8 SCIENCE INVESTIGATION

COOLING AND CRYSTAL SIZE

Name:_____

Form:_____

Teacher:_____

Due date: _____

IMPORTANT INFORMATION

Plagiarism ANSWER KEY

- The experiment is to be done in your science group but your write-up and results are to be done individually.
- Plagiarising = instant zero on assignment and you will have to re-do it.

Presentation

- Neat writing (if you struggle with this, type your information).
- Correct spelling, grammar and full sentences.
- Assignment neatly stapled together with this sheet attached to the front.

Assessment policy

Have sick note/legitimate reason from parent = new negotiated due date.
Assignment not submitted on due date and no sick note from parents = -20% mark
Assignment not submitted on new negotiated due date = -40% mark
+ Letter home to parents
+ Must attend academic completion to complete assignment

OR

Submit assignment to student services before academic completion date and academic completion not necessary.
Academic completion not attended = zero on assignment + Saturday detention

If you know that you cannot submit your assignment on the due date, let your teacher know BEFORE the due date (email them if you are not in school) or just email them your assignment the night before.

Introduction ANSWER KEY

You have looked at igneous rocks and how crystals are formed when the magma cools and solidifies (p. 280 Pearson 8).

Aim: To investigate how cooling rate affects the size of crystals.

Materials:

- Safety glasses.
- Bench mat.
- Tripod.
- 3 x 50mL test-tubes.
- Stirring rod.
- 100mL water.
- Ice water (enough to almost fill beaker).
- Cotton wool(enough to fill beaker).
- 1 x oven mitt or towel.
- Bunsen burner.
- Gauze mat.
- 1 x test-tube rack.
- 25g potassium alum.
- 1 x pair rubber gloves.
- Filter funnel.

Independent variable: **(1 mark)**

substance surrounding test tube

Dependent variable: **(1 mark)**

Length of crystal

Hypothesis: **(2 marks)**

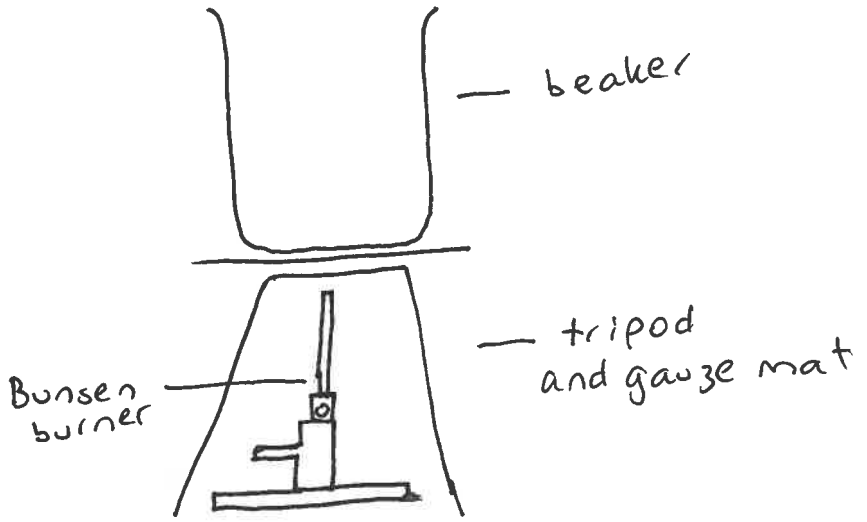
example: The test tube surrounded by cotton wool will create larger crystals compared to the crystals in the test tubes surrounded by air and ice water.

