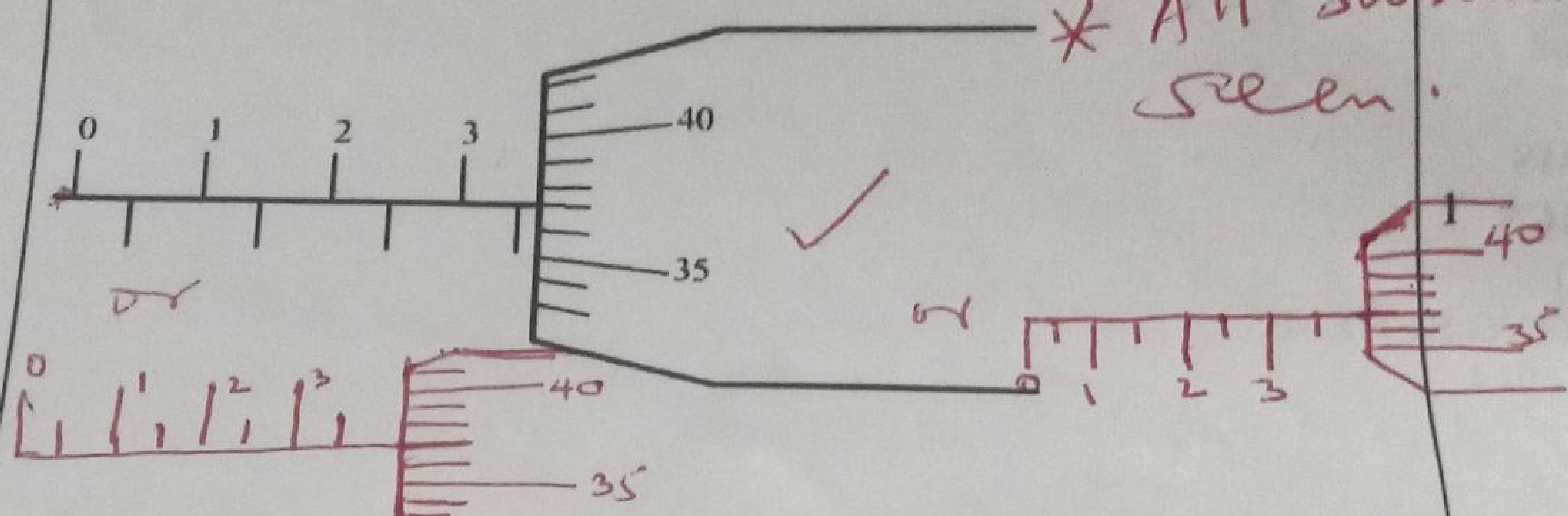
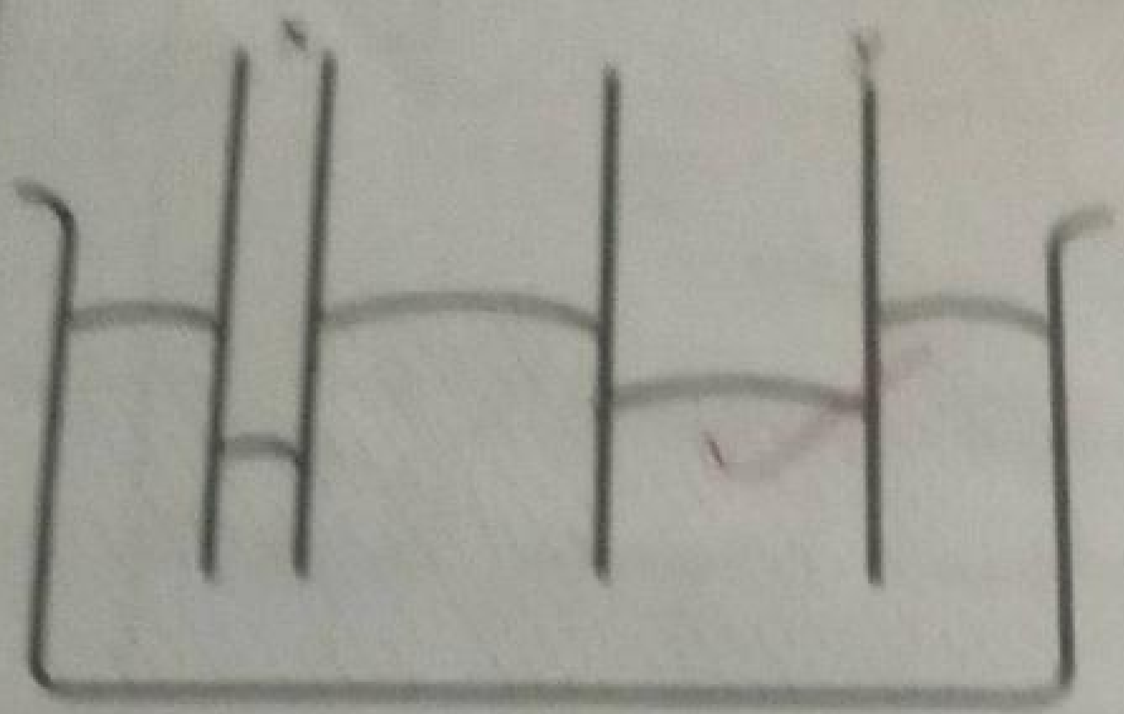
SECTION A (25 MARKS)



