10.0 PHYSICS (232)

10.1 Physics Paper 1 (232/1)

SECTION A

1. Stable
   Line through the centre of gravity is within the base the base of the lorry; 1

2. Upthrust; 1

3. F = Ke ; 1
   = 125 x 0.2 ; 1
   = 25N ; 1

4. Cooling; 1
   Aluminium contracts more than steel for the same temperature change; 1

5. P; 1
   Cool layers from top descend and are replaced by hotter layers, convection starts from top; 1

6. Terminal velocity = 80 m/s; 1

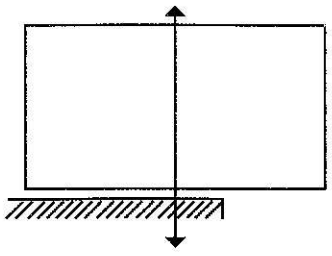
7. Surface tension at X is reduced; 1
   Higher surface tension at Y pulls the boat; 1

8. Speed of molecules increases ; 1
   Molecules hit walls more frequently with greater momentum. 1

9. Velocity at constriction is higher; 1
   Pressure drops, atmospheric pressure pushes petrol to the constriction. 1

10. Smaller intermolecular forces in liquids than solids. 1

11. Reaction



; 1

1

12. $20 \times 2.5 = F \times 10$; 1

$$F = \frac{20 \times 2.5}{10}$$

$= 5$ N; 1

13. $S = \frac{1}{2}at^2$; 1

$9 = \frac{1}{2} a \times 3^2$; 1

$a = 2\ ms^{-2}$. 1

14. Identical jets; 1

Pressure is transmitted equally throughout the liquid. 1

SECTION B

15. (a) (i) Arrow tangent at C; 1
(ii) Potential energy. 1

(b) (i) $Mgh = \frac{1}{2}mv^2$; 1
$v = \sqrt{2 \times 10 \times 0.1}$; 1
$= 1.41\ ms^{-1}$; 1

(ii) Tension $= \frac{mv^2}{r} + mg$ 1
$= \frac{0.05}{0.8} \times 2 + 0.05 \times 10$; 1
$= 0.625$ N; 1

(c) Used to do work against air resistance; 1
Converted to heat energy. 1

16. (a) (i) tangent at X; 1
(ii) 2 m/s; 1
(iii) obeys Newton's first law of motion. 1

(b) N > F; 1
m does not act on the trailer ; 1
F = Ke ; 1

(c) (i) I. $F = 25\ Nm^{-1} \times 0.03$ m ; 1
$= 0.75$ N. 1

II. $F = ma$; 1
$0.75 = 2 \times a$; 1
$a = 0.375\ m/s^2$; 1

(ii) Force in spring decreases as spring recovers original length; 1
No force on the trolley after contact with wall is lost. 1

17. (a) (i) Water vapour; 1
(ii) Vapour pressure at boiling point equals or exceeds prevailing external pressure. 1

(b) (i) Prevailing atmospheric pressure $P = \rho gh$.; 1
$= 13600 \times 10 \times 0.618$; 1
$= 84.0 \times 10^3\ Nm^{-2}$; 1

(ii) Reading of boiling point pressure at pressure $P = 84 \times 10^3$ is $95 \pm 1°C$; 1

(c) (i) Heat gained by water + heat gained by 2
calorimeter = 0.08 x 4200 x 7.7; + 0.05 x 400 x 7.7; 2
= 2741.2J; 1

(ii) Heat lost by metal = heat gained by water and calorimeter
0.1 x 71.3 x C = 2741.2; 1
$C = \frac{2741.2}{7.13}$; 1
= 384.46
$\simeq$ 384 J Kg^{-1} k^{-1}; 1

(iii) • metal cooling in the process of transferring; 1
• Metal carrying some hot water into the cold water (any 1 correct)

18. (a) Measure length of threaded part; 1
Divide the length by number of threads; 1

(b) Distance moved by effort = 2π r cm
= 50π cm; 1
Distance moved by load = 0.1 cm.
Velocity ratio = $\frac{\text{Effort distance}}{\text{Load distance}}$; 1
= $\frac{50\pi}{0.1}$
= 1570.7963
= 1571; 1

(c) From kinetic energy to heat and sound; 1
K.E = the work done against friction; 1
$\frac{1}{2}$ x 0.06 x 800 x 800 = F x 0.15; 1
F = 12800N; 1

19. (a) Upthrust = it's weight
OR weight of fluid displaced by body equals the weight of the body; 1
OR It's density in less than that of fluid.

