Newton's Toy Box Test Study Guide

Vocabulary (see Vocabulary Quizlets for definitions)
acceleration, air resistance, friction, gravity, inertia, kinetic energy, mass, momentum, newton, potential energy

Concepts

- An object's motion is described by its position in relation to nonmoving objects. Speed is a measurement of how fast an object changes position. Speed is calculated by dividing the distance an object traveled by the time it took the object to travel that distance (s=d/t). For example, if a car traveled 210 km in 2 h, 210/2=105 km/h
- Momentum is a property that a moving object has because of its mass and velocity (momentum=mv). (A small car going fast can have more momentum than a large truck going slow.) The law of conservation of momentum states that the total amount of momentum in a group of interacting objects does not change unless outside forces act on the object. Momentum can be transferred from one object to another (bowling ball to pins).
- A force is a push or a pull. Every force has size and direction; when forces are equal in size and opposite in direction, they cancel each other out, have a net force of zero, and do not cause a change in position. Unbalanced forces have a net force that is not zero; which causes acceleration in the form of speeding up, slowing down, and/or changing direction
- Newton's Laws of Motion
    - 1st law-an object at rest will remain at rest and an object in motion will continue to move at the same speed in a straight line unless a net force acts on it. It is sometimes called the law of inertia because inertia is the tendency of a still or moving object to resist changes in its motion.
    - 2nd law-an object acted on by a net force will accelerate in the direction of the force. The net force of an object is equal to its mass times its acceleration (f=ma).
    - 3rd law-for every action force exerted on an object, the object will exert a force that is equal (in strength) and opposite (in direction) reaction force (a ball bounces because it exerts a downward force on the floor and the floor exerts an upward force on the ball)
- Some amount of friction occurs between all surfaces in contact, regardless of how smooth or rough they appear; the four main types of friction are
    - static-occurs between stationary objects; it takes more force to get an object moving than to keep it moving because static friction is stronger than sliding friction
    - sliding-occurs when one object slides over another object; produces heat
    - rolling-occurs when one surface rolls across another; weaker and produces less heat than sliding friction
    - fluid-occurs when an object moves through a fluid; objects with more surface area experience greater fluid friction (like air resistance-a flat piece of paper falls slower than a crumpled one)
- Since gravity exists between any two objects in the universe, nothing is ever truly weightless. When astronauts are orbiting the Earth, they are actually in a state of free fall, which makes them appear to float. NASA calls this condition microgravity. It should not be confused with the lower gravitational force (17%) experienced on the moon.