Year 10 Science - CHEMISTRY Experimental research report on reaction rates

The speed at which chemical reactions occur varies. Some reactions occur within a fraction of a second, while others may take days or even years. Sometimes it is necessary or convenient to speed up a chemical reaction.

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This report is divided into three parts:

- 1. A risk assessment based on the chemicals used in the practical (10 marks)
- 2. Your research on reaction rates (approximately two A4 pages, you decide on the format)(20 marks)
- 3. Your experimental data on reaction rates (30 marks)

PART 1 - RISK ASSESSMENT (10 Marks)

A *risk assessment* identifies the potential hazards of an experiment and gives protective measures to minimise the risk. Most of the information used in a risk assessment is obtained from the chemical's *material safety data sheet* (MSDS).

Your experiment will determine how changing the concentration of a reactant affects the rate of a chemical reaction. In order to do this experiment in a safe manner it is necessary to complete a risk assessment of the chemicals that you will use. Your tasks are:

1. Use the internet to search for an MSDS on the following chemicals:

Sodium Thiosulfate (Na₂S₂O₃)

Another chemical selected by your teacher

2. Use the MSDS complete a risk assessment for each chemical.

An example of a risk assessment for hydrochloric acid is given. You need to locate the relevant information on the MSDS and transfer it to the relevant areas of the risk assessment table.

REACTANT	HS	DG	CLASS	MSDS	UN	HAZCHEM	
HYDROCHLORIC ACID 2M		Υ	8		1789	2R	
Risks Harmful if swallowed Toxic by inhalation Causes severe burns Risk of serious damage to the e Wear suitable protective clothi If contact occurs wash with run SEEK MEDICAL ADVICE	RecommKeep coExposurDo not	 Safety Wear suitable eye/face protection Recommended use of exhaust hood Keep container tightly closed Exposure may produce irreversible damage Do not breathe gas/fumes/vapour/spray Remove any contaminated clothing immediately 					
FIRST AID							
	Contact doctor or poisons centre. Give glass of water.						
Eye Wash with run	Wash with running water (15 minutes). Medical attention.						
Skin Flood body wi	Flood body with water. Remove contaminated clothing. Wash with soap and water.						
Inhaled Fresh air. Rest	Fresh air. Rest, keep warm. If breathing shallow, give oxygen. Medical attention.						

REACTANT		HS	DG	CLASS	MSDS	UN	HAZCHEM
SODIUM THIOSU	LFATE						
Risks			Safety				
FIRST AID							
Swallowed							
Eye							
Skin							
Inhaled							
REACTANT/CHEM	ЛІCAL	HS	DG	CLASS	MSDS	UN	HAZCHEM
Risks			Safety				
FIRST AID							
Swallowed							
Fire							
Eye							
Skin							
Skin							
Inhaled							
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PART 2 - RESEARCH ON REACTION RATES (20 marks)

Your research is to be directed by the following:

a) Define what is meant by rates of reaction?

[Definition present and correct = 1 mark]

b) List three different reactions that differ in their reaction rate?

[At least 3 examples of different reactions having significantly different reaction rates = 3 marks]

c) Describe and explain the factors that affect the rate of a reaction (excluding catalysts).

[Each of the 3 factors described with explanation of how they affect reaction rate = 6 marks]

d) What are catalysts?

[Definition present and correct = 1 mark]

e) How do catalysts work?

[Accurate description provided = 2 marks]

- f) Describe examples of catalysts that are used in industry, living things and everyday life (not from a textbook) [At least one example from each area which includes a description of the reaction it affects = 6 marks]
- g) Where did you obtain your information i.e. bibliography (excluding textbook)?

[References shown and not just textbook or Wikipedia = 1 mark]

PART 3 - EXPERIMENTAL DATA ON REACTION RATES (30 marks)

You will be given an experimental method that aims to determine the relation between the reaction rate and the concentration of a reactant. You can complete the experiment in groups of 2-3 but your report will be your own work.

You will be expected to write an experimental report that contains:

- a) Aim & Hypothesis
- b) Variables
- c) Results (including table and graph)
- d) Discussion
- e) Conclusion

Your experimental technique and safety will also be assessed

A mark scheme is shown on the next page.

Experiment:

Name:

Design			Comments			
A1	Title, Aim and Hyp	oothesis	3 2 1 0	☐ A clear title (EXP:) and aim given ☐ Provide a hypothesis for the experiment ☐ Provide a reason for your prediction		
A2	List of relevant ma	aterials	2 1 0	□ Provide a detailed list of the materials used (eg. 2x 250ml beakers)□ Include a labelled diagram		
А3	Development of a for collection of d	relopment of a method collection of data		 Outlined step by step and written in the 3rd person (ie. no personal pronouns) Indicate how you will <i>use</i> your data (eg. find the average) 		
A4	Variables and reliability: Controlling and identifying variables		3 2 1 0	 □ Independent variable – what are you changing? □ Dependent variable – what are you measuring? □ Controlled variables – what aspects are you keeping the same? 		
Data co	ollection and proce	ssing		Comments		
B1	Results: Recording raw data		43210	 □ Accuracy - IV/DV in correct positions, data recorded □ Titles/ units – column/row headings used, units provided in column heading □ Presentation – consistent number of decimal places, no units in body of table □ Presentation of results hand drawn – ruler & pencil used, neatly presented electronic – centre aligned, merged cells for headings 		
B2	Results: Processing and presenting data		43210	 □ Accuracy - Correct choice of graph with IV/DV in correct positions □ Titles/units – appropriate title provided for graph, headings provided on both axes with units □ Scale – accurate scales used on axes, no units within scale □ Presentation – hand drawn – ruler & pencil used, neatly presented electronic – axis lines & tick marks used 		
Conclu	sion and evaluation	า		Comments		
C1	Discussion: Explaining your results		3 2 1 0	 □ Detailed description of results obtained – refer to your data □ Any strange results have been discussed (eg. when your data for a condition is 14, 2 and 3 – 14 is strange!) □ What is the Science that explains your results? (You may need to do some additional research here) 		
C2	Discussion: Evaluating and improving procedures		3 2 1 0	 □ Evaluate procedure – Did your experiment allow you to collect accurate and reliable data? Is there a big spread between your repeats? If so what does this say about your method? □ Evaluate equipment – Are you using the best equipment/technique? If not, explain why. □ Improvements – Suggest ways to increase the reliability and accuracy of your data <u>and</u> increase the range of data collected. 		
С3	Concluding with re	ding with reference 3 2 1 0		□ Reference to the aim clearly made - what have you discovered? □ Was your hypothesis/prediction correct? Why/Why not? □ How could this scientific knowledge/concept be used in real life?		
Teamv	Teamwork and Safety Late submission		bmission	Comments		
	1 0	2	1 0			
Total			30			