

## 24.5 PHYSICS (232)



### 24.5.1 Physics Paper 1 (232/1)

1.  $0.562 - 0.012 = 0.550 \text{ cm}$  or  $5.62 - 0.12 = 5.50 \text{ mm}$  (1 mark)
2. Density =  $\frac{\text{Mass}}{\text{Volume}}$   

$$= \frac{1.75 \text{ g}}{(0.550)^3 \text{ cm}^3}$$

$$= 10.5 \text{ g cm}^{-3}$$
 (3 marks)
3.  $V_2, V_4, V_1, V_3$ . (1 mark)
4. Sucking air reduces pressure inside the tube; so that atmospheric pressure forces the liquid up the tube. NB. Not increased atmospheric pressure. (1 mark)
5.  $\rho_A g h_A = \rho_B g h_B$   
 $\rho_A g \times 24 = 1200 \text{ g} \times 6$   
 $\rho_A = 800 \text{ Kg m}^{-3}$  (3 marks)
6. Radiation. (1 mark)
7.  $X_2$  is made larger than  $X_1$ ; or  $X_1$  is made shorter/smaller than  $X_2$ . Since B receives radiation at a higher rate, it must be moved further from source for rates to be equal. (2 marks)
8. Taking moments and equating, principle of moments  
 $0.6 \text{ N} \times 70 \text{ cm} = mg \times 30 \text{ cm};$   
 $W = mg = 1.4 \text{ N}$  (3 marks)
9. Distance = area under curve between 0 and 3.0 seconds:  
 $= 120 \times 3 \times 0.2 = 72 \text{ m}$  (2 marks)
10. Acceleration = slope of graph at  $t = 4.0 \text{ s};$   

$$= \frac{16 \times 3}{17 \times 0.2}$$

$$= 14.11 \text{ m/s}^2$$
 (2 marks)
11. Pressure, impurities. (2 marks)
12. Kelvin (K). (1 mark)
13. The pressure of a fixed mass of a gas is directly proportional to its absolute (Kelvin) temperature provided the volume is kept constant. (1 mark)
14. Since the quantity of water in A is smaller, heat produces **greater change of Temperature in A**. This causes greater expansion per unit volume causing the cork to sink further; /greater decrease in density/lower density in A. (2 marks)
15. (a)
  - **Smoke particles:** to show the movement/behaviour of air molecules. Smoke particles are larger, therefore visible enough and light enough to move when bombarded by air molecules. (2 marks)

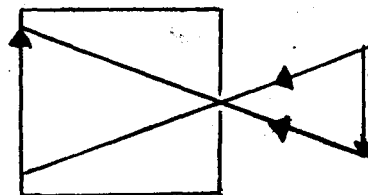
- **Lens:** concentrates/ converts/ focuses the light from the lamp on the smoke particle causing them to be observable. (2 marks)
  - **Microscope:** magnifies/ enlarges the smoke particles so that they are visible. (2 marks)
- (b)
- Smoke particles move randomly.
  - Air molecules bombard the smoke particles.
  - Air molecules are in continuous random motion/ haphazard/ zigzag/ drunken motion. (3 marks)
- (c) The speed of motion of smoke particles will be observed to be higher/move faster/speed increases random motion increases/motion increases. (1 mark)
16. (a) A body at rest or in motion at uniform velocity tends to stay in that state unless acted on by an unbalanced force. (1 mark)
- (b) (i)
- $$\text{Slope } s = \frac{\Delta U^2}{\Delta d}$$
- $$s = \frac{98.75 - 0}{16 - 0}$$
- $$= 6.172 \quad (3 \text{ marks})$$
- (ii)
- $$20k = s = 6.172$$
- $$k = \frac{6.172}{20}$$
- $$= 0.3085 \quad (2 \text{ marks})$$
- (iii)
- Increase in roughness increases k and vice versa.
  - Decrease in roughness decreases k. (1 mark)
- (c) Applying equation
- $$v^2 - u^2 = 2as$$
- $$v^2 - 0 = 2 \times 1.2 \times 400$$
- $$v = \sqrt{2 \times 1.2 \times 400}$$
- Momentum  $p = mv$
- $$= 800 \times \sqrt{2 \times 1.2 \times 400}$$
- $$= 24800 \text{ Kgms}^{-1} \quad (4 \text{ marks})$$
17. (a) Quantity of heat required to change completely into vapour 1 kg of a substance at its normal boiling point without change of temperature/ Quantity of heat needed to change unit mass of substance from liquid to vapour without change in temperature/constant temperature. (1 mark)
- (b) (i) So that it vaporises readily /evaporates easily. (1 mark)
- (ii) In the freezing compartment the pressure in the volatile liquid is *lowered suddenly by increasing the diameter* of the tube causing vaporization. In the cooling finns, the pressure *is increased by the compressed pump* and *heat lost to the outside* causing condensation. (2 marks)
- (iii) When the volatile liquid evaporates, it takes away heat of vaporization from the freezing

