11–14 years

Chromatography of sweets

ROYAL SOCIETY OF CHEMISTRY

Education
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https://rsc.li/3MU3TEf

Aim

Food colourings contain different dyes.

Your aim is to investigate the number of different dyes in coloured sweets using chromatography.

Learning objectives

1. Recap the keywords behind chromatography.
2. Investigate the dyes that are in different coloured sweets by successfully following a method.
3. Write a conclusion and analyse the results.

Starter questions

1. What is meant by the word ‘solute’?
2. What does ‘solvent’ mean?
3. Define the term ‘solution’.
4. What is meant by the word ‘mixture’?
5. Define the term ‘chromatography’.

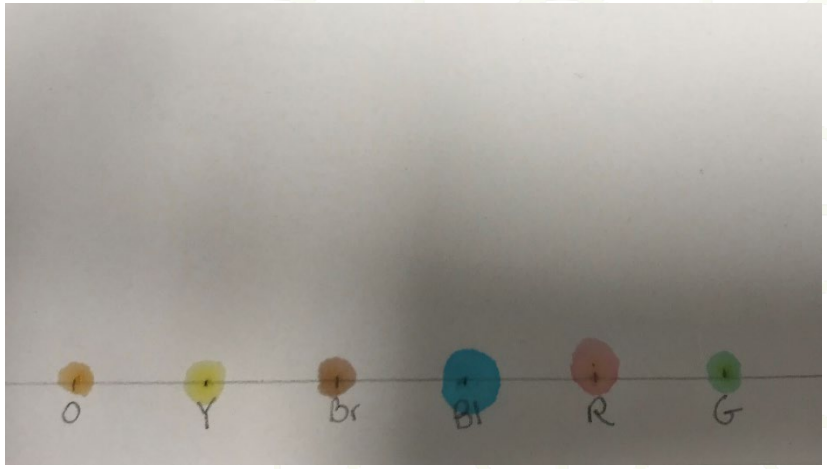
Equipment

You will need:

- Beaker, 250 cm^3
- Soft paint brush or melting point tubes
- Paper clips
- Chromatography paper, approximately 20 cm x 10 cm
- Pencil
- Ruler
- A supply of M&M's® of various colours

Prepare your chromatography paper

1. Place the piece of chromatography paper on a flat surface, with the **longer side horizontal**.
2. Draw a horizontal line in **pencil, 1.5 cm** from the base of the paper.
3. Use a dampened paint brush to remove the colour from one of the sweets and paint this colour on the pencil line 2 cm from one end. **Small spots are best**.
4. Clean the brush in fresh running water.
5. Paint the colour of *another* sweet on the line about 2 cm from the first spot.
6. Repeat this until all the colours are on the paper or until you have reached the other end.
7. Use a pencil to label the colour of each spot.

