1. (a) Distinguish between distance and displacement (2 marks)

— Distance is a measure of length between two points in no specific direction while displacement is the distance covered by a moving object in a specific direction

(b) A body accelerates from the initial velocity U to the final velocity V in time t, the distance travelled is S. if the acceleration is a. Show that

I. V=u +at (3 marks)

Acceleration = Change in Velocity / time change.

$a = \frac{v-u}{t}$ | $at = v-u$.

$v = u + at$

II. $S=ut+1/2at^2$ (3 marks)

Displacement = Average velocity x time

$S = \left(\frac{v+u}{2}\right)t$

$S = \left(\frac{u+at+u}{2}\right)t$.

$S = \left(\frac{2ut+at^2}{2}\right) \Rightarrow S = ut + \frac{1}{2}at^2$

III. $V^2=U^2+2As$ (3 marks)

Displacement = Average velocity x time.

$S = \left(\frac{V+U}{2}\right) \times \left(\frac{V-U}{a}\right)$

$S = \frac{V^2+UV+UV-U^2}{2a}$

$S = \frac{V^2-U^2}{2a}$

$V^2 = U^2+2aS$

(c) A ball is thrown vertically upwards and returns to its starting point after 6 seconds. Calculate the maximum height reached (3 marks)

$H_{max} = \frac{U^2}{2g}$

but $U = gt$

$= 10m/s^2 \times 3s = 30m/s$

$H_{max} = \frac{(30m/s)^2}{2 \times 10m/s^2}$

$= 45M$

(d) A ball is thrown from the top of a cliff 30m high with a horizontal velocity of 15m/s. Calculate

I. The time taken by the ball to strike the ground (3 marks)

$H = \frac{1}{2} gt^2$

$30m = \frac{1}{2} \times 10m/s^2 \times t^2$

$6s^2 = t^2$

$t = 2.449 \text{ sec}$

II. The distance from the foot of the cliff to where the ball strikes the ground (3 marks)

$R = Ut$

$= 15m/s \times 2.449s$

$= 36.735m$

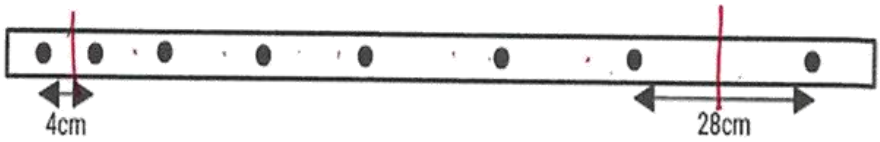
III. The vertical velocity at the time it strikes the ground(take $g=10ms^{-2}$(2 marks)

$V = U + at$

$V = 0 + 10m/s^2 \times 2.449s$

$V = 24.49 m/s$

(d) The figure below shows a tape obtained from ticker-timer of frequency 50HZ. Calculate




$f = 50Hz$

$T = 0.02s$

i. The initial velocity of the trolley (2 marks)

$u = \frac{d}{t} = \frac{0.04m}{0.02s}$

$= 2m/s$

ii. The final velocity of the trolley (2 marks)

$v = \frac{d}{t} = \frac{0.28m}{0.02s}$

$= 14m/s$

iii. The acceleration of the trolley (2 marks)

$a = \frac{v-u}{t} = \frac{14m/s - 2m/s}{(0.02 \times 6)}$

$= \frac{12m/s}{0.12s}$

$a = 100 m/s^2$

2.(a) State Newton's first law of motion (1 mark)

— A body remains in its state of motion or at rest unless acted upon by an external force

(b) A car of mass 1200kg moving at a speed of 90km/h is brought to rest over a distance 20m. Calculate the breaking force required ? (3 marks)

$F_b = ma$

$a = \frac{25m/s - 0m/s}{10s}$

$= \frac{25m/s}{10s} = 2.5m/s^2$

$F_b = 1200kg \times 2.5m/s^2$

$= 3000 kgm/s^2$

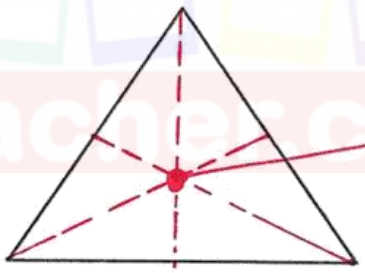
$= 3000N$

(c) State the two factors that determine the amount of breaking force required in (b) above (2 marks)

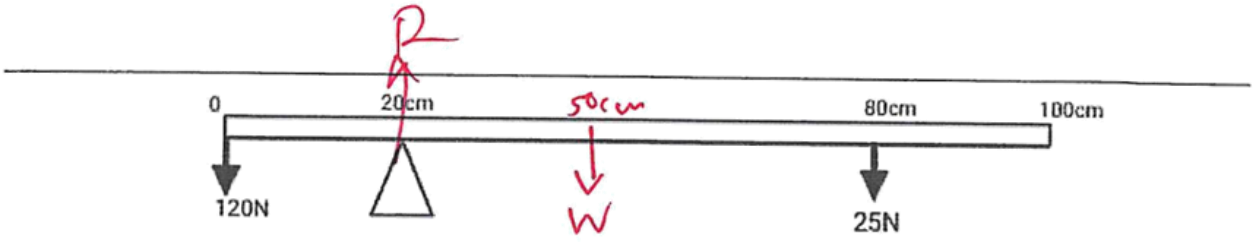
- Mass of the vehicle
- Acceleration of the vehicle

(d) When a soldier fires a bullet from a gun, he is pushed backwards. Explain (2 marks) The leaving bullet creates an action force. The reaction force pushes the soldier backwards

3. (a) Locate the center of gravity in the diagram below (1 mark)



(b) The figure below shows a metre rule in equilibrium




i. Calculate the weight of the metre rule (2 marks)

$(W \times 0.3m) + (25N \times 0.6m) = (120N \times 0.2m)$

$0.3m\ W = 24Nm - 15Nm$

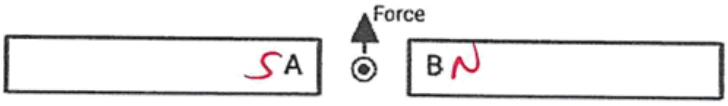
$W = \frac{9Nm}{0.3m} = 30N$

ii. What is the reaction at the pivot (1 mark)

$R = 120N + 30N + 25N$

$= 175N$

4. The figure below shows a current carrying conductor in a magnetic field direction of force on the wire as shown by the arrow. State the polarities of A and B



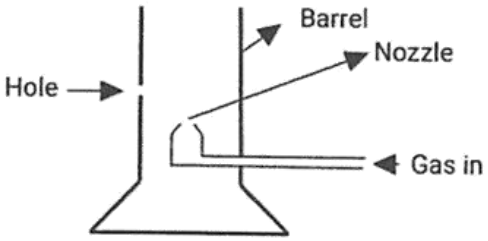

A North Pole (1 mark)

B South Pole (1 mark)

5. (a) A horse rider bends forward when the horse is on speed. Explain (2 marks)

— Bending creates a streamlined body that reducing air resistance making the horse to remain on speed.

(b) The diagram below shows a Bunsen burner. Explain how air is drawn into the burner (2 marks)




— The ~~gas~~ gas enters and passes through the barrel to the chimney at high velocity this creates low pressure inside the barrel. The high atmospheric pressure outside pushes air in through the air hole

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