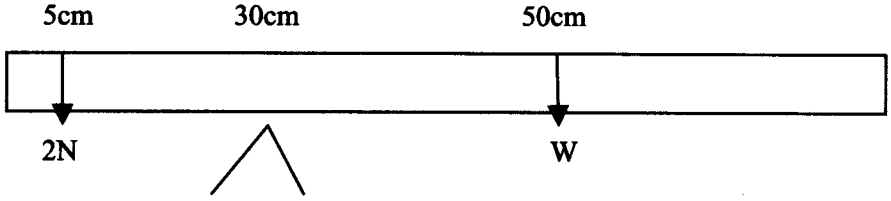
30.5 PHYSICS (232)

30.5.1 Physics Paper 1 (232/1)

1. 1.62cm (1 mark)
2. Time = (2.53 + 0.50)s = 3.03s (1 mark)
3. Air molecules expelled by heating;
cooling creates partial vacuum – pressure inside is less than atmospheric pressure.
Therefore collapses; (2 marks)

4. Flame heats air which becomes less dense and hence moves upwards. This will push the blades upwards and cause clockwise rotation.
This creates a conventional current (2 marks)

5. Flask which is in contact with the heat expands first. Then the liquid expands more than glass. (2 marks)

6. 

W x 0.2 = 2 x 0.25 (1 mark)

$\therefore W = \frac{2 \times 0.25}{0.2} = 2.5N$ (1 mark)

7. The tube below Y is narrower than the tube below X. So water flows faster below Y. Pressure is therefore lower than Y (Benoulli effect). (2 marks)

8. (a) Resistance = 8N
(b) $14 - 8 = 30\ a$

$\therefore a = \frac{6}{30} ms^{-2}$

$= 0.2\ ms^{-2}$ (2 marks)

9. Drop spreads out until the patch is one molecule thick/monolayer. (1 mark)

10. (a) Upthrust = (5.0 – 4.04)N
= 0.96N (1 mark)
(b) Weight of liquid displaced = 0.96N
$\therefore$ Mass of liquid = 0.096kg

$\frac{m}{v} = \rho$

$\frac{0.096}{V} = 800$

$\therefore V = \frac{0.096}{800} m^3$

$= 1.2 \times 10^{-4} m^3$

$= 1.2 \times 10^{2} cm^3$

$= 120 cm^3$ (2 marks)

11. Volume decreases, so more collisions per second – hence higher pressure.

(1 mark)

12. $F = mr\omega^2 = mg$

$0.200 \times 1 \times \omega^2 = 0.5 \times 10 = 5$ (1 mark)

$$\omega^2 = \frac{5}{0.200}$$ (1 mark)

$$\therefore \omega = \sqrt{\frac{5}{0.200}} = 5 \text{ rad s}^{-1}$$ (1 mark)

13. Nm^{-1} (1 mark)

14. Increase the base area or lower the c.g. (1 mark)

15. (a) Potential Energy ⟶ Kinetic energy ⟶ Heat (1 mark)

(b) (i) Work done by the force = 200 x 22.5 J
= 4500 J (2 marks)

(ii) Work done on the mass = mgh
= 30 x 10 x 7.5 J
= 2250 J (2 marks)

(iii) Work done to overcome friction = (4500 – 2250J)
= 2250 J (2 marks)

(iv) Efficiency = $\frac{work\ output}{work\ input} x100\%$

= $\frac{2250}{4500} x100\% = 50\%$ (2 marks)

(c) Reduce friction by use of rollers/smoothing (polishing surfaces)/oiling.

