Chemistry Revision Mind Map Unit 1– Reaction Rate 1

List 4 factors which will increase the rate of a chemical reaction.

How do you calculate average rate of reaction?
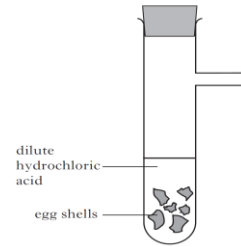
Calculate the average rate of reaction between 10 and 40 seconds, using the appropriate units.

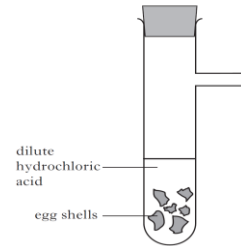| time (s)	0	10	20	30	40	50	60	70	80	90	100	120
Mass (g)	100	95	91	87	85	83	82	82	82	82	82	82

In a reaction the volume increased from **20cm³ to 80cm³** in **200 seconds.** What was the average rate of reaction in cm³s⁻¹?

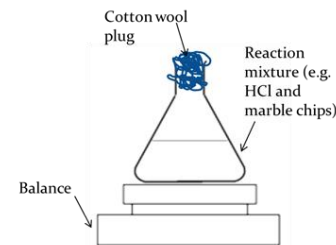Draw a label 2 pieces of apparatus which could be used to collect a gas in this reaction:

1.

dilute
hydrochloric
acid

egg shells

2.

dilute
hydrochloric
acid

egg shells

What will happen to the mass of this apparatus over time? Explain why?

Cotton wool plug

Reaction mixture (e.g. HCl and marble chips)

Balance

The graph below shows the volume of hydrogen produced in the reaction of 1g of magnesium ribbon and 1 M hydrochloric acid.
1. Draw a green line on the graph to show using 1g of magnesium powder and 1 M hydrochloric acid.
2. Draw a blue line on the graph to show using 1g magnesium ribbon and 0.5M hydrochloric acid(if acid is excess).
3. Draw a line to show when the reaction finished and state the time.
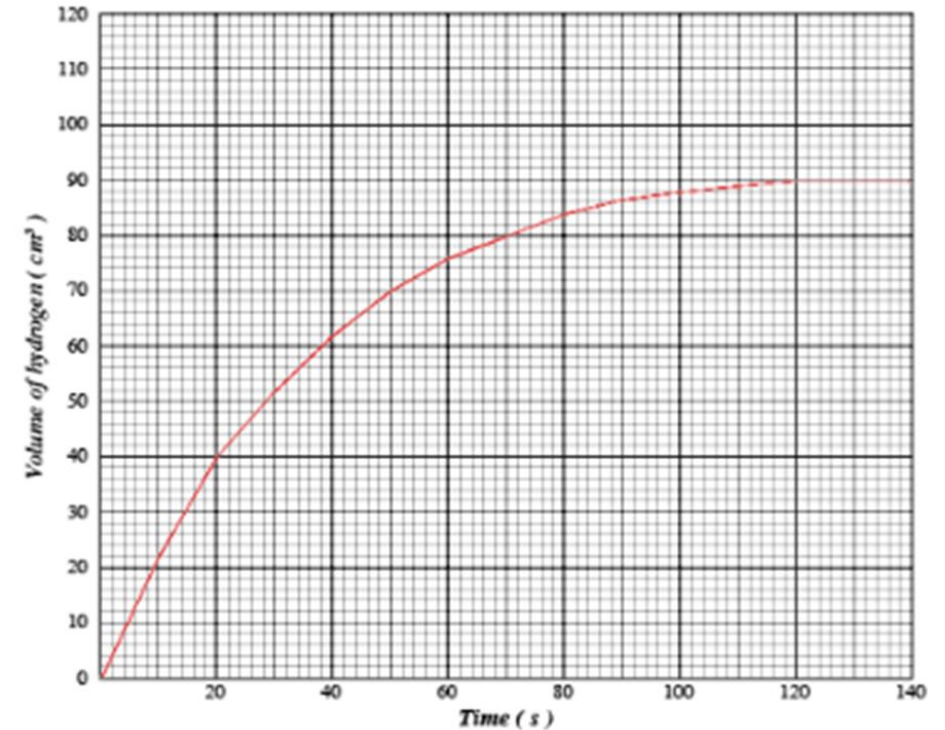
Reaction stopped:
The average rate of reaction in the first 40 seconds is:

Chemistry Revision Mind Map Unit 1– Atomic structure 2

Draw and label the structure of the atom.

Complete the table:

Particle	Mass (amu)	Charge	Where particle is found in atom
Proton			
Electron			
Neutron			

State why an atom is neutral.

What does the atomic number tell us

What charge is the nucleus of an atom.

State how you could calculate the mass number of an element.

State how you could calculate the number of neutrons in an element.

Below shows you nucleotide notation of an element. Label what each arrow is showing

$^{7}_{3}\text{Li}$

Write the nucleotide notation for Sodium which has a mass number of 23.

Complete the following:

Atom Symbol	Atomic Number	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
$^{7}_{3}\text{Li}$					
$^{23}_{11}\text{Na}$					
$^{16}_{8}\text{O}$					
$^{40}_{19}\text{K}$					

How many electrons are able to go in the 1st, 2nd, 3rd shell.

1st:

2nd:

3rd:

Draw an electron shell diagram for sodium and for oxygen add write the electron arrangement:

Sodium:

Oxygen:

What is an isotope:

Complete the following:

	$^{12}_{6}\text{C}$	$^{13}_{6}\text{C}$	$^{14}_{6}\text{C}$
No. of protons			
No. of electrons			
No. of neutrons			

Hydrogen has 3 isotopes, it has a relative atomic mass of 1.0, which isotope do you think is most abundant ?

$^{1}_{1}\text{H}$ $^{2}_{1}\text{H}$ $^{3}_{1}\text{H}$

Bromine has two isotopes, shown. The relative atomic mass of bromine is 80. What does this suggest about the percentage of each isotope?

$^{79}_{35}\text{Br}$ and $^{81}_{35}\text{Br}$

Chemistry Revision Mind Map Unit 1– Periodic Table 3

State the name of group 1 elements.

State the name of Group 7 elements.

Explain why the group 0/8 elements have similar chemical properties?

Labels the groups, high-light the metals and non-metals and identify the atomic number on the below Periodic table.
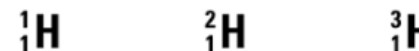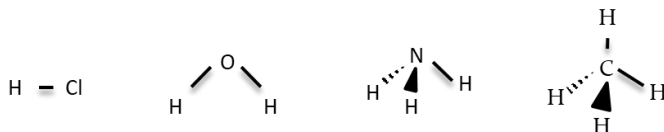
Periodic Table of the Elements

Are group 1 elements reactive or unreactive? Why?

Explain why group 7 elements have similar chemical properties?

Describe how the reactivity changes as you go down group 1.

Are group 8 elements reactive or unreactive? Why?

Explain why group 7 elements gain an electron?

Explain why group 1 elements have similar chemical properties?

Explain why group 1 metals lose an electron.

State the name of group 8/0 elements.

Define the following:
Element:

Atom:

Ion:

Chemistry Revision Mind Map Unit 1– Bonding 4

What is a covalent bond

Draw a diagram showing outer electrons to show the bonding in HCl

What name is given to describe the shapes of the following molecules.

H — Cl

O with H H

N with H H H

C with H H H H

What is a molecule
.

What holds the electrons together in a covalent bond

What group in the periodic table are monatomic? What does this mean.

What elements are diatomic? What does this mean.

Draw a diagram showing outer electrons to show N_2

Draw a diagram showing outer electrons to show NH_3

What is an ionic bond

Why can ionic solutions conduct electricity when in solution but not when solid?:

Why do elements in an ionic bond transfer electrons?

Complete the table below:

Bonding and structure	Mpt and bpt (high/low)	Conduct electricity	Solid, liquid or gas
Covalent molecular			
Covalent network			
Ionic lattice			
Metallic lattice			

What is a compound

What is a metallic bond

Why can metallic substances conduct electricity.

