

# C4.1.1 Group 1 The Alkali Metals

# Learning Objectives

- Recall the physical and chemical properties of Group 1 elements
- Predict properties from given trends
- Explain the reactions of Group 1 elements

This is group 1  
(ignore Hydrogen)



Group 1 are called the alkali metals as when they react with water they create an alkaline solution

(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1 <b>H</b> hydrogen 1.0	2											13	14	15	16	17	18 <b>He</b> helium 4.0
3 <b>Li</b> lithium 6.9	4 <b>Be</b> beryllium 9.0											5 <b>B</b> boron 10.8	6 <b>C</b> carbon 12.0	7 <b>N</b> nitrogen 14.0	8 <b>O</b> oxygen 16.0	9 <b>F</b> fluorine 19.0	10 <b>Ne</b> neon 20.2
11 <b>Na</b> sodium 23.0	12 <b>Mg</b> magnesium 24.3											13 <b>Al</b> aluminium 27.0	14 <b>Si</b> silicon 28.1	15 <b>P</b> phosphorus 31.0	16 <b>S</b> sulfur 32.1	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 39.9
19 <b>K</b> potassium 39.1	20 <b>Ca</b> calcium 40.1	21 <b>Sc</b> scandium 45.0	22 <b>Ti</b> titanium 47.9	23 <b>V</b> vanadium 50.9	24 <b>Cr</b> chromium 52.0	25 <b>Mn</b> manganese 54.9	26 <b>Fe</b> iron 55.8	27 <b>Co</b> cobalt 58.9	28 <b>Ni</b> nickel 58.7	29 <b>Cu</b> copper 63.5	30 <b>Zn</b> zinc 65.4	31 <b>Ga</b> gallium 69.7	32 <b>Ge</b> germanium 72.6	33 <b>As</b> arsenic 74.9	34 <b>Se</b> selenium 79.0	35 <b>Br</b> bromine 79.9	36 <b>Kr</b> krypton 83.8
37 <b>Rb</b> rubidium 85.5	38 <b>Sr</b> strontium 87.6	39 <b>Y</b> yttrium 88.9	40 <b>Zr</b> zirconium 91.2	41 <b>Nb</b> niobium 92.9	42 <b>Mo</b> molybdenum 95.9	43 <b>Tc</b> technetium	44 <b>Ru</b> ruthenium 101.1	45 <b>Rh</b> rhodium 102.9	46 <b>Pd</b> palladium 106.4	47 <b>Ag</b> silver 107.9	48 <b>Cd</b> cadmium 112.4	49 <b>In</b> indium 114.8	50 <b>Sn</b> tin 118.7	51 <b>Sb</b> antimony 121.8	52 <b>Te</b> tellurium 127.6	53 <b>I</b> iodine 126.9	54 <b>Xe</b> xenon 131.3
55 <b>Cs</b> caesium 132.9	56 <b>Ba</b> barium 137.3	57-71 lanthanoids	72 <b>Hf</b> hafnium 178.5	73 <b>Ta</b> tantalum 180.9	74 <b>W</b> tungsten 183.8	75 <b>Re</b> rhenium 186.2	76 <b>Os</b> osmium 190.2	77 <b>Ir</b> iridium 192.2	78 <b>Pt</b> platinum 195.1	79 <b>Au</b> gold 197.0	80 <b>Hg</b> mercury 200.6	81 <b>Tl</b> thallium 204.4	82 <b>Pb</b> lead 207.2	83 <b>Bi</b> bismuth 209.0	84 <b>Po</b> polonium	85 <b>At</b> astatine	86 <b>Rn</b> radon
87 <b>Fr</b> francium	88 <b>Ra</b> radium	89-103 actinoids	104 <b>Rf</b> rutherfordium	105 <b>Db</b> dubnium	106 <b>Sg</b> seaborgium	107 <b>Bh</b> bohrium	108 <b>Hs</b> hassium	109 <b>Mt</b> meitnerium	110 <b>Ds</b> darmstadtium	111 <b>Rg</b> roentgenium	112 <b>Cn</b> copernicium		114 <b>Fl</b> flerovium		116 <b>Lv</b> livermorium		

**Key**

atomic number

**Symbol**

name

relative atomic mass

# C2.2.2 Revision

## Typical metal properties

- Shiny
- High melting and boiling points
- Malleable (bends without breaking)
- Ductile (can be pulled into long thin wires without breaking)
- Good conductors of heat and electricity

# How does this link to alkali metals?

## Typical metal properties

- *Shiny (only when freshly cut)*
- ~~High melting and boiling points~~
- Malleable (bends without breaking)
- Ductile (can be pulled into long thin wires without breaking)
- Good conductors of heat and electricity

- We will look at lithium, sodium and potassium as they are the only ones safe enough to use in school
- They are so reactive with air and water that they must be stored under oil.

Lithium, sodium, and potassium react with water in a similar way.

metal + water  $\rightarrow$  metal hydroxide + hydrogen



# Observations with water

	Observations
All of them (lithium, sodium and potassium)	Floats Moves across the surface of the water Produces bubbles (of hydrogen) If universal indicator is added to the water a change will be seen from green (neutral) to alkaline (purple)
Lithium	Moves <b>slowly</b> across the surface of the water
Sodium	Melts to give a spherical shape
Potassium	Moves <b>quickly</b> across the surface of the water Catches fire Burns with a <b>lilac</b> flame



# Trends in reactivity

- Alkali metals lose electrons when they react
- As you go down the group the atoms get bigger
- The electron that is being lost is therefore further away from the nucleus
- It is therefore easier to lose the electron
- Therefore the reactivity **increases** as you go down the group

## Trends in physical properties

Density increases as you go down the group  
(K is an anomaly)

	Density (g/cm <sup>3</sup> )
Li	0.53
Na	0.97
K	<b>0.86</b>
Rb	1.53
Cs	1.88

## Trends in physical properties

Melting point decreases as you go down the group

	Melting Point (°C)
Li	181
Na	98
K	63
Rb	
Cs	29

Can you use this trend to predict the melting point of rubidium?

## Trends in physical properties

Melting point decreases as you go down the group

	Melting Point (°C)
Li	181
Na	98
K	63
Rb	39
Cs	29