Method

1. Put 100mL water into a 250mL beaker and heat over a Bunsen burner until boiling.
2. While the water is heating up, make an ice bath by half-filling the second beaker with ice water.
3. Once the water is boiling, turn the Bunsen burner off.
4. Insulate the third beaker with enough cotton wool to allow a test-tube to sit upright in the middle.
5. Using the oven mit carefully lift beaker of hot water off the tripod and put on the bench protector.
6. Put the potassium alum in the hot water and stir it well until it is dissolved.
7. Place three test-tubes in the test tube rack. Use a filter funnel to pour 25mL of the solution into each test-tube (they should be around half full).
8. Plug each test-tube with cotton wool.
9. Place one test-tube in the cotton wool beaker, one in the ice water beaker and one in the empty beaker.
10. Leave the beakers in a safe place for a day.
11. Observe the contents of the test-tubes the next day and record your observations.

Results:

a. Diagram: draw a diagram of the **beaker of water boiling over the Bunsen burner** using lead pencil.
Label the diagram using a ruler to draw a line and lead pencil to write.
(Use scientific drawings from p. 19 Pearson 8). **(3 marks)**



b. Diagram: draw a diagram of the **final equipment set up** using lead pencil.
Label the diagram using a ruler to draw a line and lead pencil to write.
(Use scientific drawings from p. 19 Pearson 8). **(3 marks)**

