Home assignment

1)

mass = 1200kg

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

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

$t = 4s$

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

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

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

Change in momentum

$= mv - mu$

$= 1200(v-u)$

$= 1200(-20)$

$= -24000 kgms^{-1}$

$= 1200(5) - 1200(20)$

$= 6000 - 24000$

$= -48000 kgms^{-1}$

Force $= ma$

$= 1200 \times 5$

$= 6000 N$

2) mass = 100kg
t_1 = 10s
u = 0 ms^{-1}
v = ?
s = 100m
t_2 = 5s

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

(ii) Acceleration = $\frac{v-u}{t} = \frac{20-0}{10} = \frac{20}{10} = 2 ms^{-2}$

(iii) $F = ma = 100 \times 2 = 200N$

3) According to Newton's second law of motion.

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

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

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

$\Rightarrow F = m \cdot a$

$\Rightarrow F = ma$

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

$F = ma$

⇒ F = mass x acceleration

Let's take $F = 0$

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

~~⇒ a = 0, then~~

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

∴ We can say that Newton's 1st law & 2nd 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 rocket.

(e) a person moving on the floor.

(f) a moving train colliding with a stationary train.

(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 by rocket on the gases downwards (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?

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. (a) 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 to move forward the person applies force on the boat by its feet in backward direction.

(6) 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 force on balloon in upward direction & lift it up.