Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Investigation – Cooling rate and crystal Size**

**Practical Report 2019**

***Use the Practical Sheet to fill in the sections on this page front and back.***

**Aim:** (what are you going to investigate?) **(2 Marks)**

Investigate the effect of Cooling rate on Crystal Size

1 mark for correct statement. 1 mark for I.V and D.V. ( ½ mark each)

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**Hypothesis:** (describe the relationship between the dependent and independent variables

**(3 Marks)**

Identifies I.V. = 1 mark. Identifies D.V. = 1 mark

uses if/then = ½ mark Uses decrease/increase appropriately = ½ mark

If Cooling rate is *increased/decreased* then the crystal size will be *bigger/smaller*

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**Variables: (3 Mark)**

Independent (what will be changed):

Cooling rate of test tube ( ½ mark for temperature/environment/Type of material)

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Dependent (what will be measured):

Crystal (1/2) Size (1/2)

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2 Controls (what will be kept the same):

(1/2) for any two of: solution amount in each test tube, storage place, time left etc

Batch Solution. What needs to be controlled?

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**Materials: (1 Marks)**- Safety glasses- Safety Mat- 2x Test tubes- Labels for stickers- 2x 100mL Beaker  
- 2 x Cotton wool- Stirring rod  
- 75mL Boiling Water- 25g of Alum- Pipette

**Diagram of experimental set up:** (Label everything) **(2 Marks)**

**Just picture (1/2) with labels already given (1/2). Labels: ‘crystal solution’ ‘test-tubes’ ‘beakers’ (1)**

A glass with liquid in it

Description automatically generated

**Method: (2 Marks)**

1. Collect the equipment listed above.
2. Write your group members’ names on two labels then label your test tubes.
3. Put 50mL of boiling water into a 100mL beaker.
4. Measure out the 10g alum into the 100mL beaker of hot water and using the stirring rod, stir continuously until all the alum is dissolved.
5. Using the pipette, pipette approximately ½ the liquid into each of the test tubes.
6. Plug the test tubes with cotton wool.
7. Place one of the test tubes into an ice filled beaker at the front of the class.
8. Place the last test tube into a beaker filled with cotton wool at the front of the class.
9. Leave the beakers in a secure place overnight.

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**Results:**

Table **(4 Marks)**

Size of crystals ( ½ mark for D.V) when grown in different cooling rates ( ½ mark for I.V)

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|  |  |  |
| --- | --- | --- |
|  | I.V.: Cooling Rate ( ½ )  ( ½ ) for types | |
| Ice (Fast) | Cotton  (Slow) |
| D.V: Crystal Size ( ½ )  (mm) ( ½ ) | <1mm  (1 ) mark for Data  ( ½ mark for words only) | 3-5mm |

Graph *(You should only graph the data for the Average of all the trials).*  **(6 Marks)**

Crystal Size ( ½ mark for D.V) in different cooling rates ( ½ mark for I.V)

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1 mark each:

* D.V. on y-axis, I.V. on x-axis
* I.V. label ( ½ ) and Units ( ½ )
* D.V. label ( ½ ) and Units ( ½ )
* Scale (starts with 0 and is evenly spaced)
* Column graph drawn

Analysis

Describe your observations (be sure to include actual results from the above table, do **NOT** explain why these happened that is for the discussion section) **(3 Marks)**

Ice had the smallest crystals ( ½ ) of <1 mm size ( ½ )

Cotton had the biggest ( ½ ) of 3-5 mm size ( ½ )

1 mark for patterns/extended analysis

½ mark for data, ½ mark for description for each test tube.

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Do your results support your hypothesis? Be sure to explain **why** your hypothesis was or was not supported.  **(2 Mark)**

Supported/not supported (1, has to match hypothesis) because of reason from results

(1 has to match results table)

D.N.R = Do NOT repeat hypothesis.

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**Discussion and Conclusion:**

What did this experiment inform you about the cooling rate and the crystal size? **(2 Marks)**

High/fast cooling rate (1) would create smaller crystals (1). **OR**

Low/Slow cooling rate (1) would create bigger crystals (1)

Need to use ‘cooling rate’ and ‘crystal size’ or lose (1/2 for either one)

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Use science ideas to explain your results/observations: **(2 marks)**

A slower/longer/lower cooling rate (1/2) gives more time (1) for crystals to grow/form (1/2)

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**Evaluation: (3 Marks)**

Was your experiment fair?

Reason why it was fair or not fair (1). **ALL** variables were controlled.

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Were your results accurate?

Reason why it was accurate or not accurate (1). Measuring/even distribution

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You’re your results reliable?

Reason why it was reliable or not reliable (1). Matching others data/ multiple trials.

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If you were to do this experiment again how would you change it, in order to make your results more accurate and/or gather more useful information? **(1 Mark)**

Eg. Same person measuring weight, water, pipetting.

Eg. Trial runs

Eg. Accurate measuring

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