CHAPTER 4 Content Outline for Teaching

Forces and Motion

Underlined words and phrases are to be filled in by students on the Note-taking Worksheet.

Section 1 Describing Motion

A. Motion is relative to a reference point that is relevant for the situation.

B. Motion involves a change of position.

1. **Position**—how far an object is from a reference point; location
2. Distance—the difference between the final position and the initial position if motion is in a straight line
3. **Displacement**—the direction and distance between the final position and the starting position

C. The distance traveled divided by the time needed to travel that distance is **speed**.

1. Average speed is the total distance traveled divided by the total time.
2. Motion can be plotted on a graph with time on the horizontal axis and distance on the vertical axis.

D. **Velocity**—speed in a particular direction; can change as an object moves along;

E. A change in velocity divided by the amount of time over which the change occurs is **acceleration**; the change in velocity can be due to a change in speed, a change in direction, or both.

Discussion Question

How do distance and displacement differ? Distance measures straight-line position change; displacement includes the direction as well as the distance of a position change.

END

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Section 2 Forces

A. Force—a push or a pull with size and direction

B. The motion of an object changes when a force acts on it; force causes acceleration.
   1. The more mass an object has, the greater its **inertia**, or tendency to resist a change in motion.
   2. **Balanced forces**—two equal forces that cancel each other because they are acting in opposite directions on the same object; the object's motion does not change
   3. An object's motion will change if unbalanced forces act on it; net force is the difference between two forces.

C. Friction—a force that resists motion between two touching surfaces
   1. Friction is present in almost all motion.
   2. Air resistance—friction of air

D. Gravity— the pull that all matter exerts on other matter; it acts between all objects that have mass
   1. Weight is a measure of the strength of Earth's gravitational pull.
   2. Mass is the amount of matter in an object.

Discussion Question

What is the relationship between mass and inertia? Objects with greater mass have greater inertia.

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