

**YEAR: 9**

**SUBJECT: SCIENCE**

**INVESTIGATION**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DUE DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Endothermic and Exothermic Reactions:**

Endothermic and exothermic reactions involve the absorption and release of energy. As aspiring chemistry students, it is your task to conduct the following experiment, and complete the required questions. Please utilise your marking key / rubric to ensure that you are conducting both the experiment and the presentation of your answers correctly!

**Aim:**

To investigate an endothermic and an exothermic reaction.

**Materials:**

* Sealed bottle containing potassium nitrate (KNO3)
* Sealed bottle containing calcium chloride (CaCl2)
* Measuring cylinder
* Water
* Stirring rod
* Thermometer
* 2 foam cups (or temperature sensor)
* 2 spatulas
* Stopwatch
* Wash bottle
* Residue bottle
* Safety goggles

**Method:**

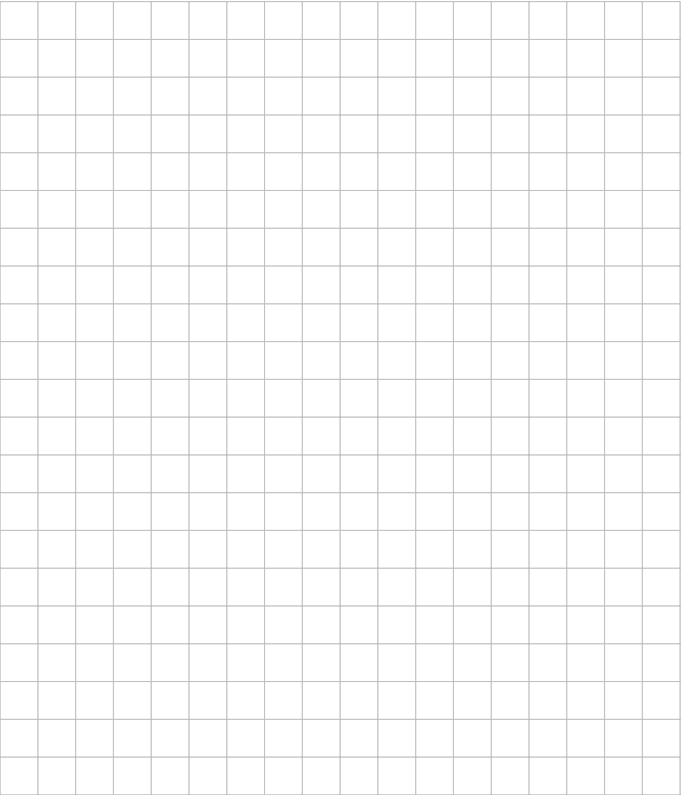
1. Prepare a table to record the times and temperatures.
2. Measure 50mL of water into a foam cup.
3. Measure the temperature of the water and record it.
4. Place three heaped spatulas of calcium chloride into the water and immediately commence stirring and timing.
5. Record the temperature every 15 seconds for 3 minutes.
6. Dispose of the solution into the container provided and carefully rinse the thermometer with the wash bottle, ensuring the rinse water is also added to the waste container. Dispose of the cup as directed by your teacher.
7. Repeat steps 2 – 6 using potassium nitrate.

**Results:**

**TABLE**

**GRAPH**

Draw a temperature / time graph and plot your results from the two chemicals on the same graph. Ensure you include a key, label both the vertical and horizontal axes, use the correct units, and draw your lines with a pencil and a ruler!



**Discussion:**

1. Which reaction was endothermic, and which reaction was exothermic? How can you tell which is which?

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1. In which reaction did the products have less energy than the reactants?

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1. Use your graph to describe how quickly the temperature changed.

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1. Did the temperature begin to steady over time? Discuss why you think it did / did not.

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**Conclusion:**

Suggest how the method used in this experiment could be changed to improve the accuracy of the results.

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***Endothermic and Exothermic Reactions – Marking Guide***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Marking Criteria*** | ***3 marks*** | ***2 marks*** | ***1 mark*** | ***0 marks*** |
| ***Graph*** | ***Key included, axis labelled, correct units, use of pencil and ruler.*** | ***Key included, axis labelled and correct units.*** | ***Axis labelled and correct units.*** | ***Not attempted*** |
| ***Exothermic vs. endothermic*** | ***Clear comparison between exothermic and endothermic*** | ***Vague comparison between exothermic and endothermic*** | ***Explanation of exothermic or endothermic*** | ***Not attempted*** |
| ***Energy in products*** | ***Correctly identifies which products have less energy than reactants, with explanation*** | ***Identifies which products have less energy than reactant, without explanation*** | ***Attempted to identify which products have less energy than reactants*** | ***Not attempted*** |
| ***Energy in reactants*** | ***Correctly identifies which reactants have less energy than products, with explanation*** | ***Identifies which reactants have less energy than products, without explanation*** | ***Attempts to identify which reactants have less energy than products*** | ***Not attempted*** |
| ***Interpretation of graph*** | ***Thorough explanation of temperature variations*** | ***Substantial explanation of temperature variations*** | ***Vague explanation of temperature variations*** | ***Not attempted*** |
| ***Explanation of temperature*** | ***Explains temperature over time, with evidence*** | ***Explains temperature over time, without evidence*** | ***Vague explanation of temperature over time, without evidence*** | ***Not attempted*** |
| ***Conclusion*** | ***At least 3 suggestions for improvement of results*** | ***At least 2 suggestions for improvement of results*** | ***At least 1 suggestion for improvement of results*** | ***Not attempted*** |
| ***Conduction of experiment*** | ***Correct laboratory protocol, safety procedures considered*** | ***Correct laboratory protocol, safety procedures not considered*** | ***Incorrect laboratory protocol, safety procedures not considered*** | ***Not attempted*** |