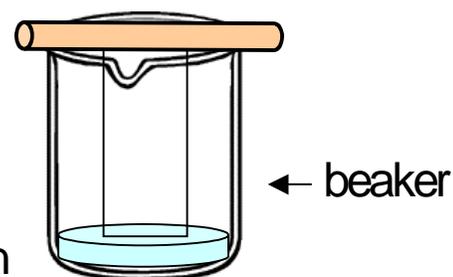
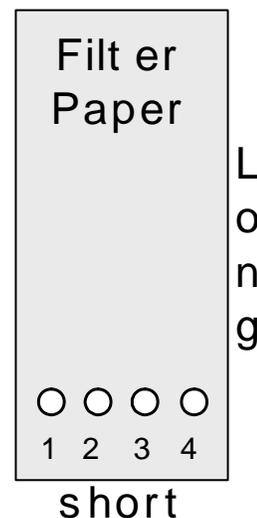




# Dye Detective

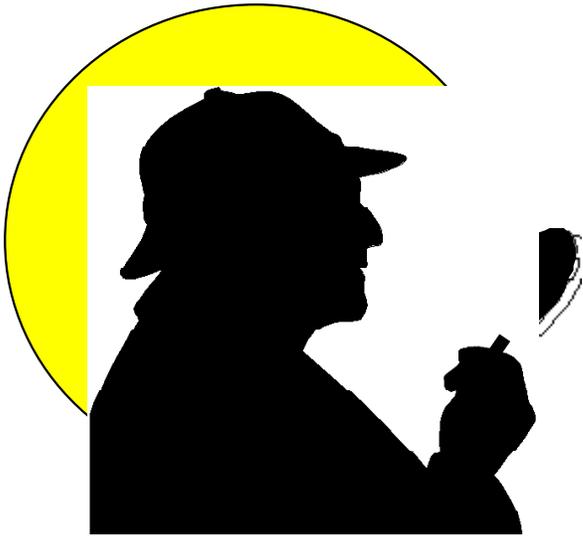
## Procedure:

1. Always wear safety goggles.
2. **Important: Use a pencil for this step.**
  - Write the numbers 1 through 4 about half an inch from the bottom of a piece of filter paper (as shown on the right).
  - Draw a circle over each number.
3. • Choose four different markers.
  - With one marker, color the circle over the number “1” on the paper. Use the other markers to fill in the other circles on the paper.
4. Add **just enough water** to the beaker to cover the bottom.
5. • Attach the paper to the clip on the round stick.
  - Hang the paper inside the beaker as shown in the picture. The bottom edge of the paper should barely touch the water in the beaker.



(If the water in the beaker does not reach the bottom of the paper, **remove the paper and add just enough water to wet the very bottom edge of the paper** when it hangs into the beaker.)

6. Watch the marker spots as the water climbs up the paper.
7. When you are done, put the paper in the waste cup.



Why did the inks travel different distances on the paper?

Could you identify a specific type of marker using this method?

## A Closer Look:



Most markers and pens contain several different inks. In this experiment, you used paper and water to separate the inks in each marker into a recognizable pattern. This process, known as [chromatography](#), is frequently used by forensic scientists to separate and identify different substances.

How does it work? The molecules of each kind of ink have different sizes, shapes, and charges, so each ink has different chemical properties. Some inks are very attracted to the paper, for instance, while others are more attracted to the water. These differences explain what happens when water moves up the paper. The inks that like water are carried quickly up the paper, while those inks that like paper are slowed down and separated.

A more powerful version of this process, called gas chromatography, uses gas to carry the chemicals instead of paper. With gas chromatography, forensic scientists can separate and identify many, many things, including paint chips,

pharmaceuticals, brands of lipstick, food residues, accelerants, and tobacco.