Joseph Banks Secondary College

Year 12 Integrated Science General 2020

TASK 06: SIS -Chemistry

Comparing the heat energy produced by combustion of various alcohols

Name: _____ Date Submitted:_____

DESCRIPTION	MARKS AVAILABLE
Introduction Investigation Aim Use correct scientific terminology to accurately describe the aim of the investigation using specific examples.	/2
Hypothesis Formulate a testable hypothesis that clearly states the relationship between dependent and independent variables.	/2

Background Information
Communicate information and concepts logically, using correct scientific language, conventions and representations. You must include the following:
• Create a table that lists the following properties of alcohols & hydrocarbons (methanol, ethanol, propanol, butanol, unleaded, diesel)
  ○ Chemical formula
  ○ Molecular structure
  ○ Density
  ○ Boiling temperature
• Describe the common combustion reaction for alcohols and provide balanced chemical equations for each alcohol type (methanol, ethanol, propanol, butanol).
• Compare and contrast the similarities and differences in the chemical structure and composition between alcohols and hydrocarbons.
• Explain why it is important to understand the amount of energy produced by each fuel (methanol, ethanol, propanol, butanol, unleaded, diesel) in relation to where each fuel type is used.
	/4
	/6
	/3
	/3

Material & Method Variables Correctly identify the independent, dependent and at least 3 control variables (including how and why they will be controlled), including any relevant units.	/6
Material Setup Draw a labelled scientific diagram of the experimental setup	/2
Safety Considerations Describe the safe and appropriate laboratory behaviour required for this experiment. Discuss what the implications could be if these measures are not adhered to.	/3
Results Table of Results - Observations Add your results to the class data table, include a copy of the class results in your report. Table must include relevant title and units.	/4
Calculations	/3

Show a representation of the calculations that have been used to determine the amount of energy produced by each reaction <u>Table of Averages</u> Collate your average data from the investigation into a separate table. <u>Graph of Results</u> Graphically represent the data into a relevant graph type. Graph must include relevant title, axes labels/unit, incremental scale.	/4 /5
Discussion <u>Introduction paragraph</u> Identify what the investigation was comparing and use your results to rank the fuels in terms of energy produced. Justify your results using the chemical composition of each alcohol. <u>Scientific Explanation of Results</u> Provide responses for each of the following topics. *Energy Loss in Chemical Reactions* Describe the process where energy is lost in a chemical reaction and how heat can be produced by combustion to cause the temperature of the water to increase. *Effect of Molecular Size on the Amount of Energy Produced in Combustion Reactions* Explain the effect that the size of the molecule has on the amount of energy produced in a combustion reaction. *Similarities and Difference between Diesel and Unleaded Fuels* Identify the similarities and differences between diesel and unleaded fuels. Use this information to explain why trucks and 4WD vehicles primarily use diesel, while family cars tend to use unleaded fuels. *Fuel Type and the Environment* Discuss which fuel type is better for the environment, in terms of the amount of CO_2 that is produced.	/5 /4 /3 /4 /3
Conclusion Summarise the investigation results and use evidence to draw conclusions that are related to the hypothesis.	/3
References Incorporate in-text referencing (where appropriate) and provide a reference list in correct format (e.g. APA).	/4
TOTAL MARKS	**/73**

Introduction

Investigation Aim *(2 marks)*

Hypothesis *(2 marks)*

Background Information

Alcohol Combustion Reactions (6 marks)

Describe the common combustion reaction for alcohols.

Provide balanced chemical equations for each of the following

Methanol

Ethanol

Propanol

Butanol

Properties of alcohols and hydrocarbons Table (4 marks)

Property	Methanol	Ethanol	Propanol	Butanol	Unleaded	Diesel
Molecular structure Diagram						
Chemical Formula						
Density						
Boiling Temp						

Alcohols and Hydrocarbons – Similarities & Differences in their chemical structure and composition (3 marks)
Compare and contrast the similarities and differences in the chemical structure and composition between alcohols and hydrocarbons.

Importance of understanding the potential heat energy of fuels (3 marks)
Explain why it is important to understand the amount of energy produced by each fuel (methanol, ethanol, propanol, butanol, unleaded, diesel) in relation to where each fuel type is used.

Materials & Method

Variables *(6 marks)*

Independent Variable

Dependent Variable

Control Variables (at least 3 controls, include how and why they will be controlled)

Material Setup *(2 marks)*

Draw a labelled scientific diagram of your experiment setup

Safety Considerations *(3 marks)*

Describe the safe and appropriate laboratory behaviour required for this experiment.

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Discuss what the implications could be if these measures are not adhered to.

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Results

Table of Observations *(4 marks)*

Title:

Fuel	Initial Temp	Final Temp	**Temp Change**	Initial mass	Final mass	**Mass used**	**Time Taken**
Methanol							
Trial 1							
Trial 2							
Trial 3							
Average							
Ethanol							
Trial 1							
Trial 2							
Trial 3							
Average							
Propanol							
Trial 1							
Trial 2							
Trial 3							
Average							
Butanol							
Trial 1							
Trial 2							
Trial 3							
Average							

Calculations *(3 marks)*

Include what calculations you have used to calculate energy

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Table of Averages *(4 marks)*

Create a table of averages that incorporates the data from your calculations.

