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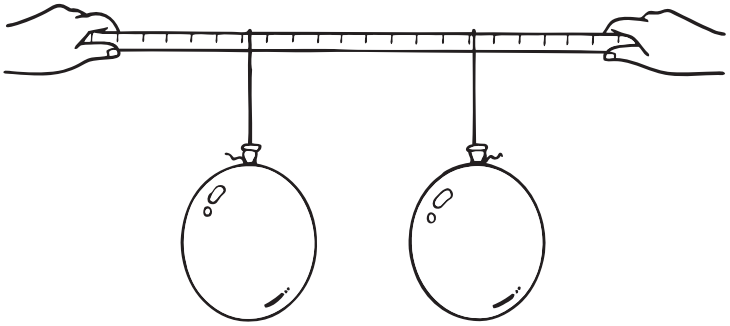
Introduction

Challenges

Name _____ Date _____

Bernoulli's Principle Activity Cards *(cont.)*

Activity 3–Friendly Balloons



Materials

- two balloons
- yardstick
- string
- straws (one per student)

Procedure

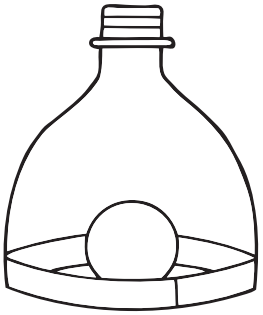
1. Two students hold the yardstick as shown so that the balloons hang freely.
2. Predict what will happen when you blow between the balloons.

   _____
3. Use your straw to blow air between the balloons.

   ➜ What happens? _____

   _____
4. Take turns holding the yardstick so that each student gets a turn to blow.

Activity 4–Keep the Ball in the Funnel



Materials

- water-bottle funnels
- Ping-Pong balls

Procedure

1. Each student should use his or her own water-bottle funnel.
2. Place the Ping-Pong ball on the table and place the water-bottle funnel upside down over it.
3. Predict what will happen when you blow through the funnel.

   _____
4. Blow!

   ➜ What happens?

   _____

Name _____ Date _____

Reaction Action

Test 2: Dish Soap, Baking Soda, and Vinegar

Directions

1. Describe the properties of each substance in the chart below in the **Before** column.
2. Set the cup of baking soda on a plate.
3. Pour the dish soap into the baking soda, and mix gently.
4. Pour the vinegar in and watch.
5. In the **After** column, describe the properties of the substance created by mixing.
6. Answer the questions below the chart. State whether you think a reaction has occurred, and provide evidence.

Properties	Before	After
Color	Baking soda	
	Dish soap	
	Vinegar	
Texture	Baking soda	
	Dish soap	
	Vinegar	
Odor	Baking soda	
	Dish soap	
	Vinegar	
State of Matter (solid, liquid, gas)	Baking soda	
	Dish soap	
	Vinegar	

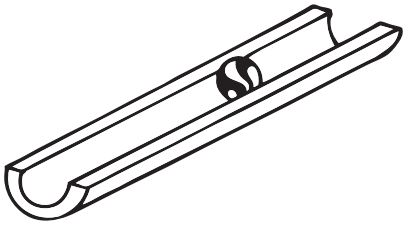
Did a reaction take place? Yes No

What is your evidence? _____

Marble Mayhem

Mini Challenge

Part 1



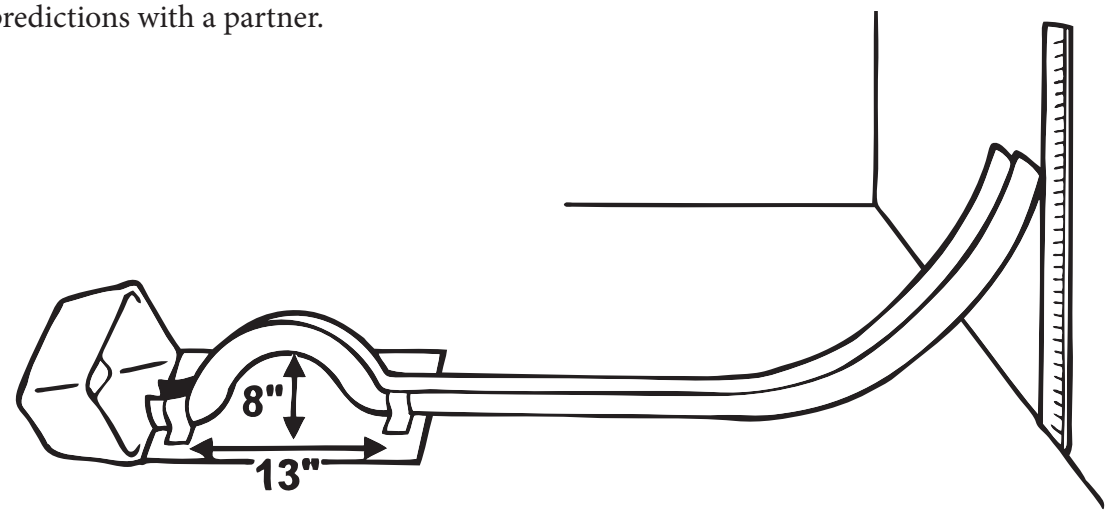
1. Show students a piece of the pipe insulation that has been split in half lengthwise. Tell them that this will be the track for their marble coasters. Demonstrate how a marble fits into the channel in the track. Ask:

