

Capillary Action Activities Worksheet

Part I: The Meniscus

Purpose

Cohesive and adhesive forces can affect water at its surface. Cohesive forces cause water molecules to be attracted to each other and hold the water together providing as little surface area as possible. Adhesive forces, on the other hand, encourage water molecules to “stick” to solid objects. The relative strength of these two forces determines how water behaves at a water-air-solid boundary.

Equipment

- graduated cylinder

Procedure

1. **Fill** a graduated cylinder half full of water.
2. In the space below, **sketch** the shape of the water’s surface. **Label** the water, glass and air in your sketch. This curvature of the water is known as the **meniscus**.

Questions—The Meniscus

1. Water is strongly attracted to glass. How does this explain the shape of the meniscus?
2. Why doesn’t the water climb higher along the glass?
3. Liquid mercury, unlike water, is repelled by glass. If you filled your cylinder with mercury instead of water, what would the surface of the mercury look like? Sketch your idea below and label the mercury, glass and air in your sketch.

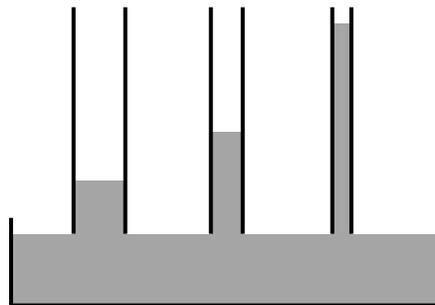
Part II. Capillary Tubes

Purpose

Consider a glass tube placed in a cup of water. Inside the tube, adhesive forces draw the water up the sides of the glass tube to form a meniscus. Cohesive forces then try to minimize the surface area by drawing water up the tube against gravity. This rise in the water level in a tube due to adhesive and cohesive forces is known as *capillary action*.

Equipment

- ring stand with support ring attached
- 3 capillary tubes of different diameters
- large Petri dish
- twist-ties
- water with dark food coloring
- ruler



Procedure—Climbing Water

1. **Place** an empty Petri dish directly below the support ring.
2. On the lab bench, **arrange** the glass capillary tubes in order of increasing inner diameter (ID) as noted on their tags.
3. **Attach** each capillary tube to support ring using a twist-tie. *Caution: Capillary tubes are delicate—handle with care.*
4. **Arrange** the capillary tubes so that each *almost* touches the bottom of the Petri dish.
5. **Fill** the Petri dish with water dyed with food coloring.
6. Watch as water begins to rise quickly in each capillary tube. **Wait** two minutes, or until the water stops rising. **Record** the water height in each capillary tube, below:

Inner Diameter (mm)	Maximum Height of Water (cm)
0.60	
0.31	
0.20	

Questions—Climbing Water

1. What happened when you put the end of a capillary tube into water?
2. If you want water to climb higher, would you use a thin tube or a thick tube?
3. Is the relationship between the inner diameter and the height of the water linear or exponential? Consider the ratio between each differing diameter and its respective height.

