

# WJEC (Eduqas) Chemistry

## A-level

### Core Topic 1.6 - The Periodic Table

#### Flashcards

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# How are elements arranged in the periodic table?



# How are elements arranged in the periodic table?

Elements are arranged in order of increasing atomic number. They are positioned in vertical groups and horizontal periods.



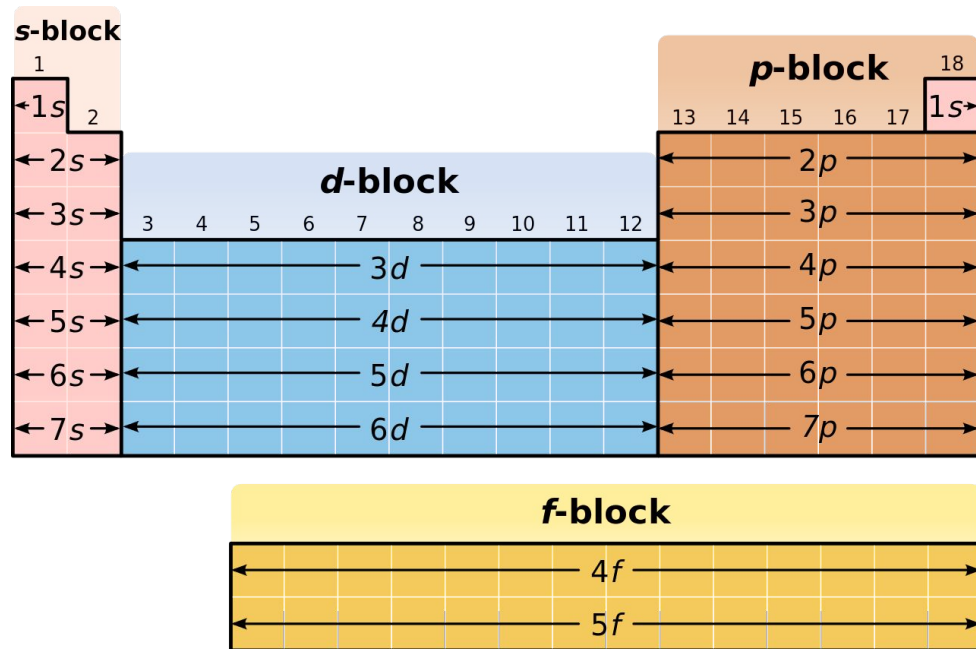
In terms of subshells, how is the periodic table divided up?



# In terms of subshells, how is the periodic table divided up?

Divided into s, p, d and f blocks.

The block denotes the subshell the elements' valence electrons are in.



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What does the group and period of an element show?



What does the group and period of an element show?

Period - tells you how many electron shells the atom has.

Group - tells you how many electrons are in the atom's outer shell.



Define oxidation in terms of electron transfer





# Define oxidation in terms of electron transfer

## Loss of electrons



Define reduction in terms of electron transfer



# Define reduction in terms of electron transfer

## Gain of electrons



What is the general trend in first ionisation energy across Period 2 and Period 3?



What is the general trend in first ionisation energy across Period 2 and Period 3?

As you go along the period, first ionisation energy increases.



Explain the reason for the drop in ionisation energy between nitrogen and oxygen in Period two



Explain the reason for the drop in ionisation energy between nitrogen and oxygen in Period two

The electron being removed from oxygen is in an electron pair so the electron is removed more easily due to repulsion between the two electrons.



Explain the reason for the drop in ionisation energy between magnesium and aluminium in Period three





## Explain the reason for the drop in ionisation energy between magnesium and aluminium in Period three

The electron being removed from aluminium is in the 3p orbital rather than 3s in magnesium. The 3p orbital is at a slightly higher energy level and the electron is found further from the nucleus. Aluminium has a lower ionisation energy as the electron is less attracted to the nucleus due to the increased distance and shielding from the 3s orbital.



Why does first ionisation energy increase  
across a period?



## Why does first ionisation energy increase across a period?

First ionisation energy increases across a period because the number of protons is increasing whilst the atomic radius is decreasing. This means there is a higher nuclear charge attracting the outer electrons. There is not much change in shielding across the period so this does not have a significant effect.



Explain the trend in ionisation energy  
down a group in the periodic table



Explain the trend in ionisation energy down a group in the periodic table

Ionisation energy decreases down the group.

This is because the amount of shielding increases along with atomic radius, so the outer electron is attracted more weakly to the nucleus, making it easier to remove.



What is the trend in electronegativity  
across a period?



What is the trend in electronegativity across a period?

As you go across a period, the electronegativity increases. This is because there are more protons and decreasing atomic radius so there is an increasing nuclear attraction to the electron density.



What is the trend in electronegativity  
down a group?





What is the trend in electronegativity down a group?

