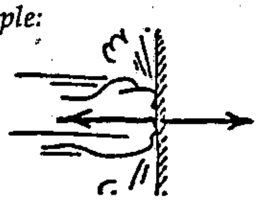
Name Period Date

Concept-Development Practice Page **6-1**

Newton's Third Law

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:

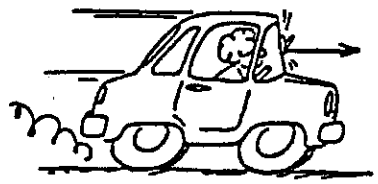


Fist hits wall.

Wall hits fist.

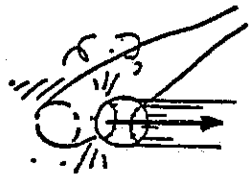
Head bumps ball.

(*a*) ____________________



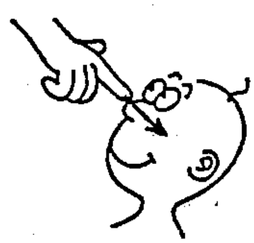
Windshield hits bug.

(*b*) ____________________



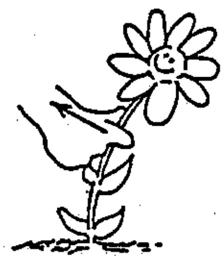
Bat hits ball.

(*c*) ____________________



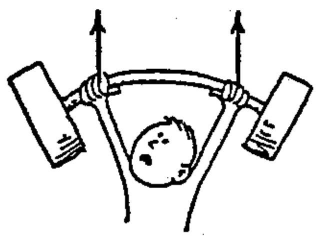
Hand touches nose.

(*d*) ____________________



Hand pulls on flower.

(*e*) ____________________



Athlete pushes bar upward.

(*f*) ____________________

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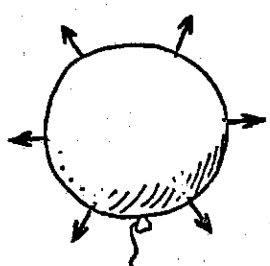

Compressed air pushes balloon surface outward.

(*g*) ____________________

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(*h*) ____________________

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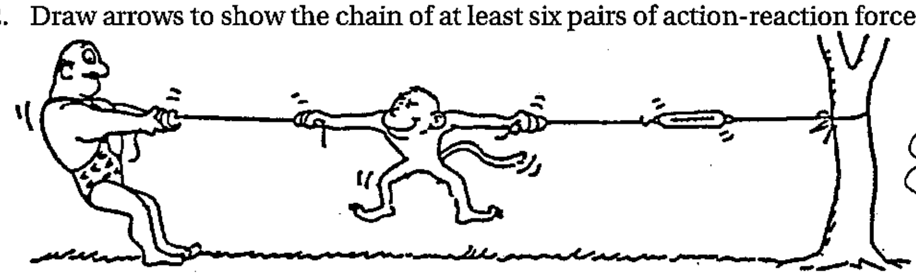
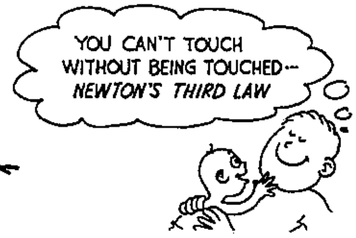
2. Draw arrows to show the chain of at least six pairs of action-reaction forces below.

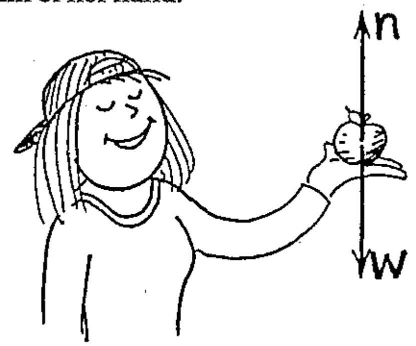




Conceptual PHYSICS

Newton's Third Law

3. Nellie Newton holds an apple weighing 1 newton at rest on the palm of her hand. The force vectors shown are the forces that act on the apple.



a. To say the weight of the apple is 1 N is to say that a downward gravitational force of 1 N is exerted on the apple by
(the earth) (her hand).

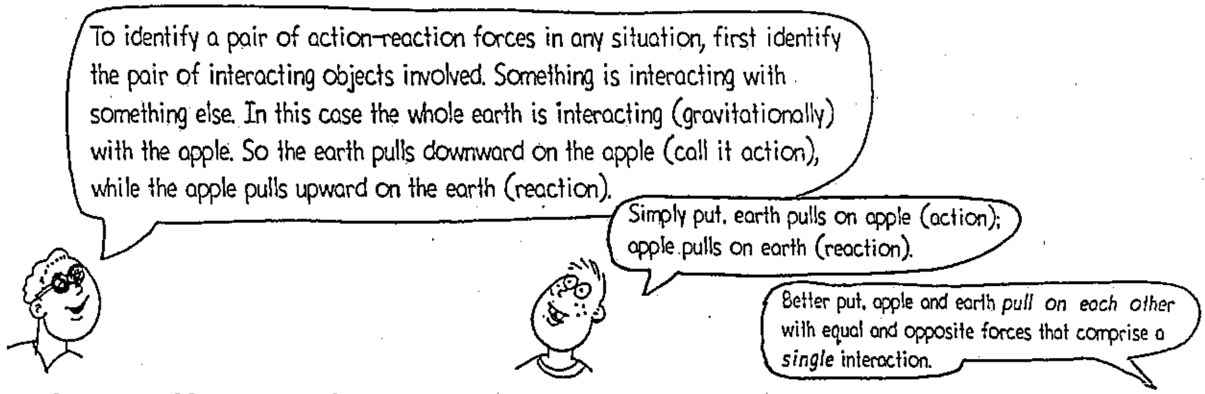
b. Nellie's hand supports the apple with normal force **n**, which acts in a direction opposite to W. We can say **n**
(equals W) (has the same magnitude as W).

c. Since the apple is at rest, the net force on the apple is (zero) (nonzero).

d. Since **n** is equal and opposite to W, we (can) (cannot) say that **n** and W comprise an action-reaction pair. The reason is because action and reaction always
(act on the same object) (act on different objects),
and here we see **n** and W
(both acting on the apple) (acting on different objects).

e. In accord with the rule, "If ACTION is A acting on B, then REACTION is B acting on A," if we say *action* is the earth pulling down on the apple, *reaction* is
(the apple pulling up on the earth) (**n**, Nellie's hand pushing up on the apple).

f. To repeat for emphasis, we see that **n** and W are equal and opposite to each other
(and comprise an action-reaction pair) (but do *not* comprise an action-reaction pair).



g. Another pair of forces is **n** [shown] and the downward force of the apple against Nellie's hand [not shown]. This force pair (is) (isn't) an action-reaction pair.

h. Suppose Nellie now pushes upward on the apple with a force of 2 N. The apple
(is still in equilibrium) (accelerates upward), and compared to W, the magnitude of **n** is
(the same) (twice) (not the same, and not twice).

i. Once the apple leaves Nellie's hand, **n** is (zero) (still twice the magnitude of W),
and the net force on the apple is (zero) (only W) (still W - **n**, which is a negative force).

***Conceptual* PHYSICS**

