30.5 PHYSICS (232)

30.5.1 Physics Paper 1 (232/1)

1. Volume run out = $46.6cm^3$;

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{54.5g}{46.6cm^3}; = 1.17gcm^{-3}; / 1.16952$$

(3 marks)

2. $T^2 = 4\pi^2 L/g$

$$1.7^2 s^2 = \frac{4\pi^2 \times 0.705m}{g};$$

$g = 9.63\ ms^2$

$= 9.6\ ms^2$; (correct no. of sig. fig.)

(2 marks)

3. Needle floats due to surface tension forces;
Detergent reduces surface tension; so that needle sinks. *(2 marks)*

4. When equal forces are applied, pressure on B is greater than on A due to smaller area;
Pressure difference is transmitted through liquid to A causing rise in the upward force on A is greater than that on B; hence upwards motion; *(2 marks)*

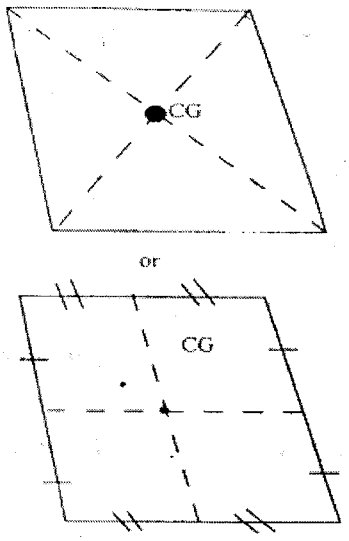
5. Molecules inside the warm water move faster than in cold water; this increases rate of diffusion; *(2 marks)*

6. Stops return of mercury to bulb when the thermometer is removed from particular body to the surroundings; *(1 marks)*

7. Dull surfaces radiate faster than bright surfaces;
P looses most of the heat supplied by burner than Q does; *(2 marks)*

8. Heat travels from container to test-tube by radiation; so the dull surface P give more heat to the test-tube; *(2 marks)*

9.



CG locted at intersection of diagonals; ***(1 mark)***

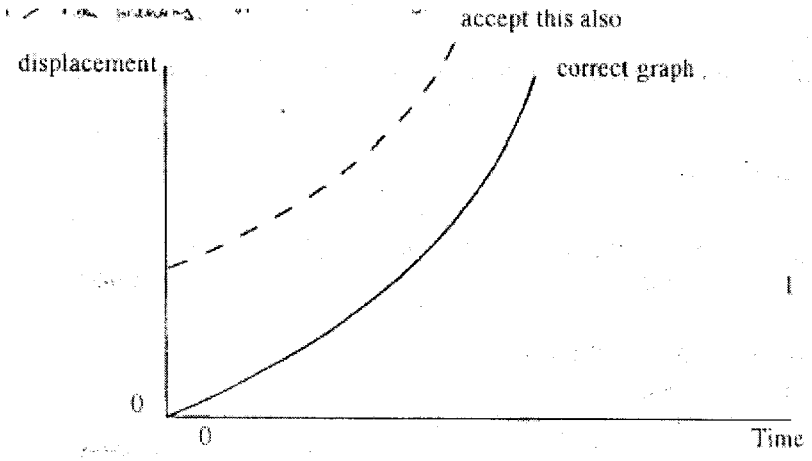
or at intersection of lines joining centres of sides;

10. Extension of each spring = 10cm;

$k = \frac{20N}{10cm} = 2N/cm;$ ***(2 marks)***

11. Air between the balloons is faster than outside. So that there is pressure reduction between; ***(1 marks)***

12.



