

How particles explain solids, liquids and gases

Grade 7 science (Year 8 · Class 7) · Lab

Name: _____ Date: _____ Class: _____

Does hot water make dye spread faster than cold water? In this lab you add a drop of food colouring to four cups at different temperatures and time how long it takes to colour the whole cup. You then link the results to the speed of the water particles.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS1-1, MS-PS1-4

Aim

To find out how the temperature of water affects how quickly a drop of food colouring spreads through it.

Equipment

- 4 identical clear plastic cups
- Cold, room-temperature and hot tap water, ice
- Thermometer
- Food colouring and a dropper
- Stopwatch or phone timer
- Measuring jug (150 mL)
- White paper

Safety

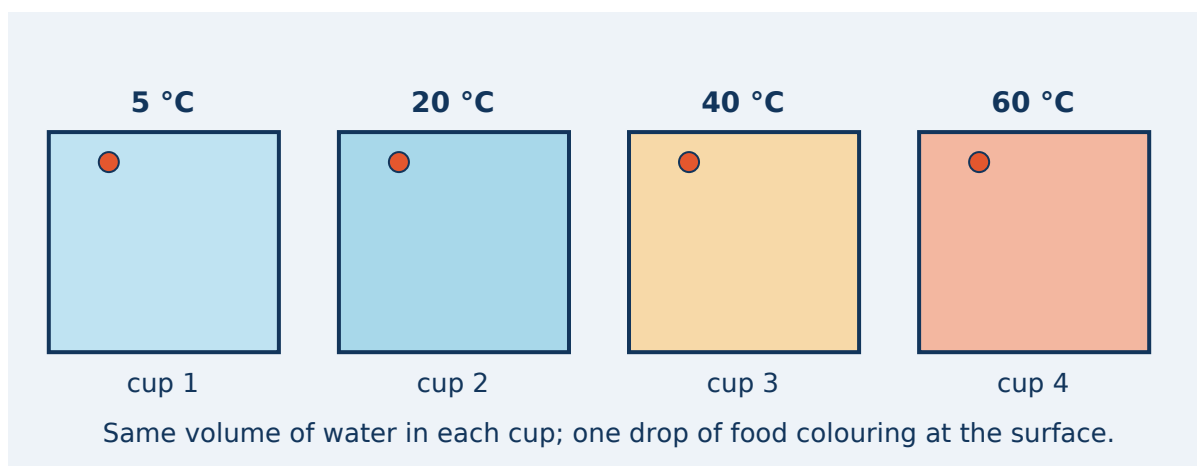
Safety

Hot water can scald. Use water no hotter than 60 °C, ask an adult to pour it, and wipe up spills straight away. Food colouring stains skin and clothes, so wear an apron.

Method

1. Place the cups on white paper and label them 1 to 4.
2. Prepare 150 mL of water at about 5 °C, 20 °C, 40 °C and 60 °C, one for each cup. Check each with the thermometer.
3. Wait 30 seconds so the water is still.
4. Add one drop of colouring at the water surface in cup 1 and start the timer at the same moment.
5. Stop the timer when the colour looks even throughout the cup.

6. Repeat for cups 2, 3 and 4 and record the times.



Set-up for the diffusion lab.

Results

A class in Kampala obtained these times:

Cup	Temperature (°C)	Time to spread evenly (s)
1	5	540
2	20	300
3	40	170
4	60	95

Analysis questions

Question 1 Identify the variables

Identify the independent variable, the dependent variable and two control variables.

Question 2 Describe the pattern

Describe how the time changes as the temperature increases.

Question 3 Compare the extremes

Calculate how many times longer the colour takes to spread at 5 °C than at 60 °C.

Question 4 Calculate the speeds

Assume the colour spreads across a cup width of 8.0 cm. Calculate the average spreading speed at 20 °C and at 40 °C.

Question 5 Explain with particles

Explain the results using the particle model.

Question 6 Judging the end point

Explain why the end point 'looks even' makes the results uncertain, and suggest an improvement.

Question 7 Another source of error

Suggest one other source of error and say how it affects the results.