   —How can I get the marble to roll along the track? (*Students may say that you should push it. Push the marble with your finger in the track. They may say that you should tilt the track. Tilt the track so that the marble runs along the channel.*)

2. Point out that when you lift one end of the track, you need to use energy to lift the marble up to the top. Then, when you put the marble in the track, its gravitational potential energy turns to kinetic energy as it rolls down the track.

3. Show students the prepared test track. Place the test track near a wall or another vertical surface (bookcase, filing cabinet, etc.) so that the free end rests on the wall. Set the start of the track less than one foot up the wall. Place a box, a bin, or a bucket on its side at the end of the track to keep the marble from rolling away. Ask students:

   —What will happen when I put the marble in at the beginning of the track? Let them discuss their predictions with a partner.



4. Carefully release the marble at the very top of the track, and let everyone watch what happens. (*The marble will not make it over the hill.*) Ask:

   —Does the marble need more or less energy to go over the hill? (*more*)

   —How can we give it more energy? (*Raise the height of the start.*)

5. Raise the start as high as you can get it to go. You will need to move the cardboard (supporting the hill) closer to the wall. Ask:

   —What happens to the marble? (*The marble went too fast and jumped out of the track near the top of the hill.*)

Name _____ Date _____

Marble Run Test

Test Track Setup

1. Bend one end of the track into a hill that is 8 inches high and about 13 inches apart at the bottom.
2. Tape the track to a piece of cardboard to keep the hill in place. Try to keep the tape out of the track channel so that it won't slow down the marble.
3. Set the other end of the track against the wall at the height listed in the first column. Use your yardstick to set the height of the start.
4. You will need to slide the hill closer to the wall as you raise the height of the start.

Testing Directions

1. As you run each test, predict what you think will happen when you send the marble down the track at each height. Write your prediction in the second column.
2. Send the marble down the track by letting it go—don't push the marble to give it extra energy.
3. Carefully watch what happens. Record your results in the third column.

Height of Start	Prediction	Results
8 inches		
10 inches		
12 inches		
14 inches		
16 inches		
18 inches		

Analyze and Evaluate

1. What patterns do you see in your results?

_____

2. Can you make any statements about the energy of the marble based on your results?

_____

Name _____ Date _____

Green Roof Models

Challenge: Build a green roof model according to the Challenge Constraints.

Challenge Constraints

- Build a green roof model using available materials.
- Your model should hold as much water as possible.
- Your model should have all of these layers: waterproof membrane, drainage/storage layer, filter layer, growing medium, and plants.

Criteria for Success: To be successful, green roof models must hold at least 75% of the one cup of water poured over them.

Construction

1. Choose the materials for each layer of your green roof.

   Plants: _____

   Growing medium: _____

   Filter layer: _____

   Drainage/storage layer: _____

   Waterproof membrane: _____

2. Assemble your model building using the 6-inch and 7-inch squares and tape.
3. Sketch your green roof model and label each layer.
4. Build your green roof model on top of your model building.

Test the Green Roof

1. Place the model in the testing tray.
2. Pour one cup of water slowly over your roof.
3. Wait 10 seconds, and remove your green roof model from the tray.
4. Pour any runoff water out of the testing tray into a measuring cup.
5. How much water ran off of your green roof model?

   ➜ What percentage of the one cup of water ran off? _____

   ➜ What percentage of the one cup of water was absorbed by your roof? _____

6. If your roof absorbed less than 75% of the water, what could you have done differently.