13. Lowest temperature possible;
or temperature at which ideal gas has zero volume (or zero pressure)
or molecules have zero/minimum energy
(any one for 1 mark) ***(1 mark)***

14. $V = r\omega$
$= r \times 2\pi f$

$= 0.08 \times 2\pi \times 33\ ms^{-1};$
$= 16.6\ ms^{-1};$ ***(3 marks)***

15. (a) Pressure, dissolved impurities ***(2 marks)***

(b) (i) BP $= 79^0C$ ***(1 mark)***

(ii) I $\Delta t = 4.5$ minute
$Q = Pt = 50 \times 4.5 \times 60$ J;
$= 13500$ J; *(2 marks)*

II $\Delta = 70 - 16 = 54^0C$ *(1 mark)*

III $\Delta t = (7.3 - 6.8)$ minutes $= 30s$;
$Q = Pt = 30 \times 50$ J;
$Q = ml$;
$L = \frac{30 \times 50\ J}{0.0018kg}$;
$= 8.33 \times 10^5 Jkg^{-1}$ *(2 marks)*

16. (a) Efficiency $= \frac{\text{work output}}{\text{work input}} \times 100$ (or equivalent); *(1 mark)*

(b) (i) Work done by effort = F x s;
= 420 N x 5.2m;
= 2184 J; *(3 marks)*

(ii) Distance raised = $5.2 \sin 25^o = 2.2$m
= 900N x 2.2m;
= 1980J; *(3 marks)*

(iii) Efficiency = $\frac{\text{work output}}{\text{Work input}} \times 100 = \frac{1980}{2184} \times 100$;
$= 90.7\%$

17. (a) A floating body displaces its own weight of the fluid on which it floats; *(1 mark)*

(b) (i) $W = T + U$ *(1 marks)*
(ii) Volume $= 0.3 \times 0.2 \times 0.2 m^3$
Mass $= v \times \rho$;
Weight $= mg = 0.3 \times 0.2 \times 0.2\ m^3 \times 10500 kgm^{-3} \times 10N/kg$
$= 1260N$ *(3 mark)*

(iii) Volume of liquid = volume of block
Weight of liquid displaced $= V\ \rho\ g$
= 0.3 x 0.2 x 0.2 x 1200 x 10N;
= 144N; *(2 mark)*

(iv) $T = W - U$
$= (1260 - 144)N$
$= 1116N$; *(1 mark)*

(c) Weight of solid = weight of kerosene displaced;
$= 800 \times 10 \times 10^{-6}$
$= 0.08N$
Mass = 0.08 kg;
Volume $= 50cm^2$
Density $= \frac{m}{v}$; $= \frac{0.008kg}{50 \times 10^{-6} m^3}$
$= 160 kgm^{-3}$ *(4 marks)*

18. (a) the pressure of a fixed mass of an ideal gas is directly proportional to the absolute temperature if the volume is kept constant; *(1 mark)*

(b) (i) volume increases as bubble rises because the pressure due to liquid column is lowered therefore pressure inside bubble exceeds that of outside thus expansion. *(1 mark)*

(ii) I at bottom $\frac{1}{v} = \frac{1}{0.5\text{cm}^3} = 2\,\text{cm}^3$

Corresponding pressure = 1.88×10^5 Pa; *(2 mark)*

II at top $\frac{1}{v} = \frac{1}{1.15\text{cm}^3} = 0.87\,\text{cm}^3$ *(2 mark)*

Corresponding pressure = 0.8×10^5 Pa; *(1 mark)*

(iii) $\Delta P = (1.88 - 0.8) \times 10^5\,\text{Pa} = 1.08 \times 10^5\,\text{Pa}$;

$\Delta P = \rho gh = \rho \times 0.80 \times 10$

$\rho = \frac{1.08 \times 10^5}{0.80 \times 10} Kgm^{-3}$

$= 13500\,\text{Kgm}^{-3}$; *(3 marks)*

(iv) Pressure at top equal atmospheric
$= 0.8 \times 10^5$Pa; *(1 mark)*

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

$25^\circ\text{C} = 298\text{K}$
$15^\circ\text{C} = 288\text{K}$

$\frac{2.7 \times 10^5 \times 3800}{298} = \frac{2.5 \times 10^5 \times V_2}{288}$;

