PHYSICS IN MOTION
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Unit 3E
Newton's 3rd Law
Balloon Racing Lab

Name:

Date:

In today's activity, you will be experiencing Newton's third law by racing your classmates in a balloon race.

Materials:

- balloon
- string
- straw
- tape
- paperclip
- measuring tape
- timer

Objective:

Your purpose is to maximize the distance and the speed your balloon travels along the string track. Priority will be given to balloons that make it the entire distance of the track with speed being the second criterion.

You will be provided a balloon, a string, tape, and a paper clip, and you will attach the balloon to the string by passing the string through the straw. You can modify the design of your balloon rocket with the paper clip, the length of the straw, how much tape is used, and how your balloon is oriented with respect to the straw.

You will need to measure the distance and time the balloon travels while air is being pushed out of the balloon, and the distance and time the balloon travels as it slows to a stop.

Diagram of First Rocket

Draw a diagram of your balloon rocket, including all important measured values:

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Data collected When air is being pushed out of the balloon:

Trials	Mass of Rocket (kg)	Distance Traveled While Air Is Being Pushed Out (m)	Time (s)	Acceleration (m/s^2)	Net Force (N)
1					
2					
3					
Average					

1. What equations will you use when calculating the average acceleration of the balloon and the net force acting on it?

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Name:

Date:

Data collected when balloon is flat and slowing down:

Trials	Mass of Rocket (kg)	Distance Traveled While Air Is Being Pushed Out (m)	Time (s)	Acceleration (m/s^2)	Net Force (N)
1					
2					
3					
Average					

2. What equations will you use when calculating the average acceleration of the balloon and the net force acting on it?

Diagram of Second Modified Rocket

Draw a diagram of your balloon rocket, including all important measured values:

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Name:

Date:

Data collected when air is being pushed out of the balloon:

Trials	Mass of Rocket (kg)	Distance Traveled While Air Is Being Pushed Out (m)	Time (s)	Acceleration (m/s^2)	Net Force (N)
1					
2					
3					
Average					

Data collected when balloon is flat and slowing down:

Trials	Mass of Rocket (kg)	Distance Traveled While Air Is Being Pushed Out (m)	Time (s)	Acceleration (m/s^2)	Net Force (N)
1					
2					
3					
Average					

questions continued on next page

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Questions to consider:

3. What are some positive aspects of your design? What did you change? Did the change(s) speed up your balloon? Explain.

4. For your first balloon, how does the average force applied to the balloon by the escaping air compare to the average force applied to the balloon as it is stopping?

5. Is the force applied by the air on the balloon constant? What evidence do you have to support your claim?

6. What forces act on the balloon to slow it down? Are these forces present on the balloon as it is speeding up?

7. How does Newton's third law apply to the motion of the balloon? Draw a diagram of the action-reaction force pairs involved in the balloon's motion.