

## AQA Chemistry Unit 2

### The periodic table

Crompton House  
□□□ Chemistry

I am able to:

		Learn it	Revise it
1	I can explain the similarities and differences of the modern periodic table and Mendeleev's periodic table.		
2	<b>I can explain the meaning and the term periods and groups in the periodic table.</b>		
3	I can fully explain why elements are placed in the same group in the periodic table.		
4	<b>I can explain the properties and reactions of group 1 and 7 comparing to group 0</b>		
5	<u>CHEMISTRY ONLY:</u> I can describe the properties of transition metals and compare them with group 1 elements, including melting points and densities, strength and hardness, and reactivity		

## **DODDLE QUIZZES**

AQA The Periodic table	_____ %
AQA Metals and non-metals	_____ %
AQA Group 1	_____ %
AQA Group 7	_____ %
AQA Group 0	_____ %

## **Kerboodle Extension Quizzes**

Positive Points/postcards for completion

C2 Homework: The Periodic Table 1	_____ %
C2 Homework: The Periodic Table 2	_____ %
C2 Progress Quiz: The Periodic Table 1	_____ %
C2 Progress Quiz: The Periodic Table 2	_____ %
C2 Checkpoint quiz: The Periodic Table	_____ %

Self Reflection

WWW:

EBI:

Checked by Teacher:

Date:

## Chapter 2: The Periodic Table

### Knowledge organiser

## Development of the Periodic Table

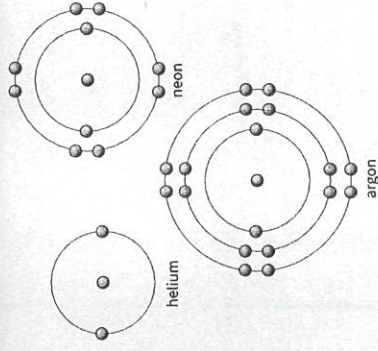
The Periodic Table has changed over time as scientists have organised it differently. Mendeleev was able to accurately predict the properties of undiscovered elements based on the gaps in the table.

	First lists of elements	Mendeleev's Periodic Table	Modern Periodic Table
How are elements ordered?	by atomic mass	normally by atomic mass but some elements were swapped around	by atomic number
Are there gaps?	no gaps	gaps left for undiscovered elements	no gaps – all elements up to a certain atomic number have been discovered
How are elements grouped?	not grouped	grouped by chemical properties	grouped by the number of electrons in the outer shells
Metals and non-metals	no clear distinction	no clear distinction	metals to the left, non-metals to the right
Problems	some elements grouped inappropriately	incomplete, with no explanation for why some elements had to be swapped to fit in the appropriate groups	—

## Group 0

Elements in **Group 0** are called the **noble gases**. Noble gases have the following properties:

- full outer shells with eight electrons, so do not need to lose or gain electrons
- are very unreactive (**inert**) so exist as single atoms as they do not bond to form molecules
- boiling points that increase down the group.



### Key terms

**Make sure you can write a definition for these key terms.**

alkali metals	chemical properties	displacement	groups	halogens	inert	isotopes
noble gas	organised	Periodic Table	reactivity	undiscovered	unreactive	

## Group 1 elements

**Group 1** elements react with oxygen, chlorine, and water, for example:

lithium + oxygen  $\rightarrow$  lithium oxide  
lithium + chlorine  $\rightarrow$  lithium chloride  
lithium + water  $\rightarrow$  lithium hydroxide + hydrogen

Group 1 elements are called **alkali metals** because they react with water to form an alkali (a solution of their metal hydroxide).

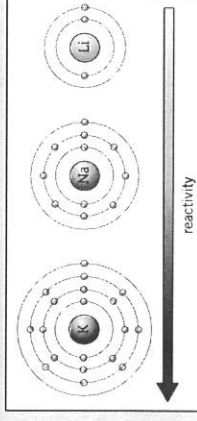
Group 1 the alkali metals	Li	Be																	H																	B	C	N	O	F	He	
	Na	Mg																																		Al	Si	P	S	Cl	Ne	
	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn																	Ga	Ge	As	Se	Br	Kr								
	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd																	In	Sn	Sb	Te	I	Xe								
	Cs	Ba	La		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg																	Tl	Pb	Bi	Po	At	Rn							
	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg																															

## Group 1 properties

Group 1 elements all have one electron in their outer shell.

**Reactivity** increases down Group 1 because as you move down the group:

- the atoms increase in size
- the outer electron is further away from the nucleus, and there are more shells shielding the outer electron from the nucleus
- the electrostatic attraction between the nucleus and the outer electron is weaker so it is easier to lose the one outer electron
- the melting point and boiling point decreases down Group 1.



## Group 7 elements

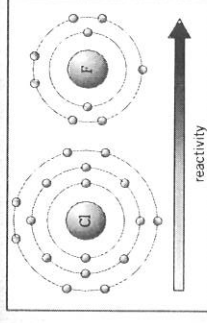
**Group 7** elements are called the **halogens**. They are non-metals that exist as molecules made up of pairs of atoms.