Chemistry Revision Mind Map Unit 1– Writing formula 5

Write the chemical formula for the following: (SVSDF)

1) Magnesium hydride

2) Carbon iodide

3) Silicon oxide

4) Beryllium sulphide

Write the chemical formula for the following: (prefix method)

1) Carbon dioxide

2) Dinitrogen tetraoxide

3) Nitrogen trihydride

4) Dihydrogen dioxide

Write the chemical formula for the following:
(SVSDF roman numerals method)

1) Copper(II) oxide

2) Nickel(II) chloride

3) Vanadium(V) oxide

Write the chemical formula for the following:
(SVSDF using complex ions, p8 of data book)

1) Magnesium phosphate

2) Copper(II) nitrate

3) Ammonium carbonate

Write the formula with charges for the following: (remember metals have a positive charge, non-metals have a negative charge)

1) Aluminium Sulfide   2) Copper (II) Nitrate   3) Aluminium hydroxide

Chemistry Revision Mind Map Unit 1– Calculations 6

|		
Draw the two calculations triangles you use in chemistry with the appropriate units	Calculate the mass of: 1) 3 moles of K_2SO_4 2) 0.025 moles of $Mg(NO_3)_2$	Calculate the concentration of 0.05 moles of $25cm^3$ HCl Calculate the volume of 0.04moles of 0.1 $molL^{-1}$ of H_2SO_4
Calculate the gram formula mass for the following: 1) CO_2 2) K_2SO_4 3) $Mg(NO_3)_2$	Calculate the number of moles of: 1) 15g of K_2SO_4 2) 0.04g of $Mg(NO_3)_2$	Calculate the mass of CO_2 produced from 5g of ethene (C_2H_4) $$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$$
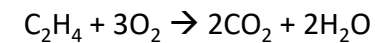
Chemistry Revision Mind Map Unit 1– Acids and Bases 7

Describe the concentration of H^+ and OH^- ions in a neutral solution.

Describe the concentration of H^+ and OH^- ions in an acidic solution.

Describe the concentration of H^+ and OH^- ions in an alkali solution.

Which type of oxides dissolve in water to form an acidic solution?

Which type of oxides dissolve in water to form an alkali solution?

Which type of oxides dissolve in water to form a neutral solution?

Name three metal bases:

Complete the word equation for the following:
Metal oxide + acid →
Metal hydroxide + acid →
Metal carbonate + acid →

Sodium oxide + hydrochloric acid →
Potassium hydroxide + sulphuric acid →
Calcium carbonate + nitric acid →

What are spectator ions?

30 cm³ of 1 mol l⁻¹ potassium hydroxide solution was neutralised by 50 cm³ of sulphuric acid. Calculate the concentration of the sulphuric acid.
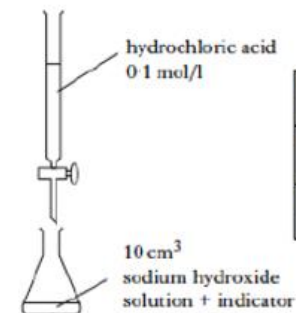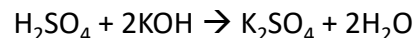
$$H_2SO_4 + 2KOH → K_2SO_4 + 2H_2O$$

hydrochloric acid
0·1 mol/l

10 cm³
sodium hydroxide
solution + indicator

	Rough titre	1st titre	2nd titre
Initial burette reading/cm³	0·3	0·2	0·5
Final burette reading/cm³	26·6	25·3	25·4
Volume used/cm³	26·3	25·1	24·9

The following titration was carried out:
Why is an indicator used?

Calculate the average volume of hydrochloric acid used in the titration.

Why is the rough titre not used?

What does concordant results mean?

What two pieces of equipment are used in titrations to measure accurate volumes?

Chemistry Revision Mind Map Unit 2– Homologous series 1

What is a homologous series?

What is the trend in boiling and melting points within a homologous series as molecular size increases?

Explain the above trend.

What are hydrocarbons?

What are saturated hydrocarbons?

What are unsaturated hydrocarbons?

Describe the test to distinguish between unsaturated and saturated compounds.

What are the prefixes for carbon compounds?

1 Carbon-   2 Carbons-

3 Carbons-   4 Carbons-

5 Carbons-   6 Carbons-

7 Carbons-   8 Carbons-

Describe how to identify an alkane from
1. their structure

2. their name

Describe how to identify an alkene from
1. their structure

2. their name

Describe how to identify an cycloalkane from
1. their structure

2. their name

Describe the steps required to name a carbon compound.

What is the general formula of:
1. alkanes

2. alkenes

3. cycloalkanes

Draw 2-methylpentane

Draw 2-methylbut-2-ene

Chemistry Revision Mind Map Unit 2–Homologous series 2

What are isomers?

Draw butane and one of its isomers

Draw propene and one of its isomers

Draw hex-1-ene and one of its isomers

What is an addition reaction?

What is meant by hydrogenation?

Draw the product made when hydrogen reacts with ethene

What is meant by hydration?

Draw the product made when water reacts with propene

What is meant by halogenation?

Draw the product made when bromine reacts with but-1-ene.

Chemistry Revision Mind Map Unit 2– Everyday consumer products 3

Describe how to identify an alcohol from
1. their structure

2. their name

Describe how to identify an carboxylic acid from
1. their structure

2. their name

Draw the full structural formula of butan-2-ol

Draw the shortened structural formula of hexan-3-ol

What is name is given to the functional group of alcohols ?

What is name is given to the functional group of carboxylic acids ?

Draw the molecular formula of propan-1-ol

What is the general formula of alcohols?

Which carboxylic acids is the main component of vinegar?

Draw the full structural formula of heptanoic acid.

What happens to the solubility of alcohols as their size increases?

What happens to the solubility of carboxylic acid as their size increases?

Draw the shortened structural formula of pentanoic acid.

Explain why as alcohols increase in size their melting and boiling points increase

Explain why as carboxylic acid increase in size their melting and boiling points increase

Draw the molecular formula of methanoic acid.

Chemistry Revision Mind Map Unit 2– Energy from fuels 4

What word is used to describe a reaction or process that releases heat energy?

What word is used to describe a reaction or process that takes in heat energy?

What is a fuel?

What happens during a combustion reaction?

What is produced when a hydrocarbon or alcohol burns in a plentiful supply of oxygen (complete combustion)?

What is produced when a hydrocarbon or alcohol burns in a limited supply of oxygen (incomplete combustion)?

Write a word equation, chemical equation and balanced chemical equation for when propane reacts completely oxygen.
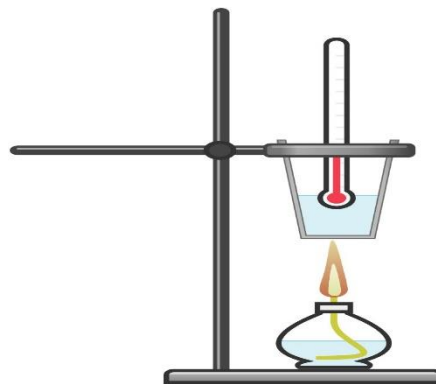
Using this apparatus which measurements would need to be taken to allow the energy released to be calculated?

Give examples of possible sources of error within this experiment. Include a way of preventing the error.

Which formula allows the energy released when a fuel burns to be calculated?

What are the units for each term in the above equation?

Calculate the energy released when $50cm^3$ of water is heated from 10.3°C to 28.4°C. Include the correct units for your answer.

Calculate the temperature rise when 100g of water absorbs 26.7 kJ of energy. Include the correct units for your answer.

Calculate the specific heat capacity of the sodium chloride solution which requires 15.6kJ of energy to heat 100g of solution by 24°C. Include the correct units for your answer

Chemistry Revision Mind Map Unit 3 – Metals 1

What is metallic bonding?

Draw the structure of a metallic lattice

Why can metals conduct electricity?

If a metal is found uncombined in the Earths crust, what does this suggest about its reactivity?

What is the name given to a naturally occurring rocks that contain metal compounds?

Metals can be extracted from their ore. Metal ions from metal atoms, what is this reaction called?

What are the three methods of extracting metals from ores and what metals would be extracted using each method?
1.

2.

3.

Why is a D.C supply used in electrolysis?

Complete the word equation for the following:
Metal + oxygen →
Metal + water →
Metal + dilute acid →

Zinc + oxygen →
Lithium + water →
Magnesium + hydrochloric acid →

What is an oxidation reaction in terms of electrons?

What is a reduction reaction in terms of electrons?

Write the ion-electron equation for iron (II) ions forming iron (III) ions. What is this reaction called?

This is a simple cell:

What is the purpose of the electrolyte?

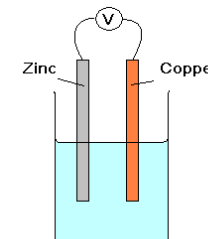Why is the electrolyte an ionic solution?

Write the reduction, oxidation and redox reaction for the cell above:
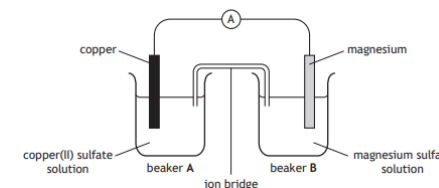Reduction:
Oxidation:

Redox:

Show on the diagram the path of electron flow.

