

## AP Chemistry Lab

### Paper Chromatography of Cations

#### Pre-Lab Questions

- 1) What are the two phases of paper chromatography?
- 2) What is a chromatograph?
- 3) What makes one ion travel a shorter or longer distance compared to another on a chromatograph?
- 4) Read the procedure. Why do you think you must cover the developing beaker with plastic wrap while developing the chromatograph?
- 5) What must be true of a solution that contains a positive metal ion?

#### Procedure

- 1) Cut a rectangle of filter or chromatography paper to be at least 9 cm from top to bottom and 12 cm long.
- 2) With a pencil, draw a line about 1 cm from the bottom (long edge) and parallel to the bottom of the paper.
- 3) Evenly space five pencil marks along the parallel line you just drew. Label them  $\text{Cu}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mn}^{2+}$ , and unknown.
- 4) Using a capillary tube, spot a small dot of each solution on the corresponding label.
- 5) Dry the spots.
- 6) Add a second drop of the same solution on top of the first.
- 7) Form the paper into a cylinder and secure the ends together with two staples. Do not overlap the paper.
- 8) Place a small volume of the developing solvent (a mixture of 6 M HCl and acetone) in the beaker. Be sure the level of the solvent remains below where the spots will touch them.
- 9) Place the paper cylinder carefully into the solvent with the spots at the bottom. Be sure that the solvent does not touch the spots.
- 10) Cover with plastic wrap and observe.
- 11) When the solvent has almost reached the top of the paper, remove the paper and place a pencil mark where the solvent stopped.
- 12) In the fume hood, spray the paper with 6 M ammonia and observe any spots.
- 13) Using a dropper full of sodium sulfide solution, streak the dropper up the paper up from each "X" to the top of the paper and observe the spots.
- 14) Compare the known dissolved metal with the unknown to identify the metals.

## **Data**

The data for this experiment is the chromatograph that you make. A picture of it should be drawn in your lab book. Label it as clearly as you can.

## **Post Lab Questions**

- 1) Which dissolved metals had the greatest attraction for the paper?
- 2) Which dissolved metal had the greatest solubility?
- 3) What is the ratio of the distance traveled in millimeters of the dissolved copper compared with the distance traveled by the solvent? This is called the  $R_f$  value.
- 4) Why do you think the colored chloride and the colored ammonia complexes faded?
- 5) How can you identify an unknown dissolved metal salt with this technique?