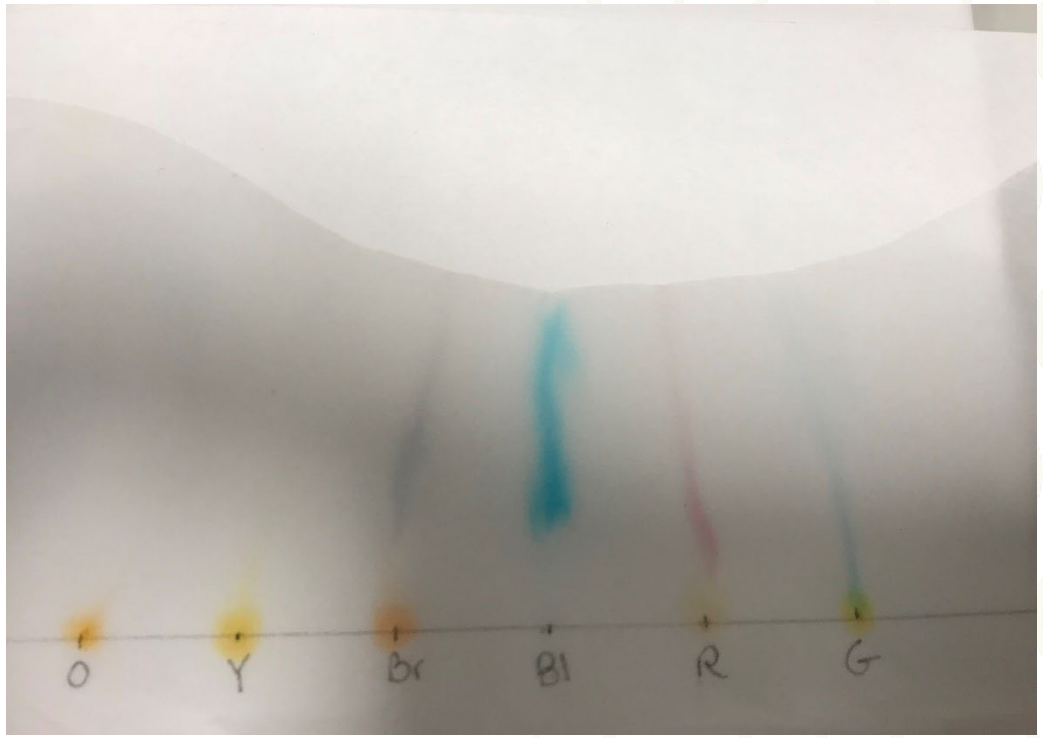


Separating the dyes

8. Roll the paper into a cylinder and hold this in place with the paper clips. Avoid any overlapping of the paper when you make the cylinder.
9. Put water into a beaker up to depth of about 1 cm.
10. Lower the paper cylinder into the beaker of water allowing the water to rise up the paper. Ensure that the water is below the level of the spots. Avoid moving the paper cylinder once it is in position.

Finishing

11. When the water approaches the top of the paper cylinder remove it from the water. Mark with a pencil the level of the water at the top of the filter paper.
12. Allow the paper cylinder to dry, using a hairdryer if available or by clamping it and leaving it to dry overnight.



Conclusion questions

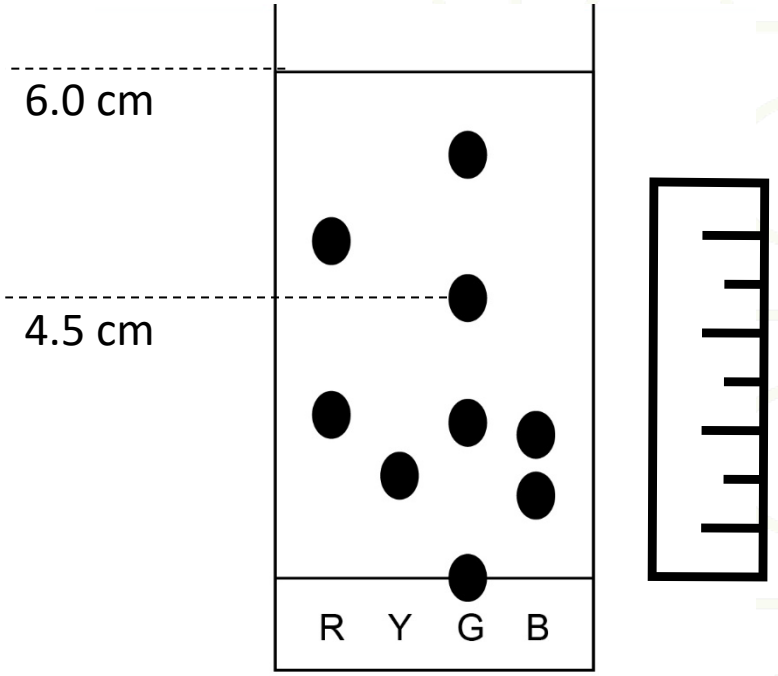
1. List the sweet colours that contained one dye.
2. List the sweet colours that contained a mixture of dyes.
3. Identify two sweets that contained the same dye.
4. Suggest why some dyes separate out into different colours while others do not.
5. Suggest why some colours move further up the paper than others.
6. Give one way of improving the separation between the different spots.
7. What common errors can be made during the procedure?
8. Why is the start line drawn in pencil rather than pen?

Extension

Challenge

Can you calculate the R_f values for your own chromatogram? Use the model answer below:

One of the dyes has moved 4.5 cm up the chromatography paper. The solvent front has moved 6.0 cm.



$$R_f \text{ value } = \frac{distance \text{ travelled } by\ a\ dye}{distance\ travelled\ by\ the \text{ solvent } front}$$

$$R_f \text{ value} = \frac{4.5}{6.0} = 0.75$$