This is a half cell:

What is the purpose of the ion bridge?

Show the path of electron flow.

What non-metal can be used as electrodes in half-cells?

Electrons flow from the metal _____ in the electrochemical series to the metal _____ in the electrochemical series.

The further apart metals are in an electrochemical series, the _____ the voltage.

When copper is connected to copper in an electrochemical cell the voltage is _____.

Plastics are materials known as:

Polymers are long chain molecules formed by joining what together?

What is the name of the reaction called forming a polymer?

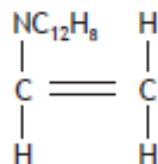Name the monomers used to make the following:
1. Polystyrene

2. Polyethene

3. Polyvinylchlride

Name the polymer made from the following monomers:
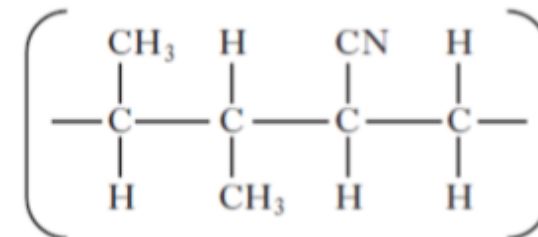1. Propene

2. Styrene

3. Tetraflouroethene

Is a monomer saturated or unsaturated? What does this mean?

Draw a section of a polymer showing three of the following monomers joined together:

$$NC_{12}H_8 \quad H$$
$$C = C$$
$$H \quad H$$

Draw the repeating unit for the above polymer you have drawn.

From the following co-polymer, draw the two monomers used to make it.

$$\left(\begin{array}{cccc} CH_3 & H & CN & H \\ | & | & | & | \\ -C - & C - & C - & C - \\ | & | & | & | \\ H & CH_3 & H & H \end{array} \right)$$

Chemistry Revision Mind Map Unit 3 – Fertilisers 3

The three elements required for plant growth are:

What are the two reactants for the Haber process?

What is the catalyst used in this process?

What is the purpose of fertilisers?

Write a balanced chemical equation to show the production of ammonia.

Complete the following equations:

Ammonia + Nitric acid →

Potassium hydroxide + Nitric acid →

Circle the salts produced above.

Give two reasons why these salts would be good fertilisers.

Why do fertilisers need to be soluble?

The production of ammonia is a reversible reaction, draw the arrows used to represent this.

What is the formula for ammonia?

What catalyst is used in the Haber process?

What is the name given to the reactions above?

What is the purpose of adding a catalyst?

When ammonia dissolves in water, what colour would pH paper turn? Why?

Calculate the percentage of nitrogen in the fertiliser ammonium nitrate (NH_4NO_3)?

What is the name of the process used to make Nitric acid?

What is the name of the process used to make ammonia?

What are the three starting materials in this process?

Chemistry Revision Mind Map Unit 3 – Nuclear Chemistry 4

Where does radioactive decay occur in an atom?

An alpha particle can be represented as:

What does the term half-life mean?

Unstable nuclei become more stable by giving out which three forms of radiation?

1.

2.

3.

A beta particle can be represented as:

A proton can be represented as:

What affect would increasing the temperature have on the half-life of an isotope?

Alpha particles are stopped by:

Beta particles are stopped by:

Gamma particles are stopped by:

A neutron can be represented as:

16 g of a radioisotope has a half-life of 20 days. What mass of the original isotope will still be left after 60 days?

Complete the following equations and decide whether the isotope is undergoing alpha or beta decay.

1. $^{242}_{94}Pu \longrightarrow \quad ? \quad + \quad ^{4}_{2}He$

2. $^{234}_{90}Th \longrightarrow \quad ? \quad + \quad ^{0}_{-1}e$

Alpha particles are attracted to a _____ plate

Beta particles are attracted to a _____ plate.

Gamma particles are not deflected by an electric field.

A luminous watch dial containing a material with a half life of 2.5 years has only 1/8th of its original glow. How old is the watch?

Chemistry Revision Mind Map Unit 1– Reaction Rate 1

List 4 factors which will increase the rate of a chemical reaction.

- INCREASED concentration
- INCREASED temperature
- DECREASED particle size
- catalyst

How do you calculate average rate of reaction?

$$Rate = \frac{\Delta quantity}{\Delta time}$$

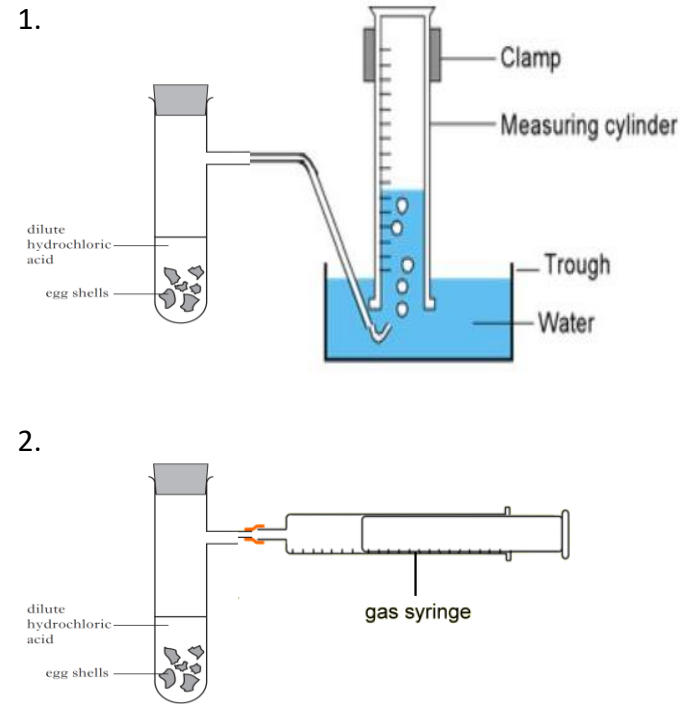Calculate the average rate of reaction between 10 and 40 seconds, using the appropriate units.

time (s)	0	10	20	30	40	50	60	70	80	90	100	120
Mass (g)	100	95	91	87	85	83	82	82	82	82	82	82

$$Rate = \frac{\Delta quantity}{\Delta time} = \frac{(95-85)}{(40-10)}$$

$$= 0.33 \text{ g / s}$$
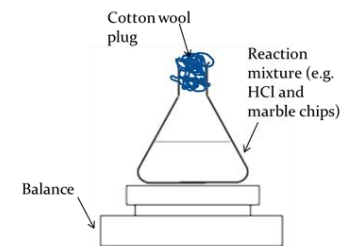
In a reaction the volume increased from **20cm³ to 80cm³** in **200 seconds.** What was the average rate of reaction in cm³s⁻¹?

$$Rate = \frac{\Delta quantity}{\Delta time} = \frac{(80-20)}{200} = 0.3 \text{cm}^3 / s$$

Draw a label 2 pieces of apparatus which could be used to collect a gas in this reaction:

1.

dilute hydrochloric acid

egg shells

Clamp

Measuring cylinder

Trough

Water

2.

dilute hydrochloric acid

egg shells

gas syringe

What will happen to the mass of this apparatus over time? Explain why?

Cotton wool plug

Reaction mixture (e.g. HCl and marble chips)

Balance

Decrease – losing gas bubbles and gas bubbles have mass

The graph below shows the volume of hydrogen produced in the reaction of 1g of magnesium ribbon and 1 M hydrochloric acid.

1. Draw a green line on the graph to show using 1g of magnesium powder and 1 M hydrochloric acid.
2. Draw a blue line on the graph to show using 1g magnesium ribbon and 0.5M hydrochloric acid(if acid is excess).
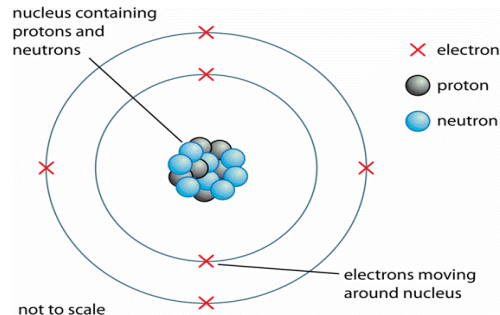3. Draw a line to show when the reaction finished and state the time.