(1 mark)

16. (a) Mass of water completely filling the bottle
= (66.4 – 43.2)g
= 23.3g (2 marks)

(b) Volume of water completely filling the bottle = 23.3 cm^3 (1 mark)

(c) Volume of density bottle = 23.2 cm^3 (1 mark)

(d) Mass of sand = (67.5 – 43.2)g = 24g (1 mark)

(e) Mass of water filling space above sand = 82.3 – 67.5
= 14.8g (1 mark)

(f) Volume of sand = (23.2 – 14.8) cm^3
= 8.4 CM^3 (3 marks)

(g) Density of sand $= \frac{m}{v} = \frac{24g}{8.4cm^3}$

$= 2.807\ gcm^{-3}$ (2 marks)

17. (a) At high altitudes pressure is low so boiling point is low. So pressure cooker increases pressure which raises the boiling point, hence faster cooking.

(2 marks)

(b) (i) Heat absorbed by water = 3 x 4200 x 80 J
= 1008000 J (2 marks)

(ii) Heat absorbed by kettle = 450 x 80 J
= 3600 J (2 marks)

(iii) Heat applied by heater = pt = 3000t J
= 3000t = 1008000 + 36000 J
= 1044000

$\therefore t = \frac{1044000}{3000}$

$= 348s$

$= \frac{348}{60}$ minutes

= 5.8 minutes (3 marks)

(iv) Time taken to boil away

$m_{/v} = Pt$

$3 \times 2.3 \times 10^6 = 3000t$

$\therefore t = \frac{3x2.3x10^6}{3000} s =$ 2300 s

$= \frac{2300}{60}$ minutes = 38.3 minutes (3 marks)

18. (a) $\frac{m}{v} = \rho$

$\frac{4}{v} = 3000$

$\therefore v = \frac{v4}{3000} m^3$

$v = 1.33 \times 20^{-3} m^3$

(2 marks)

(b) Mass of liquid displaced = m

$\frac{m}{v} = 800 \Rightarrow m = 800 \times 1.33 \times 10^{-3} kg$ (1 mark)

= 1.064 kg (1 mark)

Weight of the displaced liquid = 10.64 N (1 mark)

Upthrust = 10.64 N (1 mark)

(c) Weight of stove in air = 40 N
Reading of spring balance= (40 – 10.64) N (1 mark)
= 29.36 N (1 mark)

(d) When the stone is removed reading of compression balance
= (85 – 10.64) N = 74.36 N (2 marks)

19. (a) (i) **OA** - Body moves from rest at constant acceleration.

(ii) **AB** - Body moves with decreasing acceleration.

(iii) **BC** - Body moves with constant velocity i.e. zero acceleration.
(3 marks)

(b) (i) $u = 10\ ms^{-1}$

$a = -25\ ms^{-2}$

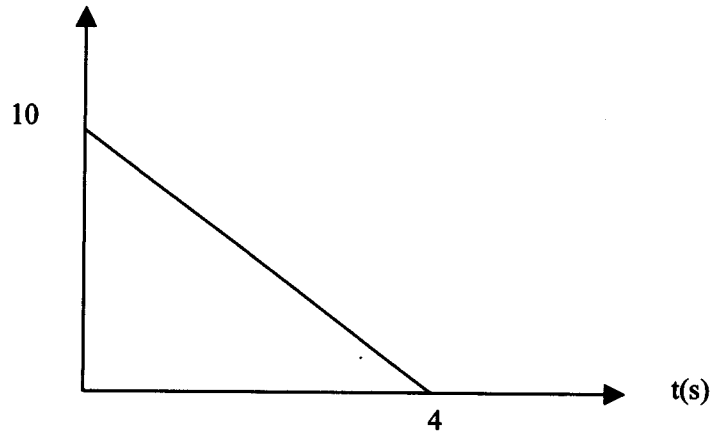
$t = 1.5s$

$V = u + at = 10\text{-}25 \times 1.5 = 6.25\ ms^{-1}$

(ii) $S = ut + \frac{1}{2}at^2$
$= 10(1.5) - \frac{1}{2}(2.5)\ 1.5)^2 = 12.1875m$ (1 mark)
$= 12.19m$ (1 mark)

(iii) $V = 0$
i.e. $o = 10 - 2.5t$
$\Rightarrow t = \frac{10}{2.5}s = 4s$ (1 mark)

(c) (i)
$V\ (ms^{-1})$



(1 mark)

(ii) Distance = Area of triangle (1 mark)
$= \frac{1}{2} \times 4 \times 10 = 20m$ (1 mark)

30.5.2 Physics Paper 2 (232/2)

1.

