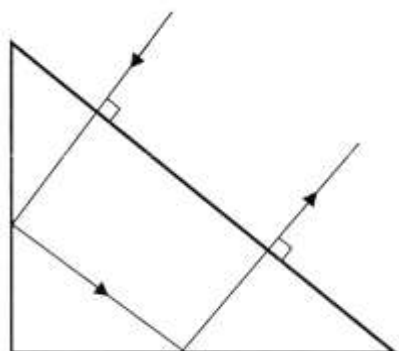
1

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. $Q = It$ } 1 mark for either formula
 $n = \frac{Q}{e}$ }

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

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

SECTION B

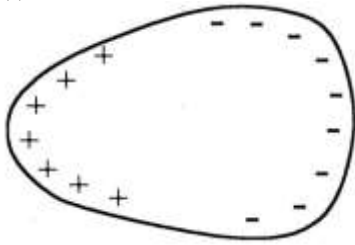


14. (a) Ecolebooks.com (i) I D - soft iron armature ✓ 1
- II E - contacts ✓ 1
- (ii) I. Soft iron core is magnetised ✓ and attracts the armature ✓ the hammer hits the gong. 1
- II. Contact is broken ✓ when armature is attracted by the core. The core then loses magnetism. ✓ The armature loses magnetism and ✓ springs back making contact again and the process is repeated. 1
- (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
			Ecolebooks.com		
	(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 $\frac{\text{power output}}{\text{power input}}$	✓	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)

Ecc

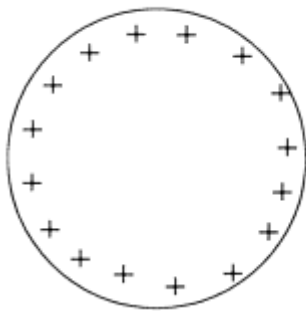


- ✓ - concentration of positive charges at sharp end
- ✓ +ve & -ve charges in correct position

1
1

- (ii) (I) The conductor loses the negative charges to earth. ✓ 1
- (II) The conductor acquires a net ✓ positive charge/which redistributes itself.

(iii)

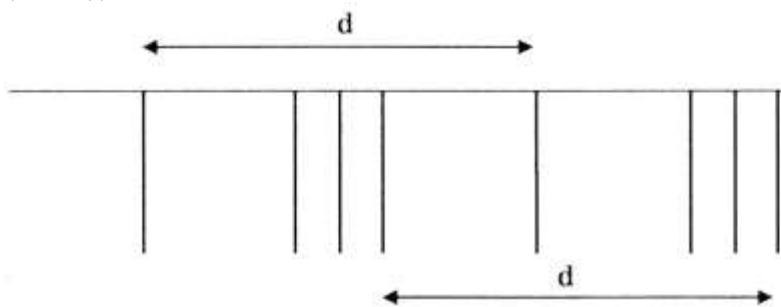


- ✓ +ve charges uniformly distributed

1

17. (a) (i) (I) sound is soft when the waves arrive out of phase; ✓
such waves undergo destructive interference. 1
- (ii) same sound - loud. ✓ 1
- along PQ the waves undergo
constructive interference as they arrive in phase. ✓ 1

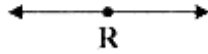
(b) (i)