Volume of hydrogen (cm³) vs *Time (s)*
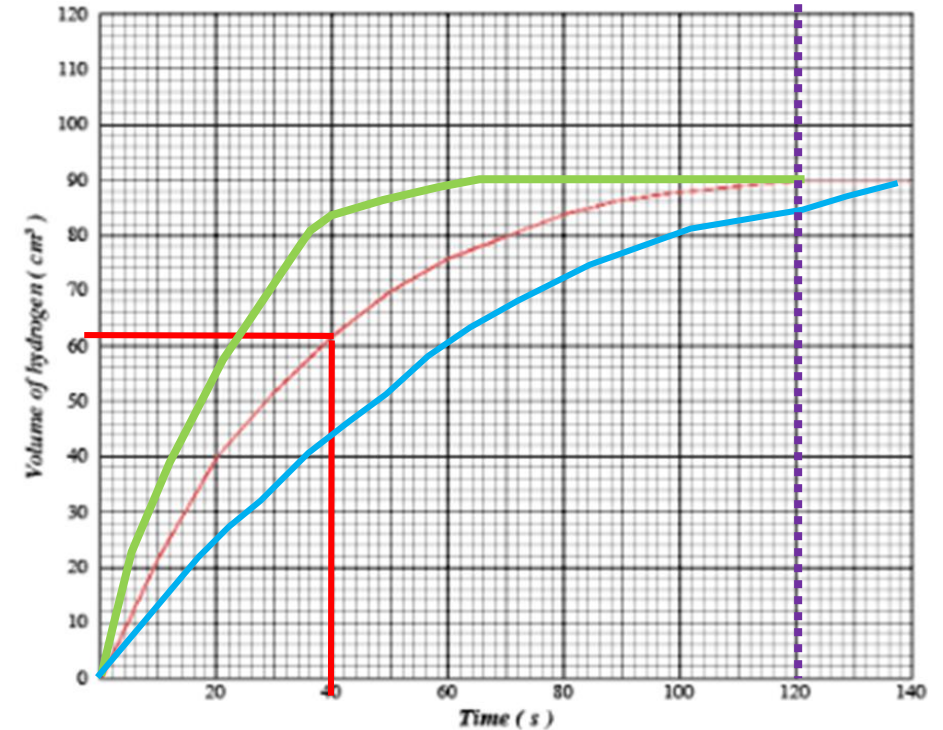
Reaction stopped:

The average rate of reaction in the first 40 seconds is:

$$Rate = \frac{\Delta quantity}{\Delta time} = \frac{(60-0)}{(40-0)} = 1.5 \text{ cm}^3 / s$$

Chemistry Revision Mind Map Unit 1– Atomic structure 2

Draw and label the structure of the atom.

nucleus containing protons and neutrons

× electron
● proton
● neutron

electrons moving around nucleus

not to scale

Complete the table:

Particle	Mass (amu)	Charge	Where particle is found in atom
Proton	1	1+	nucleus
Electron	none	1-	Energy levels
Neutron	1	none	nucleus

State why an atom is neutral.
Equal numbers of protons and electrons

DO NOT WRITE protons cancel electrons as this also happens in ions which are NOT neutral

What does the atomic number tell us
No of protons

What charge is the nucleus of an atom.
Positive (protons are here)

State how you could calculate the mass number of an element.
Protons and neutrons together

State how you could calculate the number of neutrons in an element.
Mass number – atomic number = no of neutrons

Below shows you nucleotide notation of an element. Label what each arrow is showing

Mass No → 7
Atomic No → 3 Li ← Symbol

Write the nucleotide notation for Sodium which has a mass number of 23.

23
11 Na

Complete the following:

Atom Symbol	Atomic Number	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
$^{7}_{3}$Li	3	7	3	3	4
$^{23}_{11}$Na	11	23	11	11	12
$^{16}_{8}$O	8	16	8	8	8
$^{40}_{19}$K	19	40	19	19	21

How many electrons are able to go in the 1st, 2nd, 3rd shell.
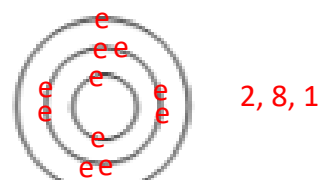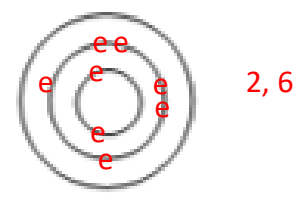1st: 2
2nd: 8
3rd: 8

Draw an electron shell diagram for sodium and for oxygen add write the electron arrangement:

Sodium: 2, 8, 1

Oxygen: 2, 6

What is an isotope:
Particles with the same atomic number but different mass numbers (same protons different neutrons)

Complete the following:

	$^{12}_{6}$C	$^{13}_{6}$C	$^{14}_{6}$C
No. of protons	6	6	6
No. of electrons	6	6	6
No. of neutrons	6	7	8

Hydrogen has 3 isotopes, it has a relative atomic mass of 1.0, which isotope do you think is most abundant ?
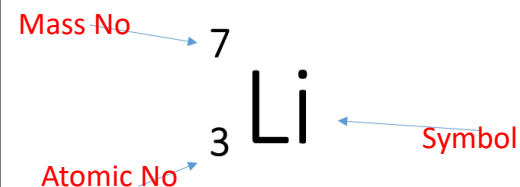
$^{1}_{1}$H $^{2}_{1}$H $^{3}_{1}$H

RAM is closest to 1

Bromine has two isotopes, shown. The relative atomic mass of bromine is 80. What does this suggest about the percentage of each isotope?

$^{79}_{35}$Br and $^{81}_{35}$Br

Same amount of each.
RAM is in the middle of both masses

Chemistry Revision Mind Map Unit 1– Periodic Table 3

State the name of group 1 elements.

Alkali metals

Are group 1 elements reactive or unreactive? Why?

Very reactive – have 1 outer e⁻

Describe how the reactivity changes as you go down group 1.

Get more reactive

Explain why group 1 elements have similar chemical properties?

Same number of outer e⁻

State the name of Group 7 elements.

halogens

Explain why group 7 elements have similar chemical properties?

Same number of outer e⁻

Explain why group 7 elements gain an electron?

To achieve stable electron arrangements

Explain why the group 0/8 elements have similar chemical properties?

Same number of outer e⁻

Are group 8 elements reactive or unreactive? Why?

Unreactive – already have achieved stable electron arrangements

Labels the groups, high-light the metals and non-metals and identify the atomic number on the below Periodic table.

Noble gases

halogens

Transition metals

Atomic numbers

Non-metals

Alkali metals

Explain why group 1 metals lose an electron.

To achieve stable electron arrangements

State the name of group 8/0 elements.

Noble gases

Define the following:
Element: Substance in which all the atoms are the same type

Atom: Proton and electron numbers are equal – neutral charge overall

Ion: Proton and electron numbers are unequal.
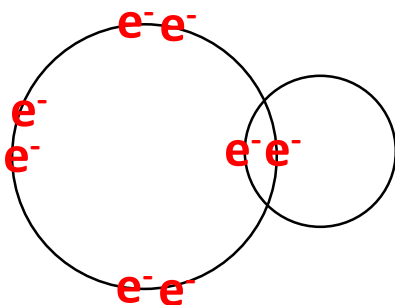+ ions have more p than e.   – ions have more e⁻ than p

Chemistry Revision Mind Map Unit 1– Bonding 4

What is a covalent bond

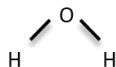Name for the attraction that two nuclei have for a shared pair of electrons

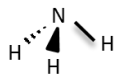**Draw a diagram showing outer electrons to show the bonding in HCl**

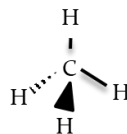**What name is given to describe the shapes of the following molecules.**

linear   angular   Trigonal pyramidal   tetrahedral

What is a molecule
.

Small group of atoms covalently bonded together

What holds the electrons together in a covalent bond

Attraction that two nuclei have for a shared pair of electrons

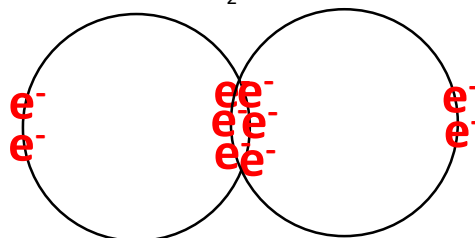**What group in the periodic table are monatomic? What does this mean.**

Group 0 - Atoms not bonded to anything.

What elements are diatomic? What does this mean.

H_2, N_2, O_2, F_2, Cl_2, I_2, Br_2

Exist as pairs of two atom molecules

Draw a diagram showing outer electrons to show N_2

Draw a diagram showing outer electrons to show NH_3
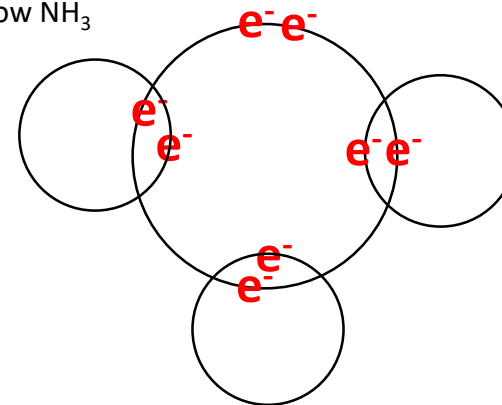
What is an ionic bond

Attraction between positive and negative ions

Why can ionic solutions conduct electricity when in solution but not when solid?:

(aq) – ions free to move to electrodes

(s) – ions not free to move to electrodes

Why do elements in an ionic bond transfer electrons?

