Chemistry Revision

AQA Trilogy

Use your PLC to identify which topic you need to revise & complete the relevant task

- ❑ C1 Atomic Structure and the Periodic Table
- ❑ C2 Bonding, structure and the properties of matter
- ❑ C3 Quantitative Chemistry
- ❑ C4 Chemical changes
- ❑ C5 Energy changes

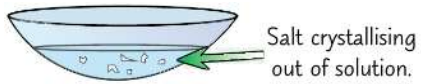
Assessment – Paper 3: Chemistry 1 (70 marks -16.7% of GCSE)

C1 Atomic Structure and the Periodic Table AQA Trilogy

Write the word equation for:
Burning magnesium in air

Can you write the balanced symbol equation?

Explain crystallisation as a separation technique



Name of particle	Charge	Relative Mass
Proton		
Neutron		
Electron		

Define the following terms:
Atom

Element

Compound

Mixture

Balance the symbol equations below:

H_2SO_4 + NaOH → Na_2SO_4 + H_2O

Zn + O_2 → ZnO

CH_4 + O_2 → CO_2 + H_2O

Draw a diagram to illustrate chromatography as a separation technique

(Mass number) 23
(Atomic number) 11
Na

Number of protons =

Number of neutrons =

Number of electrons =

Write the symbols for the following elements:

Oxygen

Carbon

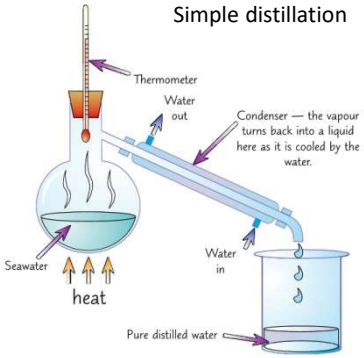
Sodium

Magnesium

Chlorine

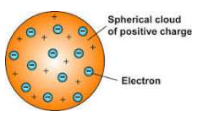
Copper

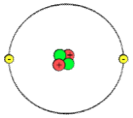
Simple distillation



Explain simple distillation as a separation technique, shown in the diagram

Describe the difference between the plum pudding and the nuclear model of an atom





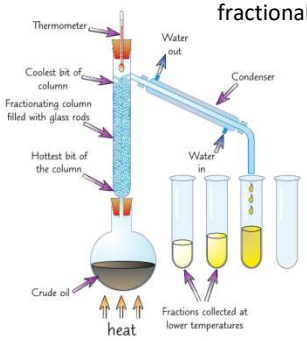
Write the name of the compound:
CO_2

H_2O

NaCl

$CuSO_4$

fractional distillation



Explain fractional distillation as a separation technique

Where in an atom are the neutrons and proton?
The number of protons = the number of_____
Atomic number is the number of _____
Mass number is the number of _____ + the number of _____
Isotopes have a different number of _____

C1 Atomic Structure and the Periodic Table AQA Trilogy

In the periodic table, the elements are arranged in order of their _____ number

Elements in the same group, have the same number of _____

Groups go _____

Periods go _____

When developing the periodic table, Why did Medeleev leave gaps?

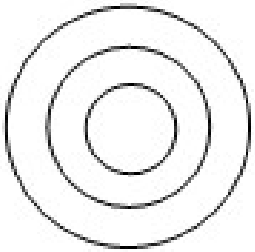
Approximately how may elements are in the periodic table?

Properties of metals

-
-
-
-
-

Draw the electron structure for sodium

23
Na
sodium
11



What is group 1 also known as?

As you go down group 1, what happens to the reactivity?

How many electrons are in the outer shell of a group 1 metal?

