

Physical Science: Newton's Three Laws of Motion & Forces



Use the matching sheet ID when checking answers.

Part A: Physics Analysis. Solve the force and motion problems below.

1. A passenger riding in a city bus jolts forward toward the driver when the bus suddenly slams on its brakes. Which physical principle explains this phenomenon?

Answer: A. Newton's First Law: The passenger's body possesses inertia and tends to keep moving forward at constant velocity until acted upon by an external stopping force.

Newton's First Law states an object in motion remains in motion at constant velocity unless an unbalanced external force acts upon it. The passenger's body continues moving forward due to inertia.
2. A soccer player kicks a 0.5 kg ball, causing it to accelerate at 40 m/s². What net force was exerted on the ball by the player's foot?

Answer: B. 20 Newtons

Using Newton's Second Law: Net Force $F = \text{mass (m)} \times \text{acceleration (a)} = 0.5 \text{ kg} \times 40 \text{ m/s}^2 = 20 \text{ Newtons (N)}$.
3. When a space rocket's engines ignite, hot exhaust gases are violently expelled downward. According to Newton's Third Law, what is the reaction force that propels the rocket upward?

Answer: B. The expelled exhaust gas particles exert an equal and opposite upward thrust force directly onto the rocket engine

Newton's Third Law states every action has an equal and opposite reaction. The rocket exerts a downward force on the gas; the gas simultaneously exerts an equal upward force on the rocket.

Part B: Newton's Laws Classification Matrix. Categorize each physical scenario under the appropriate Law of Motion.

Sort these items: A hockey puck glides across frictionless ice at constant velocity without slowing down; Doubling the mass of a cart requires twice as much force to achieve the same acceleration; A swimmer pushes backward against the pool water and accelerates forward; A seatbelt catches and restrains a driver when their car comes to an abrupt halt; Pushing a light empty shopping cart accelerates it much faster than pushing a fully loaded cart with identical force; A cannon recoils backward simultaneously as the heavy cannonball is blasted forward

1st Law (Inertia)	2nd Law ($F = ma$)	3rd Law (Action-Reaction)
A hockey puck glides across frictionless ice at constant velocity without slowing down; A seatbelt catches and restrains a driver when their car comes to an abrupt halt	Doubling the mass of a cart requires twice as much force to achieve the same acceleration; Pushing a light empty shopping cart accelerates it much faster than pushing a fully loaded cart with identical force	A swimmer pushes backward against the pool water and accelerates forward; A cannon recoils backward simultaneously as the heavy cannonball is blasted forward