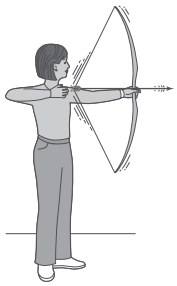
PRACTICE

Activity 4: Elastic Interactions

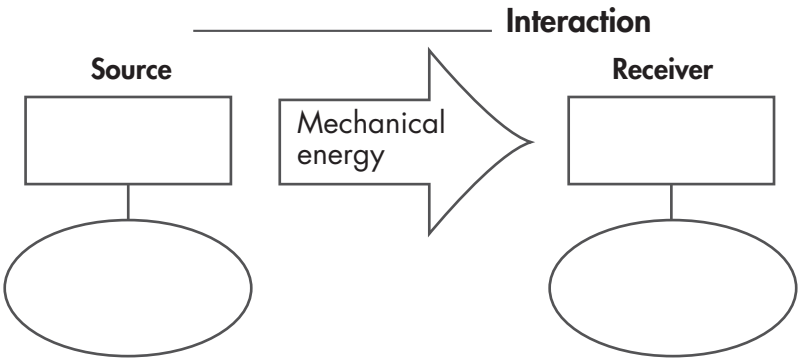
Name Date Class

Part 1

(Questions 1–3) An archer is shooting at a target to practice for a competition. She launches an arrow from her bow.

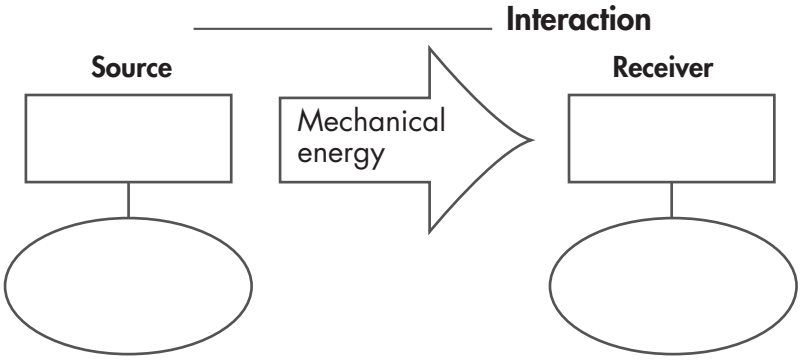


1. Complete the energy diagram for this interaction, showing the kind of interaction and the changes in energy.

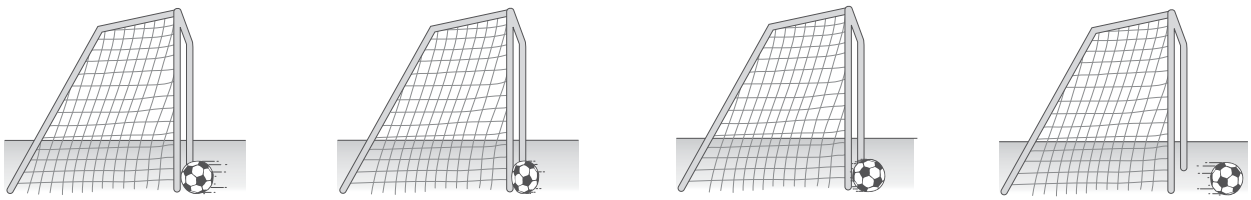


2. Does the elastic interaction continue after the arrow has left the bow? Why or why not?

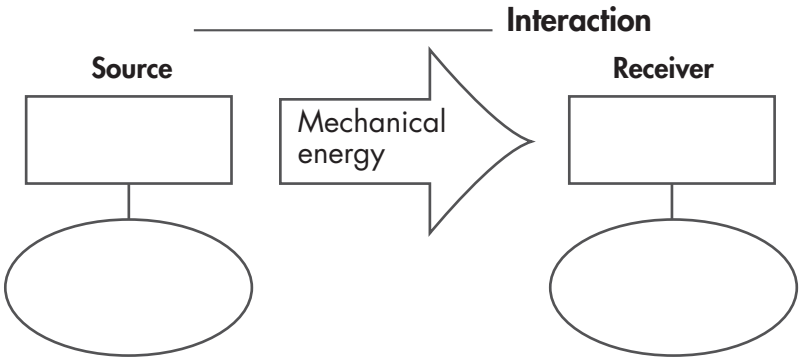
3. What does the arrow interact with after leaving the bow? Complete the energy diagram for this interaction.