7	**Li**	lithium 3
23	**Na**	sodium 11
39	**K**	potassium 19
85	**Rb**	rubidium 37

Delete as appropriate:

If you remove electrons from an atom is becomes positive/ negative

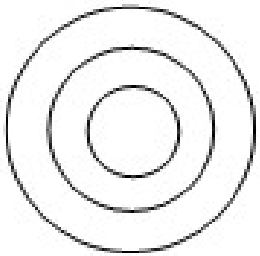
If you add electrons to an atom it becomes positive/negative

Properties of non-metals

-
-
-
-
-

Draw the electron structure for chlorine

35.5
Cl
chlorine
17



What is group 7 also known as?

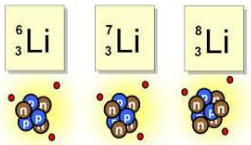
As you go down group 7, what happens to the reactivity?

What happens to melting point and boiling point as you go down the group?

How many electrons are in the outer shell of a group 7 element?

19	**F**	fluorine 9
35.5	**Cl**	chlorine 17
80	**Br**	bromine 35
127	**I**	iodine 53

What is an isotope?

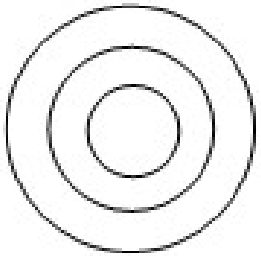


To work out the relative atomic mass using the abundance of isotopes we can use the following calculation:

(% of isotope 1 × mass of isotope 1)
+
(% of isotope 2 × mass of isotope 2)
÷ 100

Draw the electron structure for chlorine

40
Ar
argon
18



What is group 0 also know as?

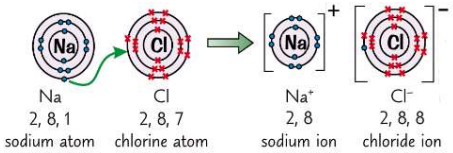
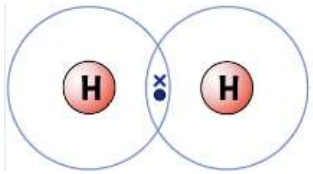
In group 0, how many electrons are in the outer shell?

How is boiling point affected as you go down the group?

4	**He**	helium 2
20	**Ne**	neon 10
40	**Ar**	argon 18
84	**Kr**	krypton 36

Copper has two stable isotopes Cu-63 which has an abundance of 69.2% and Cu-65 which has an abundance of 30.8%
Calculate relative atomic mass to 1dp.

In any sample of Chlorine 25% will be $_{37}Cl$ and 75% $_{35}Cl$. Calculate the relative atomic mass to 1dp.

C2 Bonding, structure and the properties of matter **AQA Trilogy**	Ionic bonding Describe ionic bonding What bonds together?	Covalent bonding Describe covalent bonding What bonds together?	Draw the dot and cross diagram to show the covalent bonding in NI_2
Define the following terms: Ion Electrostatic force Polymer Allotrope	Ionic bonding is represented with dot and cross diagrams Sodium chloride is shown below: 	Covalent bonding is represented with dot and cross diagrams. The covalent bond between two hydrogen atoms is shown below: 	Draw the dot and cross diagram to show the covalent bonding in H_2O
Write the charge of the following atoms when they form ions: Na Mg Cl K O Br S Ca	Draw the dot and cross diagram for magnesium oxide (MgO)	Draw the dot and cross diagram to show the covalent bonding in Cl_2	Draw the dot and cross diagram to show the covalent bonding in CH_4
Give properties of ionic compounds • • •	Draw the dot and cross diagram for magnesium chloride ($MgCl_2$)	Draw the dot and cross diagram to show the covalent bonding in O_2	Draw the dot and cross diagram to show the covalent bonding in HCl

C2 Bonding, structure and the properties of matter
AQA Trilogy

Diamond
Number of covalent bonds from each carbon

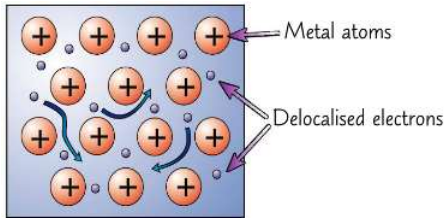
Melting point is low / high / very high

Why doesn't it conduct electricity?