To achieve stable electron arrangements

Complete the table below:

Bonding and structure	Mpt and bpt (high/low)	Conduct electricity	Solid, liquid or gas
Covalent molecular	low	never	s, l & g
Covalent network	High	Never (except graphite)	s
Ionic lattice	High	YES - aq or l No - s	s
Metallic lattice	variable	Always	s (Hg=l)

What is a compound

Two or more different types of atom(substance) chemically bonded together

What is a metallic bond
Attraction between positive ions and a sea of delocalised electrons

Why can metallic substances conduct electricity.

Free moving electrons

Chemistry Revision Mind Map Unit 1– Writing formula 5

Write the chemical formula for the following: (SVSDF)
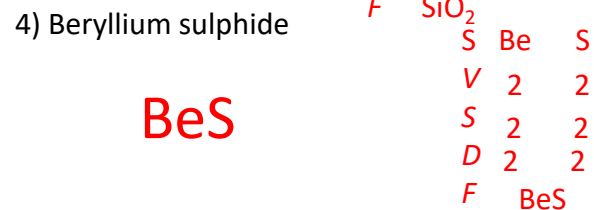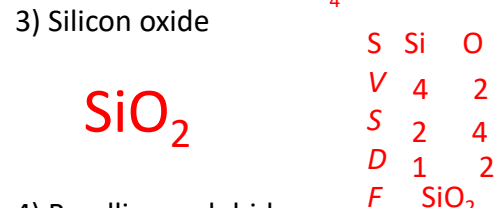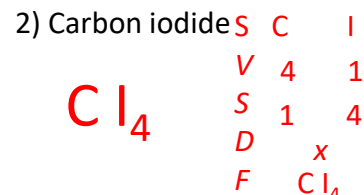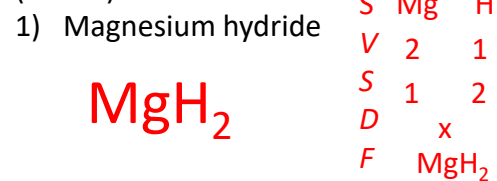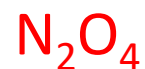
1) Magnesium hydride

	S	Mg	H
V		2	1
S		1	2
D			x
F		MgH_2	

$$MgH_2$$

2) Carbon iodide

	S	C	I
V		4	1
S		1	4
D		x	
F		CI_4	

$$CI_4$$

3) Silicon oxide

	S	Si	O
V		4	2
S		2	4
D		1	2
F		SiO_2	

$$SiO_2$$

4) Beryllium sulphide

	S	Be	S
V		2	2
S		2	2
D		2	2
F		BeS	

$$BeS$$

Write the chemical formula for the following: (prefix method)

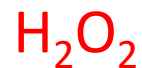1) Carbon dioxide

$$CO_2$$

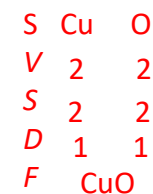2) Dinitrogen tetraoxide
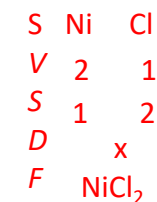
$$N_2O_4$$

3) Nitrogen trihydride

$$NH_3$$

4) Dihydrogen dioxide

$$H_2O_2$$

Write the chemical formula for the following: (SVSDF using roman numerals method)

1) Copper(II) oxide

	S	Cu	O
V		2	2
S		2	2
D		1	1
F		CuO	

$$CuO$$

2) Nickel(II) chloride

	S	Ni	Cl
V		2	1
S		1	2
D		x	
F		$NiCl_2$	

$$NiCl_2$$

3) Vanadium(V) oxide

	S	V	O
V		5	2
S		2	5
D		x	
F		V_2O_5	

$$V_2O_5$$
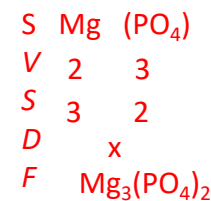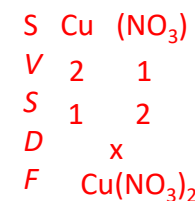
Write the chemical formula for the following: (SVSDF and using complex ions, p8 of data book)

1) Magnesium phosphate

	S	Mg	(PO_4)
V		2	3
S		3	2
D		x	
F		$Mg_3(PO_4)_2$	

$$Mg_3(PO_4)_2$$

2) Copper(II) nitrate

	S	Cu	(NO_3)
V		2	1
S		1	2
D		x	
F		$Cu(NO_3)_2$	

$$Cu(NO_3)_2$$

3) Ammonium carbonate

	S	(NH_4)	(CO_3)
V		1	2
S		2	1
D		x	
F			

$$(NH_4)_2 CO_3$$

Write the formula with charges for the following: (remember metals have a positive charge, non-metals have a negative charge)

1) Aluminium Sulfide

	S	(Al^{3+})	(S^{2-})
V		3	2
S		2	3
D		x	
F		$(Al^{3+})_2(S^{2-})_3$	

$$(Al^{3+})_2(S^{2-})_3$$

2) Copper (II) Nitrate

	S	(Cu^{2+})	(NO_3^-)
V		2	1
S		1	2
D		x	
F		$Cu^{2+}(NO_3^-)_2$	

$$Cu^{2+}(NO_3^-)_2$$

3) Aluminium hydroxide

	S	(Al^{3+})	(OH^-)
V		3	1
S		1	3
D		x	
F		$Al^{3+}(OH^-)_3$	

$$Al^{3+}(OH^-)_3$$

Chemistry Revision Mind Map Unit 1– Calculations 6

Draw the two calculations triangles you use in chemistry with the appropriate units

Mass in grams — M

Gram Formula Mass (mass of one mole in grams)

Number of moles (unit=moles) — n | Gfm

Number of moles (unit=moles) — n

Volume in **Litres** — V | C

Concentration in mol l^{-1} (moles / litre)
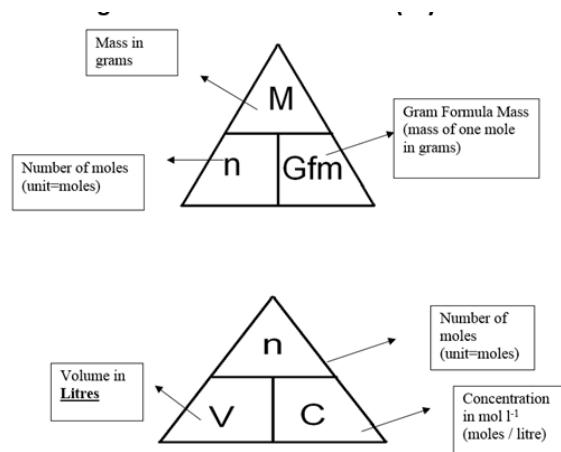

Calculate the mass of:

1) 3 moles of K_2SO_4

$2 \times 39 = 78$
$1 \times 32 = 32$
$4 \times 16 = 64$ +
$\underline{174g}$

$m = nGfm = 3 \times 174 = 522g$

2) 0.025 moles of $Mg(NO_3)_2$

$1 \times 24.5 = 24.5$
$2 \times 14 = 28$
$6 \times 16 = 96$ +
$\underline{148.5g}$

$m = nGfm = 0.025 \times 148.5 = 3.71g$

Calculate the concentration of 0.05 moles of 25cm^3 HCl

n = 0.05 moles
V = 25cm^3 = 0.025 l

$c = \dfrac{n}{v} = \dfrac{0.05}{0.025} = 2$ moles / l

Calculate the volume of 0.04moles of 0.1 mol l^{-1} of H_2SO_4

n = 0.04 moles
c = 0.1 mol l^{-1}

$V = \dfrac{n}{c} = \dfrac{0.04}{0.1} = 0.4$ l

Calculate the gram formula mass for the following:

1) CO_2

$1 \times 12 = 12$
$2 \times 16 = 32$ +
$\underline{44g}$

2) K_2SO_4

$2 \times 39 = 78$
$1 \times 32 = 32$
$4 \times 16 = 64$ +
$\underline{174g}$

3) $Mg(NO_3)_2$

$1 \times 24.5 = 24.5$
$2 \times 14 = 28$
$6 \times 16 = 96$ +
$\underline{148.5g}$

