

Lab: When Does Something Accelerate?

Instruction Sheet

Purpose: To determine under what conditions an object will experience acceleration and what direction the acceleration will occur.

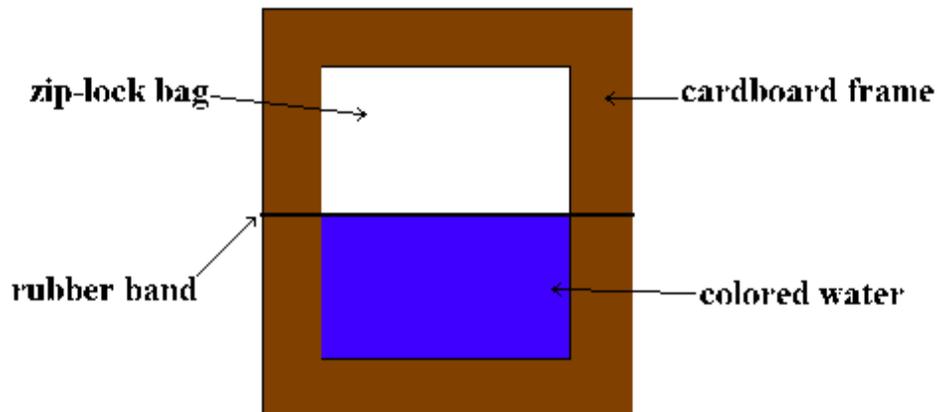
Materials: quart-size “zipper” type plastic bag duct tape
utility knife or scissors rubber band
2-pieces of cardboard (10” x 12”) water
food coloring

Procedures:

1. Cut out two (2) pieces of cardboard about 10 x 12 inches in size.
2. Place the plastic bag in the center of one of the cardboard pieces and trace its outline.
3. Cut out a rectangle in the center of the cardboard pieces that measures about one (1) inch smaller in width and height than the outline of the bag. Repeat steps 2 and 3 for the second piece of cardboard.

Safety Note: Be careful. Scissors are sharp. Improper use of the scissors can easily result in you cutting or impaling yourself on one of the blades when cutting out the center piece

4. Place the bag over the cutout in one piece of cardboard, centering it as though you were framing a picture. Tape the bottom and sides of the bag to the cardboard. Do not tape the top of the bag.
5. Place the second piece of cardboard over the bag, sandwiching it between the two cardboard pieces. Tape the cardboard pieces together at the bottom and sides. Leave the top open.
6. Open the plastic bag and fill it one-third full of colored water and seal the bag by zipping it shut.
8. Examine the plastic bag, particularly at the corners, to determine if it is leaking. If it is leaking empty the bag in the sink and get a new bag. If it is not leaking go ahead to the next step.
7. Slip a rubber band over the cardboard pieces and adjust it so that it is parallel with the water level. Congratulations, your accelerometer is now complete. It should look something like the illustration below.



How it all works: The rubber band marks the equilibrium level of the water. Thus when the accelerometer is stationary, or undergoing no acceleration, the rubber band will be level with the water. Any acceleration will cause the water to move away from the equilibrium position, indicating magnitude and direction of acceleration. The **water** will always **move** in a direction **opposite** of the **acceleration**. This is due to the water's inertia. As you accelerate the cardboard frame the water will naturally want to stay in its "current state". Thus it will be left behind and slosh to the side of the container.

Tasks: Your task is to subject your accelerometer to eight (8) different conditions / situations, observe what happens to the water lever, and conclude if acceleration occurred and if so in what direction.

In addition was there a net force acting on the accelerometer, in what direction was the net force acting, or were the forces balanced.