- ✓ -any correct d

1

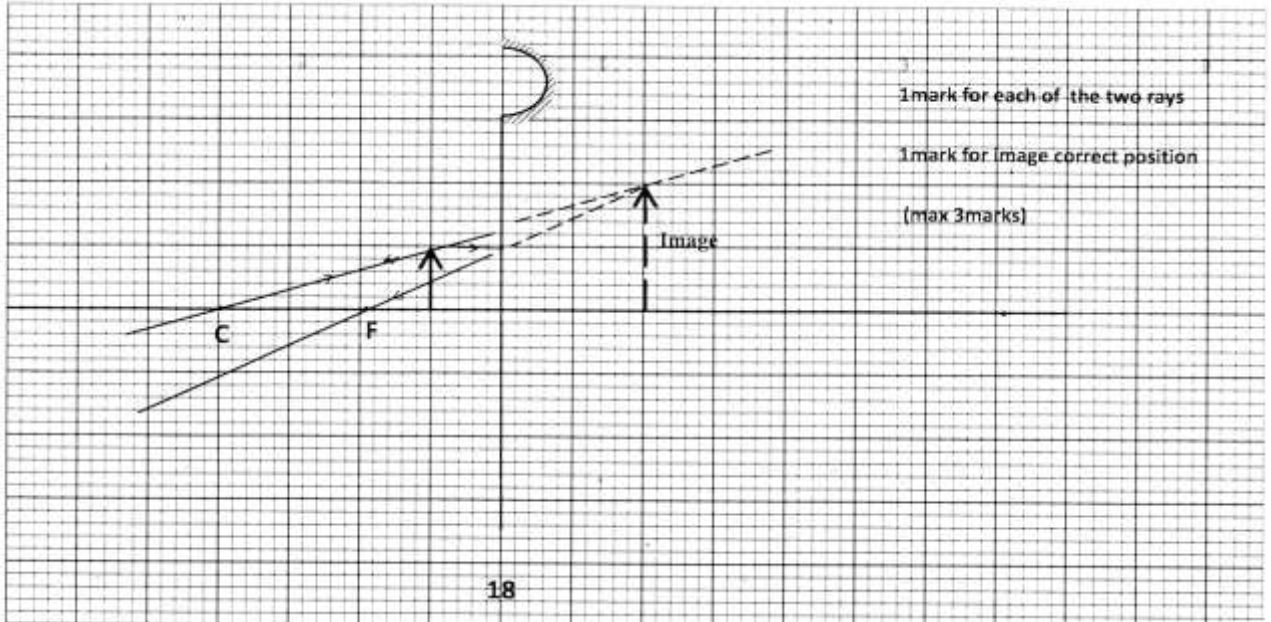
(ii)



✓

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

18.

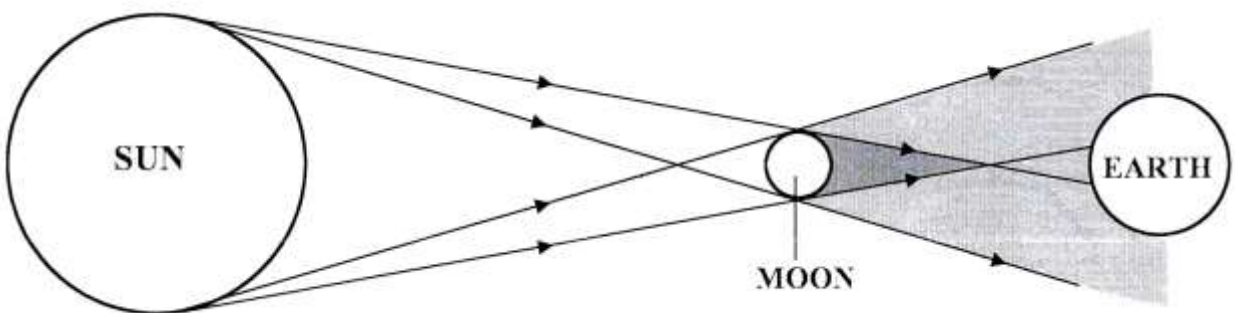


1 mark for each of the two rays
 1 mark for image correct position
 (max 3 marks)

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

(ii) magnification = $\frac{\text{Image distance}}{\text{Object distance}}$ ✓ 1
 $= \frac{20}{10}$ ✓ 1
 $= 2 \pm 0.2$ ✓ 1

(iii) Infinity. ✓ 1



- Outer pair of rays ✓
- Inner pair of rays ✓

4.5.3 Physics Paper 3 (232/3)



QUESTION ONE PART A

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(a) (i) $D = 0.38 \text{ mm} \pm 0.02$ (1 mark)

(ii) $d = 0.28 \text{ mm} \pm 0.05$ (1 mark)

(b) $C_1 = \frac{D}{d} = \frac{0.38}{0.28} = 1.357$ (1 mark)

(c) $l_1 = 38.5 \text{ cm}$ (1 mark)

$l_2 = 61.5 \text{ cm}$ (1 mark)

$(l_1 < l_2)$

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

$\sim R_p = 5.63X$ (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

$V = 3.1 \text{ volts} \pm 0.1$

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

$= 0.659 \text{ ma}$ (3 marks)

