

The Group 1 Elements – Revision Pack

Properties of Alkali Metals:

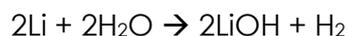
The group 1 metals are also known as the 'alkali metals'. They include caesium, rubidium, lithium, sodium and potassium. They all have similar properties because they come from group one and have one electron on their outer shell. These properties include:

- They react vigorously with water
- Hydrogen is given out
- The metal reacts with water to form an alkali (the hydroxide of the metal)

ALKALI METALS

You can predict the reactivity of certain elements by looking at the pattern of reactivity in other alkali metals.

The balanced symbol equation for Li and H₂O is:



Reactivity of Group 1 Elements:

3
Li
6.941
11
Na
22.99
19
K
39.10
37
Rb
85.47
55
Cs
132.9
87
Fr
223

LEAST
REACTIVE



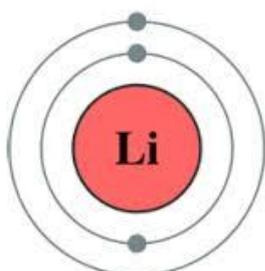
MOST
REACTIVE

Atoms of Group 1 elements will have similar properties because they have one electron in their outer shell.

When the atoms of alkali metals react, they lose one electron and form:

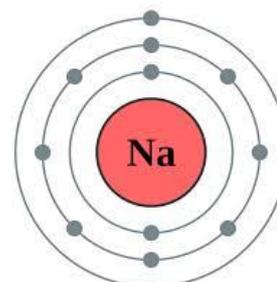
- A full outer shell, so have a **stable electronic structure**
- A positive ion which has more positive charge in its nucleus than negative charge from the surrounding shells

This can be represented through the equation:



The closer the outer shell's electron is to the nucleus, the more attractive force there is, so the electron is less easily lost. Na is more reactive than Li.

The easier it is for an atom of an alkali metal to lose its electron, the more reactive it is.



The Group 1 Elements – Revision Pack

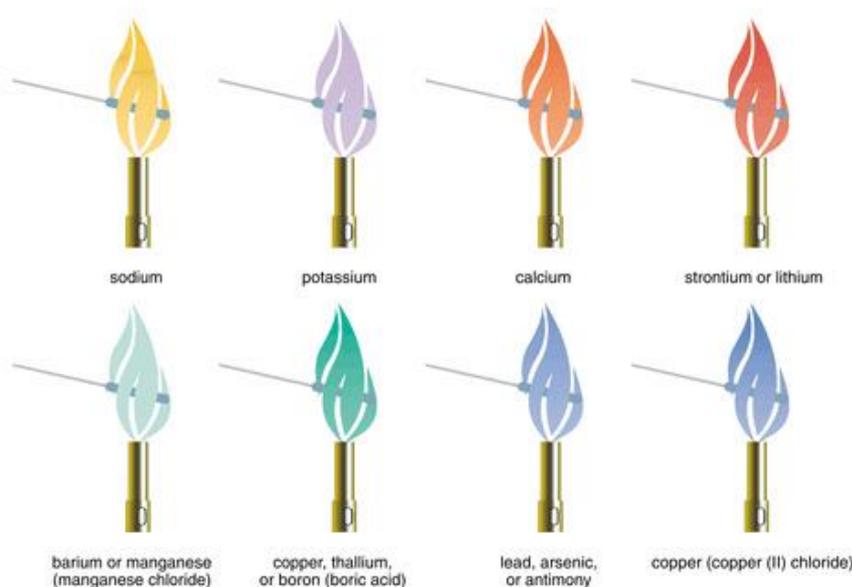
Oxidation:

Oxidation Is Loss; for example:



An atom of potassium loses an electron to form a positive ion. This is an example of oxidation.

Flame Tests:



A flame test is used to find out if lithium, sodium and potassium are present in a compound.

Alkali metal in the compound	Colour of flame
Lithium	Red
Sodium	Yellow
Potassium	Lilac

How to do it:

STEP 1 – Put on some safety goggles

STEP 2 – A flame-test wire is moistened with dilute HCl

STEP 3 – The flame-test wire is then dipped into a solid chemical

STEP 4 – The flame-test wire is then put in a blue Bunsen Burner flame

STEP 5 – You can then identify which alkali metal is present in the compound

The Group 1 Elements – Revision Pack

PPQ(2):

- 3 This question is about Group 1 elements such as sodium and rubidium.

Look at the table. It shows some information about the elements in Group 1.

element	atomic symbol	atomic number	melting point in °C	density in g/cm ³	atomic radius in pm
lithium	Li	3	181	0.53	152
sodium	Na	11	98	0.97	182
potassium	K	19	64	0.86	227
rubidium	Rb	37			

- (a) Group 1 elements, such as sodium, react with water.

Sodium hydroxide, NaOH, and hydrogen are made.

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

..... [2]

- (b) The reaction of rubidium with water is more violent than the reaction of sodium with water.

Rubidium is more reactive than sodium.

Explain why.

Use ideas about electrons.

.....

.....

..... [2]

The Group 1 Elements – Revision Pack

Mark Schemes:

PPQ(1):

Question	Answer	Marks	Guidance
3	<p>Level 3 (5–6 marks) Candidate applies knowledge of the reaction of alkali metals to predict some observations or comments of the reaction of caesium with water including a comparison of the rate of reaction with lithium AND Constructs the balanced symbol equation for the reaction between caesium or lithium and water. Quality of written communication does not impede communication of science at this level.</p> <p>Level 2 (3–4 marks) Candidate applies knowledge of the reaction of alkali metals to predict some observations or makes comments about the reaction between caesium and water AND gives the names or formulae of products formed in the reaction between caesium and water. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1–2 marks) Candidate applies knowledge of the reaction of alkali metals to predict some observations or makes comments about the reaction between caesium and water OR gives the names or formulae of products formed in the reaction between caesium and water. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to A</p> <p>Indicative scientific points at level 3 must include:</p> <ul style="list-style-type: none"> • $2\text{Cs} + 2\text{H}_2\text{O} \rightarrow 2\text{CsOH} + \text{H}_2$ OR • $2\text{Li} + 2\text{H}_2\text{O} \rightarrow 2\text{LiOH} + \text{H}_2$. • faster reaction than with lithium / more reactive / more violent <p>Indicative scientific points at levels 1, 2 and 3 may include:</p> <ul style="list-style-type: none"> • caesium + water \rightarrow caesium hydroxide + hydrogen • lithium + water \rightarrow lithium hydroxide + hydrogen • hydrogen made • caesium hydroxide made • bubbles • fizzes • floats • moves on the surface • gives a flame • gets smaller • forms a colourless solution • alkaline solution formed • explodes • caesium loses electrons more easily
Total		6	

PPQ(2):

Question	Expected answers	Marks	Additional guidance
3 (a)	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ correct formulae (1) correct balancing (1)	2	allow = sign for arrow not and or & for +
(b)	it is easier for rubidium to lose electrons when it reacts than for sodium to lose electrons because rubidium has a larger atomic radius (2) OR idea that both lose electrons when they react (1)	2	electron loss must be linked to larger atomic radius in order to gain 2 marks