(b) Ship has a large air space; 1
$\therefore$ Average density of ship is less than density of water; 1

(c) To sink, water is allowed into ballast tanks; 1
To float, pumps are used to expel water from the ballast tanks; 1

(d) (i) Upthrust = $W_1 - W_2$; 1
= (0.60 - 0.28)
= 0.32 N;

(ii) Relative density = $\frac{\text{weight of substance}}{\text{weight of equal volume of water}}$; 1
= $\frac{0.08}{0.32}$; 1
= 0.25; 1

10.2 Physics Paper 2 (232/2)

1.

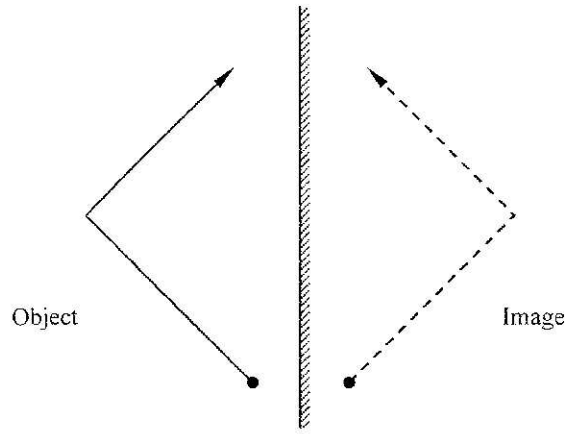


Figure 1

Figure 1
Image (lateral inversion); (1 mark)
(accept full line)

2.

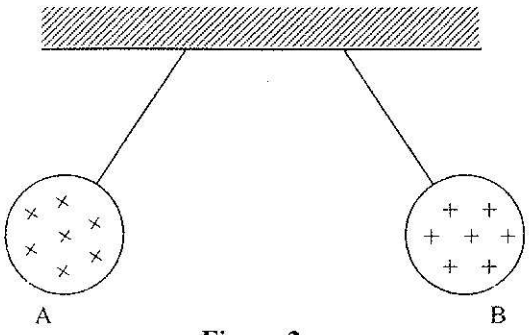


Figure 2

Pithballs repelling (1 mark)

3. Mica raises capacitance; hence lower potential difference; since V = Q/C but Q is constant.

4. A = Carbon rod (+); (1 mark)
B = Manganese (VI) oxide (1 mark)

5. Manganese (IV) oxide is a depolarizer/oxiding agent; (1 mark)

6. Hammering causes domains/domains to vibrate;
As they settle, some face North South due to earth's magnetic field;
(2 mark)

7. When S is closed, current flows in solenoid magnetizing the iron core; this attracts the iron armature closing the contacts; this causes current to flow in the motor circuit;
Motor keeps running continuously; (3 marks)

8. Steel would remain permanently magnetized causing current in mortor circuit to remain ON when S is open. (2 marks)

9. (a)

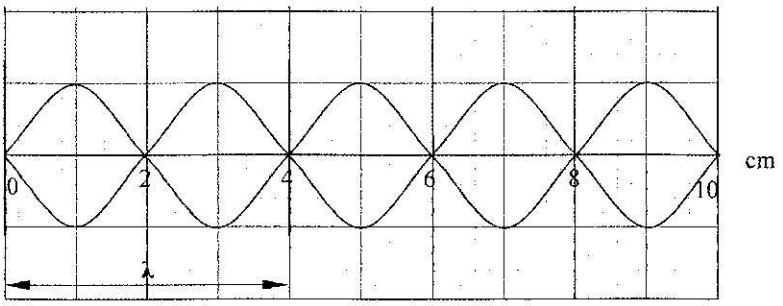


Figure 3 Any two correct vertical lines

(1 mark)

(b) $2.5\lambda = 10 \times 5$

$\lambda = 20$ cm; (1 mark)

10.

