Newton's Third Law Worksheet - (Action-Reaction) Name: _____

Try to answer the questions below.

1. A diver dives off of a raft - what happens to the diver? The raft? How does this relate to Newton's Third Law?

   Action Force: _____ Reaction Force: _____

2. A tennis racquet hits a tennis ball. Why doesn't the racquet swing backwards when the ball hits it? (Shouldn't it swing back because of action-reaction forces?)

3. What action-reaction forces are involved when a rocket engine fires? Why doesn't a rocket need air to push on?

   Action Force: _____ Reaction Force: _____

4. What forces are acting on a book sitting on a table? Are action-reaction forces involved in this situation?

5. If two people each standing on a scooter board push off of each other what happens (Newton's 3rd Law)?

6. In #5 how would the distance moved by the scooter boards compare if one person had a lot more mass than the other person?

7. If a person standing on a scooter board pushes off of a wall, what happens? Can this situation be explained in terms of Newton's 3rd Law (action-reaction)?

8. How is shooting a shotgun related to Newton's 3rd Law? b. Why does a rifle have less "kick" than shotgun?

Use Newton's third law (law of action-reaction) and Newton's second law (law of acceleration: a = F_{net}/m) to complete the following statements by filling in the blanks.

a. A bullet is loaded in a rifle and the trigger is pulled. The force experienced by the bullet is _____ (less than, equal to, greater than) the force experienced by the rifle. The resulting acceleration of the bullet is _____ (less than, equal to, greater than) the resulting acceleration of the rifle.

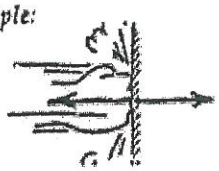
b. A bug crashes into a high speed bus. The force experienced by the bug is _____ (less than, equal to, greater than) the force experienced by the bus. The resulting acceleration of the bug is _____ (less than, equal to, greater than) the resulting acceleration of the bus.

c. A massive linebacker collides with a smaller halfback at midfield. The force experienced by the linebacker is _____ (less than, equal to, greater than) the force experienced by the halfback. The resulting acceleration of the linebacker is _____ (less than, equal to, greater than) the resulting acceleration of the halfback.

d. The 10-ball collides with the 14-ball on the billiards table (assume equal mass balls). The force experienced by the 10-ball is _____ (less than, equal to, greater than) the force experienced by the 14-ball. The resulting acceleration of the 10-ball is _____ (less than, equal to, greater than) the resulting acceleration of the 14-ball.

1. In the example below, the action-reaction pair is shown by the arrows (vectors), and the action-reaction described in words. In (*a*) through (*g*) draw the other arrow (vector) and state the reaction to the given action. Then make up your own example in (*h*).

Example:

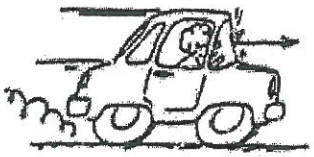


Fist hits wall.

Wall hits fist.

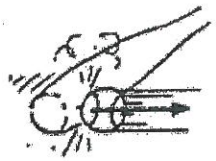
Head bumps ball.

(*a*)_____



Windshield hits bug.

(*b*)_____



Bat hits ball.

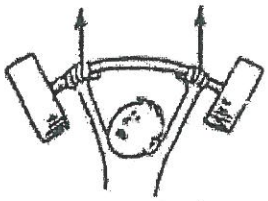
(*c*)_____

Hand touches nose.

(*d*)_____

Hand pulls on flower.

(*e*)_____



Athlete pushes bar upward.

(*f*)_____

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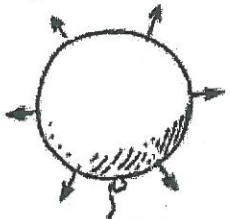

Compressed air pushes balloon surface outward.

(*g*)_____

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(*h*)_____

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