AQA GCSE Atomic structure and periodic table part 2

Alkali metals

Halogens

Noble gases

Transition metals

1	2											3	4	5	6	7	0
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
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	?	?	?						

Metals to the left of this line, non metals to the right

The Periodic table

Elements arranged in order of atomic number	***Elements with similar properties are in columns called groups***	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Development of the Periodic table

Before discovery of protons, neutrons and electrons	***Elements arranged in order of atomic weight***	Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
Mendeleev	***Left gaps for elements that hadn't been discovered yet***	Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

Metals and non metals

Metals	***To the left of the Periodic table***	Form positive ions. Conductors, high melting and boiling points, ductile, malleable.
Non metals	***To the right of the Periodic table***	Form negative ions. Insulators, low melting and boiling points.

Group 1

Alkali metals	***Very reactive with oxygen, water and chlorine***	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

With oxygen	**Forms a metal oxide**	Metal + oxygen → metal oxide	e.g. $4Na + O_2 \rightarrow 2Na_2O$
With water	**Forms a metal hydroxide and hydrogen**	Metal + water → metal hydroxide + hydrogen	e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
With chlorine	**Forms a metal chloride**	Metal + chlorine → metal chloride	e.g. $2Na + Cl_2 \rightarrow 2NaCl$

Group 7

Halogens	***Consist of molecules made of a pair of atoms***	Have seven electrons in their outer shell. Form -1 ions.	
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.	
	Reactivity decreases down the group	Increasing proton number means an electron is more easily gained	
With metals	**Forms a metal halide**	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	**Forms a hydrogen halide**	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $Cl_2 + H_2 \rightarrow 2HCl$
With aqueous solution of a halide salt	**A more reactive halogen will displace the less reactive halogen from the salt**	Chlorine + potassium bromide → potassium chloride + bromine	e.g. $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Group 0

Noble gases	***Unreactive, do not form molecules***	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

Transition metals (Chemistry only)

Compared to group 1	• ***Less reactive*** • ***Harder*** • ***Denser*** • ***Higher melting points***	• ***Cu^{2+} is blue*** • ***Ni^{2+} is pale green, used in the manufacture of margarine*** • ***Fe^{2+} is green, used in the Haber process*** • ***Fe^{3+} is reddish-brown*** • ***Mn^{2+} is pale pink***
Typical properties	• ***Many have different ion possibilities with different charges*** • ***Used as catalysts*** • ***Form coloured compounds***	

AQA GCSE Atomic structure and periodic table part 2

The Periodic table

	Elements with similar properties are in columns called groups	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

1	2											3	4	5	6	7	0
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
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	?	?	?						

Metals to the left of this line, non metals to the right

Development of the Periodic table

	Elements arranged in order of atomic weight	Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
	Left gaps for elements that hadn't been discovered yet	Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

Metals and non metals

	To the left of the Periodic table	Form positive ions. Conductors, high melting and boiling points, ductile, malleable.
	To the right of the Periodic table	Form negative ions. Insulators, low melting and boiling points.

Group 1

	Very reactive with oxygen, water and chlorine	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

	Forms a metal oxide	Metal + oxygen → metal oxide	e.g. $4Na + O_2 \rightarrow 2Na_2O$
	Forms a metal hydroxide and hydrogen	Metal + water → metal hydroxide + hydrogen	e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
	Forms a metal chloride	Metal + chlorine → metal chloride	e.g. $2Na + Cl_2 \rightarrow 2NaCl$

Group 7

	Consist of molecules made of a pair of atoms	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is more easily gained

	Forms a metal halide	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
	Forms a hydrogen halide	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $Cl_2 + H_2 \rightarrow 2HCl$
	A more reactive halogen will displace the less reactive halogen from the salt	Chlorine + potassium bromide → potassium chloride + bromine	e.g. $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Group 0

	Unreactive, do not form molecules	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

Transition metals (Chemistry only)

	• *Less reactive* • *Harder* • *Denser* • *Higher melting points*	• *Cu^{2+} is blue* • *Ni^{2+} is pale green, used in the manufacture of margarine* • *Fe^{2+} is green, used in the Haber process* • *Fe^{3+} is reddish-brown* • *Mn^{2+} is pale pink*
	• *Many have different ion possibilities with different charges* • *Used as catalysts* • *Form coloured compounds*	

AQA GCSE Atomic structure and periodic table part 2

The Periodic table

1	2											3	4	5	6	7	0
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
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	?	?	?						

Metals to the left of this line, non metals to the right

		Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Development of the Periodic table

		Early periodic tables were incomplete, some elements were placed in inappropriate groups if the strict order atomic weights was followed.
		Elements with properties predicted by Mendeleev were discovered and filled in the gaps. Knowledge of isotopes explained why order based on atomic weights was not always correct.

Metals and non metals

		Form positive ions. Conductors, high melting and boiling points, ductile, malleable.
		Form negative ions. Insulators, low melting and boiling points.

Group 1

		Only have one electron in their outer shell. Form +1 ions.
		Negative outer electron is further away from the positive nucleus so is more easily lost.

		Metal + oxygen → metal oxide	e.g. $4Na + O_2 \rightarrow 2Na_2O$
		Metal + water → metal hydroxide + hydrogen	e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
		Metal + chlorine → metal chloride	e.g. $2Na + Cl_2 \rightarrow 2NaCl$

Group 7

		Have seven electrons in their outer shell. Form -1 ions.
		Increasing atomic mass number.
		Increasing proton number means an electron is more easily gained

		Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
		Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $Cl_2 + H_2 \rightarrow 2HCl$
		Chlorine + potassium bromide → potassium chloride + bromine	e.g. $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Group 0

		This is due to having full outer shells of electrons.
		Increasing atomic number.

Transition metals (Chemistry only)

	• *Cu^{2+} is blue* • *Ni^{2+} is pale green, used in the manufacture of margarine* • *Fe^{2+} is green, used in the Haber process* • *Fe^{3+} is reddish-brown* • *Mn^{2+} is pale pink*

AQA GCSE Atomic structure and periodic table part 2

1	2											3	4	5	6	7	0
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
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	?	?	?						

Metals to the left of this line, non metals to the right

The Periodic table

Development of the Periodic table

Metals and non metals

Group 7

Group 1

Group 0

Transition metals (Chemistry only)

This is due to having full outer shells of electrons.

Increasing atomic number.