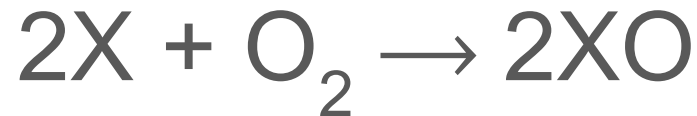
As you go down a group the electronegativity decreases. This is because electron shielding and atomic radius increases so the nuclear attraction to the bonding pair weakens down the group.



# How do Group 2 elements react with oxygen?



How do Group 2 elements react with oxygen?



Where X is the Group 2 element.



# How do Group 2 elements react with water?



How do Group 2 elements react with water?



Where X is the Group 2 element.



What is the chemical equation for the reaction between calcium and water?



What is the chemical equation for the reaction between calcium and water?

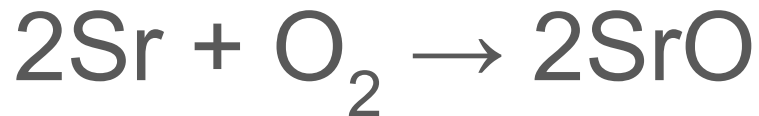


What is the chemical equation for the reaction between strontium and oxygen?





What is the chemical equation for the reaction between strontium and oxygen?



What is the chemical equation for the reaction between magnesium chloride and sodium carbonate?



What is the chemical equation for the reaction between magnesium chloride and sodium carbonate?



What is the chemical formula of the compound formed when barium ions react with sulfate ions?



What is the chemical formula of the compound formed when barium ions react with sulfate ions?

Barium ions  $\rightarrow$   $\text{Ba}^{2+}$

Sulfate ions  $\rightarrow$   $\text{SO}_4^{2-}$

Barium sulfate  $\rightarrow$   $\text{BaSO}_4$



Describe how you would carry out a  
flame test



## Describe how you would carry out a flame test

- Clean a nichrome wire using hydrochloric acid.
- Turn the Bunsen burner onto the blue flame.
- Dip the wire in a solution of the substance being tested.
- Place the wire in the flame and record the colour.



What colour is observed in the flame test for lithium ions?





What colour is observed in the flame test for lithium ions?

Crimson flame



What colour is observed in the flame test for sodium ions?



What colour is observed in the flame test for sodium ions?

Yellow flame



What colour is observed in the flame test for potassium ions?



What colour is observed in the flame test for potassium ions?

Lilac flame



What colour is observed in the flame test for calcium ions?



What colour is observed in the flame test for calcium ions?

Orange-red flame



What colour is observed in the flame test for strontium ions?





What colour is observed in the flame test for strontium ions?

Red flame



Why must the wire be cleaned before carrying out a flame test?



Why must the wire be cleaned before carrying out a flame test?

To remove any unwanted ions that might obscure the colour of the flame.



Why can a flame test not be used when a compound contains a mixture of metal ions?



Why can a flame test not be used when a compound contains a mixture of metal ions?

The flame colours of the ions will blend together so the individual flame colours won't be seen meaning the ions can't be identified.



Explain the trend in reactivity down  
Group 1 from lithium to potassium



# Explain the trend in reactivity down Group 1 from lithium to potassium

In order to react, Group 1 elements lose an electron to form a 1+ ion.

Down Group 1, the atomic radius and shielding increases so the outer electron is lost more easily. This means reactivity increases down Group 1.



Explain the trend in reactivity down  
Group 2 from magnesium to barium





Explain the trend in reactivity down Group 2 from magnesium to barium

In order to react, Group 2 elements lose two electrons to form 2+ ions.

Down Group 2, the atomic radius and shielding increases so the outer electrons are lost more easily. This means reactivity increases down Group 2.



What is the trend in thermal stabilities of Group 1 and 2 carbonates?



What is the trend in thermal stabilities of Group 1 and 2 carbonates?

The thermal stabilities of Group 1 and 2 carbonates increase down the groups.



What is the trend in thermal stabilities of Group 1 and 2 nitrates?



What is the trend in thermal stabilities of Group 1 and 2 nitrates?

The thermal stabilities of Group 1 and 2 nitrates increase down the groups.



Why do the thermal stabilities of carbonates and nitrates increase down Groups 1 and 2?



## Why do the thermal stabilities of carbonates and nitrates increase down Groups 1 and 2?

Down the groups, the ionic radii increases whilst the magnitude of charge remains the same. Therefore the charge densities of the Group 1 and 2 ions decrease. As the ions have a lower charge density, they distort the  $\text{CO}_3^{2-}$  and  $\text{NO}_3^-$  ions less, so the compounds take more energy to breakdown.



What is the trend in solubility of Group 2 hydroxides down the group?





What is the trend in solubility of Group 2 hydroxides down the group?

The solubility of Group 2 hydroxides increases down the group.



What is the trend in solubility of Group 2 sulfates down the group?



What is the trend in solubility of Group 2 sulfates down the group?

The solubility of Group 2 sulfates decreases down the group.



What is produced when a Group 1 or Group 2 hydroxide reacts with a dilute acid?