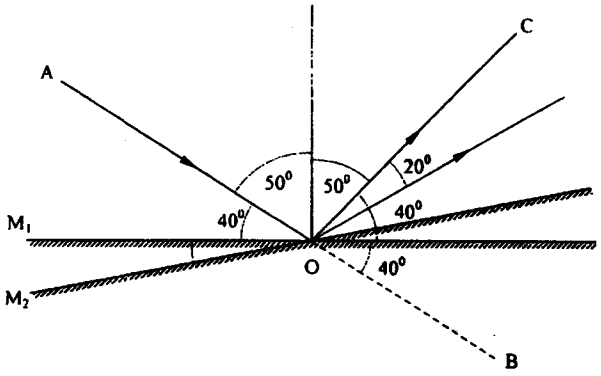
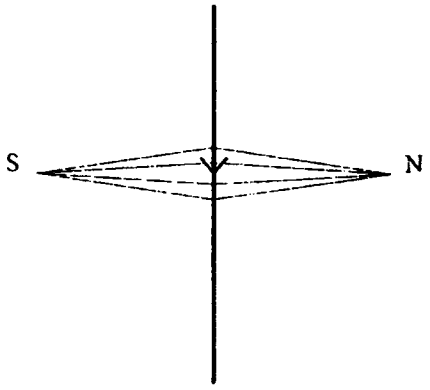


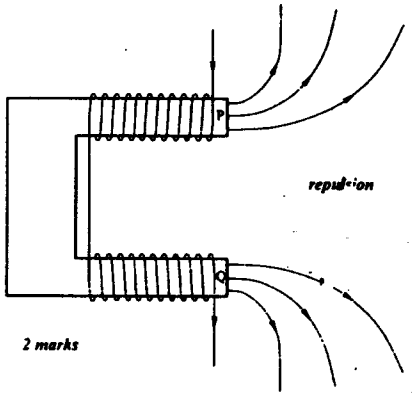
Figure
Initial deviation = 80°
Reflected ray rotates 2 x 10 = 20° (1 mark)
Final deviation = (80 + 20)° = 100° (1 mark)

2.



(1 mark)

3.



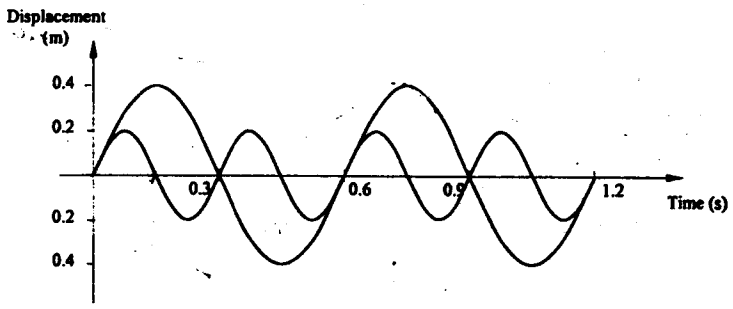
(2 marks)
Correct pattern – 1 mark
Arrow – 1 mark

4. Initially attracted because it is of opposite charge.
Then neutralised and charged positive and hence repel. (2 marks)

5. Distance = 2f = 2 x 25 = 50 cm (1 mark)

6. High voltages implies low current so reduces heat losses. (2 marks)

7.