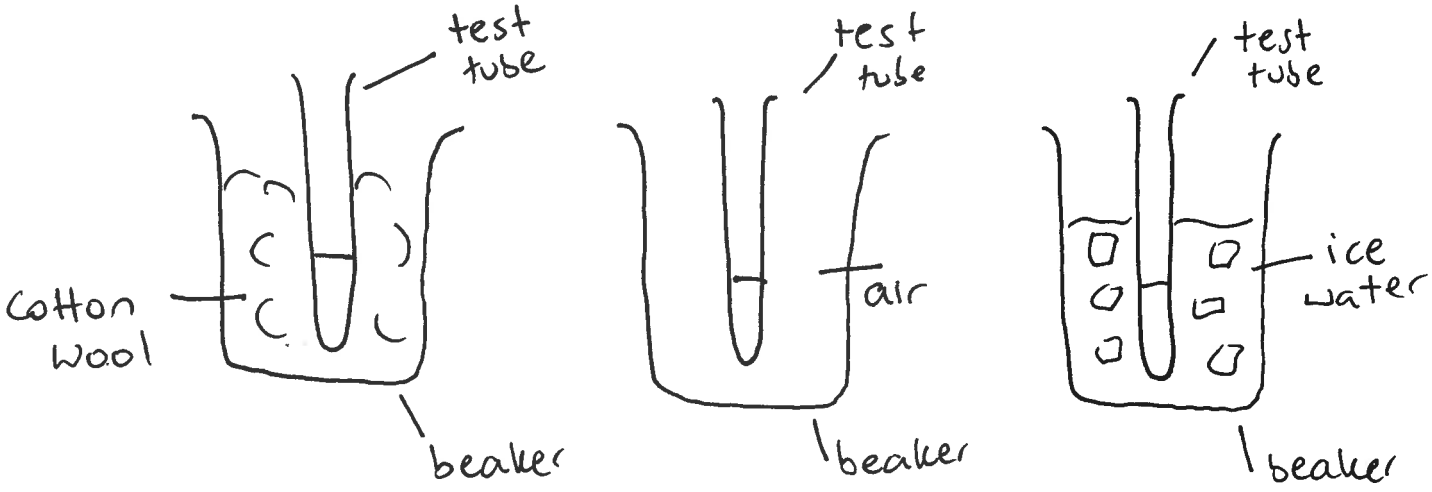


Table (show results taken from experiment). **(3 marks)**

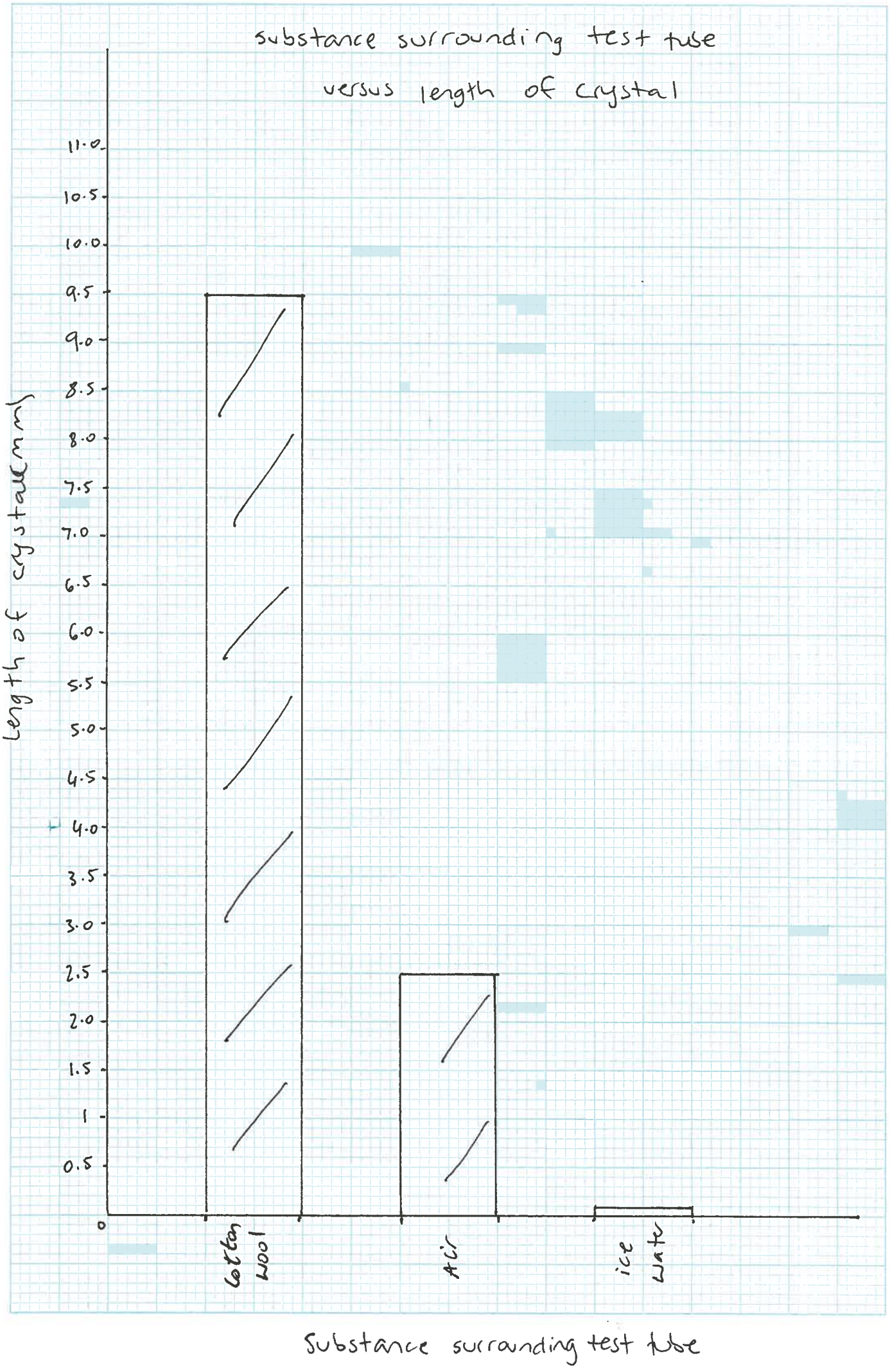
Substance surrounding test tube	Length of crystal (mm)					
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
cotton wool						
Air						
ice water						

or they may only have 2 columns as may not have had enough crystals to get average length.