Name	Formula	State at room temperature	Melting point and boiling point	Reactivity
fluorine	F <sub>2</sub>	gas		
chlorine	Cl <sub>2</sub>	gas		
bromine	Br <sub>2</sub>	liquid	Increases down the group	decreases down the group
iodine	I <sub>2</sub>	solid		

## Group 7 reactivity

Reactivity decreases down Group 7 because as you move down the group:

- the atoms increase in size
- the outer shell is further away from the nucleus, and there are more shells between the nucleus and the outer shell
- the electrostatic attraction from the nucleus to the outer shell is weaker so it is harder to gain one electron to fill the outer shell.



## Group 7 displacement

More reactive Group 7 elements can take the place of less reactive ones in a compound. This is called **displacement**.

For example, fluorine displaces chlorine as it is more reactive:  

$$\text{fluorine} + \text{potassium chloride} \rightarrow \text{potassium fluoride} + \text{chlorine}$$





- 1 Dimitri Mendeleev is regarded as the 'father' of the Periodic Table.
- a In what order did Mendeleev himself place the elements? .....
- b Why did Mendeleev place elements in groups? .....
- .....
- .....
- c Explain in detail why Mendeleev's table became accepted as a vital part of chemistry.
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- d Years after he published his table, what order did we discover that we Mendeleev had placed the elements in?
- .....
- 2 A few years before Mendeleev produced his table, John Newlands had a similar idea with his table. Explain why Newlands' table was not accepted.
- .....
- .....
- .....
- .....
- .....
- .....

## Exam Questions

**Q1.** This question is about the periodic table.

In the 19th century, some scientists tried to classify the elements by arranging them in order of their atomic weights.

The figure below shows the periodic table Mendeleev produced in 1869.

His periodic table was more widely accepted than previous versions.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Period 1	H						
Period 2	Li	Be	B	C	N	O	F
Period 3	Na	Mg	Al	Si	P	S	Cl
Period 4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br
Period 5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I

- (a) The atomic weight of tellurium (Te) is 128 and that of iodine (I) is 127

Why did Mendeleev reverse the order of these two elements?

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(1)

- (b) Mendeleev left spaces marked with an asterisk \*

He left these spaces because he thought missing elements belonged there.

Why did Mendeleev's periodic table become more widely accepted than previous versions?

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(3)

- (c) Mendeleev arranged the elements in order of their atomic weight.

What is the modern name for atomic weight?

Tick (✓) **one** box.

Atomic number

☐

Relative atomic mass

☐

Mass number

☐

Relative formula mass

☐

(1)

- (d) Complete the sentence.

In the modern periodic table, the elements are arranged in order of

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(1)

Chlorine, iodine and astatine are in Group 7 of the modern periodic table.

- (e) Astatine (At) is below iodine in Group 7.

Predict:

- the formula of an astatine molecule
- the state of astatine at room temperature.

Formula of astatine molecule \_\_\_\_\_

State at room temperature \_\_\_\_\_

(2)

- (f) Sodium is in Group 1 of the modern periodic table.

Describe what you would see when sodium reacts with chlorine.

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(2)

(Total 10 marks)

**Q2.** This question is about elements and the periodic table.

- (a) Newlands and Mendeleev both produced early versions of the periodic table.

- (i) Complete the sentence.

In their periodic tables, Newlands and Mendeleev arranged the elements in

order of \_\_\_\_\_

(1)

- (ii) Name the particle that allowed the elements to be arranged in order of their atomic number in the modern periodic table.

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(1)

- (b) The diagram below shows the position of nine elements in the modern periodic table.

[illegible]

- (i) Which **one** of the nine elements shown in the diagram above has the lowest boiling point?

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(1)

- (ii) Copper and potassium have different melting points and boiling points.  
Give **one other** difference between the properties of copper and potassium.

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(1)

- (iii) Explain why the reactivity of the elements increases going down Group 1 from lithium to rubidium but decreases going down Group 7 from fluorine to iodine.

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(4)

(Total 8 marks)

### TRIPLE SCIENCE ONLY

**Q3.** An atom of aluminium has the symbol  $^{27}_{13}\text{Al}$

- (a) Give the number of protons, neutrons and electrons in this atom of aluminium.

Number of protons \_\_\_\_\_

Number of neutrons \_\_\_\_\_

Number of electrons \_\_\_\_\_

(3)

- (b) Why is aluminium positioned in Group 3 of the periodic table?

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(1)



- (c) In the periodic table, the transition elements and Group 1 elements are metals.

Some of the properties of two transition elements and two Group 1 elements are shown in the table below.

	Transition elements		Group 1 elements	
	Chromium	Iron	Sodium	Caesium
<b>Melting point in °C</b>	1857	1535	98	29
<b>Formula of oxides</b>	CrO Cr <sub>2</sub> O <sub>3</sub> CrO <sub>2</sub> CrO <sub>3</sub>	FeO Fe <sub>2</sub> O <sub>3</sub> Fe <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	Cs <sub>2</sub> O

Use your own knowledge **and** the data in the table above to compare the chemical and physical properties of transition elements and Group 1 elements.

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(6)  
(Total 10 marks)