compartment reducing the temperature of the later. This heat is carried away and distributed at the cooling fins where the vapour is compressed to condensation giving up heat of vaporization. **(2 marks)**

- (iv) Reduces rate of heat transfer to or from outside (insulates). **(1 mark)**
- (c) (i) Heat lost by steam =  $0.003 \times 2.26 \times 10^6$   
 Heat lost by steam water =  $0.003 \times 4200 (100 - t_T)$ ;  
 Total =  $6780 + 12.6 (100 - T)$  **(3 marks)**
- (ii) Heat gained by water =  $MC\theta$ ;  
 $= 0.4 \times 4200 (T - 10)$  **(2 marks)**
- (iii) Heat lost = heat gained  
 $1680 (T - 10) = 6780 + 12.6 (100 - T)$ ;  
 $1680T - 16800 = 6780 + 1260 - 12.6T$   
 $1692.6T = 24840$   
 $T = 14.7^\circ \text{C}$  **(2 marks)**
18. (a) Acceleration directed towards the centre of the orbit. **(1 mark)**
- (b) (i)
  - Roughness/smoothness of surface.
  - Radius of path.
  - Angular velocity/speed/linear velocity.**(2 marks)**
- (ii)  $\omega_A > \omega_B > \omega_C$  **(1 mark)**
- (c)  $F = m\omega^2 r$   
 For the thread to cut  
 $F = 5.6 \text{ N}$   
 $5.6 = 0.20 \times \omega^2 \times 0.15$   
 $\omega = 13.7 \text{ radian per second}$  **(4 marks)**
19. (a) A floating body displaces its own weight of the fluid on which it floats. **(1 mark)**
- (b) (i) To enable the hydrometer float upright. **(1 mark)**  
 (ii) Making the stem thinner. **(1 mark)**  
 (iii) Float hydrometer on water and on liquid of known density in turn and mark Levels. Divide proportionally and extend on either side. **(2 marks)**
- (c) (i) Tension, upthrust, weight. **(3 marks)**  
 (ii) As water is added, upthrust and tension increases; maximum when cork is covered and staying constant then after; weight remains unchanged as water is added. **(3 marks)**

## 24.5.2 Physics Paper 2 (232/2)

1.



**(2 marks)**

2.

- Alkaline cell lasts longer than lead acid cell.
- Alkaline cell is more rugged than lead acid cell.
- Alkaline cell is lighter than lead-acid cell.

(1 mark)

3.

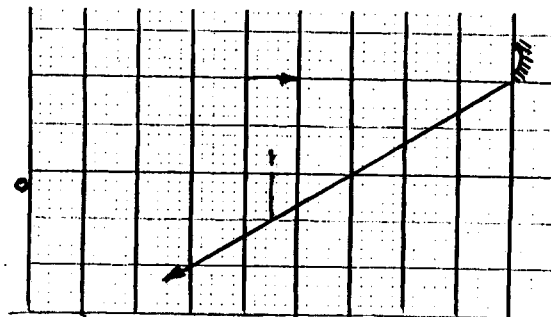
X: is north.

Y: is north.

(1 mark)

4.

(a)



(b)  $f = 3 \times 5 = 15\text{cm}$

(2 marks)

(1 mark)

5.