Graph: show your group results. **Draw on graph paper and attach.**

(6 marks)

- Use graph paper.
- Use a sharp pencil and ruler.
- Have a title at the top (independent variable versus dependent variable).
- Work out whether you need to draw a bar graph (different groups of data) or a line graph (showing data changing over time).
- Put the independent variable and dependent variable on the correct axis.
- Label each axis.
- Record the units of measurement in brackets next to each label.
- Use an appropriate scale that has the same pattern the whole way along.


substance surrounding test tube
versus length of crystal
Length of crystal (mm)
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1
0.5
0
cotton wool
air
ice
water
Substance surrounding test tube

Discussion: (describe two mistakes/errors that occurred, Explain how they affected the results and how they could be avoided next time) **(6 marks)**

Mistake (1)
How it affected results (1)
How to fix problem for next time (1)

Mistake (1)
How it affected results (1)
How to fix problem for next time (1)

1. State which test-tube had the biggest crystals and which had the smallest crystals. **(1 mark)**

The test tube surrounded by ice water had the smallest crystals, the test tube surrounded by cotton wool had the largest crystals.

2. State which test-tube cooled the fastest and which cooled the slowest. **(1 mark)**

The test tube in the ice water cooled the fastest, the test tube surrounded by cotton wool cooled the slowest.

3. Use the results of the experiment to explain the difference between crystal sizes in extrusive and intrusive igneous rocks. **(3 marks)**

Extrusive igneous rocks cool faster because the magma is cooled on the Earth's surface or under the sea, smaller crystals form as there is less time for them to grow.
Intrusive igneous rocks cool slower and have more time to grow larger crystals because they form under the Earth's surface where it is hot.

4. State the three other names that potassium alum is known as. **(3 marks)**

Potash alum, Potassium aluminium sulfate, tawas

5a. Write the chemical formula for potassium alum. **(1 mark)**

$KAL(SO_4)_2$

b. List each element symbol and the number of atoms of each element that is in the compound. **(4 marks)**

K x 1 (1) O x 8 (1)
AL x 1 (1)
S x 2 (1)

6. Describe two safety measures your group took during the experiment. **(2 marks)**

eg. Wore safety glasses because a chemical is being used as well as hot liquid being boiled which could splatter and burn eyes. (1)

And another (1)

Conclusion: (first sentence gives general result of experiment, second sentence states whether hypothesis was proven or not proven. Minimum two sentences explaining the results with scientific reasons). **(4 marks)**

eg.

- The test tube surrounded by cotton wool produced larger crystals than the test tube surrounded by air and the test tube surrounded by ice water. (1)
- Therefore the hypothesis was proven/disproven (1)

The test tube surrounded in cotton wool kept the solution warmer for longer which gave the crystals more time to grow. (1) The solutions in the ice water and air cooled faster so less time was given to the crystals to grow. (1)

MARKING KEY

Content	Description		Your mark
Independent Variable	Listed the dependent variable.	1	
Dependent Variable	Listed the dependent variable.	1	
Hypothesis	Correctly worded (e.g. if, then statement). Includes both dependent and independent variable.	1 1	
Diagram a)	Drawn neatly in pencil and with ruler for labels. Correct labels. Diagrams use scientific drawings.	1 1 1	
Diagram b)	Drawn neatly in pencil and with ruler for labels. Correct labels. Diagrams use scientific drawings.	1 1 1	
Results table	Drawn neatly in pencil and using a ruler. Includes the headings and units of measurement. Includes all the data collected during the experiment.	1 1 1	
Results graph	Shows the results, includes all the things a graph requires.	6	
Discussion	Describes at least two mistakes/errors that occurred. Explains how these mistakes/errors affected the results. Explains how these mistakes/errors could be avoided.	2 2 2	
Discussion questions		15	
Conclusion	One sentence stating the result of the experiment. One sentence stating whether hypothesis was proven or disproven. Two sentences explaining scientific reasons for the results.	1 1 2	
Presentation	Correct spelling. Correct grammar, full sentences. Written neatly or typed up neatly. Uses appropriate scientific language.	1 1 1 1	
	Total mark	48	

Mark as percentage %

Teacher's comments:

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