1.	*All subdivisions must be seen.*		
2.	(a) For the liquid to be pulled downwards by cohesive forces.		1
	(b) For point x to have a lower pressure than the liquid in the tank. / *Create pressure difference.*		1
3.	(a) $P_1 l_1 = P_2 l_2$ / $P_1V_1 = P_2V_2$ / $P_1AL_1 = P_2AL_2$		
	$76 \times 7.5 = (76-5) \times l_2$		
	$l_2 = 8.028$ cm *(Accept 8.0 cm, at least 1 d.p.)*		3
	(b) Atmospheric pressure is greater than the pressure due to the mercury thread.		1
4.	Volume drained = 2 x 3 = 6 cm^3		
	Reading = 15+6		
	= 21ml		2
	- Radius		
	- Linear velocity / *Speed.*		
	- Change in displacement / *change in linear displacement*		2
	- Time (change) / *frequency / Periodic time.*		
	(Any 2)		
	Don't accept		

6.



Rate at which the water turns black decreases. / water takes longer to turn black / Rate of diffusion decreases. 1

$K = \frac{F}{e}$

$= \frac{50}{1}$

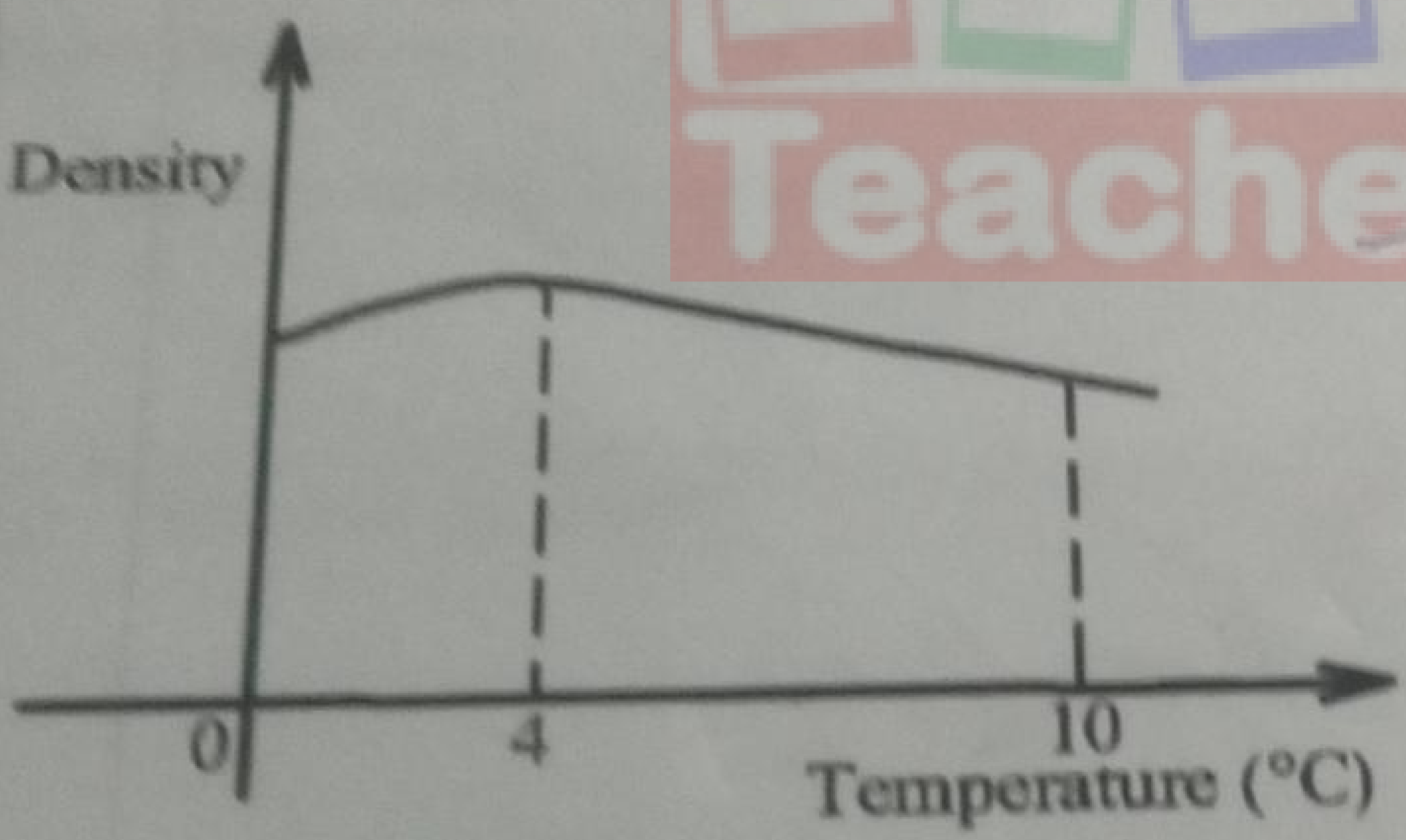
$= 50\ Ncm^{-1}$

effective K = 2 X 50 Ncm^{-1}

$= 100\ Ncm^{-1}$ = 10000 N/m

or F = Ke; K = 50/1 = 50 N/cm; $K_p = K_1 + K_2$ = 50 + 50 = 100 N/cm

or F = Ke; $e_p = \frac{1}{2}e = \frac{1}{2} \times 1 = 0.5$ cm; $K_p = \frac{50}{0.5}$ = 100 N/cm



1

4° must be shown
- should be a curve and not a straight line

To maintain stability / Vertical line of action through c.o.g (shifts) to fall within the base / lower the c.o.g within ... 1

11.	At BC the molten substance solidifies. / Freezes / changes to solid Because it is loosing latent heat. / latent heat of fusion / looses heat without change in temperature.	1 1
12.	10 x 0.5 = T x 1.4 ✓ Sum of clockwise moment = Sum of anticlockwise moment $F_1 d_1 = F_2 d_2$ T = 3.57 N ✓	2