Title:

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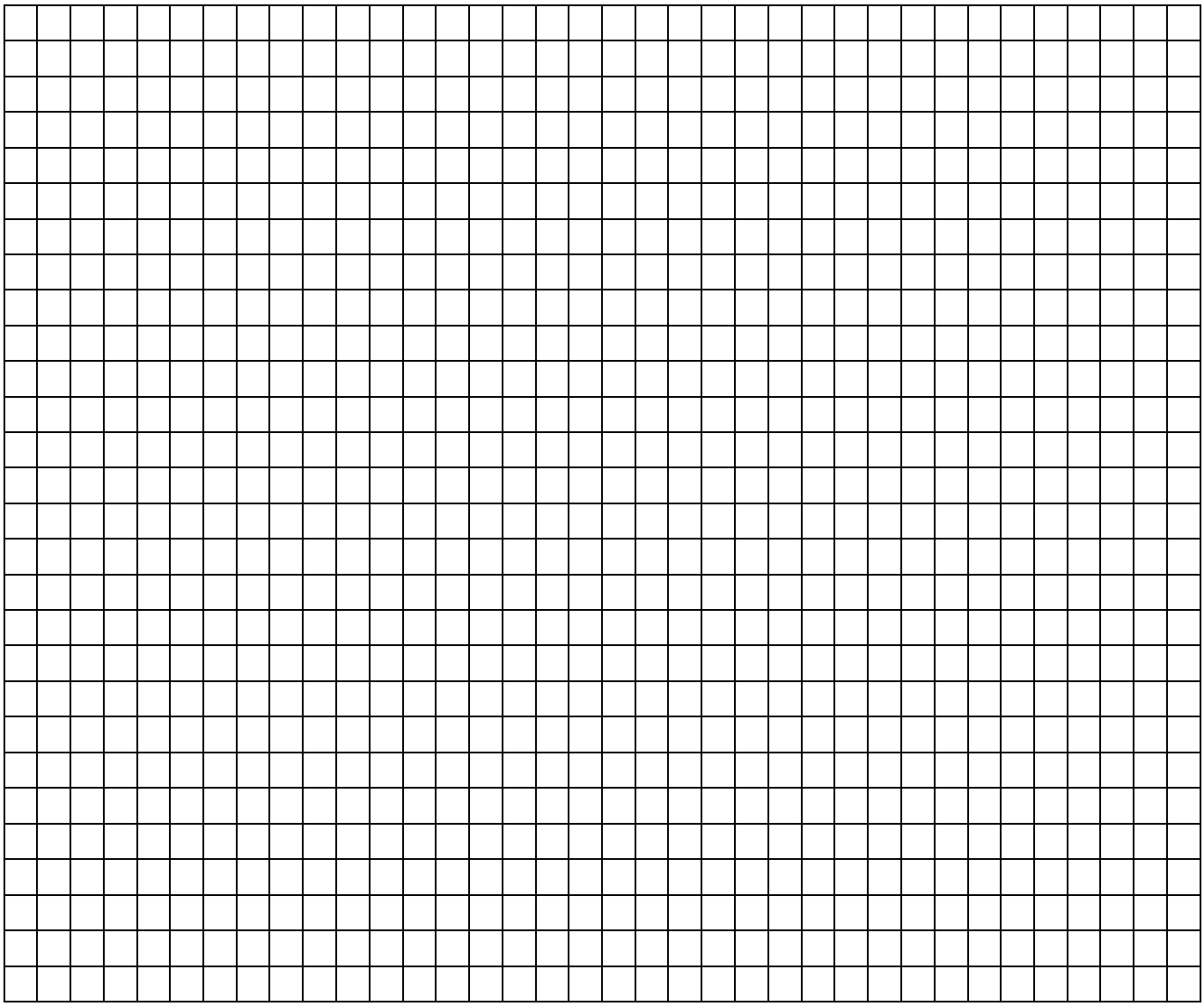
Graph *(5 marks)*

Title:



Discussion

Introduction paragraph *(5 marks)*

Identify what the investigation was comparing and describe the results, ranking the fuels in terms of energy produced, justifying your answer with scientific concepts.

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Scientific Explanation of Results

Energy Loss in Chemical Reactions (4 marks)

Describe the process where energy is lost in a chemical reaction and how heat can be produced by combustion to cause the temperature of the water to increase.

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Effect of Molecular Size on the Amount of Energy Produced in Combustion Reactions (3 marks)

Explain the effect that the size of the molecule has on the amount of energy produced in a combustion reaction.

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Similarities and Difference between Diesel and Unleaded Fuels (4 marks)

Identify the similarities and differences between diesel and unleaded fuels. Use this information to explain why trucks and 4WD vehicles primarily use diesel, while family cars tend to use unleaded fuels.

Fuel Type and the Environment (3 marks)

Discuss which fuel type is better for the environment, in terms of the amount of CO_2 that is produced.

Conclusion

Summarise the investigation results and use evidence to draw conclusions that are related to the hypothesis.

(3 marks)

References

Incorporate in-text referencing (where appropriate) and provide a reference list in correct format (e.g. APA).

(4 marks)