

# Home assignment

$$\text{mass} = 1200 \text{ kg}$$

$$u = 90 \text{ km/h} = \frac{90 \times 5}{18} = 25 \text{ ms}^{-1}$$

$$v = 18 \text{ km/h} = 5 \text{ ms}^{-1}$$

$$t = 4 \text{ s}$$

$$a = \frac{v-u}{t}$$

$$= \frac{18 - 90}{4} = \frac{5 - 25}{4}$$

$$= -\frac{20}{4} = -5 \text{ ms}^{-2}$$

Change in momentum = ~~mass × force~~

$$= mv - mu$$

$$= 1200(v-u)$$

$$= 1200(-20)$$

$$= -24000 \text{ kgms}^{-1}$$

$$= 1200(5)$$

$$= 1200(20)$$

$$= 60000 - 24000$$

~~$$= 36000$$~~

$$= -48000 \text{ kgms}^{-1}$$

$$\text{Force} = ma$$

$$= 1200 \times 5$$

$$= 6000 \text{ N}$$

2) mass = 100 kg

$t_f = 10 \text{ s}$

$u = 0 \text{ ms}^{-1}$

$v = ?$

$s = \cancel{100} \cdot 100 \text{ m}$

$t_2 = 5 \text{ s}$

① Velocity acquired =  $\frac{s}{t_2} = \frac{100}{5} = 20 \text{ ms}^{-1}$

② Acceleration =  $\frac{v-u}{t} = \frac{20-0}{10} = \cancel{\frac{20}{10}} = 2 \text{ ms}^{-2}$

③  $F = ma = 100 \times 2 = 200 \text{ N}$

3) According to ~~new~~ Newton's second law of motion -

$\Rightarrow F \propto \frac{\text{change in momentum}}{\text{time}}$

$\Rightarrow F = \frac{mv - \cancel{mu}}{t}$

$\Rightarrow F = \frac{m(v-u)}{t}$

$\Rightarrow F = m \cdot a$

$\Rightarrow F = ma$

4) Show how the first law of motion can be mathematically stated from the mathematical expression for the second law of motion?

$$F = ma$$

$\Rightarrow F = \text{mass} \times \text{acceleration}$

Let's take  $F = 0$

$\Rightarrow a = 0 \text{ ms}^{-2}$  &  $m \neq 0$  ( $\because$  mass can never be 0)

~~$a=0$ , then  $\text{velocity} = \text{constant}$~~

If  $a = 0 \text{ ms}^{-2}$  then  $v = k$  (constant)

$\therefore$  We can say that Newton's 1<sup>st</sup> law & 2<sup>nd</sup> law of motion are interrelated.

## PART -2

1) Name & state the action & reaction in the following areas:-

- (a) firing of a bullet from a gun.
  - (b) hammering a nail
  - (c) a book lying on a table.
  - (d) moving socket.
  - (e) a person moving on the floor.
  - (f) a moving train colliding with a stationary train.
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- (a) Force is exerted on bullet (action) & the gun experiences recoil (reaction).
  - (b) weight of the force exerted by hammer on nail (action) & force is exerted on hammer by nail (reaction).
  - (c) weight of book acting downwards on the table (action) & Normal force exerted by table

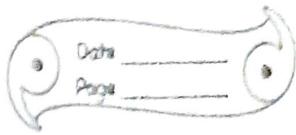
on the book (reaction).

- (d) Force exerted <sup>downwards</sup> by rocket on the gases. Action & the gasses exert force on the rocket upwards (reaction).
- (e) Force exerted by feet on ground backwards (action) & force exerted by ground on feet forward (reaction).
- (f) Force exerted by a moving train on the stationary train (action) & force exerted by stationary train on the moving train (reaction).

2.

- (a) Explain why is it difficult to hold a hose , which ejects a large amount of water at a high velocity ?

~~ans~~ It is very difficult to hold a hose , which ejects large amount of water at a high velocity , because it gives a large amount



of recoil force which is not easy to handle.

(b) why action & reaction do not cancel each other?

Action & Reaction forces don't cancel each other because they both act on different bodies.

3. (i) If someone jumps to the shore from a boat, the boat moves in the opposite direction. Explain.

If someone jumps to the shore from a boat, the boat moves in the opposite direction because the person applies force on the boat by its feet in backward direction.

(B) When air from an inflated balloon is allowed to be released, the balloon moves in a direction opposite to that of air. Explain.

When air from an inflated balloon is allowed to be released, the balloon moves in a direction opposite to that of air because the air flows in the downward direction at a pretty good amount of speed which can exert ~~for~~ <sup>an balloon</sup> force in upward direction & lift it up.