(2 marks)
Amplitude 1
Frequency 1

8. $v_1 = f\lambda_1$ (1 mark)
$v_2 = f\lambda_2$ (1 mark)

Refractive index

$$= \frac{v_1}{v_2} = \frac{f\lambda_1}{f\lambda_2}$$

$$= \frac{\lambda_1}{\lambda_2} = \frac{18}{14.4} = 1.25$$

(1 mark)

9. 20g ⟶ 10 g ⟶ 5g ⟶ 2.5g ⟶ 1.25g

Mass remaining = 1.25g (1 mark)

Half-lives (idea) (1 mark)

10. I_o - Initial current
P $= I^2R = I^2_oR$;
$I_2 = 7I_o$
P $= (7I_o)^2R = 49I^2_oR$;
Power is 49 times initial value. (3 marks)

11. Motion out of paper. (1 mark)

12. Increase the acceleration voltage by setting a higher value. (1 mark)

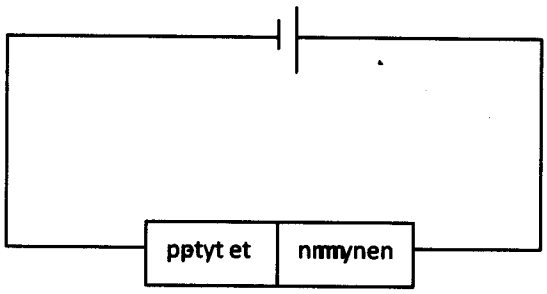
13.

$$f = \frac{v}{\lambda} = \frac{c}{\lambda} = \frac{3.0\times10^8}{1\times10^3} Hz$$

$$= 3.0\times10^5 Hz$$

(2 marks)

14.



(1 mark)

15. (a) (i) High current which falls off to zero. (1 mark)

(ii) Current flows when the capacitor is charging. When fully charged current stop (no current) and p.d. is equal to charging voltage.

(2 marks)

(b) (i) V_R = 0 volts (1 mark)

(ii) V_c = 5 volts (1 mark)

(c) (i) $\frac{1}{C_s} = \frac{1}{4} + \frac{1}{5} = \frac{5+4}{20} = \frac{9}{20}$ (1 mark)

$C_s = \frac{20}{9}\mu F$

$C_T = \frac{20}{9} + 3.0 = 5\frac{2}{9}\mu F$ (1 mark)

= 5.22 μF (1 mark)

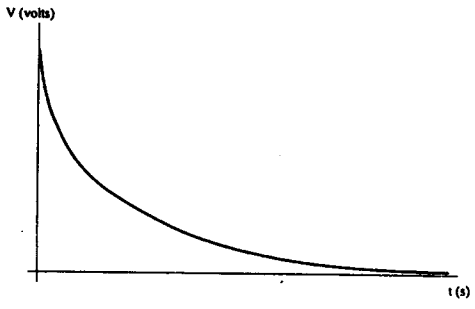
(ii) Charge on series section

$Q = CV = \frac{20}{9} \times 10\,\mu C$ (1 mark)

