GCSE Chemistry required practical activity: Chromatography

Student sheet

Investigation into the use of paper chromatography to separate and identify a mixture of food colourings

You will use paper chromatography to separate the different colours present in an unknown mixture of food colourings. You will then measure the distance travelled by each colour and the solvents to calculate R_f values.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

- 250 cm^3 beaker
- glass rod
- a rectangle of chromatography paper
- four known food colourings labelled **A**-**D**
- an **unknown mixture** of food colourings labelled **U**
- glass capillary tubes.

Read these instructions carefully before you start work.

1. Use a ruler to draw a horizontal pencil line 2 cm from a short edge of the chromatography paper.

   Mark five pencil spots at equal intervals across the line. Keep at least 1 cm away from each end.
2. Use a glass capillary tube to put a small spot of each of the known colourings on four of the pencil spots. Then use the glass capillary tube to put a small spot of the unknown mixture on the 5th pencil spot.

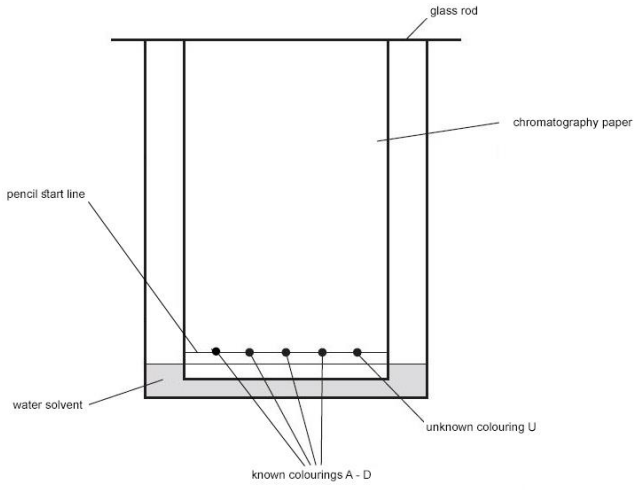
   Try to make sure each spot is no more than 5 mm in diameter. Label each spot **in pencil**.

3. Pour water into the beaker to a depth of **no more than 1 cm**.
4. Tape the edge of the chromatography paper to the glass rod. The paper needs to be taped at the end furthest from the spots.

   Rest the rod on the top edge of the beaker. The bottom edge of the paper should dip into the water.

   Ensure that the:

   - **pencil line is above the water surface**
   - **sides of the paper do not touch the beaker wall.**



5. Wait for the water solvent to travel at least three quarters of the way up the paper. Do **not** disturb the beaker during this time.

Carefully remove the paper. Draw another pencil line on the dry part of the paper as close to the wet edge as possible.

6. Hang the paper up to dry thoroughly.
7. Measure the distance in mm between the two pencil lines. This is the distance travelled by the water solvent.

   Measure and record the same distance for each food colouring in the table below.

Food colouring	Distance travelled in mm		Rf value
	Solvent	Spot	
A	80	45	
B	80	57	
C	80	25	
D	80	10	

7. For each of the four known colours, measure the distance in mm from the bottom line to the centre of each spot. Write each measurement in the table.

8. Use the following equation to calculate the R_f value for each of the known colours.

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Write the calculated values in the table.