

Predicting Chemical Reactions (H)

1. A student investigates the reactivity of four metals, **A**, **B**, **C** and **D**.

He adds a small piece of each metal to cold water.

He then adds a small piece of each metal to dilute hydrochloric acid.

Look at his results.

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Metal	Observations in water	Observations in dilute hydrochloric acid
A	slow bubbling	very fast bubbling
B	no reaction	no reaction
C	fast bubbling	very fast bubbling
D	no change	slow bubbling

Write down the order of reactivity of the four metals **A**, **B**, **C** and **D**.

..... **most reactive**

.....

.....

..... **least reactive**

[2]

2 (a). Sodium is in Group 1 of the Periodic Table.

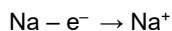
Sodium reacts with water to make sodium hydroxide, NaOH, and hydrogen.

Write the **balanced symbol** equation for the reaction between sodium and water.

..... [2]

(b). Sodium ions, Na⁺, are formed when sodium reacts with water.

Look at the equation. It shows how a sodium ion is formed from a sodium atom.



The symbol e⁻ means an electron.

The formation of a sodium ion from a sodium atom is an example of **oxidation**.

Explain why.

.....

..... [1]

(c). Rubidium is another element in Group 1.

Rubidium reacts much faster than sodium does.

Explain why.

Use ideas about electrons in your answer.

----- [2]

3 (a). Look at the table. It shows information about the Group 7 elements.

Complete the table.

Element	Formula	Colour	State at room temperature
Fluorine	F ₂	pale yellow	gas
Chlorine	Cl ₂
Bromine	Br ₂	brown	liquid
Iodine	I ₂	grey

[3]

(b). The Group 7 elements exist as simple molecules.

Fluorine boils at -188 °C.

Explain why fluorine has a low boiling point.

[2]

(c). The elements in Group 0 (the noble gases) are unreactive.

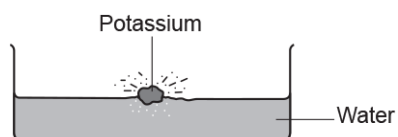
Explain why, in terms of their electronic configurations.

[2]

(d). This question is about the properties of elements in Groups 1, 7 and 0.

Lithium, sodium and potassium are all Group 1 elements.

A teacher adds a small piece of potassium to a trough of water, as shown in the diagram.



The potassium fizzes and a gas is produced.

Describe what else you would observe.

[2]

(e). Reactivity **increases** going down Group 1 from lithium to potassium.

Explain this trend in reactivity.

Use ideas about the electronic configurations of the atoms in your answer.

[2]

4. A student reacts some metals with different salt solutions and records her results.

She places a tick (✓) in her results table if she sees a chemical change and a cross (x) if there is no reaction.

Some of the boxes are blanked out.

	Magnesium chloride	Silver nitrate	Copper(II) sulfate	Iron(II) sulfate
Magnesium		✓	✓	✓
Silver	x		x	x
Copper	x	✓		x
Iron	x	✓	✓	

Which metal has the **least** tendency to form a positive ion?

- A. copper
- B. iron
- C. magnesium
- D. silver

Your answer

[1]

5. Which statement is correct for a Group 1 element?

- A. It dissolves in water to form a bleach.
- B. It is a non-metal.
- C. It is an inert gas.
- D. It reacts with water to form hydrogen.

Your answer

[1]

6 (a). The Group 7 elements are known as the halogens. The halogens have similar chemical properties. Their physical properties vary with increasing atomic number. Look at the table of information about the halogens.

Halogen	Atomic symbol	Atomic number	Molecular formula	Atomic radius in pm	Reaction of halogen with sodium iodide solution
fluorine	F	9	F ₂	64	Makes iodine and sodium fluoride
chlorine	Cl	17	Cl ₂	99	Makes iodine and sodium chloride
bromine	Br	35	Br ₂	114
iodine	I	53	I ₂	133	No reaction
astatine	At	85	No reaction

- i. Predict the molecular formula and atomic radius of astatine. Put your answers in the table.

[2]

- ii. Predict the reaction of bromine with sodium iodide solution. Put your answer in the table.

[1]

- iii. Explain your answer to (ii) in terms of the reactivity of the halogens.

----- [1]

(b). All halogens react with alkali metals to make a salt.

- i. All halogens have similar chemical reactions. Explain why in terms of electronic structure.

----- [1]

- ii. Sodium reacts with bromine to make sodium bromide, NaBr. Construct the **balanced symbol** equation for this reaction.

----- [2]

- iii. What is the formula of the product of the reaction between astatine and potassium?

----- [1]

END OF QUESTION PAPER