Name _____ Date _____ Period _____

Balloon Rockets Lab

Newton's third law of motion (Action and Reaction)

Background:

A rocket's movement depends on ***Newton's Third Law of Motion – For every action there is an equal and opposite reaction***.

Objectives:

1. To understand that every action has an equal and opposite reaction
2. To investigate the forces affecting a rocket
3. To use the SI units of measurements correctly during our investigation

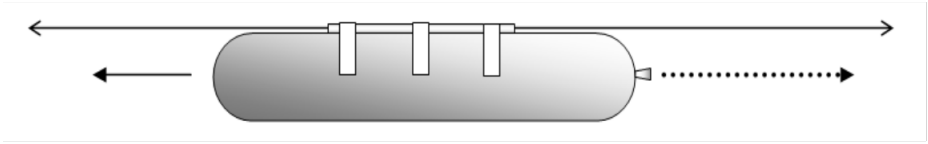
Problem:

How will the amount of air inside a balloon affect the speed of a rocket?

Hypothesis:

Materials:

- balloon
- string/fishing line
- stopwatch
- scissors, tape
- Clothes pins
- Straw
- Sheets of paper



Procedures:

1. Using the materials available, design and construct a balloon rocket.
2. Blow up the balloon (full) and clamp it shut with the clothespin again.
3. Thread the string through the drinking straw. Tape the long side of the balloon along the length of the straw.
4. Have two people hold the ends of the string. Make sure the string is stretched tight.
5. Slide the balloon-straw system into the string as seen on the diagram above.
6. Release the clothespin and run the balloon rocket. Measure the distance and the time traveled by the rocket and record this data on the data-table titled "Full of air." Complete at least 3 trials. Use
7. Calculate all the averages (use a calculator if needed)
8. Blow up the balloon and repeat steps 5 and 6 but this time only fill the balloon half-full of air.
9. Repeat 3 trials and record your data in the data table
10. Do all the calculations needed (use a calculator if needed)
11. Answer the questions after you have completed the data-table

Data Tables

Balloon full of air			
Trial	**Distance (m)**	**Time (s)**	**Average speed**
1			
2			
3			
Average			

Balloon half-filled with air			
Trial	**Distance (m)**	**Time (s)**	**Average speed**
1			
2			
3			
Average			

Balloon full of air with pennies			
Trial	**Distance (m)**	**Time (s)**	**Average speed**
1			
2			
3			
Average			

Questions:

1. What is the action force in this investigation?

2. What is the reaction force in this investigation?

3. How is the speed of these two objects compared?

4. Draw a diagram of your balloon rocket and label forces acting on it.

5. Where did you see acceleration on these experiments? Explain why?

6. What other forces were acting on your balloon rocket?

7. What happened when the amount of force (amount of air in the balloon) was changed?

8. How might you modify your design to make it travel further and faster?

9. What do you think would happen if your balloon had more mass when you launched it? Answer the question using Newton's First and Second Laws.

10. Tape 4 pennies on your balloon to increase its mass and see if your hypothesis in question #9 was correct. Record all your data on the 3rd data-table. Explain your answer below