What is produced when a Group 1 or Group 2 hydroxide reacts with a dilute acid?

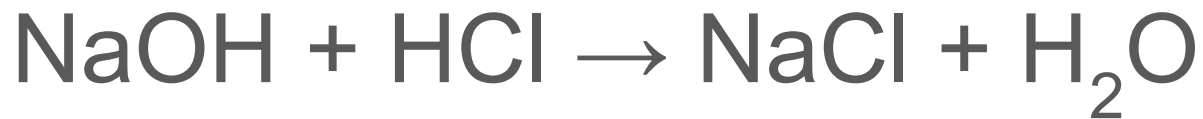
Salt and water.



What is the chemical equation for the reaction between sodium hydroxide and dilute hydrochloric acid?



What is the chemical equation for the reaction between sodium hydroxide and dilute hydrochloric acid?



What is produced when a Group 1 or Group 2 oxide reacts with a dilute acid?





What is produced when a Group 1 or Group 2 oxide reacts with a dilute acid?

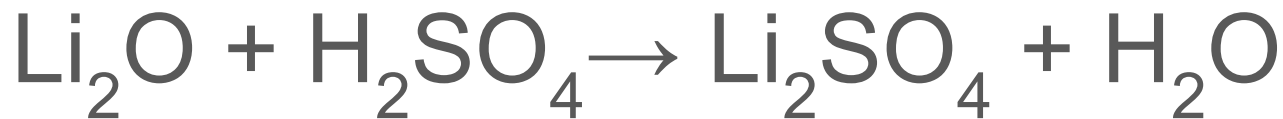
Salt and water.



What is the chemical equation for the reaction between lithium oxide and dilute sulfuric acid?



What is the chemical equation for the reaction between lithium oxide and dilute sulfuric acid?



What are the Group 7 elements often referred to as?



What are the Group 7 elements often referred to as?

The halogens



Why do the halogens exist in different states at room temperature? What is the trend down the group?



Why do the halogens exist in 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 increases.



Why does melting and boiling point increase down Group 7?





## Why does melting and boiling point increase down Group 7?

The molecules get bigger and the number of electron shells increases down the group so there are more intermolecular forces to overcome during melting/boiling, so more energy is required to change state.



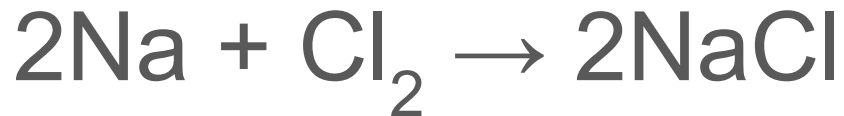
What is produced when a halogen reacts with a metal?



What is produced when a halogen reacts with a metal?

A salt is produced.

E.g.



# Why does reactivity decrease down Group 7?



## Why does reactivity decrease down Group 7?

As you go down Group 7, the outer shell is further from the nucleus and electron shielding increases. Attraction between the nucleus and outer electrons decreases so it is harder for the atom to gain an electron meaning reactivity decreases.



Link the reactivity trend of the halogens  
to the relative oxidising power of the  
halogens



Link the reactivity trend of the halogens to the relative oxidising power of the halogens

Reactivity decreases down Group 7. This means the oxidising power of the halogens also decreases down the group because it is harder for the atom to gain an electron.



# How can halide ions be identified in a solution?





## How can halide ions be identified in a solution?

Add nitric acid followed by silver nitrate solution. Silver halide precipitates will form. Ammonia solution can be added further distinguish between the halide precipitates.

Silver chloride: White precipitate soluble in dilute ammonia

Silver bromide: Cream precipitate soluble in concentrated ammonia

Silver iodide: Yellow precipitate insoluble in ammonia



# What is a redox reaction?



## What is a redox reaction?

A redox reaction is one in which oxidation and reduction occur on different species simultaneously.



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.



Why can't iodine displace chloride or bromide ions from an aqueous ionic solution?



Why can iodine not displace chloride or bromide ions from an aqueous ionic solution?

Because reactivity decreases down the group and iodine is below chlorine and bromine in Group 7. Displacement will only occur if iodine is more reactive than the halogen in the ionic compound.



What is the chemical equation for the reaction between bromine and potassium iodide?





What is the chemical equation for the reaction between bromine and potassium iodide?



What type of reactions are halogen and halide ion displacement reactions?



What type of reactions are halogen and halide ion displacement reactions?

Redox



What is a common use of chloride and fluoride ions?



What is a common use of chloride and fluoride ions?

The ions are used in water treatment.

They kill bacteria in the water.



What are the health and ethical debates surrounding the use of chloride and fluoride ions in water?



What are the health and ethical debates surrounding the use of chloride and fluoride ions in water?

People argue that, since chlorine is toxic, it shouldn't be put into water supplies. It is also argued that people should have the choice about whether their water is treated with these ions.



# What is a precipitation reaction?





# What is a precipitation reaction?

A reaction in which two soluble salts combine to form an insoluble salt.

