

11–14 years

# Melting and freezing of stearic acid





# The problem

Stearic acid is used to make candles.

At room temperature it is a white solid.

When a candle burns, a liquid is observed near the flame.

When the candle is put out, it doesn't take long for the liquid to return to the solid state.

Today we are going to investigate the melting and freezing point of stearic acid.



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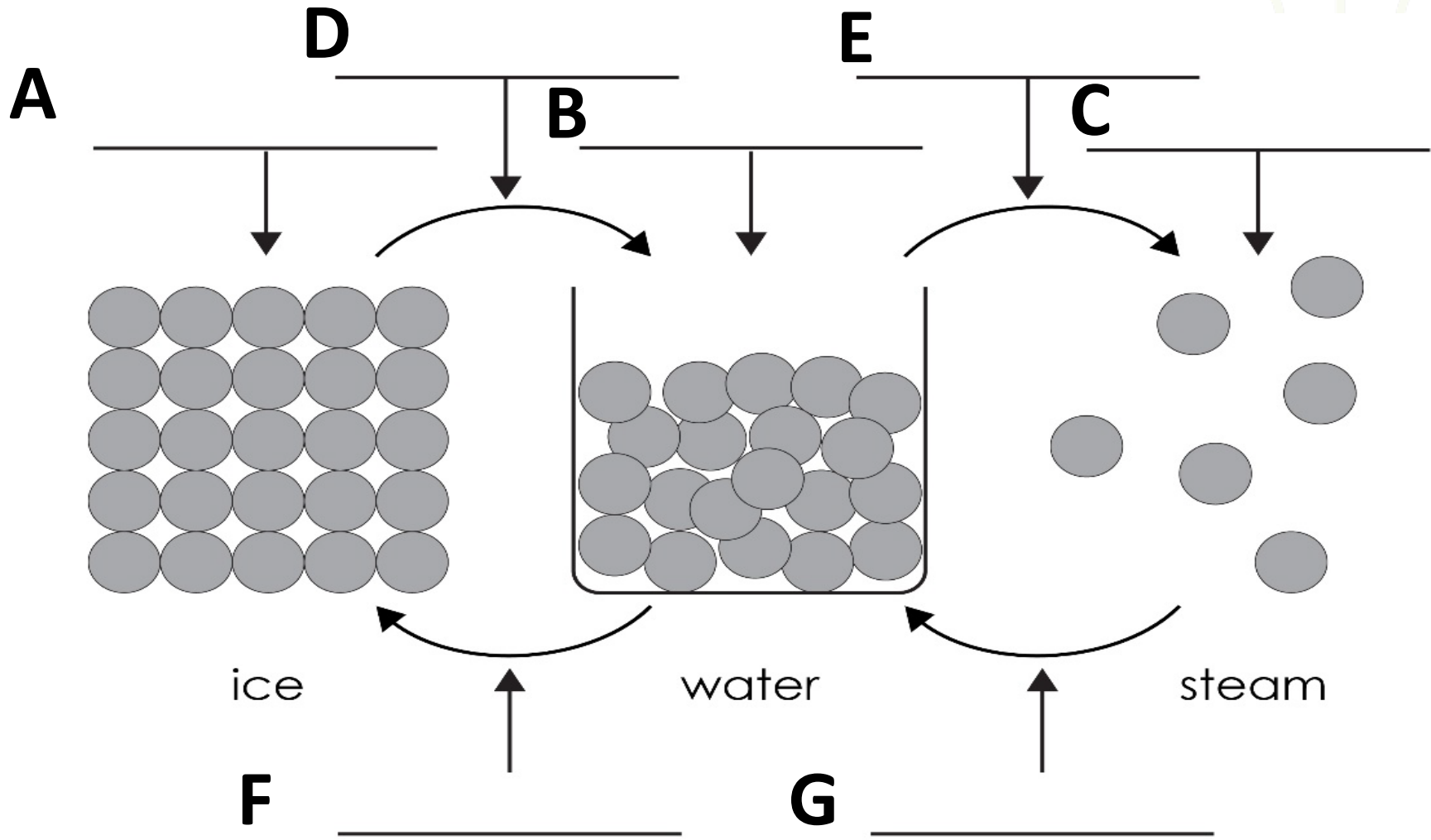
# Learning objectives

During this lesson, you will:

- Determine the melting and freezing point of a sample of stearic acid by setting up and carrying out an experiment.
- Carefully make temperature readings and record them in a table.
- Plot and interpret a heating and/or cooling curve.
- Use particle theory to explain what happens during melting and freezing.

