Combined Science - Chemistry - Key Stage 4

Energy Changes

Writing a method to test a hypothesis

Mrs. Begum

Independent task 1

Hypothesis: Increasing the mass of iron filings added to copper sulfate solution affects the highest temperature change of the reaction.

1. What is the independent variable?
2. What is the dependent variable?
3. What are the control variables?
4. Make a list of equipment you may need to test this hypothesis. What will you use this piece of equipment for?

Independent task 1 answers

1. What is the independent variable?
    - **The mass of the iron filings**
2. What is the dependent variable?
    - **The maximum temperature of the reaction**
3. What are the control variables?
    - **The volume of copper sulfate solution**
    - **The concentration of copper sulfate solution**
    - **The surface area of the iron filings**
4. Make a list of equipment you may need to test this hypothesis. What will you use this piece of equipment for?
    - **Measuring cylinder - accurately measures the volume of copper sulfate**
    - **Balance - accurately measures the mass of iron filings**
    - **Thermometer - measures the temperature**
    - **Stirring rod - to stir the iron filings and copper sulfate**
    - **Beaker - inside which the reaction will take place**

Independent task 2

Hypothesis: The **mass of iron filings** added to **copper sulfate solution** affects the **highest temperature** change of the reaction.

Write a step by step method that will enable you to get accurate and reliable results.

Volumes and masses

Equipment

Repeats

Independent task 2 answer

1. Measure **25 cm^3 of 1 M copper sulfate solution** using a **measuring cylinder** and pour it into **a polystyrene cup**.
2. Using a balance, measure **1 g of iron filings** and add it to the cup. Stir it and place the lid on the cup.
3. Measure the **highest temperature** reached by the solution and record it.
4. **Repeat** the experiment with **2 g, 3 g, 4 g and 5 g** of iron filings.
5. Repeat with all masses of iron filings until you have 3 readings for each mass of iron filings.

Independent task 3

Hypothesis: Increasing the mass of iron filings added to copper sulfate solution affects the highest temperature change of the reaction.

Draw a table to record the results of your practical.

Include:

- Labels and units
- Repeats
- Mean

Independent task 3 answers

Mass of iron filings (g)	Maximum temperature (°C)			Mean temperature (°C)
	1	2	3	
1				
2				
3				
4				
5				

Exam style question

A student investigated the temperature change when different masses of sodium hydrogen carbonate were added to 50 cm^3 of hydrochloric acid.

1. Identify the independent, dependent and control variables.
2. Write a method to test the hypothesis.
3. Produce a table to record the results.

Exam style question answers

A student investigated the temperature change when different masses of sodium hydrogen carbonate were added to 50 cm^3 of hydrochloric acid.

1. Identify the independent, dependent and control variables.

Independent variable - Different masses of sodium hydrogen carbonate (g)

Dependent variable - The temperature change (°C)

Control variable - The volume of hydrochloric acid (cm^3)

Exam style question answers

2. Write a method to test the hypothesis
    - Measure **50 cm^3 of hydrochloric acid** using a **measuring cylinder** and pour it into **a polystyrene cup**.
    - Using a balance, measure **0.2 g of sodium hydrogen carbonate** and add it to the cup. Stir it and place the lid on the cup.
    - Measure the **highest temperature** reached by the solution and record it.
    - **Repeat** the experiment with **0.4 g, 0.6 g, 0.8 g and 1 g** of sodium hydrogen carbonate.
    - Repeat with all masses of sodium hydrogen carbonate until you have 3 readings for each mass.

Exam style question answers

3. Produce a table to record the results.

Mass of sodium hydrogen carbonate (g)	Maximum temperature (°C)			Mean temperature (°C)
	1	2	3	
0.2				
0.4				
0.6				
0.8				
1.0				