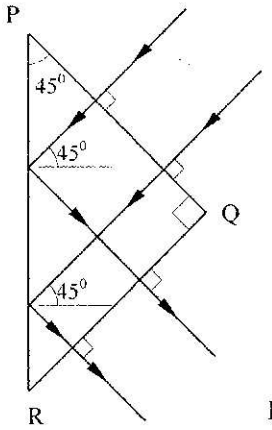


Figure 4

Figure 4 (3 marks)

11.

$$P = \frac{V^2}{R}$$

$$= \frac{6 \times 6}{4}$$

$$= \frac{36}{4} \quad = 9W$$

(2 marks)

12. Radiowaves Microwaves Yellow light Gamma rays; (1 mark)

13. High voltage leads to low current hence low power (I^2R) losses; (1 mark)

14. The minimum frequency of an incident radiation to cause emission of photo electrons. (1 mark)

SECTION B

15. (a)

(i) Does not obey ohm's law;. (1 mark)
Graph is non-linear i.e. current is not directly proportional to p.d.; (1 mark)

(ii) at $I = 1.5A$

R = gradient of tangent at I

$$= \frac{9.2 - 4.8}{3.6 - 0.1}$$

$$= \frac{4.4}{3.5}$$

$$= 1.26\Omega \pm 0.1 ;$$

(2 marks)

at $I = 3.5A$

R = gradient of tangent at I

$$= \frac{9.4 - 7.2}{5.4 - 1.5}$$

$$= \frac{2.2}{3.9}$$

$$= 0.56\Omega \pm 0.1 ;$$

(2 marks)

(iii) R decreases as I increases; (1 mark)
(iv) Change (increase) in temperature; (1 mark)

(b) (i) $V_{total} = 1.6 + 1.6 + 1.6 = 4.8V = E$; (1 mark)

(ii) Let r to be the combined internal resistance

Using $E = I(R + r)$;

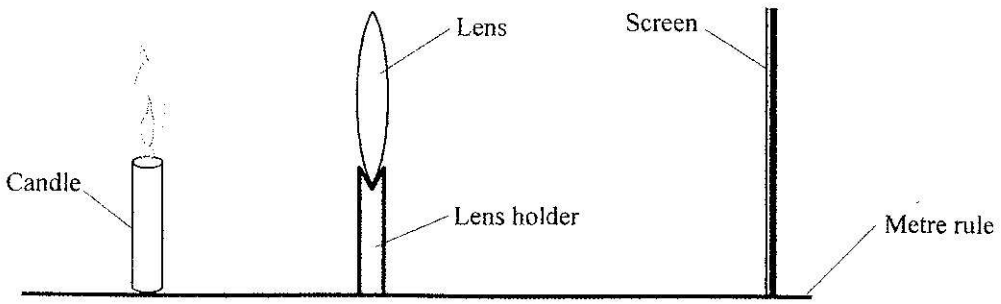
$4.8 = 0.32(11.4 + r)$;

for one cell, $r = \frac{15 - 11.4}{3}$

$= 1.2\Omega$ (3 marks)

16. (a) The point at which rays close to and parallel to the principal axis converge or seem to diverge from after striking the lens; (1 mark)

(b) (i)



(ii) Candle is placed at a certain distance from the lens. The distance between the screen and the lens is adjusted until a sharp image is focused on screen.

(iii) The distance of candle from lens (U) is measured;
The distance of screen from lens (V) is also measured;

(3 marks)

(iv) The values of U and V are substituted in the equation

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

f is then computed as $f = \frac{uv}{u+v}$

(2 marks)

(b)

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$
$$\frac{1}{v} = \frac{1}{-20} - \frac{1}{30}$$
$$\frac{1}{v} = \frac{-3-2}{60}$$
$$\frac{1}{v} = \frac{-5}{60}$$
$$v = -12$$

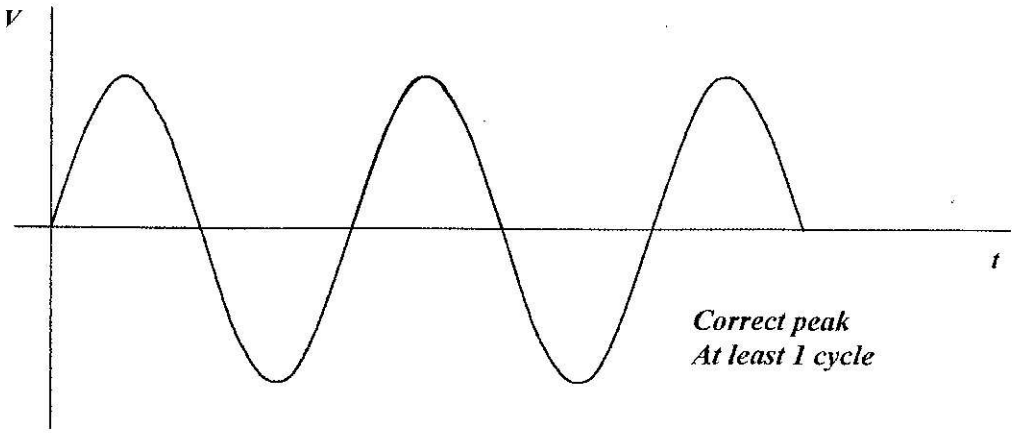
$$M = \frac{v}{u}$$
$$= \frac{-12}{30}$$
$$= 0.4$$