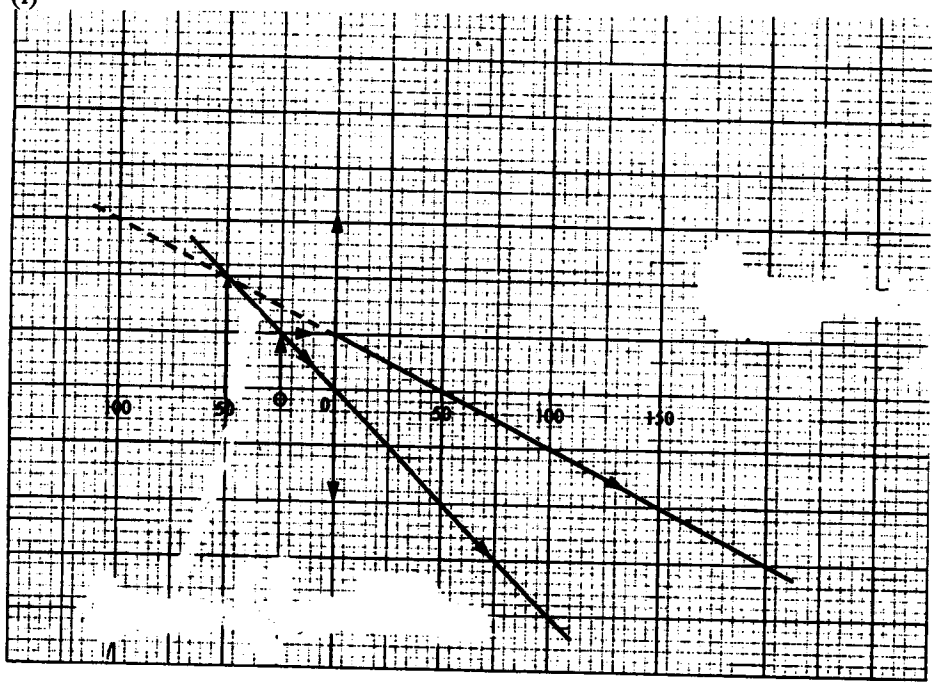
= $\frac{200}{9}\mu C = 22.2\mu C$ (1 mark)

Same charge on each phase (series)
Charge on 5.0μF is 22.2μC (1 mark)

(iii)



16. (a) (i)



(ii) (I) V = 50 cm (1 mark)

(II) $m = \frac{v}{u} = \frac{h_i}{h.} = \frac{50}{25} = 2$ (2 marks)

(iii) Reduce the object distance. (1 mark)

(iv) Simple microscope (magnifying glass) (1 mark)

(b) U = 80 mm
f = 50

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

$$\frac{1}{80} + \frac{1}{v} = \frac{1}{80} \qquad \frac{1}{v} = \frac{1}{50} - \frac{1}{80} = \frac{3}{400}$$ (1 mark)

$$v = \frac{400}{3}$$

When u = 80 + 60 mm = 140 mm (1 mark)

$$\frac{1}{v} = \frac{1}{50} - \frac{1}{140} = \frac{9}{700}$$ (1 mark)

$$v = \frac{700}{9} mm$$

Length of image = $\frac{400}{3} - \frac{700}{9} = 55.5$

= 55.6 mm (1 mark)

(b) (i) Total resistance

$R_1 = 3 + 0.75 + R$

$R_T = R + 3.75$

$E = (IR_T)$ (1 mark)

$1.5 = I(R + 3.75) = 0.15 (R + 3.75)$

$R + 3.75 = \frac{1.5}{0.15} = 10$ (1 mark)

$R = 10 - 3.75\Omega$

$= 6.25\Omega$ (1 mark)

17. (a) (i) Lamps L_1 and L_2 (1 mark)

(ii) Brighter (1 mark)

(iii) Total resistance is less now. (1 mark)

(b) (i) (I) E.m.f = 1.5V (1 mark)

(II) $1.5 = IR + Ir$

$IR = 1.2$

$3I = 1.2$

$I = 0.4$ A (2 marks)

(III) $Ir = 1.5 - 1.2 = 0.3$

$0.4r = 0.3$

$r = \frac{0.3}{0.4}\Omega = 0.75\Omega$ (2 marks)

18. (a) (i) Deflected towards the positive plate. (1 mark)

(ii) E.m.f. increased deflection will be greater. (1 mark)

(iii) (I) Spot moves back and forth. (1 mark)

(II) there will be a horizontal line. (1 mark)

(b) Electrons are given off as a result of heat produced by the current. (2 marks)

(c) By increasing the filament current so that more electrons are released. (2 marks)

(d) $P = V1 = 100 \times 1.5 \times 10^{-3} J = 1.5 Js^{-1}$ (2 marks)

19. (a) Intensity of radiation. (1 mark)

(b) (i) The negative potential sufficient to just stop the ejection of the electron. (1 mark)