$i_1 = 0.63 \text{ ma}$

For $\frac{I_1}{2}$

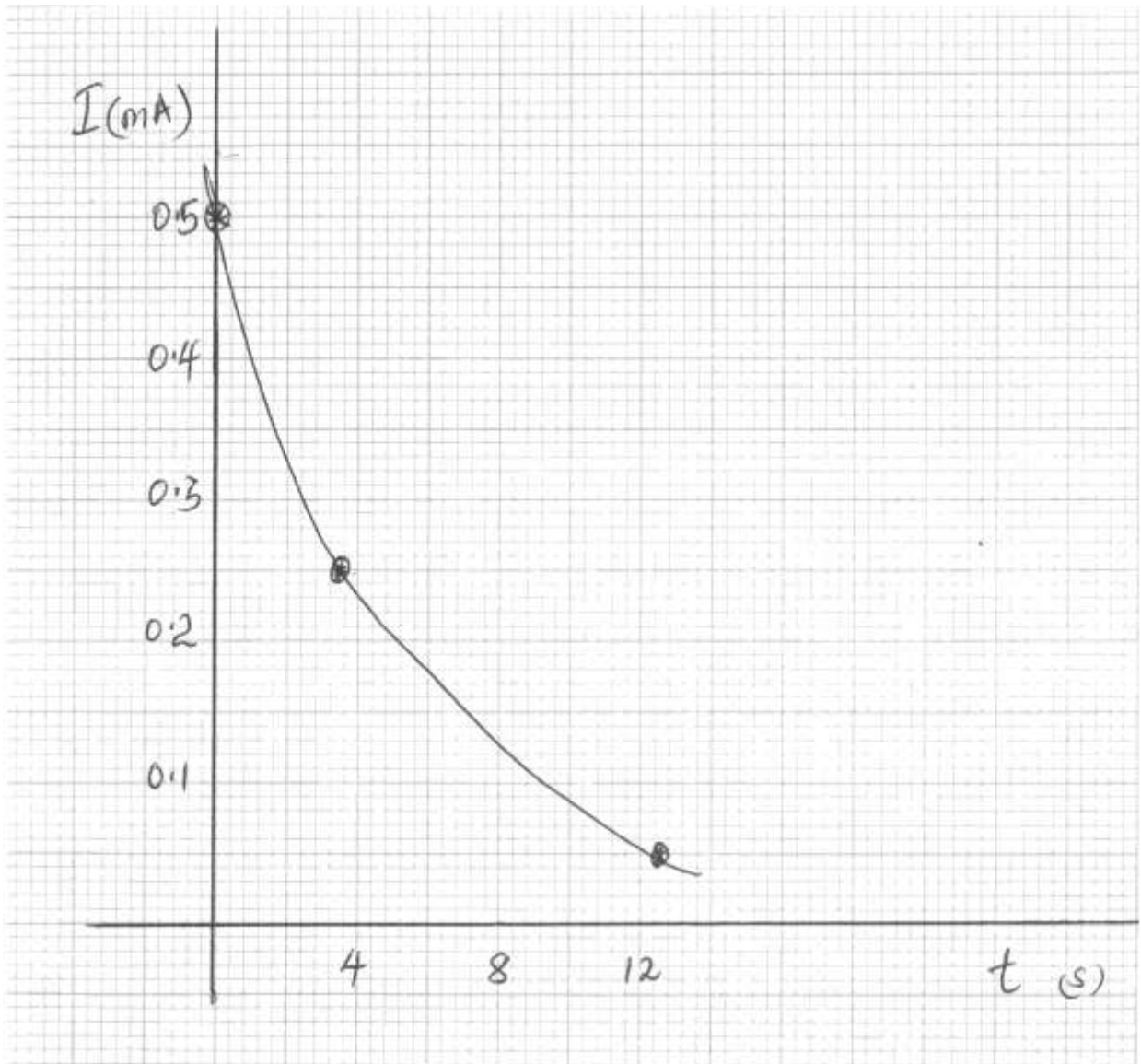
$t_1 = 3.9 \text{ s}$ (1 mark)

For $\frac{I_1}{10}$

$t_2 = 13.5 \text{ s}$ (1 mark)

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I	0.5	0.25	0.01
t	0	3.6	12.5



(3 marks)

