Problem Statement: On Valentine's Day Ella received three different cards from secret admirers. She suspected that all the cards were written with the same black ink. Plan and design an experiment to confirm or deny Ella's suspicions. Note that the black ink is insoluble in water.

Topic: Paper Chromatography

Title: Investigating the differences between inks by using Paper Chromatography

Hypothesis: If the retention factor of the three inks is the same, then the same pen was used to write all three letters.

Aim: To determine whether the black inks are the same

Apparatus/Materials: chromatography paper, ethanol, pencil, the three letters, scissors, beaker

Variables

Manipulated: the ink spot

Responding: the retention factor,

Controlled: the three cards, ethanol,

Procedure:

1. Cut 3 pieces of filter paper, each 10cm by 3 cm. Draw a line at the bottom of the paper, called the baseline.
2. Put each valentine's day card into a petri dish with ethanol to allow the ink to dissolve.

3. Take a capillary tube, get ink from each card, and put a drop onto the center of the baseline of each filter paper.
4. Add 20ml of ethanol to a beaker.
5. Poke a hole in the top of each paper, put a skewer through it, and put the skewer horizontally over the beaker, ensuring that the water does not pass the baseline.
6. Mark where each component separated using a pencil.
7. Use a ruler to measure the distance travelled by the component and the distance travelled by the solvent (solvent front), and write the results down in the respective columns.
8. Calculate the retention factor and the solvent front using the formula following: retention factor = distance travelled by component/solvent front
9. Repeat steps 4 to 6 for the other 2 strips of paper, recording the results in the table below.
10. Analyse the retention factors, and draw the relevant conclusions.

Expected Results and interpretation: If the retention factors of the inks on the cards is the same, it is most likely the same pen used.

Data Collection:

	Solvent front	**Distance travelled by solvent**	**Retention factor**
Ink1			
Ink2			
Ink3			

Precautions:

1. Do not put the baseline in the solvent.
2. Ensure you use a pencil, not a pen so that the ink does not dissolve in the solvent

Sources of Error:

1. The solvent front may be measured inaccurately, since our ruler is only so precise
2.

Limitations:

1. The kind of paper used on each letter could be different

Assumptions: We assume that the letter is written in a way that allows there to be free space surrounding the ink; the entire paper is not filled with words, leaving the ink with nowhere to travel.