Force and motion

• Tick (✓) the correct answer

a. which of the following is equivalent to 1 newton force?

→ i. 1000 dynes   ii. 10^7 dynes   iii. 10^8 dynes   iv. 10^{-5} dynes

b. what value is obtained as the sum of two vectors?

→ i. Positive   ii. Negative   iii. zero   iv. All of these ✓

c. If a bus is moving with velocity of 54km/h✓ what is the velocity in m/s?

→ i. 15 ✓   ii. 10   iii. 20   iv. 12·5

($54 \times 1000 / (60 \times 60) = \dfrac{54000}{3600} = 15$)

d) If the velocity of car becomes 20m/s from 10m/s in 10 seconds what is the acceleration of car?

i. 30m/s²   ii. 1 m/s² ✓   iii. 10m/s²   iv. 3m/s²

$$\left[a = \frac{v-u}{t} = \frac{20-10}{10} = 1 \text{ m/s}^2 \right]$$

1. what does first law of motion give?
   i. measurment of force
   ii. Definition of inertia ✓
   iii. Action and Reaction
   iv. measurment of momentum

g. which is of the following is based on the third law of motion?
   → i. shaking of the branches to get fruits
   ii. mud from flying way from wheel
   iii. Rowing of a boat ✓
   iv. Lowering of a hand while catching a ball

2. Answer in brief

1. The resultant force changes the State of a body. support with two examples

   → Resultant force is the net force acting on a body. It can change State of body State of rest or uniform motion.
   examples

   1. Kicking a football →
   1. Braking a moving bicycle → The bicycle Stops due to the net force of brake changes State from motion to rest

   2. pushing Stationary box → The box moves when net force is applied

m. There is more probability of passenger's bus accident in the hilly region : explain with reference to high speed and Newton's first law of motion.

→ In hilly regions a fast moving bus has high inertia. Now according to 1st law of motion in hilly region bus tends to keep moving if the bus stops or turn suddenly. This can cause loss of balance or control, contributing accidents to passe in hilly region.

5 Give reason

i. If we shake branches, mangoes fall down from the mango tree.
→ It is because of inertia of rest, mangoes tend to stay in place and when branches moves suddenly and hence fall down.

ii. A bag placed near the seat of a passenger is often found to be moved to the back position while the passenger gets off.
→ It is because of inertia of rest, a bag placed near seat of a passenger in stopping bus wants to stay at rest and when bus starts moving bag slides backward later bus stops smoothly then bag is often to be moved to the back.

ii. Passengers of a bus jerk forward when the moving bus suddenly stops.

→ It is because of inertia of motion, the bag continues the passengers try to keep moving forward even when the bus stops suddenly

iv. An athlete runs before taking a long jump.

→ It is because to have more momentum, which helps to cover longer distance during jump.

v. A swimmer pushes water backwards while swimming.

→ It is because by newton's third law of motion, every action has equal and opposite reaction by pushing water backwards swimmer is pushed forward.

vi. The boat slightly moves backward when we jump from it.

→ Due to newton's third law of motion, jumping forward applies an equal and opposite force pushing the boat backword.

vii. A cricket player lowers his hands while catching the ball.

→ To increase time of impact which reduces force of impact to hand which prevents injury.

viii. A gun recoils when a bullet is fired from it

→ It is because of newtons third law of motion. bullet moves forward making action and gun moves backward with equal and opposite reaction.

ix. A motor cycle, car, bus and truck moving with the same velocity require different time to come to rest.

→ It is because of momentum, momentum(P) is higher in bodies with higher mass than lower given by

$$p = m \times v$$

where, m is mass of body
v is velocity of body

Since they are all of same velocity but of different mass they all need different amount of force to stop so they take different time to stop.

x. when two rubbers of balls of same size are allowed to fall from the same height to the same floor, one ball jump up higher.

→ It is because of difference in elasticity of rubber ball, even-though they are both rubber one may have more elasticity than another so, one with more elasticity will jump higher.

xi. when we jump on concrete surface, the feet get injured.

→ It is because concrete surface doesn't deform or absorb impact force so large force is acted back on the feet, feets get injured.

xii. A rubber band should not be stretched beyond its elastic limit.

→ It is because it gets permanently deformed after being stretched to its elastic limit and ~~doesn't~~ it may break and can also cause injury to the person.

xiii. Working of a rocket is based on the newton third law of motion.

→ a Rocket pushes gases backward and b gasses pushes Rocket in ~~equal an~~ opposite direction with the equal force the rocket pushes gas which is exactly stated as third law of motion. So, working of rocket is b: third law of motion.