Newton's Laws of Motion (Secondary 1)

Passage

When we observe how objects move, we often see patterns that seem simple but are actually governed by important scientific rules. These rules are known as Newton's Laws of Motion, named after the scientist Isaac Newton. They help us understand why objects start moving, stop moving, or change direction.

Newton's First Law is sometimes called the law of inertia. It states that an object will stay at rest or keep moving at a constant speed in a straight line unless a force acts on it. This explains why a ball on the ground eventually stops — friction, a force, slows it down. Without friction, the ball would keep rolling forever.

Newton's Second Law describes how force, mass, and acceleration are related. It can be written as Force = Mass × Acceleration. This means a heavier object needs a bigger force to accelerate. For example, pushing an empty shopping cart is easier than pushing a full one because the full cart has more mass.

Newton's Third Law states that for every action, there is an equal and opposite reaction. When you jump off the ground, your legs push down on the floor, and the floor pushes you upward with the same amount of force. This reaction force is what lifts you into the air.

Together, these three laws help us understand everyday motion — from why seatbelts are important to how rockets launch into space.

Questions

Part A — Multiple Choice

1. Which situation best shows Newton's First Law?
A. A rocket launching into space
B. A ball rolling and slowing down because of friction
C. A swimmer pushing water backward to move forward
D. A heavy box needing more force to push than a light box

2. According to Newton's Second Law, which object needs the greatest force to accelerate?
A. A 1 kg ball
B. A 2 kg ball
C. A 5 kg box
D. A 10 kg box

3. Which example shows Newton's Third Law?
A. A car slowing down on a rough road
B. A person pushing a wall and feeling the wall push back
C. A ball staying still until someone kicks it
D. A light object accelerating faster than a heavy one

Part B — Short Questions

4. Why does a ball eventually stop rolling on the ground, even though Newton's First Law says it should keep moving?

5. Explain why pushing a full shopping cart requires more force than pushing an empty one.

Part C — Data Interpretation

A student pushes a 4 kg trolley, causing it to accelerate at 3 m/s².

6. Calculate the force applied to the trolley.

A second trolley has a mass of 8 kg. The same force is applied.

7. Will the second trolley accelerate more, less, or the same? Explain.

Part D — Challenge Question

8. When a swimmer pushes backward on the water, the swimmer moves forward. Use Newton's Third Law to explain why.

Answer Key

Part A

1. B

2. D

3. B

Part B

4. The ball stops because friction acts on it. Friction is an external force that slows the ball down, so it cannot keep moving forever.

5. A full cart has more mass, so according to Newton's Second Law, it needs a larger force to produce the same acceleration.

Part C

6. Force = mass × acceleration = 4 × 3 = 12 N

7. It will accelerate less because it has more mass. With the same force, a heavier object produces a smaller acceleration.

Part D

8. When the swimmer pushes backward on the water (action), the water pushes forward on the swimmer with an equal and opposite force (reaction), causing the swimmer to move forward.