

1. TEMPERATURE AND CHANGE

What effect does temperature have on the time it takes for a solid to dissolve?

Objectives

- Measure, record, and analyze data.
- Investigate factors that affect the rate in which a solid dissolves.

Materials and Equipment

- Data collection system
- Temperature sensor
- Beaker or clear cup (3), 250-mL or similar volume
- Stir rod
- Tape
- Sugar cubes (3)
- Water, room temperature, 200 mL
- Water, warm, 200 mL
- Water, cold, 200 mL

Safety

Follow your regular classroom procedures.

Procedure

1. Select Sensor Data in SPARKvue.
2. Connect your temperature sensor to your device.
3. Select the Graph display under Templates to create a graph of Temperature ($^{\circ}\text{C}$) versus Time (s).
4. Put 200 mL of room temperature water into your beaker or clear cup.
5. Place the temperature sensor in the beaker so that the tip of the sensor is at the bottom of the beaker.
 - Note: If necessary, tape the sensor in place so that it does not come out of the beaker and is held out of the way so you can stir. Also, make sure to wait a couple seconds once you place the temperature sensor in the water before you start collecting data so it has time to stabilize. You will know the temperature is stabilizing when it stops changing and begins to stay the same.
6. Place the sugar cube in the water and immediately start recording the data.
7. Constantly stir the sugar cube and the water, with a stir rod, until all the sugar has dissolved. Note: Try not to physically poke the sugar cube to break it up. Do not use sensor to stir.
8. When all the sugar has dissolved, stop recording your data.
9. Record type of water used, beginning temperature, and the time in seconds that it took the sugar cube to dissolve in Table 1.
8. Repeat steps 4 - 9 using warm and cold water. Collect each run of data on the same graph as the room temperature water.

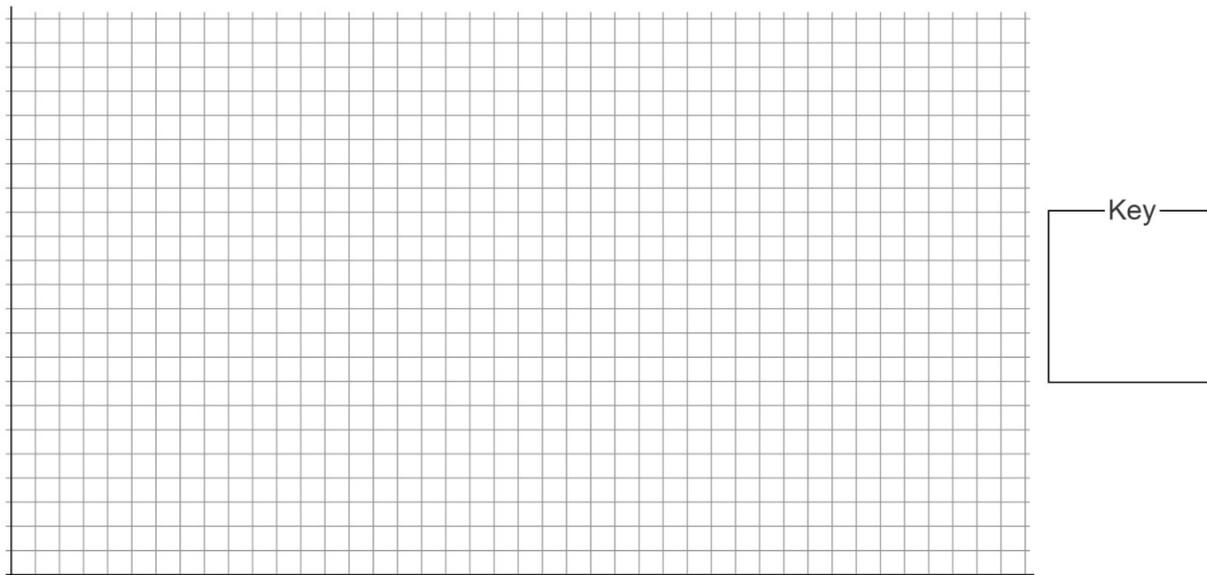
9. Look at your graphing data on SPARKvue and fill in Graph 1. Make sure to create a key in either color or line design so you tell all three runs apart. Make sure to label the x axis and y axis. As a challenge, see if you can properly recreate the scale of the x, y axis.

Data Collection

Table 1: Time and temperature data collected while dissolving sugar cubes in water

Water	Temperature (°C)	Time to Dissolve (s)

Graph 1: Time it takes a sugar cube to dissolve in different temperatures of water



Questions and Analysis

- Using data, which temperature of water dissolved the sugar cube the fastest?
- Using data, which temperature of water dissolved the sugar cube the slowest?
- Use evidence from your data collection to describe the overall effect that temperature had on the time it took a sugar cube to dissolve in water.
- Is dissolving a sugar cube in water a physical or chemical change? Explain your answer.