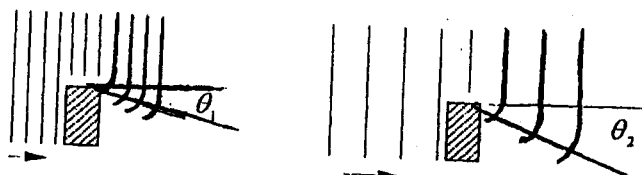
$$T = \frac{0.007s}{3}$$

$$f = \frac{1}{T} = \frac{3}{0.007}$$

$$= 429H_z$$

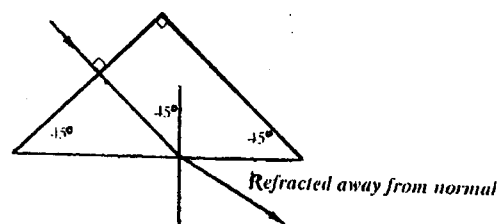
(3 marks)

6.



(1 mark)

7.



(1 mark)

8.

$$I = \frac{1.5}{R+r}$$

$$0.13 = \frac{1.5}{10+r}$$

$$r = 1.5\Omega$$

(3 marks)

$$9. \quad R_1 = \frac{V^2}{P}, \quad R_2 = \frac{V^2}{8P}$$

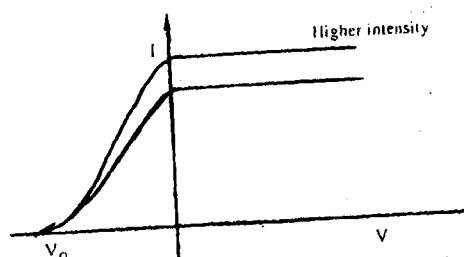
$$\frac{R_1}{R_2} = \frac{V^2}{P} \times \frac{8P}{V^2}$$

$$= 8$$

(3 marks)

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

11.



(1 mark)

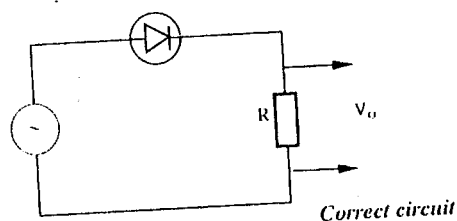
12. The higher the intensity implies greater number of electrons and hence higher saturation current.

(1 mark)

13.  $a = 234$ ,  $b = 82$

(2 marks)

14.



(2 marks)

15. (a) The ratio of the pd across the ends of a metal conductor to the current passing through it is a constant. (1 mark)

(b) (i) It does not obey Ohm's law, because the current – voltage graph is not linear throughout. (2 marks)

(ii) Resistance =  $\frac{V}{I}$  = inverse of slope

$$= \frac{(0.74 - 0.70)V}{(80 - 50)mA}$$

$$= \frac{0.40V}{30 \times 10^{-3} A}$$

$$= 1.33\Omega$$

(3 marks)

- (iii) From the graph, current flowing when pd is 0.70V is 60 mA  
 Pd across R = 6.0 - 0.7 = 5.3V

$$R = \frac{5.3V}{60mA}$$

$$= 88.3 \Omega$$

(3 marks)

- (c) (i) Parallel circuit  $\frac{1}{30} + \frac{1}{20} = \frac{5}{60}$   
 $R = 12 \Omega$   
 Total resistance = 10 + 12 = 22Ω

(2 marks)

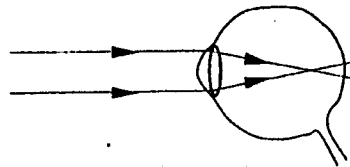
(ii)  $I = \frac{V}{R} = \frac{2.1}{22} = 0.095A$

(1 mark)

(iii)  $V = IR = 10 \times \frac{2.1}{22}$   
 $= 0.95V$

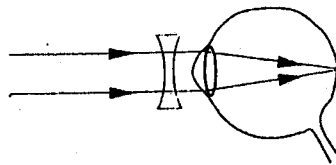
(2 marks)

16. (a) (i)



(1 mark)

(ii)



(2 marks)

- (b) (i) A - Diaphragm.  
 B - Film.

(2 marks)

- (ii) The distance between the lens is adjusted; so that the image is formed on the film.

(2 marks)

(iii)

- **Shutter:** opens for some given time to allow rays from the object to fall on the film creating the image impression.
- **A (Diaphragm):** controls intensity of light entering the camera.
- **B (Film):** coated with light sensitive components which react with light to create the impression.