Calculate the number of moles of:

1) 15g of K_2SO_4

$2 \times 39 = 78$
$1 \times 32 = 32$
$4 \times 16 = 64$ +
$\underline{174g}$

$n = \dfrac{m}{Gfm} = \dfrac{15}{174} = 0.086$ moles

2) 0.04g of $Mg(NO_3)_2$

$1 \times 24.5 = 24.5$
$2 \times 14 = 28$
$6 \times 16 = 96$ +
$\underline{148.5g}$

$n = \dfrac{m}{Gfm} = \dfrac{0.04}{148.5} = 2.69 \times 10^{-4}$ moles

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Calculate the mass of CO_2 produced from 5g of ethene (C_2H_4)   D

Q
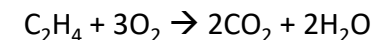
$$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$$
D   Q

D:Q mole ratio: 1mole C_2H_4 $\rightarrow$ 2 moles CO_2

$2 \times 12 = 24$
$4 \times 1 = 4$ +
$\underline{28g}$

$1 \times 12 = 12$
$2 \times 16 = 32$ +
$\underline{44g}$

Fix units:
(question is in mass)

$m = nGfm$
$= 1 \times 28$
$= 28g$

$m = nGfm$
$= 2 \times 44$
$= 44g$

D:Q ratio in grams: 28g C_2H_4 $\rightarrow$ 88g CO_2

Scale ratio to question data (5g)
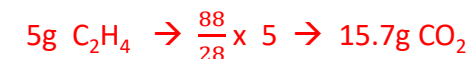
28g C_2H_4 $\rightarrow$ 88g CO_2

5g C_2H_4 $\rightarrow$ $\dfrac{88}{28} \times 5$ $\rightarrow$ 15.7g CO_2

Describe the concentration of H^+ and OH^- ions in a neutral solution.

$$[H^+] = [OH^-]$$

Describe the concentration of H^+ and OH^- ions in an acidic solution.

$$[H^+] > [OH^-]$$

Describe the concentration of H^+ and OH^- ions in an alkali solution.

$$[H^+] < [OH^-]$$

Which type of oxides dissolve in water to form an acidic solution?

Non-metal oxides dissolve to make acids

Which type of oxides dissolve in water to form an alkali solution?

Metal oxides dissolve to make acids

Which type of oxides dissolve in water to form a neutral solution?

Name three metal bases:

Metal oxides   Metal hydroxides   Metal carbonates

Complete the word equation for the following:

Metal oxide + acid → Salt + water
Metal hydroxide + acid → Salt + water
Metal carbonate + acid → Salt + water + carbon dioxide

Sodium oxide + hydrochloric acid → Sodium chloride + water
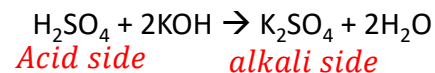Potassium hydroxide + sulphuric acid → Potassium sulfate+water
Calcium carbonate + nitric acid → Calcium nitrate + water + Carbon dioxide

What are spectator ions?

Ions that do not take part in the reaction – remain unchanged at the end of reaction

30 cm³ of 1 mol l⁻¹ potassium hydroxide solution was neutralised by 50 cm³ of sulfuric acid. Calculate the concentration of the sulphuric acid.
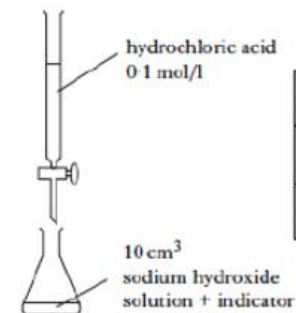
$$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$$

Acid side   *alkali side*

$$\frac{C_1 V_1}{n_1} = \frac{C_2 V_2}{n_2}$$

$$\frac{C_1 x 50}{1} = \frac{1x30}{2}$$

$$\frac{C_1 x 50}{1} = 15$$

$$C_1 x 50 = 15 x 1$$

$$C_1 = \frac{15 x 1}{50} = 0.3 \text{ mol } l^{-1}$$

	Rough titre	1st titre	2nd titre
Initial burette reading/cm³	0·3	0·2	0·5
Final burette reading/cm³	26·6	25·3	25·4
Volume used/cm³	26·3	25·1	24·9

hydrochloric acid
0·1 mol/l

10 cm³
sodium hydroxide
solution + indicator

The following titration was carried out:
Why is an indicator used?

So that the end point is visible

Calculate the average volume of hydrochloric acid used in the titration.

Only use concordant results and ignore rough titre

$$\frac{(25.1 + 24.9)}{2} = 25.0 cm3$$

Why is the rough titre not used?

It is done quickly / not as accurate

What does concordant results mean?

Within 0.2cm³ of each other

What two pieces of equipment are used in titrations to measure accurate volumes?

Pipettes & burettes

(standard solutions are also used. These are solutions with very accurately known concentrations.)

Chemistry Revision Mind Map Unit 2– Homologous series 1

What is a homologous series?

Group of chemicals that share similar chemical properties and the same general formula

What is the trend in boiling and melting points within a homologous series as molecular size increases?

Increasing size, increases mp's/bp's

Explain the above trend.

Larger molecules have stronger intermolecular forces which need more energy to overcome

What are hydrocarbons?

Molecules made of hydrogen and carbon only

What are saturated hydrocarbons?

Molecules with no C=C

What are unsaturated hydrocarbons?

Molecules with C=C

Describe the test to distinguish between unsaturated and saturated compounds.

Unsaturated molecules decolourise bromine water immediately

What are the prefixes for carbon compounds?

1 Carbon-	meth	2 Carbons-	eth
3 Carbons-	prop	4 Carbons-	but
5 Carbons-	pent	6 Carbons-	hex
7 Carbons-	hept	8 Carbons-	Oct

Describe how to identify an alkane from
1. their structure

   Chains of carbons, all single bonds, C_nH_{2n+2}

2. their name

   End in 'ane'

Describe how to identify an alkene from
1. their structure

   Chains, have C=C, C_nH_{2n}

2. their name

   End in 'ene'

Describe how to identify an cycloalkane from
1. their structure

   Rings, all single bonds, C_nH_{2n}

2. their name

   Start with 'cyclo' end in 'ane'

Describe the steps required to name a carbon compound.

1. Identify the longest chain (that contains the FG)
2. Name the parent giving the FG the LOWEST number
3. Identify, name and number any branches
4. Group any like branches and add a prefix (eg dimethyl)
5. Arrange branches in alphabetical order and then write name

What is the general formula of:
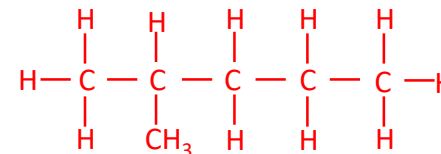1. alkanes

   C_nH_{2n+2}
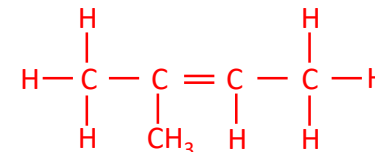
2. alkenes

   C_nH_{2n}

3. cycloalkanes

   C_nH_{2n}

Draw 2-methylpentane
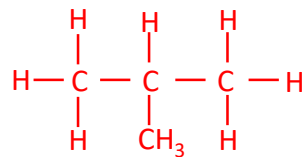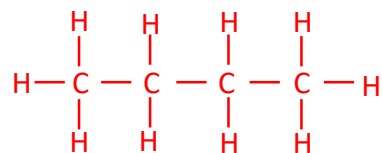

Draw 2-methylbut-2-ene

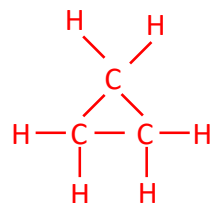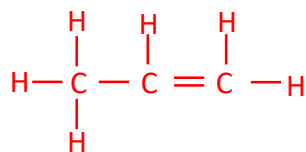# Chemistry Revision Mind Map Unit 2–Homologous series 2

What are isomers?

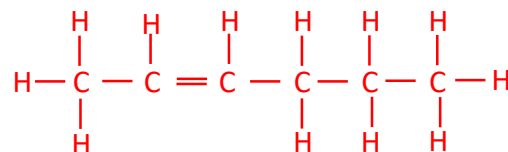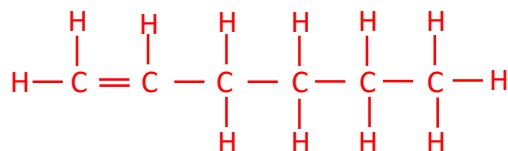Molecules with the same molecular formula but different structural formula

Draw butane and one of its isomers

Draw propene and one of its isomers

Draw hex-1-ene and one of its isomers

What is an addition reaction?

