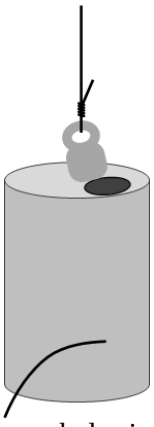
Science 8 Name: _____

LAB #10: SPRINKLERS Date: _____

Sprinklers Lab #10



Discussion: Some sprinklers used to water a lawn have an S shaped top that spins when the water is running. How can we use what we have learned about Newton's 3rd Law of Motion and Pascal's Principle to explain how such a sprinkler works? If we make a soda can sprinkler like the one shown to the right, do you think adding more water will make it spin faster, slower, or the same speed? If we measure how fast a soda can sprinkler rotates with one hole to drive it, how fast will it turn with two or three holes to drive it?

Purpose: To explain how a soda can sprinkler works in terms of Newton's 3rd Law of Motion and Pascal's Principle. We will also create and test a hypothesis.

Hypothesis: Do you think that adding more water to the can will cause the can to spin faster, slower, or at the same speed? Will more holes in the soda can cause the can to spin faster, slower, or at the same speed?

Theory: Use Newton's three laws of motion to predict how the addition of more water and more holes in the soda can will affect the rate of spin of the sprinkler.

Materials: water soda can pin fishing line

Method and Data Collection:

1. The instructor will make a soda can sprinkler by using a pin to make a small hole in the side of a soda can and pulling the pin off to the side to make a spout. The can will be suspended using fishing line.
2. Add water to the can until it is about ½ full. Suspend the can and measure and record the time required for the can to make 5 full turns.

   Time required for 5 turns: _____ seconds
3. Predict how adding more water to the can will affect the rate the sprinkler spins. Also add a theory (explanation) that supports your prediction.

   Prediction: _____

   Explanation (theory): _____

   _____

   _____
4. Fill the can almost full of water, suspend the can, measure and record the time required to complete 5 full turns.

   Time required for 5 turns: _____ seconds

5. Predict how adding more holes to the can will affect the rate the sprinkler spins. Also add a theory (explanation) that supports your prediction.

   Prediction: _____

   Explanation (theory): _____

   _____

   _____

6. Add a second hole to the can then measure and record the time required to complete 5 full turns.

   Time required for 5 turns: _____ seconds

7. Add a third hole to the can then measure and record the time required to complete 5 full turns.

   Time required for 5 turns: _____ seconds

8. Add a fourth hole to the can then measure and record the time required to complete 5 full turns.

   Time required for 5 turns: _____ seconds

Analysis:

1. What should happen to the water pressure in the can as more water is added? What should happen to the force on the water coming out of the can? Base your answers on Pascal's Principle.

   Pressure: _____

   Force: _____

2. Remember that Newton's 1st Law of Motion is sometimes called the law of inertia. How should increasing the mass of water in the can affect the speed of rotation of the can? Base your answer on Newton's laws of motion.

   _____

   _____

3. When more water was added to the can, did it spin faster, slower, or at about the same speed? Now that you know the actual result, correctly explain the behavior of the sprinkler based on Newton's three laws of motion and Pascal's Principle.

   _____

   _____

   _____

4. Did your experimental data match your prediction for adding more holes in the can?

   _____

5. Did the rate of spin vary directly with the number of holes in the can? Support your answer with data from the lab.

   _____

   _____

   _____

Conclusions:

1. Explain how increasing the amount of water in the can changed the pressure and the inertia of the can. Did these factors affect the rate of spin the same way or in opposing ways?

2. Based on your answer to conclusion #1 above, explain why it is important to consider all factors when a variable is changed in an experiment.

3. Based on your answers to conclusions #1 and #2 above, explain why it is important to take actual measurements in an experiment.