(3 marks)

- (c) (i) magnification  $= \frac{v}{u} = 3$   
 since  $v + u = 80$   
 $u = 80 - v$   
 $\frac{v}{80 - v} = 3$

$$v = 240 - 3v$$

$$v = 60\text{cm}$$

(3 marks)

- (ii) From above  $u = 20\text{cm}$

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} = \frac{1}{60} + \frac{1}{20}$$

$$f = 15\text{cm}$$

(2 marks)

17. (a) The induced current flows in such a direction that its magnetic effect opposes the change producing it. (1 mark)

- (b) (i) As the diaphragm vibrates, it causes the coil to move back and forth in the magnetic field cutting the field lines, thus causing a varying to be induced in the coil which causes a varying current to flow. (3 marks)

- (ii)
- Increasing number of turns in the coil.
  - Increasing the strength of the magnet.
- (2 marks)

(c) (i)

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

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

$$V_s = 40\text{V}$$

(2 marks)

(ii)  $P_s = P_p = 600\text{w}$

$$I_s = \frac{600}{40} = 15\text{A}$$

(2 marks)

(iii)  $I_p = \frac{600}{400} = 1.5\text{A}$  (1 mark)

18. (a) (i) **A** - Grid.  
**B** - Filament. (2 marks)

- (ii) Filament heats cathode.  
Electron boil off cathode (thermionic emission). (2 marks)

- (iii)
- Accelerating.
  - Focusing.
- (2 marks)

- (iv) Across X - plates (1 mark)

- (v) To reduce collisions with air molecules that could lead to ionization. (1 mark)

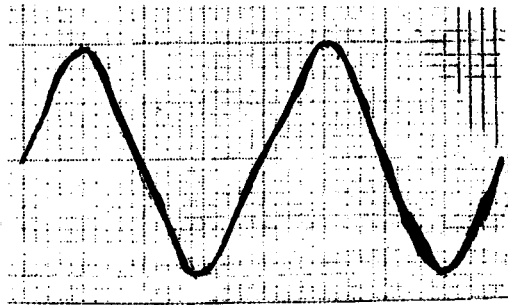
(b) (i) height = 4cm  
peak value = 4 x 5  
= 20V (2 marks)

(ii) 2 wavelength = 16cm  
T = 8 x 20 x 10<sup>-3</sup>  
= 0.16s

$$f = \frac{1}{T} = \frac{1}{0.16} = 6.25 \text{ Hz}$$

(3 marks)

(iii)



(2 marks)

### 24.5.3 Physics Paper 3 (232/3)

1.

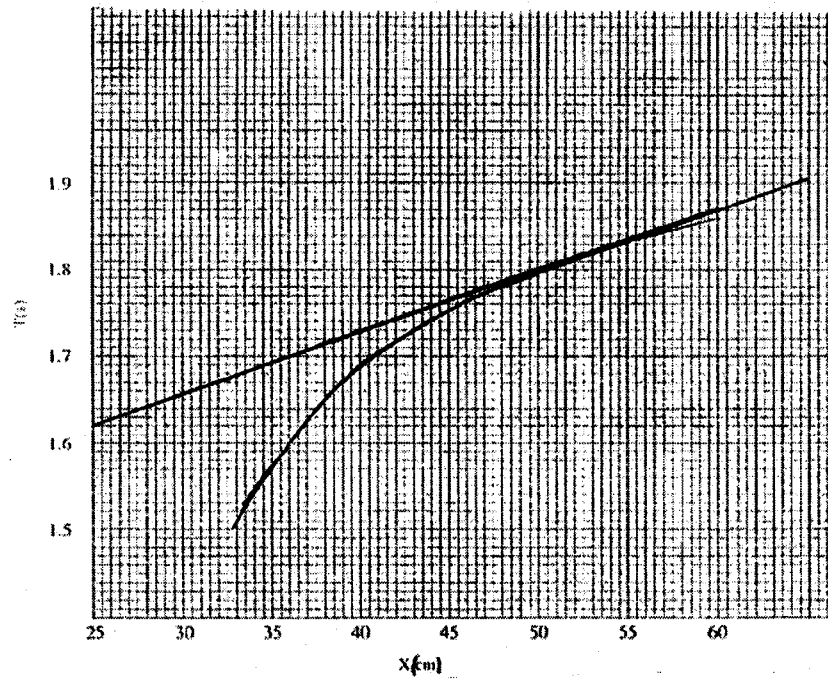
(c)

