

Groups and the Periodic Table

1 This question is about the periodic table.

1.1 In 1869, Dmitri Mendeleev proposed a periodic table of the elements. His idea took several years to be accepted. The discovery of some new elements helped this to happen. Explain how the development of Mendeleev's table and its eventual acceptance show the scientific process at work.

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1.2 The order of elements in the modern periodic table is linked to atomic structure. Explain how aluminium's position in the periodic table is linked to the structure of its atoms.

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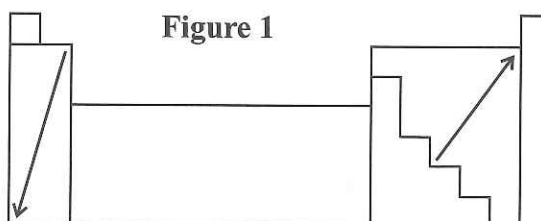
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[3]

1.3 The arrows in **Figure 1** show the increasing trend in reactivity of non-metals and Group 1 and Group 2 metals.



When metals and non-metals react, heat is given out.

The amount of heat given out increases with the reactivity of the reactants.

Which of the compounds below would give out the most heat when produced? Tick **one** box.

Caesium chloride Caesium iodide Sodium chloride Sodium iodide

Explain your reasoning.

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[4]

[Total 11 marks]

2 This question is about the elements in Group 1 and Group 7 of the periodic table.

2.1 Predict the structure and bonding of elemental astatine. Explain your prediction.

Prediction:

Explanation:

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2.2 Predict the formula of the product that would be formed from the reaction of astatine and sodium. Explain your answer.

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2.3 Describe the reaction, if any, that you would expect to take place between astatine and aqueous sodium chloride. Explain your answer.

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2.4 Rubidium and iodine are both in Period 5. Explain why rubidium is highly reactive but iodine has low reactivity.

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2.5* Compare the reactions of lithium and potassium with water. Describe what would be observed in each reaction and explain the similarities and differences.

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[Total 17 marks]

3 Iodine can form compounds with sodium and with chlorine.

3.1 Predict the bonding in each of these compounds.

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3.2 Chlorine water is added to a solution of sodium iodide.
Predict and explain what would be observed.

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[Total 5 marks]

4 This question is about Group 0 elements.

4.1 Predict the boiling point of krypton using the data in **Table 1**.
Explain your reasoning.
In your answer, refer to the structure and bonding of Group 0 elements.

Table 1

Element	Boiling point (°C)
neon	-246
argon	-186
xenon	-108

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4.2 In 1962, chemists mixed xenon and fluorine at high pressures.
Xenon fluorides were formed. Suggest how this experiment changed the accepted view of Group 0's reactivity. Explain your answer.

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[Total 8 marks]

- 5 A chemist mixes chlorine gas and hydrogen gas in a darkened container. She then shines a bright light into the mixture. A rapid reaction occurs.

5.1 HCl is formed in the reaction. Write a balanced equation to show this. Include state symbols.

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5.2 The chemist repeats the experiment, but replaces chlorine with gaseous iodine. Explain, in terms of the electronic structure of halogens, why this reaction is very slow.

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5.3 The chemist places a glass lid over a beaker containing aqueous iodine. She places an ice cube on top of the lid. She then gently heats the solution. Predict and explain her observations.

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[Total 10 marks]

- 6 Fluorine will react with a Group 1 element to form a fluoride compound. Describe and explain how fluorine's bonding changes during this reaction.

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..... [Total 4 marks]

Score: / 55

Exam Practice Tip

To get the top grades, make sure you at least attempt every question on the paper, so you can pick up as many marks as possible — examiners often award marks for working, even if you don't get the final answer. With multiple choice questions make sure you select an answer even if you're not sure — after all, there's at least a 25% chance that you'll get it right.