(ii) (I) Gradient

$= \frac{3}{(12 - 4.4) \times 10^{14}} = 3.95 \times 10^{-15}$ (1 mark)

$$\frac{h}{e} = 3.95\times10^{-15}$$

$$\therefore h = 3.95\times10^{-15}\times1.6\times10^{-19} \quad \text{(1 mark)}$$

$$= 6.32\times10^{-34}\,Js$$

(iii) $$-\frac{w}{e} = -1.75 \quad \text{(1 mark)}$$

$$w = 1.75\times e$$

$$= 1.75\times1.6\times10^{-19}\,J \quad \text{(1 mark)}$$

$$= \frac{1.75\times1.6\times10^{-19}}{1.6\times10^{-19}}\,ev$$

$$= 1.75 \text{ ev} \quad \text{(1 mark)}$$

30.5.3 Physics Paper 3 (232/3)

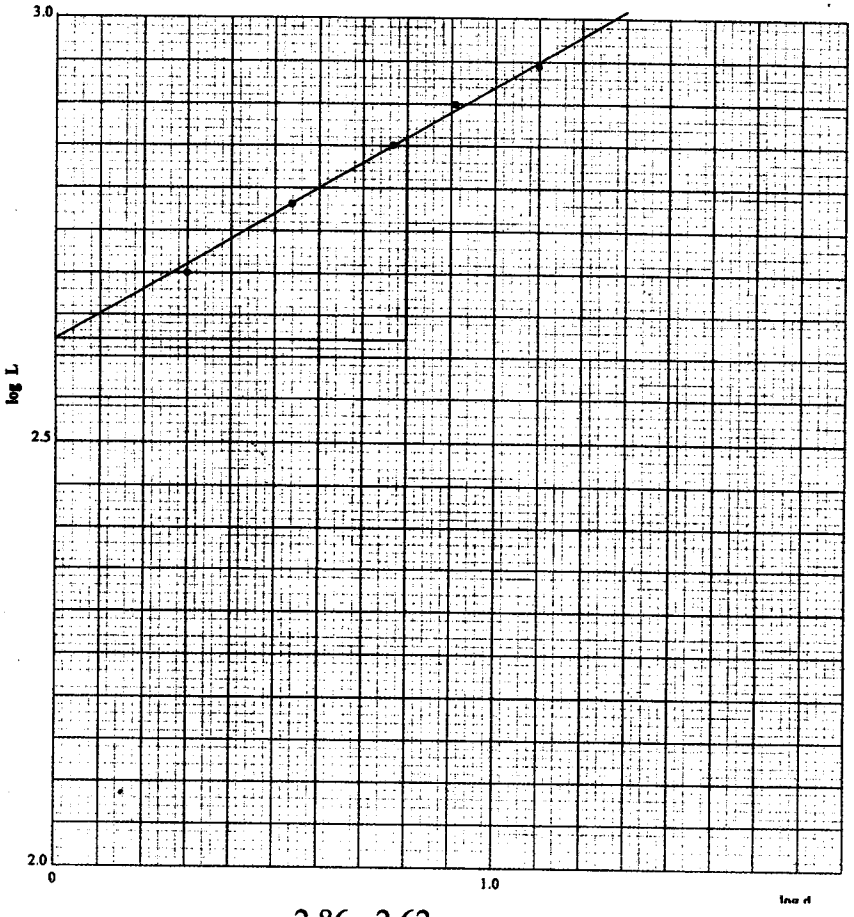
1. (a) $h_o = 92.8$ mm (1 mark)

(d) Table 1

Length L mm	900	800	700	600	500
Height h mm	79.8	84.7	86.9	89.4	90.8
Depression $d(h_o - h)$ mm	12.9	8.1	5.9	3.4	2.0
Log L	2.95	2.90	2.85	2.78	2.70
Log d	1.11	0.91	0.77	0.53	0.30