C=C breaks open and a molecule adds into the newly created spaces

What is meant by hydrogenation?

Addition reaction with hydrogen

Draw the product made when hydrogen reacts with ethene
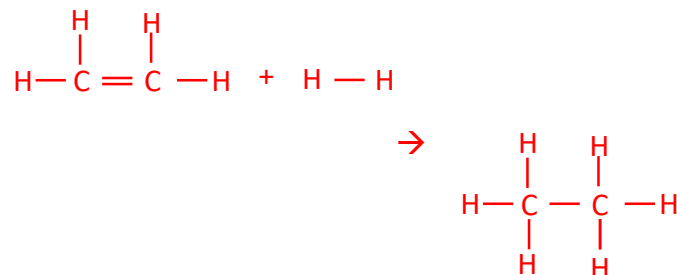
What is meant by hydration?

Addition reaction with water

Draw the product made when water reacts with propene

What is meant by halogenation?

Addition reaction with a halogen

Draw the product made when bromine reacts with but-1-ene.

Describe how to identify an alcohol from

1. their structure

   Have a hydroxyl functional group (-OH)

2. their name

   Names end in 'ol'

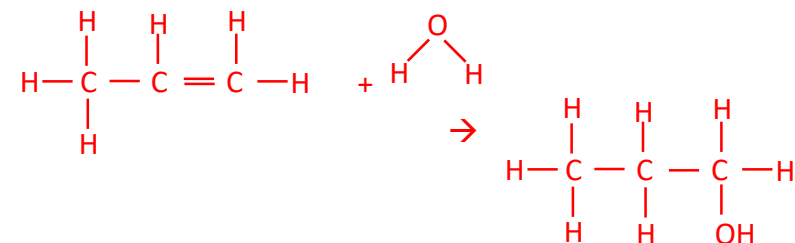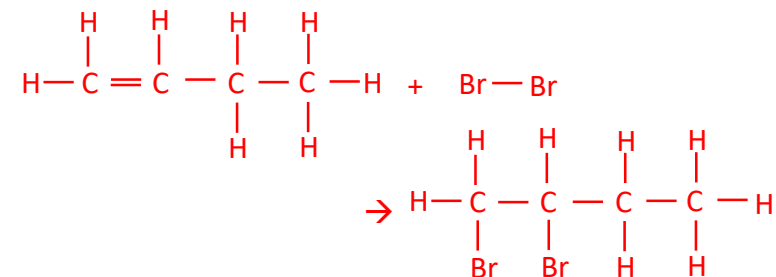Describe how to identify an carboxylic acid from

1. their structure

   Have a carboxyl functional group (-COOH)

2. their name

   End in 'oic acid'

Draw the full structural formula of butan-2-ol

Draw the shortened structural formula of hexan-3-ol

$CH_3CH_2CH(OH)CH_2CH_2CH_3$

or

$CH_3CH_2CH(OH)(CH_2)_2CH_3$

What is name is given to the functional group of alcohols?

hydroxyl functional group (-OH)

What is name is given to the functional group of carboxylic acids?

carboxyl functional group (-COOH)

Draw the molecular formula of propan-1-ol

C_3H_7OH

or

C_3H_8O

What is the general formula of alcohols?

$C_nH_{2n+1}OH$ (or $C_nH_{2n+2}O$)

Which carboxylic acid is the main component of vinegar?

Ethanoic acid

Draw the full structural formula of heptanoic acid.

What happens to the solubility of as their size increases?

Increasing alcohol size decreases solubility

What happens to the solubility of carboxylic acid as their size increases?

Increasing carboxylic acid size decreases solubility
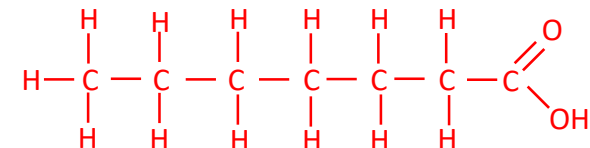
Draw the shortened structural formula of pentanoic acid.

$CH_3(CH_2)_3COOH$

Explain why as alcohols increase in size their melting and boiling points increase

Larger molecules have stronger intermolecular forces which need more energy to overcome

---

Explain why as carboxylic acid increase in size their melting and boiling points increase

Larger molecules have stronger intermolecular forces which need more energy to overcome

---

Draw the molecular formula of methanoic acid.

HCOOH

or

CH_2O_2

What word is used to describe a reaction or process that releases heat energy?

Exothermic

What word is used to describe a reaction or process that takes in heat energy?

Endothermic

What is a fuel?

A substance that burns to release energy

What happens during a combustion reaction?

Fuel reacts with oxygen

What is produced when a hydrocarbon or alcohol burns in a plentiful supply of oxygen (complete combustion)?

Carbon dioxide and water

What is produced when a hydrocarbon or alcohol burns in a limited supply of oxygen (incomplete combustion)?

Carbon monoxide + soot (carbon)

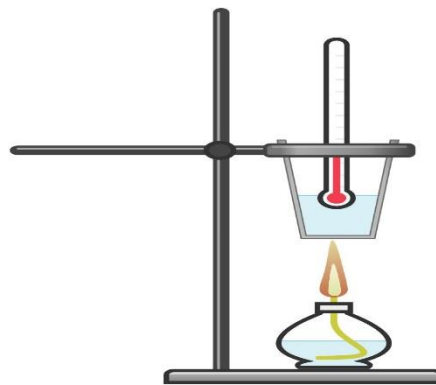Write a word equation, chemical equation and balanced chemical equation for when propane reacts completely oxygen.

Propane + oxygen → carbon dioxide + water

$$C_3H_8 \quad + \quad 5O_2 \quad \rightarrow \quad 3CO_2 \quad + \quad 4H_2O$$

Using this apparatus which measurements would need to be taken to allow the energy released to be calculated?
-Starting and ending water temp
- Mass of water present (or a volume that can be converted to mass)

Give examples of possible sources of error within this experiment. Include a way of preventing the error.

Error source: Heat loss.   FIX: heat shield / loose fitting lid

Error source: poor heat transfer.   FIX: copper can used

Error source: measuring temp of can instead of water. FIX: keep thermometer off can when taking measurement

Error source: Incomplete combustion. FIX: good O_2 supply

Which formula allows the energy released when a fuel burns to be calculated?

$$E_h = cm\Delta T$$

What are the units for each term in the above equation?
E_h = energy in kJ
c = heat capacity for water kJ kg^{-1} $^oC^{-1}$ (unit in databook)
m = mass of water in kg (1 litre = 1kg)
ΔT = change in temperature (^oC)

Calculate the energy released when 50cm^3 of water is heated from 10.3^oC to 28.4^oC. Include the correct units for your answer. $E_h = cm\Delta T$
c = 4.18 (databook)
m = 50cm^3 in kg = 0.05kg
ΔT = 28.4-10.3 = 18.1^oC

E_h = 4.18 x 0.05 x 18.1
    = 3.78kJ

Calculate the temperature rise when 100g of water absorbs 26.7 kJ of energy. Include the correct units for your answer.

$\Delta T = \dfrac{E_h}{cm}$ E_h = 26.7kJ   m=100g in kg = 0.1kg
C=4.18 (databook)

$\Delta T = \dfrac{26.7}{(4.18 \times 0.1)} = 63.9^oC$

Calculate the specific heat capacity of the sodium chloride solution which requires 15.6kJ of energy to heat 100g of solution by 24^oC. Include the correct units for your answer
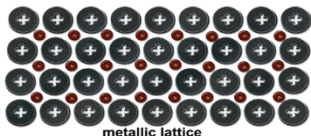
$\Delta T = \dfrac{E_h}{m\Delta T}$ $= \dfrac{15.6}{(0.1 \times 24)}$ $= \dfrac{15.6}{(0.1 \times 24)}$ = 6.5 kJ kg^{-1} $^oC^{-1}$

Chemistry Revision Mind Map Unit 3 – Metals 1

What is metallic bonding?

Attraction between positive metal ions and a sea of delocalised electrons

Draw the structure of a metallic lattice

metallic lattice

Why can metals conduct electricity?

They have free moving electrons

If a metal is found uncombined in the Earths crust, what does this suggest about its reactivity?

Low reactivity
(as it hasn't combined with oxygen)

What is the name given to a naturally occurring rocks that contain metal compounds?

Metals can be extracted from their ore. Metal ions from metal atoms, what is this reaction called?

Reduction
(metal ions gain electrons to become atoms again)

What are the three methods of extracting metals from ores and what metals would be extracted using each method?