$V_2 = 3966\text{cm}^3$; *(4 marks)*

19. (a) Rate of change of angular speed with time; *(1 mark)*

(b) (i) mass, force of friction : *(2 marks)*

(iii) oil will reduce friction;
since friction provides centripetal force, the frequency for sliding off is lowered; *(2 marks)*

(c) $v_2 = u^2 + 2as$

$v_2 = 0 + 2\,(0.28)h$

$v = \sqrt{0.56 \times 1.26}$;

$v = r\omega$ ***(4 marks)***

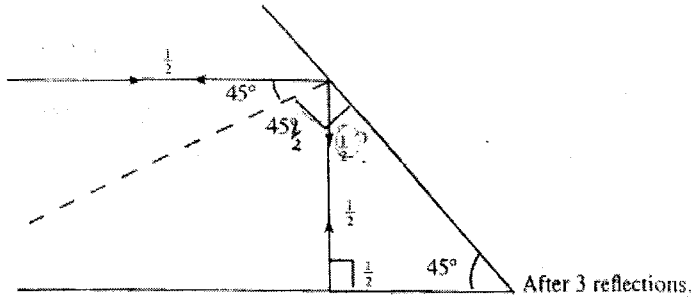
$0.84 = 0.14 \times \omega$

$\omega = \dfrac{0.84}{0.14} = 6 \text{ rads}^{-1}$;

30.5.2 Physics Paper 2 (232/2)

1. Infinite or very many. ***(1 mark)***

2.



(2 marks)

3. Negative charge. ***(1 mark)***

4. To allow for passing – release hydrogen and oxygen produced at the electrodes. ***(1 mark)***

5. Increase magnitude of current/ No. of turns WITE
Increase the number of turns per unit length. ***(1 mark)***

6. T = 0.5 ***(1 mark)***

$f = \dfrac{1}{T} = \dfrac{1}{0.5} = 2Hz$ *(2 marks)*

7. $\dfrac{3.0 \times 10^8}{v} = 1.33$ ***(1 mark)***

$\therefore v = \dfrac{3.0 \times 108}{1.33} \text{ ms}^{-1}$

$2.26 \times 10^8 \text{ ms}^{-1}$ ***(2 marks)***

8. Current = 1A ***(1 mark)***

9. f=L-q cm ***(1 mark)***

10. (i) Magnetic field lines of the magnet links the coil. *(1 mark)*

Movement of magnet causes flux linkage to change. *(1 mark)*

(ii) When current flows from Q to P a north pole is created which opposes the approaching north pole (Lenz's law). *(1 mark)*

11. Increase in pd increases current in the filament:
This produces more electrons by thermionic emission;
and hence result on more intense x-rays: *(3 marks)*

12. $\frac{2d}{0.5} = \frac{2d+34}{0.6}$ or $v = \frac{2\times17}{0.1}$ *(2 marks)*

$= 340$

$0.5(2d+34) = 2dx0.6$

$1.0d + 17 = 1.2d$

$0.2d = 17$

$\therefore d = \frac{17}{0.2} = 85m$

$\therefore Speed = \frac{2\times85}{0.5} m/s = 340m/s$

(1 mark)

13. This is because the diode in figure 6(a) is forwarded biased. *(1 mark)*

Or
The battery in 6(a) enhances flow of electrons across the barrier while in 6(b) the barrier potential is increased.

14. (a) Capacitance decreases; *(1 mark)*
Because the area of overlap decreases; *(1 mark)*

(b) (i) for parallel arrangement
$Cp = 5 + 3 = 8\,\mu F$ *(1 mark)*
Hence for whole circuit
$\frac{1}{C} = \frac{1}{4} + \frac{1}{8} = \frac{12}{32}$ *(1 mark)*
$\therefore C = \frac{32}{12} = \frac{8}{3}\mu F = 2.67\mu F$ *(1 mark)*

(ii) $Q = CV = \frac{8}{3}\times12\mu C;$
$= 32\,\mu C$ *(2 marks)*

(iii) If p.d. across A is V_1, then
$V_1 = \frac{Q}{C} = \frac{32\times10^{-6}}{4\times10^{-6}} = 8$ volts *(1 mark)*