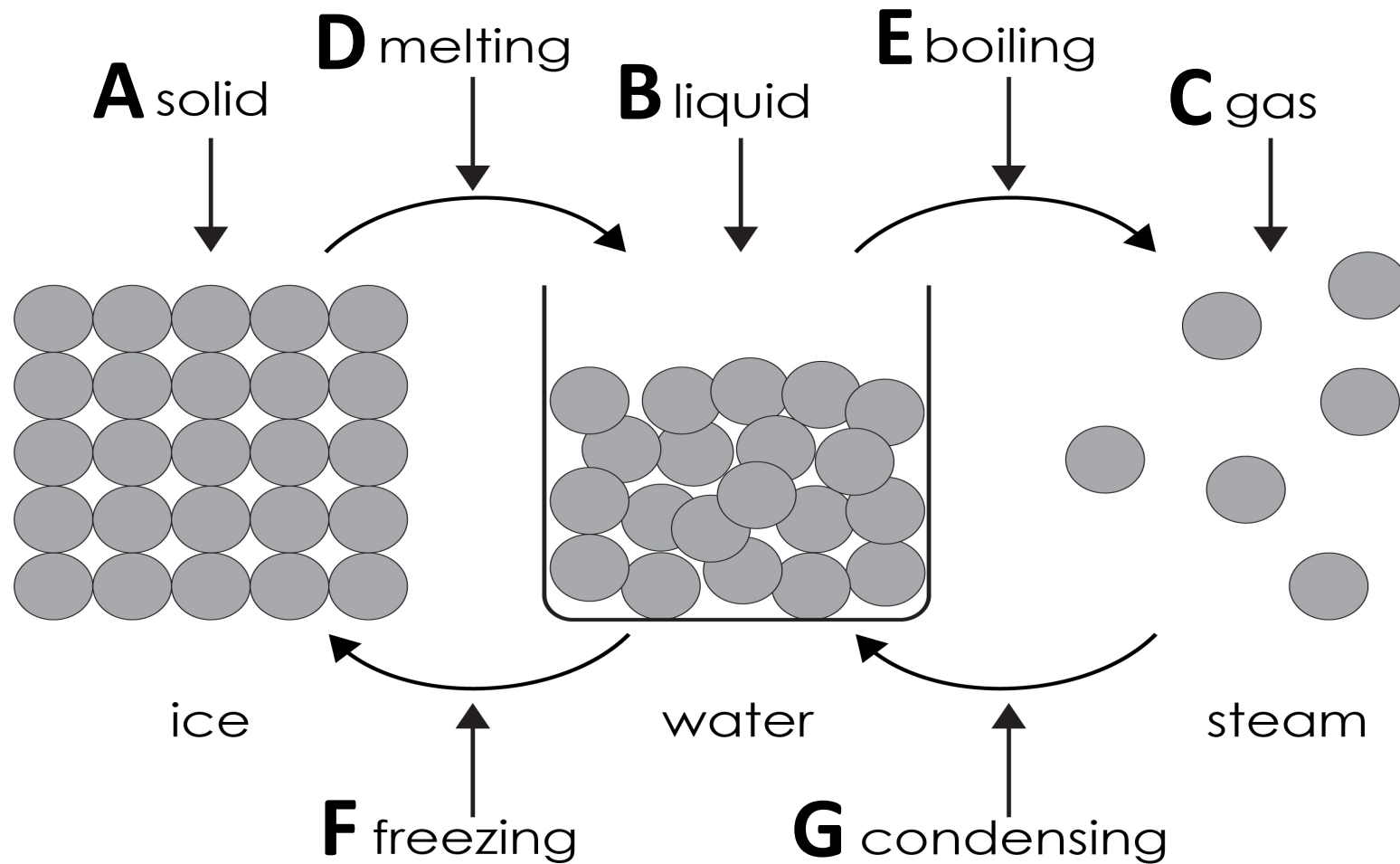


# Revisiting changes of state



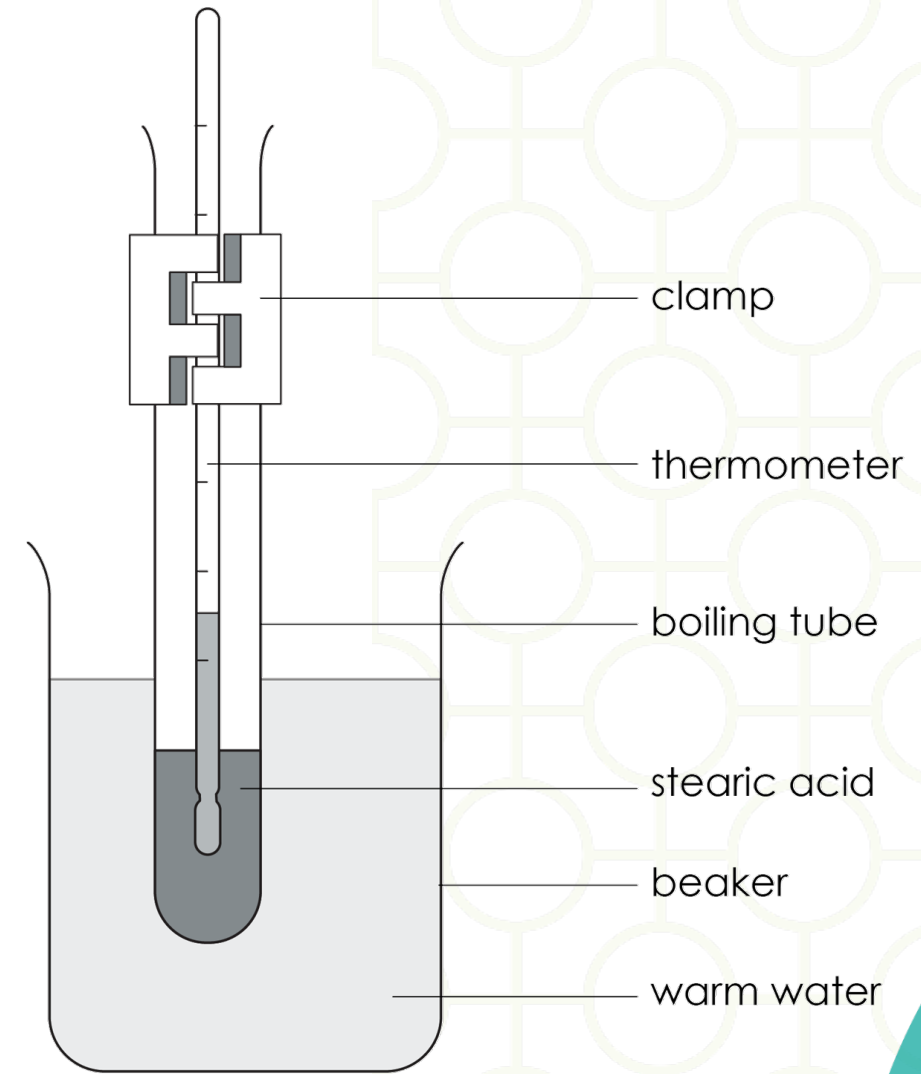


# Revisiting changes of state: answers



# Method

1. Put about 150 cm<sup>3</sup> water into the beaker.
2. Heat it on a tripod and gauze until the water just starts to boil.
3. Set up the apparatus as shown in the diagram and start the timer. Keep the water boiling, but not vigorously.
4. Record the temperature of the stearic acid every minute until it reaches about 80°C.
5. Use the clamp stand to lift the tube from the hot water. Record the temperature every minute as the stearic acid cools until it reaches about 30°C.