QUESTION TWO

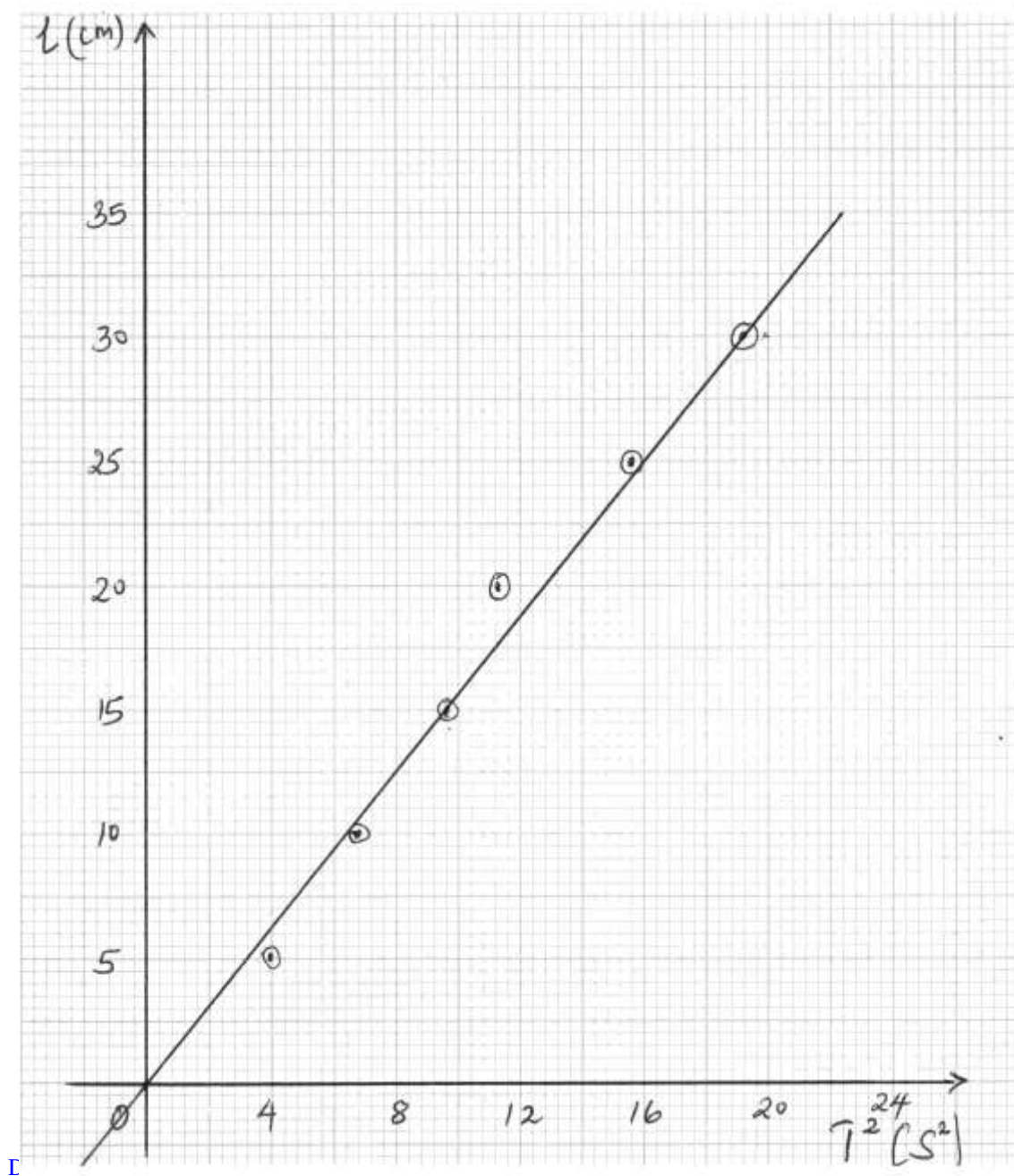
(d) Ecolebooks.com

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)



$$\begin{aligned} \text{(f) Gradient} &= \frac{20}{16} \text{ cm/s}^2 \\ &= \frac{0.20}{16} \text{ cm/s}^2 \\ &= 0.015625 \text{ ms}^{-2} \end{aligned}$$

(3 marks)

$$\text{(g) } l_N = 20 \text{ cm} = 0.2 \text{ m}$$

$$\text{(i) } t_N = 52.0$$

$$\text{(ii) } T_N = 5.2$$

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

(1 mark)

$$H = \frac{0.2}{27.04} = 0.007396$$

(1 mark)

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

$$= 0.4737$$

(2 marks)