

# CIE Chemistry IGCSE

## Topic 9 - The Periodic Table

### Flashcards



# What is the periodic table?



# What is the periodic table?

A method of classifying elements.



# How is the periodic table arranged?



## How is the periodic table arranged?

The elements are arranged in order of increasing atomic number. This places elements in vertical groups (columns) and horizontal periods (rows).

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



Where are metals and non-metals found  
in the periodic table?



Where are metals and non-metals found in the periodic table?

Metals make up most of the periodic table and are found towards the left of the table.

Non-metals are found towards the top right of the periodic table.



How does metallic character change  
across a period?





How does metallic character change across a period?

It decreases across the period.



How does non-metallic character change across a period?



How does non-metallic character change across a period?

It increases across the period.



Why do elements in the same group  
have similar chemical properties?  
(extended only)



Why do elements in the same group have similar chemical properties? (**extended only**)

Chemical properties are determined by the number of electrons in the outer shell of an atom. Elements in the same group have the same number of electrons in their outer shell so they react in a similar way.



How many electrons are in the outer shell of a group V element?  
(extended only)



How many electrons are in the outer shell of a group V element? (extended only)

Five



What is the charge on group I and group II ions? (extended only)





What is the charge on group I and group II ions?  
(extended only)

Group I and group II elements are metals so they lose electrons to form positive ions.

Group I forms 1+ ions.

Group II forms 2+ ions.



What is the charge on group VI and  
group VII ions?  
(extended only)



What is the charge on group VI and group VII ions?  
(extended only)

Group VI and group VII elements are non-metals so they gain electrons to form negative ions.

Group VI forms 2- ions.

Group VII forms 1- ions.



Which group do lithium, sodium and potassium belong to?



Which group do lithium, sodium and potassium belong to?

Group I



What trends can be seen in group I elements (lithium, sodium and potassium)?



What trends can be seen in group I elements (lithium, sodium and potassium)?

- All relatively soft metals.
- Trend in melting point.
- Trend in density.
- Trend in reactivity with water.



How does melting point change down  
Group I?





# How does melting point change down Group I?

Melting point decreases down the group because the strength of the metallic bonds decreases so less energy is required to break these bonds to turn the solid into a liquid.



# How does density change down Group 1?



How does density change down Group I?

Density increases down the group.

All Group I elements have low densities and will float on water.



What is the trend in the reactivity with water down Group I?



What is the trend in the reactivity with water down Group I?

Reactivity increases down the group.



Why does reactivity increase down  
Group I?



## Why does reactivity increase down Group I?

Group I elements lose an electron when they react. Atomic radius and electron shielding increase down the group so there is weaker attraction between the nucleus and outer shell electron. This means less energy is required to remove this electron from elements further down the group.



Describe the general reaction of a Group I element with water





Describe the general reaction of a Group I element with water

Vigorous reaction with water, producing hydrogen and an alkaline solution.

Bubbles will be seen due to the production of hydrogen.



Using the trend in melting points, predict which element in Group I has the highest melting point



Using the trend in melting points, predict which element in Group I has the highest melting point

Lithium



Using the trend in density, predict which element in Group I has the highest density



Using the trend in density, predict which element has the highest density out of sodium, lithium and caesium

Caesium



Which group do the elements chlorine, bromine and iodine belong to? What is another name for this group of elements?



Which group do the elements chlorine, bromine and iodine belong to? What is another name for this group of elements?

Group VII, the halogens.



Halogens are diatomic. What does this mean?





Halogens are diatomic. What does this mean?

They form molecules consisting of 2 atoms.

E.g.  $\text{Cl}_2$ ,  $\text{Br}_2$  ...



What is the colour and state of chlorine at room temperature?



What is the colour and state of chlorine at room temperature?

Pale green gas



What is the colour and state of bromine at room temperature?



What is the colour and state of bromine at room temperature?

Red-brown liquid



What is the colour and state of iodine at room temperature?



What is the colour and state of iodine at room temperature?

Black solid



Why are the halogens at different states at room temperature? What is the trend down the group?





Why are the halogens at different states at room temperature? What is the trend down the group?

At room temperature, chlorine is gaseous, bromine is liquid and iodine is solid because they have different melting and boiling points. As you go down the group, melting and boiling point increase.



What state would you expect the halogens fluorine and astatine to be at room temperature?



What state would you expect the halogens fluorine and astatine to be at room temperature?

Fluorine is above chlorine so should have a boiling point lower than chlorine. This means it would be a gas at room temperature.

Astatine is below iodine in Group VII so should have a higher melting point than iodine. Therefore you can predict that it would be a solid at room temperature.



What is trend in colour and density of the  
Group VII elements?



What is trend in colour and density of the Group VII elements?

Colour gets darker down the group.

Density increases down the group.



Why do melting and boiling point  
increase down Group VII?



