**Name: _____ Block: ___ Date: _____**

# You Gotta Keep 'em Separated

**Separation Lab – Part I – Paper Chromatography**

**Background**

Although they appear as one pure color, most black inks are comprised of a mixture of pigments -- sometimes as many as eight or nine. A filter paper wedge acts as a wick, drawing water up to a full circular filter paper spotted with black ink. As the water is then absorbed outward and flows past the black spots, each of the pigments gets subjected to two opposing forces: its attraction to the filter paper, which is acting to hold the pigment in place and is known as the "stationary phase", and its attraction to the water, which is acting to pull the pigment outward along with it and is known as the "mobile phase". Due to the nature of the molecules that make them up, some of these pigments are more attracted to the filter paper than the water and thus stay more or less where they are spotted, while others are more attracted to the water than the paper and thus move out quite far. Thus, chromatography can be thought of as a race, separating out the fast pigments from the slower ones. The longer the chromatography is allowed to run, the more separated out the pigments become. If, however, the filter paper is not removed before the water reaches the edge, then the pigments, which cannot evaporate the way the water can, are deposited on the edge, one on top of the other. If given enough time, the pigments would eventually end up all together again in a circle along the entire edge of the filter paper. The color of this circle would, of course, be black. To prevent this from happening, the filter paper should be lifted up out of the water when the separation is greatest, effectively stopping the race in the middle and freezing the pigments in place.

Note that the slower pigments may have a strong attraction to both the water and the filter paper. However, the key is that the slower pigment is attracted to the paper more strongly than to the water; the slower pigment spends more time attached to the paper than dissolved in the moving water.

**Procedure**

1. Make sure your work space has a clean dry surface. Use pencil for any labels. (The pencil does not run.)
Obtain a piece of filter paper and poke a hole (2-3 mm diameter) through its center. Using a pencil, write your first and last names lightly along the edge of it.

2. Use a black pen to make five or six dots equally spaced out in a small circle around the center hole. The dots should be about 6-8 mm from the center.

3. Now select a second pen, a different color than the first, and use it to make dots in between the first dots. You should end up with 10-12 black dots in a circle around the center of the paper.

4. Wrap 1/3 of a paper towel around the base of a wooden skewer. Insert the skewer through the center hole. Fill a cup with water to within about a centimeter of the top, and dry the rim with a paper towel. Then, carefully place the filter paper on top of the cup so that the base of the paper towel extends down into the water and lightly touches the filter paper.

5. Go on to other parts of the separation lab while the water soaks into the paper……

6. Once the water has spread to within 1-2 cm of the edge, carefully lift up the filter paper and set it on an empty cup to dry.

**Questions:**

1. Which color had the strongest attraction to the solvent (water)? How do you know?

2. Which color had the weakest attraction to the solvent?

**Separation Lab – Part 2 – Distillation**

**Background**

Distillation is the process of heating a liquid until it boils, capturing and cooling the resultant hot vapors, and collecting the condensed vapors. In the chemistry laboratory, distillation is a powerful tool, both for the identification and the purification of organic compounds. The boiling point of a compound—determined by distillation—is well-defined and thus is one of the physical properties of a **compound by which it is identified**. Distillation is used to **purify a compound** by separating it from a non-volatile or less-volatile material. When different compounds in a mixture have different boiling points, they separate into individual components when the mixture is carefully distilled.

**Procedure**

1. Observe the distillation apparatus that has been set up in the lab.
2. Illustrate the set-up, make sure to label each piece of equipment. Note any important physical characteristics.
3. Record the temperature of the vapors.

1. Heating mantle
2. Ring stand
3. Florence flask
4. Rubber stopper
5. Thermometer
6. Condenser
7. Cold water inlet/outlet
8. Distillate container

---

Physical Characteristics:

Original Substance
Description: _____

Distillate
Description:_____

Temperature: ___

**Questions:**

1. Define distillate:

2. If the boiling points of the two liquids are substance A 100°C and substance B 130°C, which substance is collecting in the distillate container? How do you know?

**Separation Lab – Part 3 – Magnetism**

**Background**

Magnetic Poles, Forces, and Fields

Every magnet has two poles. This is where most of its magnetic strength is most powerful. These poles are called north and south or north-seeking and south seeking poles. The poles are called this as when a magnet is hung or suspended the magnet lines up in a north - south direction. When the north pole of one magnet is placed near the north pole of another magnet, the poles are repelled. When the south poles of two magnets are placed near one another, they also are repelled from one another. When the north and south poles of two magnets are placed near one another, they are attracted to one another.

Magnetic Materials

The term magnetism is derived from Magnesia, the name of a region in Asia Minor where lodestone, a naturally magnetic iron ore, was found in ancient times. Iron is not the only material that is easily magnetized when placed in a magnetic field; others include nickel and cobalt.

Magnets can also be formed that are called electromagnets. A simple electromagnet is formed with a battery and copper wire coiled around a metal rod such as a nail. There is evidence that there is an electrical basis for magnetism.

**Procedure**

1. Observe the mug of bits 'n beans. It is a collection of material from a broken food processor. Record your observations.
2. Using the magnet remove all contaminants possible. Record results.

| |
|---|
| Observations:<br><br>Results:<br>Magnetic items:<br><br>Non-magnetic items: |

**Questions**

1. Were you able to remove all foreign objects from the beans? Why?

2. Discuss two alternate methods that could be used to remove the remaining contaminants.