Name: _____ _____/ 24

Chapter 4.1 Homework
Conceptual Physics Parent Signature: _____

Reviewing Concepts
Each question is worth 1 point.

1. State Newton's third law in your own words.

2. Action and reaction forces always have the _____ strength and act in _____ directions.

3. You and a friend are sitting across from each other on chairs with wheels. You push off each other and move in opposite directions. Explain the following:

a. How does the force you feel compare to the force your friend feels?

b. If your mass is greater than your friend's mass, how do your accelerations compare?

4. A book rests on a table. The force of gravity pulls down on the book. What prevents the book from accelerating downward?

5. Provide three examples of Newton's third law in everyday life. List the action and reaction forces in each example.

6. What two things does an object require to have momentum?

7. Consider an airplane at rest and a person walking through the airport.

a. Which has greater mass?

b. Which has greater velocity?

c. Which has greater momentum? Explain.

8. Explain the two different ways to calculate *impulse*.

9. Is the unit used to represent impulse the same as the unit for momentum? Explain.

10. State the law of conservation of momentum in your own words.

11. You and your little cousin are standing on in-line skates. You push on each other and both move backwards.

a. Which of you moves back at a greater speed? Use the law of conservation of momentum to explain your answer.

b. How does your impulse compare to your cousin's impulse?

12. When you jump, you move upward with a certain amount of momentum. Earth moves downward with an equal amount of momentum. Why don't you notice the Earth's motion

Solving Problems

1. You throw a basketball by exerting a force of 20 N. According to Newton's third law, there is another 20-N force created in the opposite direction. If there are two equal forces in opposite directions, how does the ball accelerate? (1)

2. What is the momentum of a 2-kg ball traveling at 4 m/s? (1)

3. How fast does a 1,000-kg car have to move to have a momentum of 50,000 kg·m/s? (1)

4. Idil's momentum is 110 kg·m/s when she walks at 2 m/s. What's her mass? (1)

5. Which has more momentum: a 5,000-kg truck moving at 10 m/s or a sports car with a mass of only 1,200 kg moving at 50 m/s? (1.5)

6. Two hockey players on ice skates push off each other. One has a mass of 60 kg. The other has a mass of 80 kg.

    a. If the 80-kg player moves back with a velocity 3 m/s, what is his momentum? (0.5)

    b. What is the 60-kg player's momentum? (0.5)

    c. What is the 60-kg player's velocity? (0.5)

7. A 75-kg astronaut floating in space throws a 5-kg rock at 5 m/s. How fast does the astronaut move backwards? (1)

8. A 2-kg ball is accelerated from rest to a speed of 8 m/s.

a. What is the ball's change in momentum? (0.5)

b. What is the impulse? (0.5)

c. A constant force of 32 N is used to change the momentum. For how much time does the force act? (1)

9. A 1,000-kg car uses a braking force of 10,000 N to stop in 2 s.

a. What impulse acts on the car? (0.5)

b. What is the change in momentum of the car? (0.5)

c. What was the initial speed of the car? (1)