(4 marks)

17. (a) The production of induced e.m.f when the magnetic flux linking a circuit is changed; (1 mark)

(b) (i) P - brushes
Q - slip rings

(ii)



(1 mark)

(iii) Increasing number of turns/coils;
Increasing speed of rotation;
Increasing strength of field;
Winding the coil on soft iron core. Any two correct

(2 marks)

(c) (i) Vs = 200 x 0.5
= 100V;

(1 mark)

(ii)
$$\frac{N_p}{N_s} = \frac{V_p}{V_s}$$
$$V_p = \frac{100}{10} \times 1 = 10V$$

(2 marks)

(iii)
$$\frac{V_p}{V_s} = \frac{I_s}{I_p}$$
$$\frac{10}{100} = \frac{0.5}{I_p}$$
$$I_p = \frac{0.5 \times 100}{10}$$
$$I_p = 5A$$

(2 marks)

18. (a) -Cathode rays have charge but e.m radiations don't have charge;
-Cathode rays are particles and have a mass but e.m radiations are waves;
-Cathode rays travel at a speed depending on the accelerating voltage but e.m radiations travel at the speed of light in vacuum;
- Different in the mode of production.

(any two correct) (2 marks)

(b) (i) M - grid;

N - accelerating anode/anode/vacuum;

(2 marks)

(ii) Cathode is heated by filament;
electrons are released from cathode;
by thermionic emission

(2 marks)

(iii) (I) across Y-Y plates.

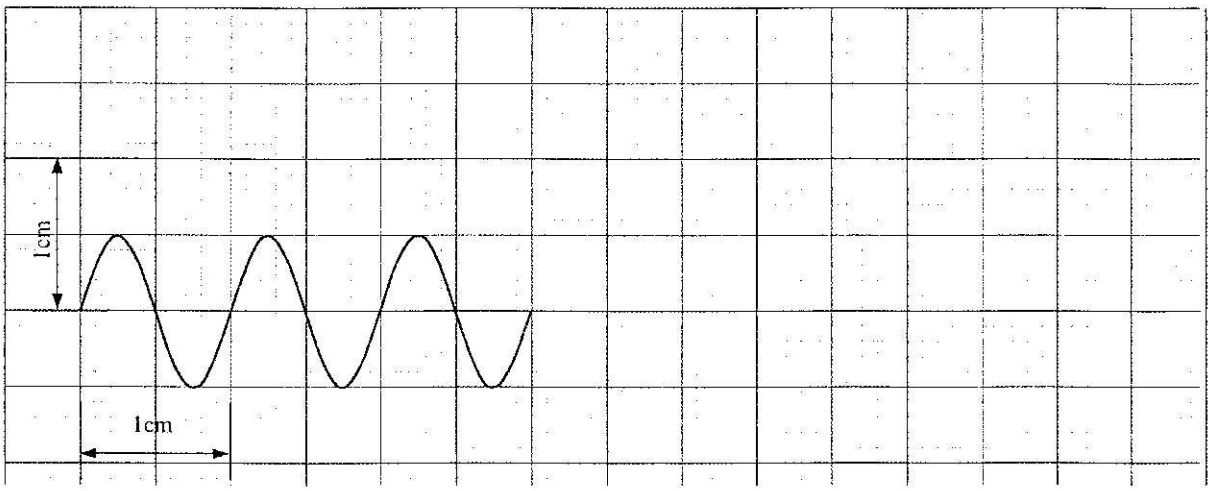
(II) across X-X plates. (2 marks)

(iv) to reduce collisions, (hence ionization) with air molecules in the tube.