13.	Hot water rises up due to lower density to heat ice B before A. / It is due to convection. More heat reach B than A.	1
14.	Velocity of the stream of air is higher under the folded paper than above the paper. ✓ Hence the pressure below is lower than above causing the paper to collapse. ✓	2

SECTION B (55 MARKS)

15. (a)	(i) Weight of block = weight of displaced water $= \frac{1}{3} \rho_w V_w g.$ $= \frac{1}{3} \times 1000 \times 90 \times 10^{-6} \times 10$ $= 0.3$ N		
	(ii) Weight of metal block = weight of extra water to be displaced $= \frac{2}{3} \rho_w . V_w g$ $= \frac{2}{3} \times 1000 \times 90 \times 10^{-6} \times 10$ $= 0.6$ N		3
(b)	(i) - Tension - Weight (ii) - Tension increases - Weight remains constant		2 2
16. (a)	Quantity of heat required to change a unit mass of a material from solid to liquid at constant temperature.		1
(b)	(i) Heat lost by water $= MC\Delta\Theta$ $= \frac{10.5}{1000} \times 4200 \times (100-40)$ $= 2646$ J		3

(ii) Heat gained by ice = MCΔΘ

$= \frac{5}{1000} \times 2100 \times 10$

$= 105$ J

(iii) $Q = mL_f$

$= \frac{5}{1000} \times L_f$

(iv) $Q = M C \Delta\Theta$

$= \frac{5}{1000} \times 4200 \times 40$

$= 840$ J

(v) Heat lost = heat gained

$2646 = 105 + 0.005 L_f + 840$

$L_f = 3.402 \times 10^5 \text{ JKg}^{-1}$

7. (a)	$F \times 0.4 = 100 \times 2$ $F = 500$N $P = \frac{F}{A}$ $= \frac{500}{\pi x (5.64 x 10^{-2})^2}$ $= 50033.61$Pa $= 5.003 \times 10^4$ Pa		5
	L = P.A $= 5.003 \times 10^4 \times \pi(14.24 \times 10^{-2})^2$ $= 3.187 \times 10^3$ N		
	M.A	$= \frac{L}{E}$ $= \frac{3.187 \times 10^3}{500}$ $= 6.375 = 6.4$	

