Alternative Assessment

1. Predict what will happen in the following test of the laws of motion. You and a partner face each other, each holding a bathroom scale. Place the scales back to back, and slowly begin pushing on them. Record the measurements of both scales at the same time. Perform the experiment. Which of Newton's laws have you verified?
2. Research how the work of scientists Antoine Lavoisier, Isaac Newton, and Albert Einstein related to the study of mass. Which of these scientists might have said the following?
   - **a.** The mass of a body is a measure of the quantity of matter in the body.
   - **b.** The mass of a body is the body's resistance to a change in motion.
   - **c.** The mass of a body depends on the body's velocity.

   To what extent are these statements compatible or contradictory? Present your findings to the class for review and discussion.
3. Imagine an airplane with a series of special instruments anchored to its walls: a pendulum, a 100 kg mass on a spring balance, and a sealed half-full aquarium. What will happen to each instrument when the plane takes off, makes turns, slows down, lands, etc.? If possible, test your predictions by simulating airplane motion in elevators, car rides, and other situations. Use instruments similar to those described above, and also observe your body sensations. Write a report comparing your predictions with your experiences.
4. With a small group, determine which of the following statements is correct. Use a diagram to explain your answer.
   - **a.** Rockets cannot travel in space because there is nothing for the gas exiting the rocket to push against.
   - **b.** Rockets can travel because gas exerts an unbalanced force on the rocket.
   - **c.** The action and reaction forces are equal and opposite. Therefore, they balance each other, and no movement is possible.

Graphing Calculator Practice

Static Friction

The force of static friction depends on two factors: the coefficient of static friction for the two surfaces in contact, and the normal force between the two surfaces. The relationship can be represented on a graphing calculator by the following equation:

$$Y_1 = SX$$

Given a value for the coefficient of static friction (S), the graphing calculator can calculate and graph the force of static friction (Y_1) as a function of normal force (X).

In this activity, you will use a graphing calculator program to compare the force of static friction of wood boxes on a wood surface with that of steel boxes on a steel surface.

Visit go.hrw.com and type in the keyword **HF6FORX** to find this graphing calculator activity. Refer to **Appendix B** for instructions on downloading the program for this activity.

Alternative Assessment ANSWERS

1. Scales will have identical readings because of Newton's third law.
2. Lavoisier: (a), because Lavoisier is credited with establishing the fact that mass is conserved in chemical reactions; Newton: (a) and (b), because Newton established a definition of force by relating it to mass and acceleration; Einstein: (a), (b), and (c), because Einstein showed that at high speeds, Newton's second law of motion requires an additional correction term that is speed dependent
3. Students may construct accelerometers and/or anchor helium-filled balloons to the elevator or car floor. Students' reports should compare their predictions to their experiences.
4. Statement b is true. The gas pushes in all directions. Some gas pushes forward on the rocket, and some exits through the back. The net force in the forward direction causes the acceleration.

extension

Graphing Calculator Practice

Visit go.hrw.com for answers to this Graphing Calculator activity.

Keyword HF6FORXT