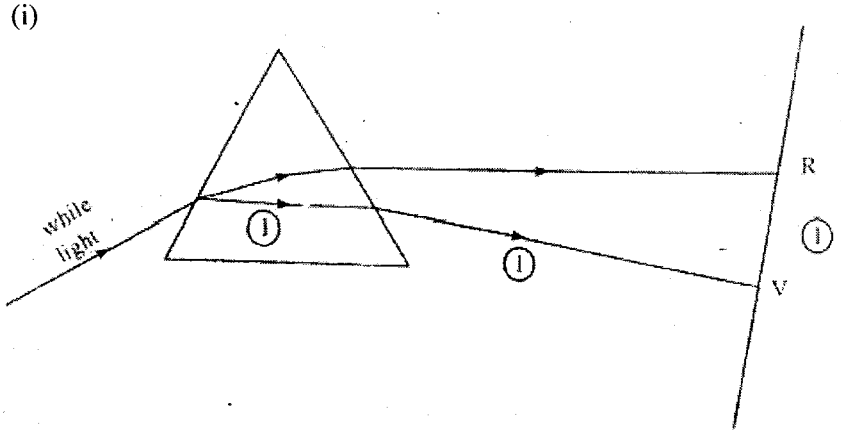
15. (a) Increase of current causes rise in temperature;
Rise in temperature causes rise in resistance; *(2 marks)*

(b) lamp X resistance = $\frac{V}{I} = \frac{2.5}{1.2}\Omega$ *(2 marks)*
$= 2.1\Omega$ *(1 mark)*

(c) p.d. across Y = 1.0V *(1 mark)*
(directly read from the graph)

(d) Power on
Lamp Y = 1V = 0.8 x 3 watts
= 2.4 watts *(2 marks)*

16. (a) (i)



(3 marks)

(ii) highest reading near the red end;
red light has more heat than violet; *(2 marks)*

(b) Apparent depth = (11.5 – 3.5) cm
= 8cm *(1 mark)*

Refractive index = $\frac{\text{Real depth}}{\text{Apparent depth}}$ *(1 mark)*

= $\frac{11.5}{8} = 1.4375$ *(2 marks)*

17. (a) β - particle *(1 mark)*

(b) (i) Ionises the gas *(1 mark)*
(ii) ions are attracted towards electrodes; and collision with other molecules cause avalance of ions which on attraction to the electrons causes the discharge; *(1 mark)*

(c) (i) x = 36, y = 92 *(2 marks)*
(ii) Energy comes from a small decrease in mass. *(1 mark)*
(iii) Each of the neutrons produced at each collision causes further collision; with uranium atom causing chain reaction. *(2 marks)*

18. (a) (i) Electrons are emitted from zinc plate; thus reducing the charge on the leaf. ***(2 marks)***

(ii) Any electron that would have been emitted is attracted back to the electroscope. ***(1 mark)***

(iii) Photon of infrared radiation having lower frequency than ultra-violet has insufficient energy to cause electrons to be emitted. ***(1 mark)***

(b) (i) The number of electrons emitted per unit time will increase. ***(1 mark)***

(ii) The maximum Kinetic energy of the emitted electrons will increase. ***(1 mark)***

(c) (i) $v = f_0 \lambda_0$

$$\therefore fo = \frac{V}{\lambda_0} = \frac{3.0\times10^{8}}{8.0\times10^{-7}} \text{ Hz}$$

$$= 3.75 \times 10^{14} \text{ Hz}$$ ***(2 marks)***

(ii) $W = hf_o$

$$= 6.63\times10^{-34} \times 3.75\times10^{14} \text{ J} = 2.49\times10^{-19} \text{ J}$$

$$= \frac{2.49\times10^{-19}}{1.6\times10^{-19}} \text{ ev}$$

$$= 1.55 \text{ ev}$$ ***(1 mark)***

(iii) Maximum Kimetric Energy = $hf - hf_o$

$= h(8.5 - 3.75) \times 10^{14}$ J

$= 6.63 \times 10^{-34} \times 4.75 \times 10^{14}$ J

$= 3.149 \times 10^{-19}$ J ***(1 mark)***

19. (a) (i) Attach the two identical dippers to same vibrator, switch on and the circular waves produced are coherent. ***(2 marks)***

Or Use one straight vibrator with two slits to produce coherent waves.

