

Scientific Method

Variables

1. For each of the following investigations, identify the independent variable and dependent variable.
 - a. The students investigated the effect of temperature on the time taken for seeds to germinate.
 - b. The student blew across the top of a tube to investigate the impact of tube length on the pitch of the sound.
 - c. The students investigated the height of bubbles three different washing-up liquids made.
 - d. The students measured the impact of caffeine on the heart rate.

2. Explain why it is important to control some variables during an investigation.

3. A doctor noticed that sailors who ate lemons and limes did not suffer from scurvy. He predicted that all acids cure scurvy. To test this theory, he gave sailors different additions to their diet, including apple cider, oranges and lemons, seawater and vinegar. What variables would he need to control?



Method

A method can be planned in order to test a **prediction**. Scientists will often set up a **control experiment** for comparison. The control can be used to help prove that any change in the **dependent variable** is due to the change in the **independent variable**.

1. A student investigated the impact of temperature on the rate of reaction between magnesium and hydrochloric acid. They used a water bath to change the temperature.






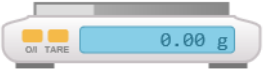




- a. State the independent and dependent variables.
- b. List the control variables.
- c. Write a suitable method for the investigation. You need to think carefully about how you will monitor the rate of the reaction – look at the chemical equation to help you. Use bullet points and ensure you name the items of equipment you will use, e.g.
 - i. Measure 25cm³ of dilute hydrochloric acid using a measuring cylinder.

Equipment

It is important to use the correct name for a piece of equipment or apparatus.

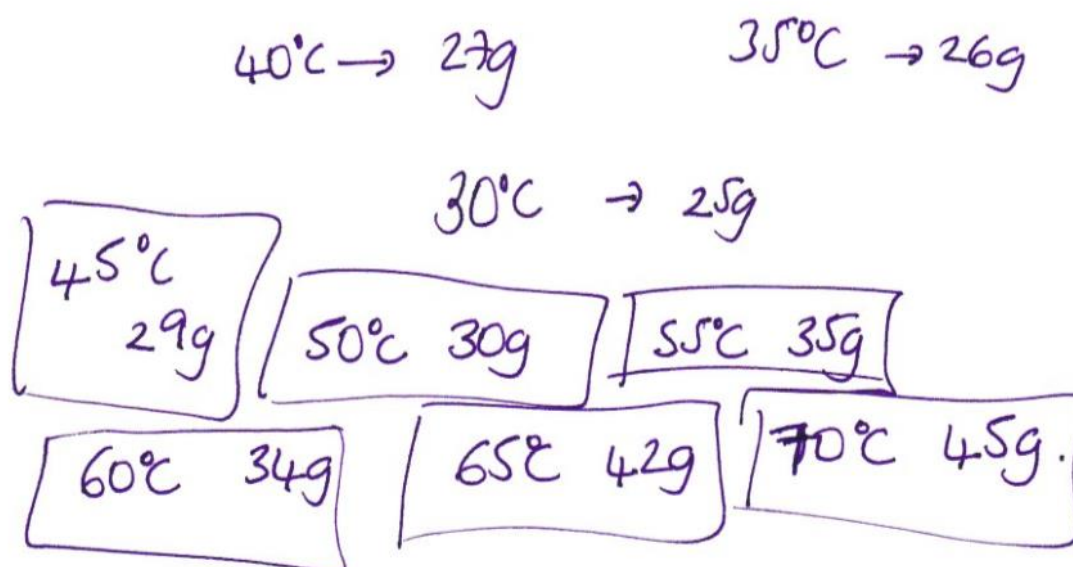
1. Name the pieces of equipment in each of the following images:

A		
B		
C		
D		
E		
F		
G		
H		

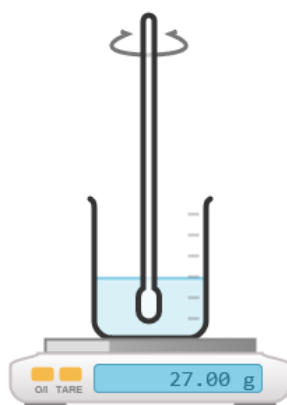
2. Describe how you would use the equipment in H to obtain dry copper sulfate crystals from copper sulfate solution.
3. Explain how B is used to separate mixtures.

Data analysis

Look at the following data collected by a student. They were investigating the impact of temperature on the solubility of copper sulfate crystals. They measured the mass of copper sulfate needed to produce a saturated solution at different temperatures.



1. Produce a suitable results table for the data.
2. Plot a suitable graph of the data.
3. Circle the anomalous result on the graph.
4. Draw an appropriate line of best fit.
5. Use the graph to predict a more likely measurement of mass for the anomalous result.
6. Suggest a mistake the students may have made to produce the anomalous result.
7. Look at the diagram, this is the reading for 40°C . Explain how the students ensured the balance only measured the mass of copper sulfate solution dissolved in the water.



5 questions, 5 sentences, 5 words

For each of the following questions, use either the website suggested or a textbook to write a five-point summary. Identify five key words from your summary.

Question and source	5 Sentences	5 Key words
<p>Explain why an anomalous result can occur.</p>		
<p>https://www.bbc.co.uk/bitesize/guides/z8r84qt/revision/2</p>		
<p>Explain the difference between a hypothesis and a prediction.</p>		
<p>https://www.bbc.co.uk/bitesize/guides/zh7sfcw/revision/1</p>		
<p>Identify the things scientists should consider when observing an experiment.</p>		
<p>https://www.bbc.co.uk/bitesize/guides/zh7sfcw/revision/3</p>		
<p>Explain the meaning of the terms directly proportional and inversely proportional.</p>		
<p>https://www.bbc.co.uk/bitesize/guides/zpm4dmn/revision/4</p>		
<p>Explain the difference between random errors and systematic errors.</p>		
<p>https://www.bbc.co.uk/bitesize/guides/zh7sfcw/revision/5</p>		



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