NAME_____ DATE_____ CLASS_____

STUDY GUIDE Chapter 3

Action and Reaction

Choose the term from the list below that is best described by each statement. Write the term to the left of each statement.

Newton's second law of motion	reaction	mass
Conservation of momentum	momentum	action
Newton's third law of motion	velocity	

_____ 1. When one object exerts a force on a second object, the second object exerts a force that is equal in size and opposite in direction.

_____ 2. The backward "kick" of a rifle that is fired is an example of a(n) _____ force.

_____ 3. The total amount of momentum of a group of objects does not change unless outside forces act on the objects.

_____ 4. A net force acting on an object causes the object to accelerate in the direction of the force.

_____ 5. Air rushing out the neck of a balloon causes the balloon to move. The air that comes from the balloon is an example of a(n) _____ force.

_____ 6. In the equation $p = mv$, p represents _____ .

_____ 7. Momentum has direction because _____ has direction.

_____ 8. Momentum is a property a moving object has because of its _____ and velocity.

Think for a minute about Newton's third law of motion. Can you remember any event when you experienced this law? If so, draw a diagram below to show the action-reaction forces. If you can't remember an event that you experienced, try to think up one and draw it below.

NAME_____ DATE_____ CLASS_____

REINFORCEMENT Chapter 3

Action and Reaction

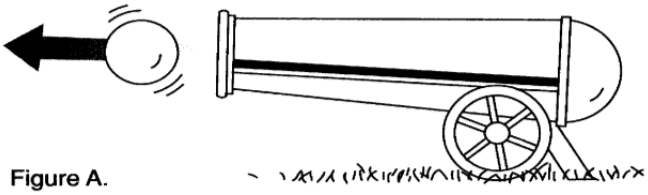

Figure A.

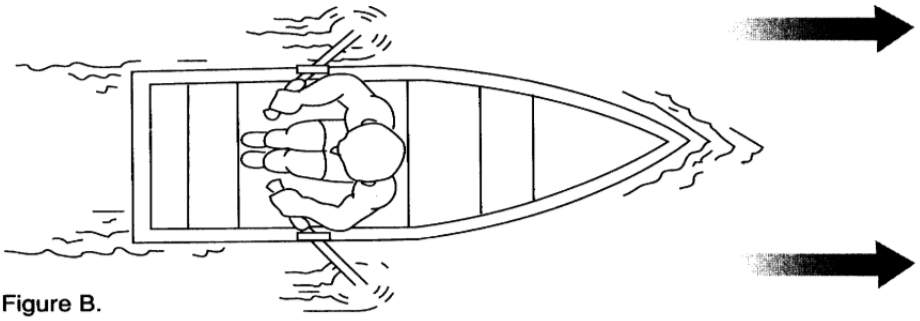

Figure B.

Use the diagram *to complete the following.*

1. Draw an arrow on Figure A to show the direction the cannon will move when the cannonball is fired.
2. Draw arrows on Figure B to show the direction the oars must move to propel the boat forward.
3. Does the arrow you drew on Figure A represent an action force or a reaction force?

_____

4. Does the arrow you drew on Figure B represent an action force or a reaction force?

_____

5. If the force which propels the cannonball forward is 500 N, how much force will move the cannon backward? Explain._____

_____

Solve the following.

1. What is the momentum of a 2-kg toy truck that moves at 10 meters per second?

2. What is the momentum of a 2000-kg truck that moves at 10 meters per second?

3. Which truck has more momentum? Why?_____

_____

NAME_____ DATE_____ CLASS_____

ENRICHMENT Chapter 3

Action and Reaction

NEWTON'S LAWS /N MOT/ON

Coach Rogers had 6 positions to fill on his football team. In order to be considered for a particular position, the players had to meet certain physical criteria, Table 1. Coach Rogers had obtained data on each player that he planned to use in assigning players to positions Table 2. Determine each player's mass from his weight. Assume a = 9.8 m/s/s. Use your knowledge of Newton's laws to assign the players to the positions for which they are best suited.

Table 1

Position	Description/Criteria
line	Stops other players from crossing the scrimmage line. Requires great strength in a short distance.
back	Runs with football. Requires speed and agility.
end	May block as a lineman or act as a pass receiver. Requires both speed and strength.

Table 2

Player	Weight	Mass	Time/36-m dash	Speed at finish line
Allen	833 N		4.51 s	16.0 m/s
Terry	735 N		4.40 s	16.4 m/s
Frank	911 N		1.82 s	16.0 m/s
Dave	825 N		4.71 s	15.3 m/s
Bob	1010 N		4.90 s	14.7 m/s
Carlos	932 N		4.60 s	15.7 m/s

Select two players for each position. Assign each player to a position. Explain your selection in terms of Newton's laws

Position	Player	Reasoning

Assuming their accelerations remained the same, how many kilograms would Dave have to gain to exert the same force at the finish line as Allen? (Hint: Determine ***a*** for each boy using $v = v_0 + at$, where $v_0 = 0$ because the players started from a rest position. Then use ***F=ma*** *to* solve for ***m***,)