

How particles explain solids, liquids and gases

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

These model answers use the sample class results from the table. Your own times will differ, but the pattern should be the same: higher temperature, shorter time. Compare your reasoning and calculations with the steps below.

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

Question 1 Identify the variables

The independent variable is the water temperature and the dependent variable is the time to spread evenly. Controls: the volume of water, the size of the drop and the cup type.

Independent: temperature; dependent: time.

Question 2 Describe the pattern

The time falls from 540 s at 5 °C to 95 s at 60 °C. **Higher temperature gives a shorter time.**

Question 3 Compare the extremes

$540 \div 95 = 5.68$. **About 5.7 times longer.**

Question 4 Calculate the speeds

20 °C: $8.0 \text{ cm} \div 300 \text{ s} = 0.0267 \text{ cm/s}$. 40 °C: $8.0 \text{ cm} \div 170 \text{ s} = 0.0471 \text{ cm/s}$. **0.027 cm/s and 0.047 cm/s.**

Question 5 Explain with particles

In warmer water the water particles move faster and collide with dye particles harder and more often, so the dye particles are carried around the cup sooner. **Faster particles give faster diffusion.**

Question 6 Judging the end point

Different people may decide the end point at different moments, and the dropper may swirl the water. Use the same person for all timings and a colour card to compare. **A fixed end-point test reduces the uncertainty.**

Question 7 Another source of error

The water in cup 4 cools while waiting, so it may be below 60 °C. The measured time would then be too long for 60 °C. **Cooling makes hot-water times too long.**