1 About 150 cm<sup>3</sup> water

2 Heat until it just boils

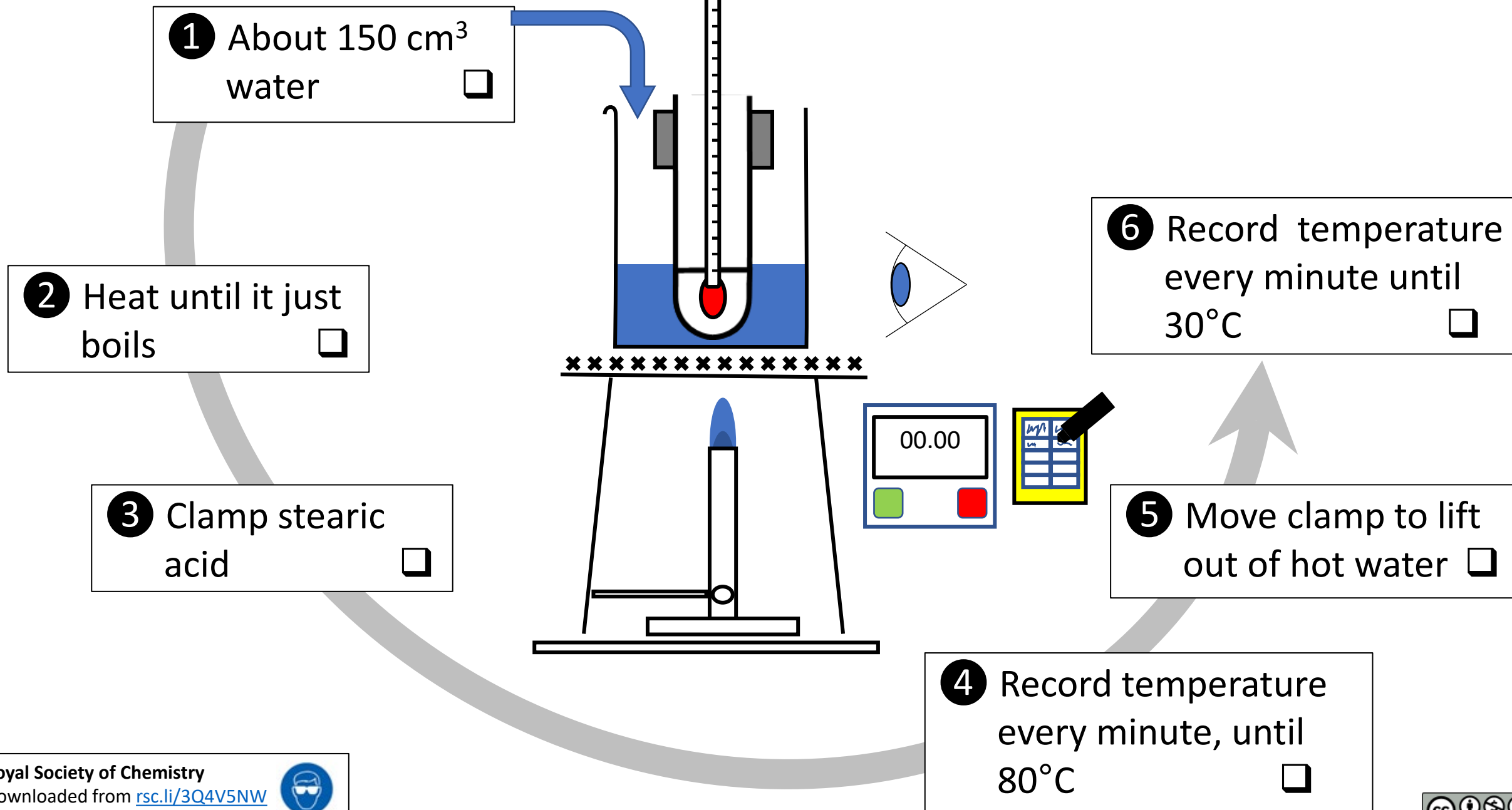
3 Clamp stearic acid

4 Record temperature every minute, until 80°C

5 Move clamp to lift out of hot water

6 Record temperature every minute until 30°C







# Results table

| Time (minutes) | Temperature (°C) | Observations |
|----------------|------------------|--------------|
|                |                  |              |
|                |                  |              |
|                |                  |              |
|                |                  |              |
|                |                  |              |
|                |                  |              |
|                |                  |              |

# Questions

1. Plot a graph of the results and draw a line of best fit.
2. Describe the shape of the line graph you have drawn.
3. Label the parts of that graph that show stearic acid:
  - (a) as a solid
  - (b) as a liquid
  - (c) melting
  - (d) freezing
4. Use your graph to determine the melting and freezing temperature of stearic acid.
5. Draw a diagram to show how the particles are arranged in: (a) solid stearic acid and (b) liquid stearic acid.
6. Use particle theory to explain what happens when stearic acid melts.

# Recap: Learning objectives

Have you met the learning objectives for today's lesson?

- Determine the melting and freezing point of a sample of stearic acid by setting up and carrying out an experiment.
- Carefully make temperature readings and record them in a table.
- Plot and interpret a heating and/or cooling curve.
- Use particle theory to explain what happens during melting and freezing.