Distance x (cm)	35	40	45	50	55	60
Time t for 20 Osc(s)	31.8	33.8	35	36	36.8	37.2
Period $T = \frac{t}{20}$ (s)	1.59	1.69	1.75	1.8	1.84	1.86

(8 marks)



(d)



(5 marks)

(e) Slope: tangent at  $x = 52\text{cm}$

$$\frac{\Delta T}{\Delta x}$$

$$S = 6.7 \times 10^{-3}$$

(3 marks)

$$\begin{aligned} (f) \quad n &= 52 \times (6.7 \times 10^{-3})^2 \\ &= 2.33 \times 10^{-3} \end{aligned}$$

(2 marks)

$$\begin{aligned} (g) \quad P &= \frac{\pi^2}{4 \times 2.33 \times 10^{-3}} \\ &= 1.05 \times 10^3 \end{aligned}$$

(2 marks)

2.

(b) (i)  $E = 3.1$  volts

(1 mark)

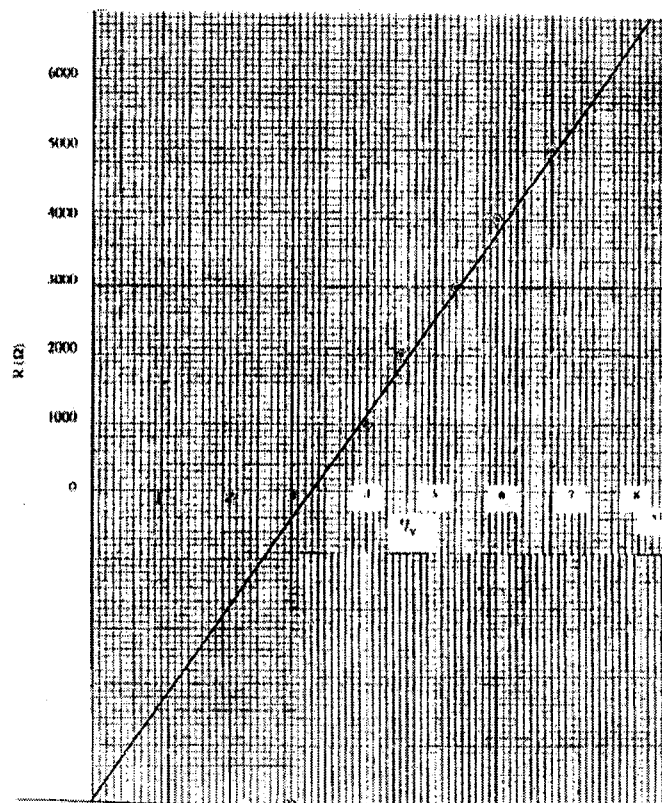
(c)

For range 0 – 5v

$R(\Omega)$	1000	2000	3000	4000	5000	6000
V	2.5	2.2	1.9	1.7	1.5	1.3
$V^{-1}$	0.4	0.45	0.53	0.59	0.67	0.77

(6 marks)

(d)



(e) 
$$\text{Slope} = \frac{\Delta R}{\Delta \frac{1}{V}}$$

$$= \frac{10.5 \times 1000}{0.75} = 14000 \quad (3 \text{ marks})$$

(f) 
$$G = \frac{14000}{3.1} = 4.5 \times 10^3 \Omega \quad (2 \text{ marks})$$

(g) (i) 
$$\frac{1}{V} = 0.32 (\text{when } R = 0)$$

$$V_0 = 3.1 \quad (1 \text{ mark})$$

(ii) 
$$R_g = 4.5 \times 10^3 \Omega \quad (1 \text{ mark})$$

(iii) 
$$\frac{G}{R_g} = \frac{4516 \times 10^3}{4.5 \times 10^3}$$

$$= 1.003 \quad (1 \text{ mark})$$