Homework

physics

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1) Mass of motor car = 1200 Kg

Velocity of car = 90 km/h

= 25 m/s

Velocity of car after slowing down = 18 km/h

= 5 m/s

Time interval in which the body slowed down

= 4s

Acceleration of the body = $\frac{v-u}{t}$

= $\frac{5-25}{4}$ = $-5\ m/s^2$

Change in momentum of motor car

= $mv - mu$

= $m(v-u)$

= $1200(5-25)$

= 1200×-20

= -24000 Kg. m/s

Magnitude of force applied on body

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

= $\frac{-24000}{4}$ = -6000 N

2) mass of a body = 100 kg

Time for which the force acted on the body = 10s

After the force is applied,

distance travelled by body = 100m.

Time taken to cover distance = 5s

i) Velocity acquired by body = $\frac{s}{t}$

= 100 / 5 = 20 m/s

ii) Acceleration produced by body

= $\frac{v-u}{t}$ = $\frac{20-0}{5}$ = 4 m/s.

iii) Magnitude of force applied on body :-

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

= m x a

= 100 x 4

= 400 N.

3) Mass of body = m

Initial velocity of body = u

Final velocity of body = v

Initial momentum of body = mu

Final momentum of body = mv

Rate of change of momentum :-

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

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

Therefore,

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

$$\Rightarrow F \propto ma$$

Hence Force = mass x Acceleration.

4) According to Newton's second law of motion :-

$F = m \times a$

When $F = 0$

$\Rightarrow F = m \times a$

$\rightarrow 0 = m \times a$

$\Rightarrow a = \frac{0}{m}$

$= 0 \text{ m/s}^2$

Hence, when force applied on a body is 0N, the acceleration is 0, then velocity is constant as the first law of Newton states.

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1) a) Action force :- Force applied on bullet by gun

Reaction force :- Recoil experienced by gun

b) Hammering a nail.

Action force :- Force applied on the nail by the hammer

Reaction force :- Force exerted by the nail on the hammer simultaneously

c) A book lying on table

Action force :- Weight of book acting downwards

Reaction force :- Normal force applied by table upwards.

d) moving rocket

Action force :- Force exerted by rocket on the gases moving backwards

Reaction force :- Force exerted by gases on the rocket moving forwards

e) Person moving on floor

Action force:- Force exerted by feet on the ground by an angle

Reaction force:- Normal force exerted by the ground on feet by an angle.

f) A moving train colliding with stationary train.

Action force:- Force exerted by a moving train on a stationary train.

Reaction force:- Force exerted by the stationary train on moving train.

2) a) It is difficult to hold a hose which ejects large amount of water at higher velocity because the water is

2a) It is difficult to hold a hose which ejects water at higher velocities because of the Newtons third law of motion. that every action has equal and opposit reaction

A person holding a hose ejecting a large amount of water at higher velocities experiences a large reaction force backwards because of force of water moving in forward direction. Thus the force of water makes it difficult for the person to hold the hose as it pushes the person backwards heavily.

b) Action and reaction force do not cancel out each other because both the forces rather than acting on the same body acts on two different bodies simultaneously

3a) When the man jumps from boat he applies a force on the boat and also the boat applies an equal and opposit reaction force on the man because of newtons 3rd law of motion. Hence when the man jumps to shore, the boat move backwards

b) When air from an inflated balloon is released the balloon moves in a direction opposit to air because the air filled in balloon rushes out pushing the balloon in direction opposit to that of air. Hence we can conclude that the equal and opposite reaction of the rushing air moves the balloon

Home Assignment

a) The direction of rockets acceleration is opposit to direction of release of gas because when gas is expelled out of the rocket it exerts an equal and opposit force on the rocket for which the rocket moves in upward direction when the gas expelled in downward direction.

b) Yes, the expelled gas exert a force on the rocket in the opposite direction in which the gas is expelled out of rocket.

c) The magnitude of rockets acceleration will also be doubled if the mass of gas is expelled with double acceleration.

d) The magnitude of rockets acceleration will also be doubled if the the mass of gas expelled out will be doubled.

e) The magnitude of rockets acceleration will be of four times if both the mass and acceleration of gas expelled out will be doubled.

The force exerted on the rocket will be 4 times than the initial force exerted on the rocket.