Name ______________________ Class ______________ Date ______________

Concept-Development Practice Page **7-2**

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).

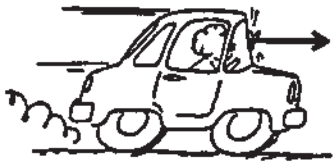
Example:

Fist hits wall

Wall hits fist

Head bumps ball

a. ______________________



Windshield hits bug

b. ______________________

Bat hits ball

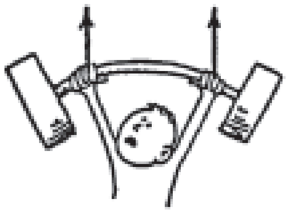
c. ______________________

Hand touches nose

d. ______________________

Hand pulls on flower

e. ______________________



Athlete pushes bar upward

f. ______________________

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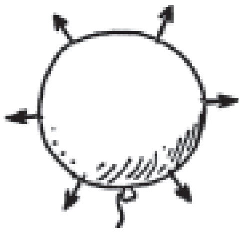

Compressed air pushes balloon surface outward

g. ______________________

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h. ______________________

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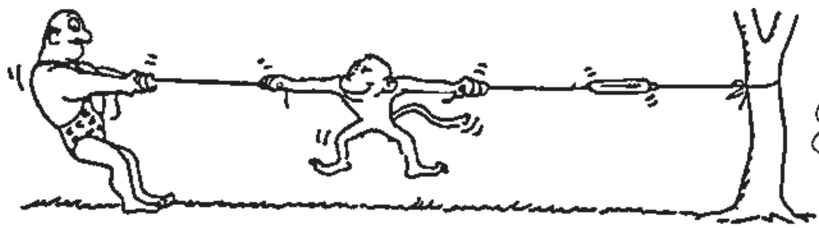
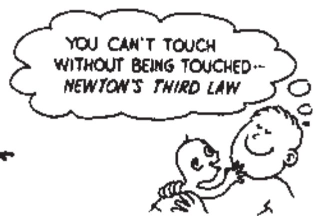
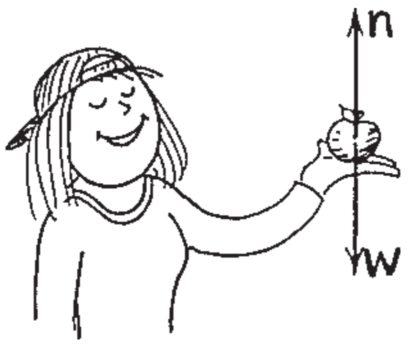
2. Draw arrows to show the chain of at least six pairs of action-reaction forces below.





CONCEPTUAL PHYSICS

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 (Earth) (her hand).

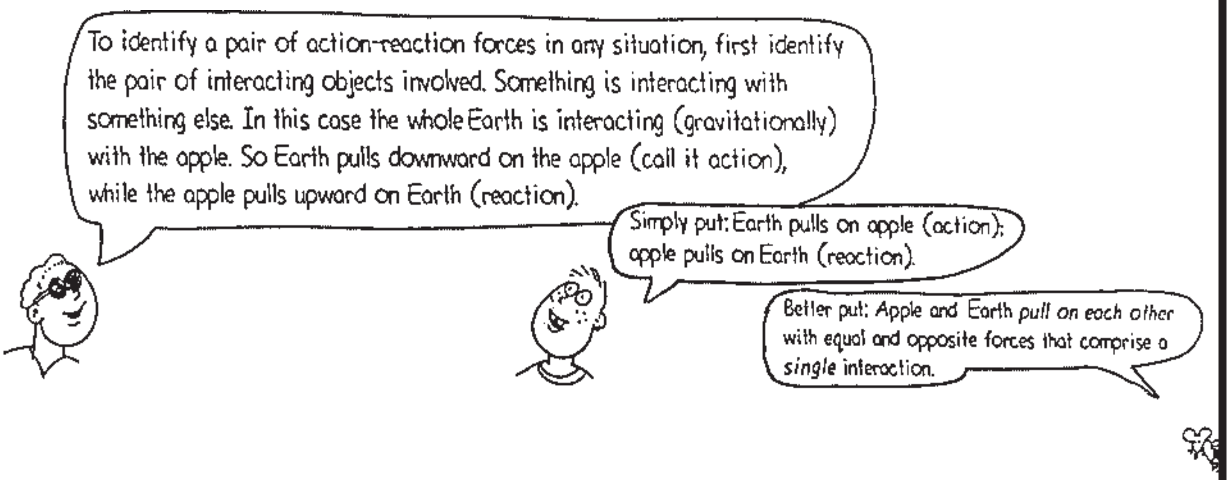
   b. Nellie's hand supports the apple with normal force **n**, which acts in a direction opposite to **W**. We can say **n** (equals **W**) (has the same magnitude as **W**).

   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 Earth pulling down on the apple, *reaction* is (the apple pulling up on 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