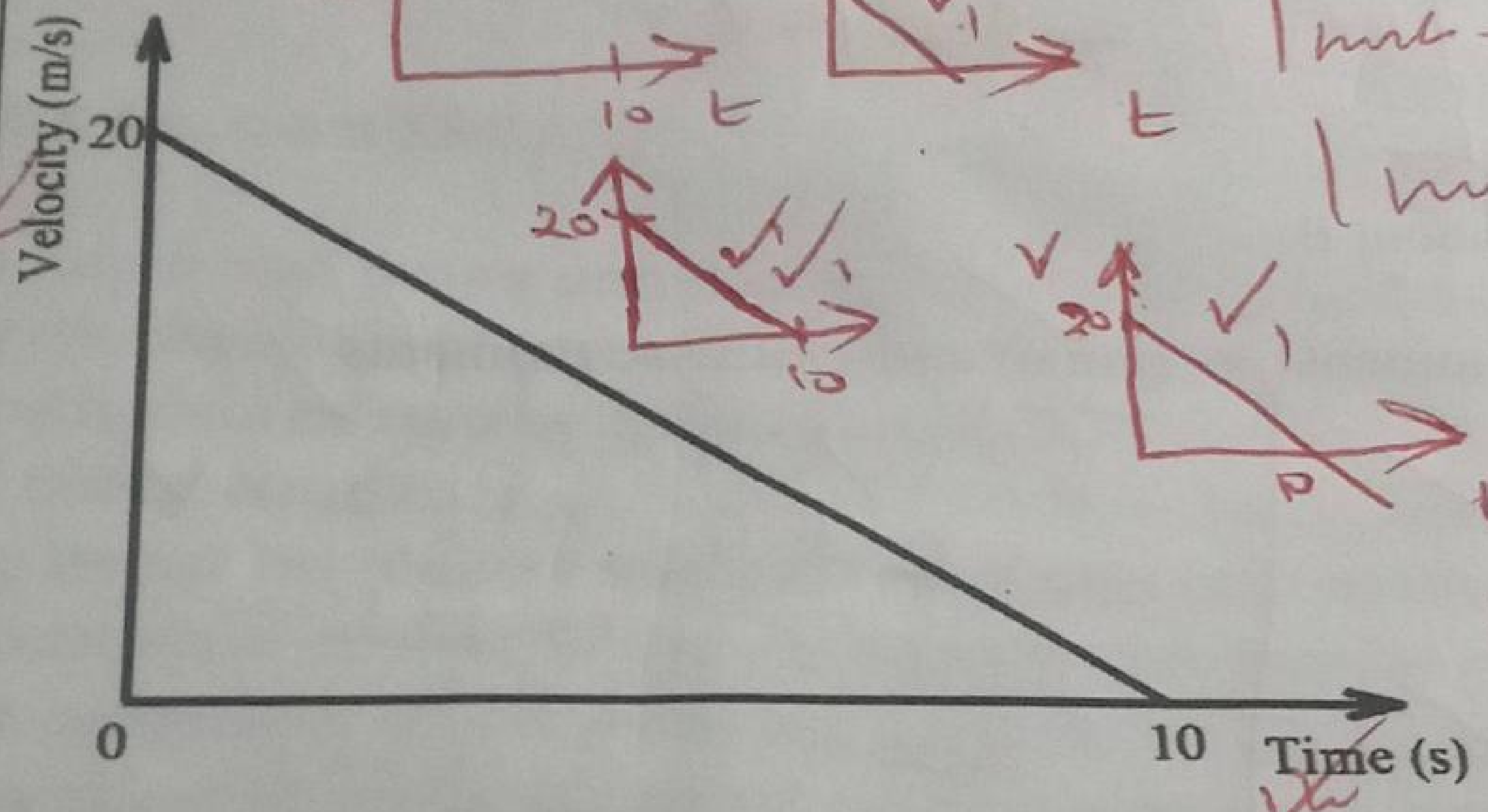
18. (a) (i) $t = \frac{v-u}{a}$

$= \frac{0-20}{-2}$

$= 10s$

3

(ii)



(iii) S = Area under curve

$= \frac{1}{2} \times 10 \times 20$

$= 100m$

4

(b) $m_1u_1 + m_2u_2 = (m_1+m_2)V$

$(1000Kg)(40m/s) + 0 = (1000+800)V$

$\therefore V = 22.22\ m/s$

But $F = \frac{mv-mu}{t}$

$= \frac{1000(22.22)-1000(40)}{3}$ or $F = \frac{800(22.22)-800(0)}{3}$

$= -5.92x10^3N$ $\quad F = 5.926x10^3N$

= -5926N $\quad$ = 5926N

Scanned by TapScanner

19. (a)	- The sum of forces in one direction is equal to the sum of the forces in the opposite direction. - The sum of clockwise moments about a point is equal to the sum of anticlockwise moments about the same point.		
(b)	(i) R = 80 + 120 = 200N		1
	(ii) Taking moments about B, Sum of clockwise moments = sum of anti-clokwise moments $200 \times x = 80 \times 4$ $x = \frac{80x4}{200}$ $= 1.6$ m		3
(c)	(i) – Place the metre rule on the knife edge and adjust it until it balances. - Mark the position of the knife edge which gives the position of the centre of gravity.		2
	(ii) - With the rule balanced at c.o.g. place the mass M_1 on one side of the knife edge. - Adjust the position of the knife edge to balance the metre rule with the mass. - Measure the distance of the position of centre of gravity from the knife edge and the distance of the mass M_1 from the knife edge. - Use the principle of moments to determine M.		4

THIS IS THE LAST PRINTED PAGE