(7 marks)

(e) (5 marks)



(f) (i) Extraction $\frac{2.86-2.62}{0.80-0}$ (1 mark)

Subtraction and division $\frac{0.24}{0.80}$ (1 mark)

Value of S. 0.30 (1 mark)

f (ii) $\frac{1}{0.30} = 0.33$ (1 mark)

f (iii) Extrapolation (1 mark)

Reading G = 2.62 (1 mark)

f(iv)

Correct substitution of ΔX and ΔY in the equation (½)
Correct evaluation to the nearest whole number
or 1 decimal place (½) (1 mark)

2. (a) d_1 = 4.68 cm
d_2 = 5.08 (1 mark)
X = $\frac{d_2 - d_1}{2} = \frac{5.08 - 4.68}{2} = \frac{0.4}{2} = 0.2$

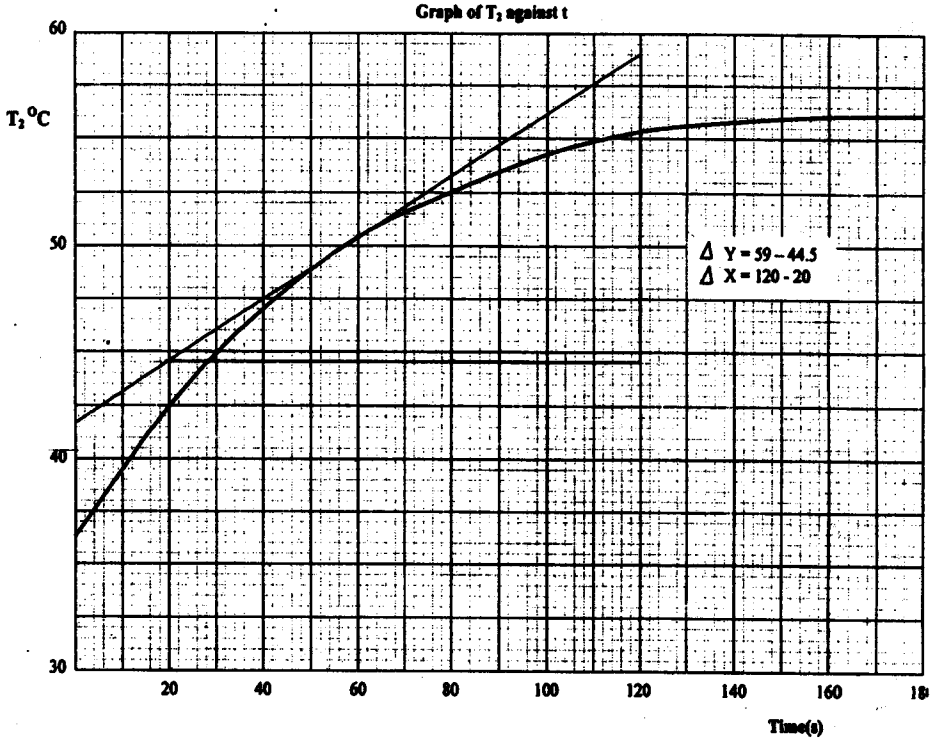
(b) h = 4.3
A = 68.8 cm^2 (1 mark)

(e)

Time (s)	0	20	40	60	80	100	120	140	160	180
Temperature T_1 °C	75	73.5	72.0	68.5	67	66.5	65.5	64.0	62.5	62.0
Temperature T_2 °C	37	37	42	51.5	52	54	55	55.5	56	56.5

(6 marks)

(f



(g) (i) slope $\frac{\Delta Y}{\Delta X} = \frac{14.5}{100} = 0.145$ (3 marks)

(ii) k = $\frac{315SX}{A(T_1 - T_2)} = \frac{315 \times 0.145 \times 0.21 \times 10^{-2}}{68.8 \times 10^{-4} \times 17}$
= 0.82 (2 marks)