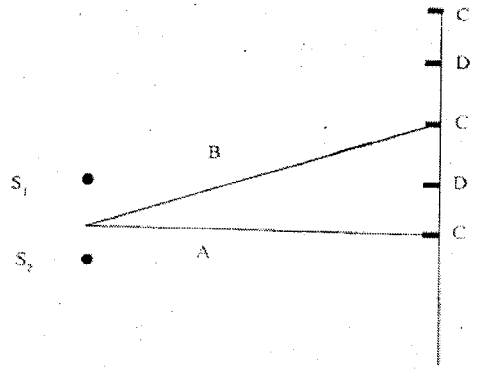
(ii) Constructive interference – bright

Destructive interference – dark ***(1 mark)***

(b) Constructive interference – when two waves arrive at a point in phase i.e. Crest and crest meet or trough and trough meet.

Destructive interference – occurs when crest and trough meet gives zero intensity. ***(1 mark)***

(c)



30.5.3 Physics Paper 3 (232/3)

1. (c) (i) amplitudes of the two pendulums increase from zero to maximum and then decrease to zero alternately. *(1 mark)*

(ii) alternate interchange/transfer of energy from one pendulum to the other. *(1 mark)*

(e)

D (cm)	20	25	30	35	40	45	50
T (s)	12.8	10.2	7.7	5.6	4.4	3.4	2.8
$f = \frac{1}{T}$ (s^{-1})	0.08	0.10	0.13	0.18	0.23	0.30	0.36

Table 1 7 marks

(f) see graph
axes labeled + units *(1 mark)*
scale *(1 mark)*
points plotted *(2 marks)*
smooth curve *(1 mark)*

(g) $f_b = 0.21s^{-1}$ *(1 mark)*

(h) n = 3 *(1 mark)*
t = 4.7s *(1 mark)*

(i) $f_o = \frac{3}{4.7} = 0.64\ s^{-1}$ *(1 mark)*

(j) $f_b = f_1 - f_o$
$0.21 = f_1 - 0.64s^{-1}$ *(1 mark)*
$f_o = 0.85s^{-1}$ *(1 mark)*

2. (b) E = 1.55 ± 0.05V *(1 mark)*

(c) I = 0.35A *(1 mark)*
V = 1.45 ± 0.05V *(1 mark)*

(d) $X = \frac{1.45}{0.35} = 4.1\Omega$ *(1 mark)*
$r = \frac{0.1}{0.35} = 0.29\Omega$ *(1 mark)*

(g)

Number of carbon resistors	One	Two	Three	Four	Five	Six
PB = a (cm)	70.1	56.0	44.2	39.0	33.0	29.1
$\frac{1}{R}$ (Ω^{-1})	0.1	0.2	0.3	0.4	0.5	0.6
a^{-1} (cm^{-1})	1.43	1.79	2.26	2.56	3.03	3.43

Table 2 *(6 marks)*

(h) Graph
Axes labeled + units *(1 mark)*
Scale *(1 mark)*

Points correctly plotted *(2 marks)*
Straight line through points *(1 mark)*

(i) Slope – correct extraction *(1 mark)*
Evaluation
Slope $\approx 4.0 \times 10^{-2}\ \Omega\ cm^{-1}$ *(1 mark)*

(j) $m = \frac{X}{100\ cm} = 4.0 \times 10^{-2}\ \Omega\ cm^{-1}$ *(1 mark)*

$X = 4.0 \pm 0.1\Omega$ *(1 mark)*