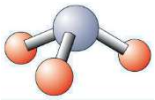
Metallic bonding
Describe metallic bonding

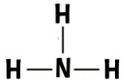
What bonds together?

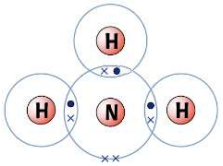
Metallic bonding

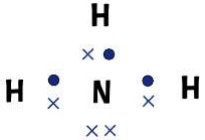


There are several ways to represent covalent bonds:





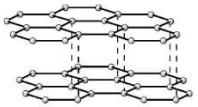




Graphite
Number of covalent bonds from each carbon

Melting point is low / high / very high

Why does it conduct electricity?

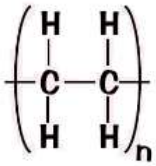


Why are most metals:
solid at room temperature?

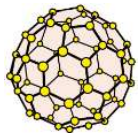
Good conductors of electricity and heat

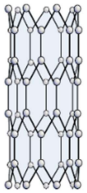
Draw a diagram to show why alloys are harder than pure metals

The repeating unit of poly(ethene) is shown below. What is the molecular formula of poly(ethene)



Write about the uses of Fullerenes like Bucky balls and nanotubes





Draw a diagram to show why most metals are malleable

	melting point	boiling point
oxygen	–219 °C	–183 °C
nitrogen	–210 °C	–196 °C
bromine	–7 °C	59 °C

Predict the state of:

Bromine at room temperature (25°C)

Nitrogen at room temperature (25°C)

Oxygen at – 220°C

The reason that most polymers are solid at room temperature is:

Name the process:
Solid → liquid
Liquid → gas
Gas → liquid
Liquid → solid

Draw particle diagrams to show a solid, liquid and a gas

solid	liquid	gas

Ethanol melts at -114°C and boils at 78°C. Predict the state at:

-150°C

0°C

25°C

100°C

C3 Quantitative Chemistry AQA Trilogy	When magnesium burns, the mass increases. Explain why and write an equation 	Write the equation for calculating the number of moles in a given mass (You need to be able to rearrange this) 	What is meant by the term limiting reactant?
State what is meant by the law of conservation of mass	When calcium carbonate thermally decomposes, the mass decreases. Explain why and write an equation	Calculate the number of moles in: 66g of carbon 28g of N_2 gas 88g of CO_2	Calculate the mass of aluminium oxide formed when 135g of aluminium is burned in air $4Al + 3O_2 \rightarrow 2Al_2O_3$
Relative formula mass (M_r) is calculated by adding the relative atomic masses of the atoms in the compound. Calculate the M_r of the following compounds: CO_2 H_2O NaCl $CuSO_4$	Using M_r show that mass is conserved in the following reaction: $2Li + F_2 \rightarrow 2LiF$	Calculate the mass of carbon in 4 moles of CO_2	Write the equation used to calculate concentration (You need to be able to rearrange this)
Find the percentage of sodium in sodium carbonate (Na_2CO_3)	What is the symbol for moles? What is the value of Avagadro's constant? The mass of 1 mole is = to the _____	8.1g of zinc oxide reacts completely with 0.6g of carbon to form 2.2g of carbon dioxide and 6.5g of zinc. Write a balanced symbol equation (A_r C=12, O = 16 Zn = 65)	Calculate the concentration in g/dm^3 of a solution of sodium chloride where 30g of sodium chloride is dissolved in 0.2dm^3 of water

C4 Chemical changes AQA Trilogy

Delete as appropriate:

When metals react they form positive / negative ions

The more reactive a metal the more / less likely it is to form an ion

Aqueous solutions of alkalis contain hydrogen / hydroxide ions

Define the following key terms:
Oxidation

Reduction

Redox reaction

Alkali

Neutralisation

Define the following key terms:
Ore

Displacement

Electrolysis

Metal + oxygen → Metal oxide

Magnesium + oxygen →

Zinc + oxygen →

The above are oxidation reactions. Explain why

Reactive metal + water → metal hydroxide + hydrogen

Lithium + water →

Potassium + water →

Calcium + water →

Less reactive metals won't react with water

Metal + acid → salt + hydrogen

Magnesium + hydrochloric acid →

Zinc + sulfuric acid →

Iron + hydrochloric acid →

Metal oxide + acid → salt + water

Copper oxide + hydrochloric acid →

Zinc oxide + sulfuric acid →

Magnesium oxide + nitric acid →

Acid + base → salt + water

Hydrochloric acid + sodium hydroxide →

$H^+_{(aq)} + OH^-_{(aq)} \rightarrow$

Metal carbonate + acid → salt + water + carbon dioxide

Calcium carbonate + hydrochloric acid →

Copper carbonate + sulfuric acid →

Metal hydroxide + acid → salt + water

Lithium hydroxide + hydrochloric acid →

Sodium hydroxide + sulfuric acid →

Potassium hydroxide + nitric acid →

RPA 8: Describe how to prepare a pure, dry sample of a soluble salt

Name the salt produced when you use:

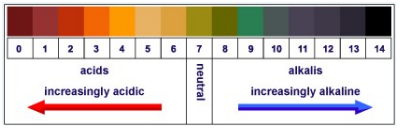
- Hydrochloric acid
- Sulfuric acid
- Nitric acid

The pH scale goes from ___ to ___

Numbers of pH less than 7 are _____

pH 7 is _____

Numbers of pH above 7 are _____



In relation to acids define the following terms:

Dilute

Concentrated

Weak

Strong

Write the symbols for:
Hydrochloric acid

Sulfuric acid

Nitric acid

C4 Chemical changes AQA Trilogy

Write the reactivity series below and add on the symbols for each element

Electrolysis key terms:
Electrolyte

Cathode

Anode

Inert

In the electrolysis of lead bromide:

What forms at the cathode?

What forms at the anode?

For electrolysis to occur the lead bromide must be solid/ molten

Unreactive metals such as _____ are found in the Earth as the metal itself.

More reactive metals such as _____ are found in _____.

Metals less reactive than carbon can be extracted using _____ with carbon.

Where does carbon fit into the reactivity series?

Which metals can be extracted using carbon?

<u>Using electrolysis to extract aluminium</u>

Why is aluminium oxide (bauxite) mixed with cryolite?

Why must the positive electrode (anode) be continually replaced?

What forms at the anode?

What forms at the cathode?

<u>RPA 9: Electrolysis – investigate what happens when aqueous solutions are Electrolysed.</u>

In solutions that do not contain a halide ion (Cl^-,Br^-,I^-) Which gas is produced at the:
Anode
Cathode

In solutions that contain a halide ion (Cl^-,Br^-,I^-) Which gas is produced at the:
Anode
Cathode

Oxidation and reduction

O

I

L

R

I

G

<u>Redox reactions</u>

The ionic equation for iron reacting with dilute hydrochloric acid is shown below

$Fe + 2H^+ \rightarrow 2Fe^{2+} + H_2$

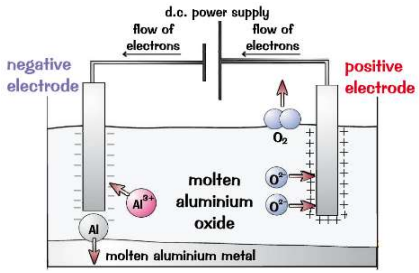
Iron is oxidised / reduced

$Fe - 2e^- \rightarrow Fe^{2+}$

Hydrogen is oxidised / reduced

$2H^+ + 2e^- \rightarrow H_2$

<u>Using electrolysis to extract aluminium</u>



An aqueous solution of $CuCl_2$ is electrolysed using inert electrodes.
Write the **<u>half equations</u>** for the

anode

cathode

<u>Oxidation or reduction</u>

$Mg + O_2 \rightarrow 2MgO$

The magnesium is oxidised / reduced

$2CuO + C \rightarrow 2Cu + CO_2$

The copper is oxidised / reduced

<u>Displacement reactions</u>

More reactive metal will displace a less reactive metal

Iron + copper sulfate →

Magnesium + zinc chloride →

Iron + zinc sulfate →

Write the words for the compounds below:

NaOH

$CuCl_2$

KSO_4

$CaCO_3$

MgO

Write the words for the compounds below:

HCl

H_2SO_4

HNO_3

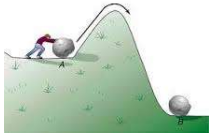
Fe_2O_3

$Ca(OH)_2$

C5 Energy changes
AQA Trilogy

Chemical reactions only occur if…

Activation energy is



The overall energy change of a reaction
=
The sum of the energy needed to break the bonds in the reactants
-
The sum of the energy needed to make the bonds in the products

---

<u>Exothermic reactions</u>

What is an exothermic reaction

Give examples of exothermic reactions

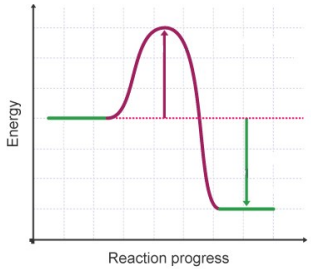
Give useful applications of exothermic reactions

Delete as appropriate:

Energy is released when bonds are made / broken.
This is exothermic / endothermic

Energy needs to be supplied when bonds are made / broken
This is exothermic / endothermic

Energy level diagram label on: reactants, products, activation energy & energy change



Hydrogen and chlorine react to form hydrogen chloride gas: $H_2 + Cl_2 \rightarrow 2HCl$
Calculate energy change.

Bond	Bond Energy (kJ/mole)
H–H	436
Cl–Cl	243
H–Cl	432

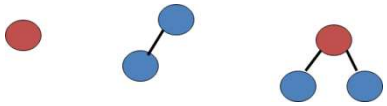
<u>Endothermic reactions</u>

What is an endothermic reaction

Give examples of endothermic reactions

Give useful applications of endothermic reactions

In an exothermic reaction, the energy _____ from forming new bonds is greater than the energy needed to break existing bonds
In an endothermic reaction, the energy needed to _____ existing bonds is greater than the energy released from forming new bonds



Sketch an energy level diagram to show an exothermic reaction with labels

Hydrogen bromide decomposes to form hydrogen and bromine: $2HBr \rightarrow H_2 + Br_2$
Calculate energy change

Bond	Bond Energy (kJ/mole)
H–Br	366
H-H	436
Br-Br	193

<u>RPA 10: Temperature changes</u>

Describe how to tell is a reaction is exothermic or endothermic

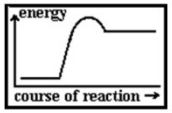
What measurements need to be taken?

Why might the reaction mixture be placed in a polystyrene cup rather than a glass beaker?

Claire puts 25cm^3 of ethanoic acid into a polystyrene cup with 25cm^3 of potassium hydroxide. Both liquids started at 21°C. After 2 minutes the temperature of the reaction mixture is 28.5^{o}C. Is the reaction endothermic or exothermic?

Sketch an energy level diagram to show an endothermic reaction with labels

State is the diagrams show endo or exothermic reactions

a


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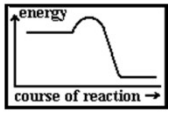

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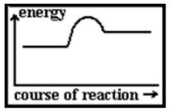

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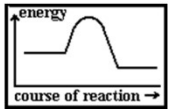

The Periodic Table

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Uut** ununtrium 113	[289] **Fl** flerovium 114	[289] **Uup** ununpentium 115	[293] **Lv** livermorium 116	[294] **Uus** ununseptium 117	[294] **Uuo** ununoctium 118

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.