## Why do melting and boiling point increase down Group VII?

The molecules get bigger down the group so there are stronger intermolecular forces to overcome during melting / boiling so more energy is required to change state.



When does a halogen displacement reaction occur?





When does a halogen displacement reaction occur?

When a more reactive halogen displaces a less reactive halogen from an aqueous solution of its halide ions.



# Why does reactivity decrease down Group VII?



## Why does reactivity decrease down Group VII?

Group VII elements gain an electron when they react. As you go down Group VII, atomic radius and electron shielding increase. This means that the attraction between the nucleus and outer electrons decreases so it is harder for the atom to gain an electron.



Why will halogen A only be displaced by halogen B if B is above A in Group VII?



Why will halide ions A only be displaced by halogen B if B is above A in Group VII?

The most reactive halogen (B) will displace the less reactive halogen (A) to become part of the ionic compound. Reactivity increases as you go up the group so B must be higher in Group VII to be more reactive than A.



Which halogens can chlorine displace from an aqueous ionic solution?



Which halogens can chlorine displace from an aqueous ionic solution?

Chlorine can displace any halogens below it in Group VII. It will displace iodine and bromine.



Which halogens can't be displaced from an aqueous ionic solution by bromine?





Which halogens can't be displaced from an aqueous ionic solution by bromine?

Bromine can't displace any halogens above it in Group VII. These are chlorine and fluorine.



Why can't iodine displace chlorine or bromine from an aqueous ionic solution?



Why can iodine not displace chlorine or bromine from an aqueous ionic solution?

Because reactivity decreases down the group and iodine is below chlorine and bromine Group VII. Displacement will only occur if iodine is more reactive than the halogen in the ionic compound.



Write the word equation for the reaction between chlorine and potassium bromide



Write the word equation for the reaction between chlorine and potassium bromide

Chlorine + potassium bromide  $\rightarrow$  potassium chloride + bromine



Write the word equation for the reaction between bromine and calcium chloride



Write the word equation for the reaction between bromine and calcium chloride

No reaction will occur because bromine is less reactive than chlorine so chlorine won't be displaced.

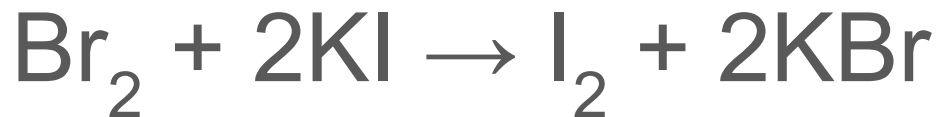


Write the balanced symbol equation for the reaction that takes place between bromine and potassium iodide





Write the balanced symbol equation for the reaction that takes place between bromine and potassium iodide



Which halogens would you expect astatine to be able to displace?



Which halogens would you expect astatine to be able to displace?

None of them. It is at the bottom of Group VII so has the lowest reactivity.



What colours are solutions of chlorine,  
bromine and iodine?



What colours are solutions of chlorine, bromine and iodine?

Chlorine water - colourless

Bromine water - orange

Iodine solution - brown



What would you observe when chlorine is added to potassium bromide?



What would you observe when chlorine is added to potassium bromide?



Colour change from colourless (due to  $\text{Cl}_2$ ) to orange (due to  $\text{Br}_2$ ).



What are the general properties of transition metals?





# What are the general properties of transition metals?

- Relatively high densities.
- High melting points.
- Form coloured compounds.
- Often act as catalysts.



Fill in the blank: 'Transition metals have  
variable \_\_\_\_\_',  
(extended only)



Fill in the blank: 'Transition metals have variable \_\_\_\_\_' (extended only)

Oxidation states



# Show that transition metals have variable oxidation states (extended only)



Show that transition metals have variable oxidation states (**extended only**)



.....



What name is given to elements in  
Group 0?



What name is given to elements in Group 0?

Noble gases



The noble gases are monatomic gases.  
What does monatomic mean?





The noble gases are monatomic gases. What does monatomic mean?

Molecules consist of only one atom.



How many electrons do the noble gases have in their outer shell?



How many electrons do the noble gases have in their outer shell?

0

Their outer shell of electrons is full (no incomplete shells).



# What does chemically inert mean?



# What does chemically inert mean?

Not chemically active



# Why are the noble gases chemically inert?



Why are the noble gases chemically inert?

They have full outer electron shells. This is a very stable electron configuration and means the elements are very unreactive.



What properties of helium makes it suitable for use in balloons?





What properties of helium makes it suitable for use in balloons?

It is less dense than air and does not burn.



Why is argon used to fill electric light bulbs?



Why is argon used to fill electric light bulbs?

It is very chemically inert so will not react when the light bulb gets hot. It is non-flammable.



# Why is argon used for welding?



# Why is argon used for welding?

It provides an inert welding atmosphere.  
Argon is more dense than air so keeps air away from the metal.

