Laws of Motion

Assertion Reason Questions

Two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (a), (b), (c) and (d) as given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false

1. Assertion (A): A table cloth can pulled from a table without disloding the dishes. **Reason (R):** To every action there is an equal and opposite reaction.

Ans. (b) Both A and R are true and R is not the correct explanation of A.Explanation: Newton's first law states that when a cloth is dragged off a table, it enters a state of motion, while the dishware stays motionless because of the law of initial. Therefore, the disher doesn't move when we remove the cloth from the table.

2. Assertion (A): A rocket works on the principle of conservation of linear mo- mentum. **Reason (R):** For two bodies system when there is a change in mom- entum of one body, the same change occurs in the mom- entum of the second body but in the opposite direction.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: As the fuel in the rocket undergoes combustion, the gases so produced leave the body of the rocket with large velocity and give upthrust to the rocket. If we assume that the fuel is burnt at a constant rate, then the rate of change of momentum of the rocket will be constant. As more and more fuel is burnt, the mass of the rocket goes on decreasing and it leads to increase of the velocity of rocket more and more rapidly.

3. Assertion (A): A particle is thrown vertically upwards. If air resistance is taken into consideration, then retardation in upward journey is more than the acceleration in downward journey.

Reason (R): Some mechanical energy is lost in the form of heat due to air friction **Ans.** (b) Both A and R are true and R is not the correct explanation of A.

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Explanation: Retardation in upward journey,

$$a_1 = \frac{w + F}{m}$$

 $a_2 = \frac{W - F}{m}$

Acceleration in downward journey,

Therefore,

4. Assertion (A): It is difficult to move a cycle along the road with brakes on. **Reason (R):** Sliding friction is greater than rolling friction.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: When the brakes are applied, the wheels skid rather than rolling. Rolling friction is less than sliding friction. Therefore, moving a bicycle down the road when its brakes are engaged is challenging.

5. Assertion (A): Friction always opposes motion of a body.**Reason (R):** Without friction also, one can move on a smooth surface.

Ans. (d) A is false and R is also false.

Explanation: Friction opposes the relative motion of the bodies in contact. By throwing something backwards, you can move forward.

6. Assertion (A): It is difficult to move a cycle along the road with its brakes on. **Reason (R):** Sliding friction is greater than rolling friction.

Ans. (a) Both A and R are true and R is the correct explanation of A. **Explanation:** When brakes are on there is no rolling of the wheels and the wheels slide. The sliding friction is greater than the rolling friction. Thus, it is difficult to move a cycle along the road with its brakes on.

7. Assertion (A): Centripetal force is always required for motion in curved path. **Reason (R):** On a banked curved track, vertical component of normal reaction provides the necessary centripetal force.

Ans. (d) A is false and R is also false.

Explanation: The horizontal portion of a normal response supplies centripetal force. The vehicle's vertical component balances its weight. For turning, a centripetal force is necessary.

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8. Assertion (A): Friction opposes motion of a body.

Reason (R): Static friction is self-adjusting, while kinetic friction is constant.

Ans. (d) A is false and R is also false.

Explanation: Friction opposes the relative motion of the bodies in contact, not the motion.

9. Assertion (A): Mass is a measure of inertia of the body in linear motion.Reason (R): Greater the mass, greater is the force required to change its state of rest or of uniform motion.

Ans. (a) Both A and R are true and R is the correct explanation of A.

Explanation: Inertia is the resistance of any physical object to any change in its state of motion. It is the parameter used to describe the motion of the object and how it is affected by the applied force. And the mass (m) is the measure of it.

Again

$$\vec{F} = m \frac{dv}{dt}$$
.

So, force is proportional to mass. So, greater the mass, the greater is the force required to change its state of rest or of uniform motion.