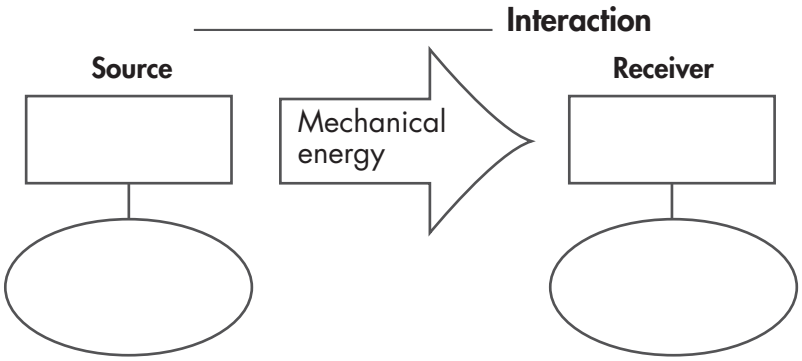
(Questions 4–6) A soccer player kicks a soccer ball to try to score a goal and just misses! The ball hits the metal pole on the side of the goal and rebounds backward. These four sketches show the ball hitting the pole, then bouncing off backwards and rolling on the grass (before the goalie scoops it up!)



4. Complete the energy diagram below by describing what happens to the energy as the ball comes to a stop against the pole.



5. Complete the energy diagram below by describing the ball rebounding off the pole.

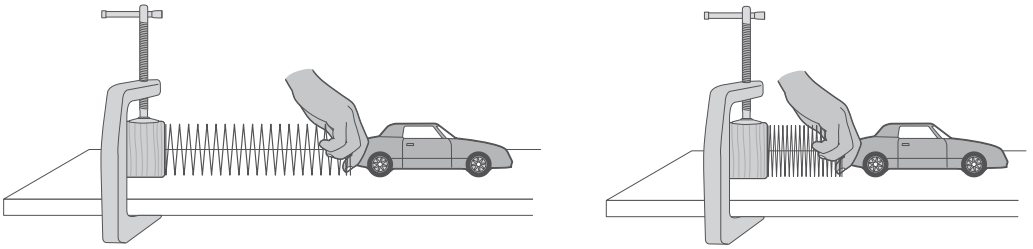


6. Does the ball's interaction with the pole continue after they are no longer touching? How do you know?

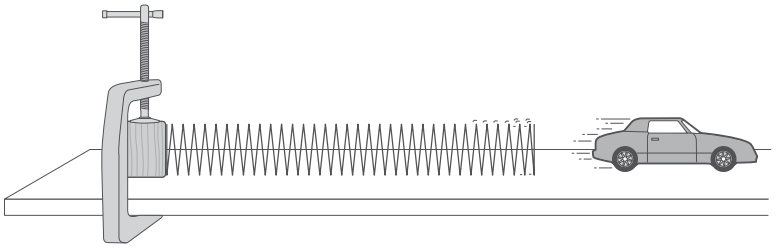
Part 2

(Questions 1–8) A class wants to do an experiment to find an answer to the following:

Does the amount that a stretchy object is compressed affect its interaction with another object?



To test this, a class set up the following exploration. A spring launcher was clamped to a table. The spring could be half compressed or completely compressed, then used to launch a toy car. Students used the partially compressed spring to launch the toy car and did this four times. For each launch, a student measured how far the car traveled. Next, the toy car was launched four times using the completely compressed spring. The distance that the car traveled was measured each time.



1. Rewrite the experiment question in the form of a relationship:

If _____*changes*,

(Write the *manipulated variable*.)

then what happens to _____?

(Write the *responding variable*.)

2. Write your hypothesis and reasons:

*I think that if the*_____*increases*,

(Write the *manipulated variable*.)

then the _____ will _____

(Write the *responding variable*.) (*increase*, *decrease*, or *stay the same*)

because _____

_____

(Write the reasons that support your hypothesis.)

3. Describe how the *responding variable* could be measured. (Remember to include units if applicable.)

4. Brainstorm the variables that could affect the exploration's results. In *Table 1: Control Variables*, list the variables and describe how each of these variables could be controlled (held constant) to make a fair test.

Table 1: Control Variables

Variable	How it could be controlled

The class collected the following data for the distance the toy car traveled.

Table 2: Distance Toy Car Moves versus Spring Compression

Distance object moves (cm)	Spring compression	
	Position 1 Halfway compressed	Position 2 Completely compressed
Launch 1	40 cm	65 cm
Launch 2	38 cm	68 cm
Launch 3	39 cm	67 cm
Launch 4	41 cm	68 cm
Average		
Uncertainty		

5. Calculate the averages and uncertainties, and record them in Table 2.

6. Interpret your results, then write your conclusion using evidence from the class's experiment to support your conclusion.

I conclude _____

Use the checklist entitled *How to Evaluate an Experiment Conclusion* to check whether your conclusion is a good one. If it is poor, rewrite your conclusion.

7. How does your conclusion compare with your hypothesis?

8. Draw an energy diagram below to describe the stretchy interaction in this exploration.