UNIT-3 DYNAMICS SELF ASSESSMENT QUESTIONS

Q1: Why momentum is considered equal to zero when a body comes to rest?

ANS:

Momentum is considered **zero when a body comes to rest** because momentum depends on velocity.

The formula for momentum is:

$$P = mv$$

When a body is at rest:

The velocity of a body is zero $v = 0$

So:

$$P = mv$$
$$P = m(0)$$
$$P = 0$$

Therefore, the momentum of a body at rest is **zero** , even though it still has mass.

Momentum becomes zero because the body has **no motion** .

Q2: Why do you pull your hands while catching a fast moving ball?

Ans:

You pull your hands backward while catching a fast-moving ball to **increase the time taken to stop the ball** .

By Newton's second law:

$$F = \frac{\Delta P}{\Delta t}$$

where:

F = force , ΔP= change in momentum,

Δt= time taken

When you pull your hands back, the stopping time Δt increases. Since the change in momentum is the same, the force on your hands decreases.

So, pulling your hands back **reduces the impact force** and helps prevent injury.

Q3: What is reason that you experience a jerk whenever the school bus stops all of sudden?

Ans:

You experience a jerk when the school bus stops suddenly because of **inertia of motion** .

When the bus is moving, your body is also moving with the same speed. If the bus suddenly stops, your feet in contact with the bus stop quickly, but the upper part of your body tends to keep moving forward due to inertia.

So you feel a ***forward jerk*** .

This is explained by **Newton's First Law of Motion** , which says that a moving body continues to move unless an external force acts on it.

Q4: Why it is dangerous to jump from a moving bus?

ANS:

It is dangerous to jump from a moving bus because of **inertia of motion** .

When you are inside a moving bus, your body is also moving forward with the same speed as the bus. If you jump out, your feet touch the ground and may stop suddenly

due to friction, but the upper part of your body continues moving forward due to inertia.

This can make you: fall forward, lose balance, and get injured.

So, jumping from a moving bus is dangerous because your body continues to move forward even after your feet hit the ground.

Q5: What is role of force according to Newton's second law of motion?

ANS:

According to Newton's Second Law of Motion , the role of force is to change the state of motion of a body by producing acceleration .

It states that:

$$F = ma$$

So, force is responsible for:

increasing the speed of a body,

decreasing the speed of a body,

changing the direction of motion,

producing acceleration.

Greater force produces greater acceleration, while greater mass produces less acceleration for the same force.

Q6: What happens according to Newton's third law, while you pull a catapult?

ANS:

According to Newton's Third Law of Motion , when you pull a catapult, you apply a force on the rubber band , and the rubber band applies an equal and opposite force back .

Newton's Third Law states:

For every action, there is an equal and opposite reaction

So while pulling a catapult:

Action: Your hand pulls the rubber band backward.

Reaction: The rubber band pulls your hand forward with equal force.

When you release it, the stretched rubber band pulls the stone forward, making it move at high speed.

Q7: Why mass does not differ, while weight differs from place to place?

ANS:

Mass does not differ from place to place because **mass is the amount of matter in an object** , and the amount of matter remains the same everywhere.

But weight differs from place to place because **weight depends on gravitational force** .

W=mg

The value of g changes slightly from place to place, such as:

Earth, Moon, mountains, poles, and equator.

So:

Mass remains constant because matter does not change.

Weight changes because gravitational pull changes.

Q8: Why do we feel pushed outward while a car turns on a curved road?

ANS:

When a car turns, the car is accelerating **toward the center of the curve** . To make you turn with the car, something must provide an inward, or **centripetal** , force on your body—usually friction from the seat, the seatbelt, or the car door.

Your body, however, tends to keep moving in a straight line due to inertia. So as the car turns inward, your body resists changing direction and seems to slide or lean toward the outside of the turn.

From the car's rotating frame of reference, it feels like there is an outward force pushing you. This is often called the Pseudo force (**centrifugal force)** , but it is not a real force in an inertial frame; it is an apparent force caused by being in a turning, accelerating car.

Q9: Which force prevents a passenger from falling down a roller coaster while it turns the riders into upside-down position?

ANS:

A passenger doesn't fall out mainly because the roller coaster provides a **centripetal force** that keeps them moving in a circular path.

At the top of an upside-down loop:

- **Gravity** pulls the passenger downward.
- The **seat/harness/track contact** can also push or hold the passenger downward toward the center of the loop.
- Together, these provide the needed **centripetal force** toward the center of the circular motion.

If the coaster is moving fast enough, the passenger's inertia keeps them following the loop rather than dropping straight down. In many coasters, the **safety harness** also physically restrains the rider, but the physics reason is the required **centripetal force** during circular motion.

Q10: Why it is easier to walk wearing flat slippers than the high heel sandals?

ANS:

It's easier to walk in flat slippers than in high-heel sandals mainly because flat slippers give you better balance and stability .

Larger area of support: Flat slippers touch the ground over a wider area, so your body is supported more evenly.

More natural posture: Flat footwear lets your feet and legs move in a more natural way, while high heels tilt your body forward and make walking harder.

Q11: Why leather sheet is used in brake drums of motor bike?

ANS:

Leather sheet (or a similar **friction lining**) is used in motorcycle brake drums because it helps produce **large friction** .

When the brake is applied, the brake shoe with the lining presses against the rotating drum. The friction between them:

- **Opposes the rotation** of the wheel
- **Slows down or stops** the motorcycle
- Provides better grip than bare metal contact
- Helps reduce wear on the metal parts.