1. Electrolysis (most reactive set – Al and up in the ECS)

2. Heating with C or CO (moderate reactivity eg Mg – Cu in ECS)

3. Heat alone / no extraction needed (low reactivity egAg/Au/Pt)

Why is a D.C supply used in electrolysis?

So that the products can be easily identified (ie the metals will ALWAYS form on the negative electrode and vice versa)

Complete the word equation for the following:
Metal + oxygen → Metal oxide
Metal + water → Metal hydroxide + hydrogen
Metal + dilute acid → Salt + hydrogen

Zinc + oxygen → Zinc oxide
Lithium + water → Lithium hydroxide + hydrogen
Magnesium + hydrochloric acid → Magnesium chloride + hydrogen

What is an oxidation reaction in terms of electrons?

Oxidation Is Loss of electrons (OILRIG)

What is a reduction reaction in terms of electrons?

Reduction Is Gain of electrons (OILRIG)

Write the ion-electron equation for iron (II) ions forming iron (III) ions. What is this reaction called? (use databook pg 10)

Fe^{2+} → Fe^{3+} + e^- (oxidation)

This is a simple cell:

Zinc   Copper
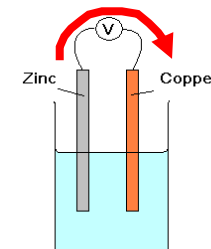
What is the purpose of the electrolyte?

Complete the circuit

Why is the electrolyte an ionic solution?

Must conduct electricity

Write the reduction, oxidation and redox reaction for the cell above:
Reduction: Cu^{2+} + $2e^-$ → Cu
Oxidation: Zn → Zn^{2+} + $2e^-$ (use databook pg 10)

Redox: Zn + Cu^{2+} → Zn^{2+} + Cu

Show on the diagram the path of electron flow.

This is a half cell:

copper   magnesium
copper(II) sulfate solution   magnesium sulfate solution
beaker A   beaker B   ion bridge

What is the purpose of the ion bridge?
Complete the circuit
Show the path of electron flow.
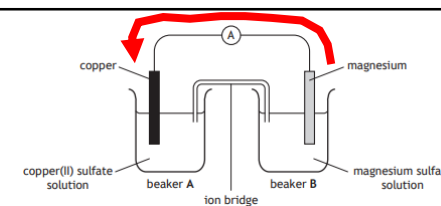
What non-metal can be used as electrodes in half-cells?
Graphite (has delocalised electrons and is fairly unreactive)

Electrons flow from the metal ___higher___ in the electrochemical series to the metal ___lower___ in the electrochemical series.

The further apart metals are in an electrochemical series, the ___higher___ the voltage.

When copper is connected to copper in an electrochemical cell the voltage is ___0___.

Plastics are materials known as:

polymers

Polymers are long chain molecules formed by joining what together?

monomers

What is the name of the reaction called forming a polymer?

Polymerisation
(addition polymerisation)

Name the monomers used to make the following:
1. Polystyrene   styrene

2. Polyethene   ethene

3. Polyvinylchlride   vinylchloride

Name the polymer made from the following monomers:
1. Propene   polypropene

2. Styrene   polystyrene
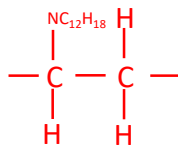
3. Tetraflouroethene   polytetrafluoroethene

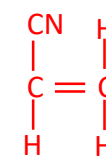Is a monomer saturated or unsaturated? What does this mean?
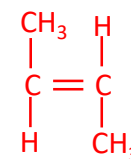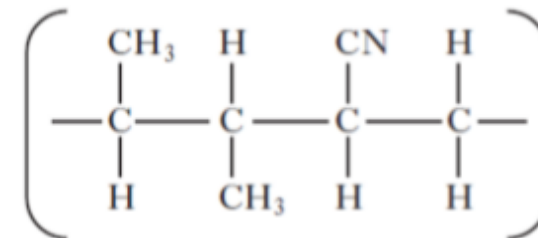
Unsaturated – has a C=C

Draw a section of a polymer showing three of the following monomers joined together:
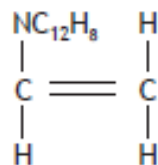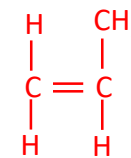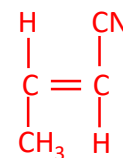

Draw the repeating unit for the above polymer you have drawn.

From the following co-polymer, draw the two monomers used to make it.

A different answer is possible as they haven't told you one of the monomers. This will not happen in your exam.

Chemistry Revision Mind Map Unit 3 – Fertilisers 3

The three elements required for plant growth are:

NPK - nitrogen, phosphorous and potassium

What is the purpose of fertilisers?

Replace soil nutrients

Why do fertilisers need to be soluble?

So that they can be absorbed with water in the roots of plants

What is the formula for ammonia?

NH_3

When ammonia dissolves in water, what colour would pH paper turn? Why?

Blue/purple – ammonia solution is an alkali

What is the name of the process used to make ammonia?

Haber process

What are the two reactants for the Haber process?

N_2 + H_2

Write a balanced chemical equation to show the production of ammonia.

N_2 + $3H_2$ ⇌ $2NH_3$

The production of ammonia is a reversible reaction, draw the arrows used to represent this.

⇌

What catalyst is used in the Haber process?

Iron   (H&I are together in the alphabet)

What is the purpose of adding a catalyst?

Speed up reaction. Allow reaction to take place at a lower temperature therefore lowering fuel costs

What is the name of the process used to make Nitric acid?

Ostwald process

What are the three starting materials in this process?

Ammonia, oxygen and water are needed to make nitroc acid.

First the NH_3 and O_2 are converted to NO_2, then water is added to dissolve the NO_2 into nitric acid (HNO_3)

What is the catalyst used in this process?

Platinum   (O&P are together in the alphabet)

Complete the following equations:

Ammonia + Nitric acid → Ammonium nitrate + water

Potassium hydroxide + Nitric acid → potassium nitrate + water

Circle the salts produced above.

Give two reasons why these salts would be good fertilisers.

Have NP or K.
Are soluble

What is the name given to the reactions above?

Neutralisation

Calculate the percentage of nitrogen in the fertiliser ammonium nitrate (NH_4NO_3)?

1 x 14 = 14
4 x 1   = 4
1 x 14 = 14
3 x 16 = 48 +
            80g

% by mass = $\frac{m}{Gfm}$ x 100 = $\frac{28}{80}$ x 100 = 35%

Chemistry Revision Mind Map Unit 3 – Nuclear Chemistry 4

Where does radioactive decay occur in an atom?

nucleus

Unstable nuclei become more stable by giving out which three forms of radiation?

1. Alpha α

2. Beta β

3. Gamma γ

Alpha particles are stopped by:

Few cm of air / paper

Beta particles are stopped by:

Thin Al foil

Gamma particles are stopped by:

Thick concrete or Pb

Alpha particles are attracted to a _negative_ plate

Beta particles are attracted to a _positive_ plate.

Gamma particles are not deflected by an electric field.

An alpha particle can be represented as:

$$^{4}_{2}\alpha \quad \text{or} \quad ^{4}_{2}He$$

A beta particle can be represented as:

$$^{0}_{-1}\beta \quad \text{or} \quad ^{0}_{-1}e$$

A proton can be represented as:

$$^{1}_{1}p$$

A neutron can be represented as:

$$^{1}_{0}n$$

Complete the following equations and decide whether the isotope is undergoing alpha or beta decay.

1. $^{242}_{94}Pu \longrightarrow ^{238}_{92}U + ^{4}_{2}He$

2. $^{234}_{90}Th \longrightarrow ^{234}_{91}Pa + ^{0}_{-1}e$

What does the term half-life mean?

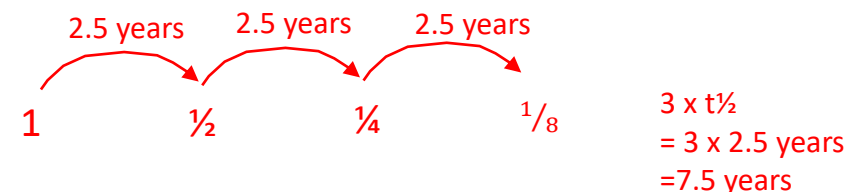Time taken for half of the nuclei to decay

What affect would increasing the temperature have on the half-life of an isotope?

None

16 g of a radioisotope has a half-life of 20 days. What mass of the original isotope will still be left after 60 days?

20days → 20days → 20days →

16g   8g   4g   2g

A luminous watch dial containing a material with a half life of 2.5 years has only 1/8th of its original glow. How old is the watch?

2.5 years → 2.5 years → 2.5 years →

1   ½   ¼ $^{1}/_{8}$

3 x t½
= 3 x 2.5 years
=7.5 years