(1 mark)

(c) (i) peak-to-peak voltage = 5 x 2
= 10v

(ii)



19. (a) α - radiation;
short range with intense ionization hence thick tracks;

(2 marks)

(b) No. of half-lifes = $\frac{19.15}{3.83} = 5$

Activity

Days	0 0	1 3.83	2 7.66	3 11.49	4 15.32	5 19.15
Activity	1.6×10^3	8×10^2	4×10^2	2×10^2	1×10^2	0.5×10^2

Activity = 0.5×10^2
= 50 disintegrations per second

(2 marks)

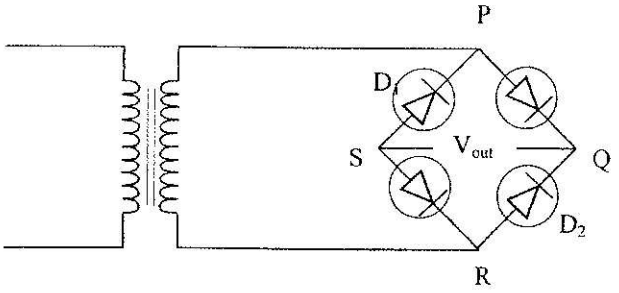
(c) A semiconductor in which impurities have been added to change conductivity.

(1 mark)

(d) By connecting it in forward biased mode (i.e. P to + and n to -)

(1 mark)

(e)



(i) Correct diode direction; (2 marks)
(ii) Across QS; (1 mark)

10.3 Physics Paper 3 (232/3)

1. Part A

(a) Eo = 3.0 ± 0.2V (1 mark)
(d) Table 1

AO= Bo = Xcm	25	30	35	40	45	50
p.d $\sqrt{}$ (V)	0.58	0.66	0.74	0.80	0.90	0.92
$\frac{1}{x}$ (Cm^{-1})	0.04	0.033	0.029	0.025	0.022	0.02
$\frac{1}{v}$ (V^{-1})	1.72	1.52	1.35	1.25	1.11	1.10

for V $\frac{1}{2}$ mark for each correct value - (3 marks)

$\frac{1}{x}$ 1 mark for at least 4 correct values - (1 mark)

$\frac{1}{V}$ 1 mark for at least 4 correct values - (1 mark)

(e) graph (see attached)
- axes labelled + units - (1 mark)
- suitable scale - (1 mark)
- points plotted $\frac{1}{2}$ mark for 4 points - (2 marks)
- straight line - (1 mark)

(f) Slope - correct interval $\frac{\Delta y}{\Delta x}$ (1 mark)

correct evaluation (1 mark)
S = 34±3 (1 mark)

(g) h correctly evaluated from $\frac{8}{E_o S}$

substituting (1 mark)

evaluating (1 mark)

1 PART B

(i) OM and ON shown on outline. (1 mark)

$\angle M\hat{O}N = 2A = 144°$

(ii) q correctly evaluated (1 mark)

Total (19 marks)

2. PART A

(a) $M_1 = 53.5g$ (1 mark)

(b) $M_2 = 73.0g$ (1 mark)

(c) Correct mass liquid L = 19.5 g. (1 mark)

density = evaluate from candidates values of M_1 and M_2

PART B

(f) Table 2

Time in minutes	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Temperature of W(°C)	80	79	77.5	76	75	74	72.5	71	70	69
Temperature of L(°C)	80	76	75	72	70	68	66	64.5	62.5	61.0

5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
68	67	66	65	64.5	63.5	62.5	61.5	61	60	
59										

Correct temperatures of distilled water

6 points x (3 marks)

5 to 9 points (1 mark)

Correct temperatures of L

8 and more (3 marks)

4 to 7 points (1 mark)

(h) Graphs (see attached graphs)

(i) - axis labelled + units (1 mark)

- appropriate scale

- points plotted correctly

6 correct points (2 marks)

3- 5 correct points (1 mark)

- smooth curve (1 mark)

(ii) - points plotted correctly

- 6 correct points (2 marks)

- 3 - 5 correct points (1 mark)

- smooth curve points (1 mark)

(i) (i) (value obtained from the graph (1 mark)

(value obtained from the graph

(1 mark)

(j) $r = \frac{4.2 \times 2.5}{0.78 \times 4.5}$ correct evaluation (1 mark)

$r = 3.0 \pm 0.1$ (1 mark)

Total (20 marks)