

Chemistry Revision Mind Map Unit 1 – Bonding of first 20 elements 1

Annotate the first 20 elements of The Periodic Table to show their **structure** and **bonding**.

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 0
1 Hydrogen H							2 Helium He
3 Lithium Li	4 Beryllium Be	5 Boron B	6 Carbon C	7 Nitrogen N	8 Oxygen O	9 Fluorine F	10 Neon Ne
11 Sodium Na	12 Magnesium Mg	13 Aluminium Al	14 Silicon Si	15 Phosphorus P	16 Sulfur S	17 Chlorine Cl	18 Argon Ar
19 Potassium K	20 Calcium Ca						

Note: Carbon in the form of fullerene (C₆₀) is covalent molecular

Explain why sulfur has a higher melting point than phosphorus?

Going down group 8 elements boiling points increase. Explain why this happens?

Explain why chlorine has a higher melting point than argon?

What is the strongest type of bonding broken when boron melts?

What is the strongest type of bonding broken when sulfur melts?

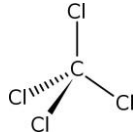
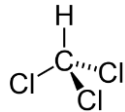
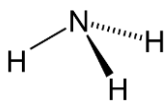
Explain fully in terms of structure and bonding why silicon nitride has a high melting point?

Explain why boron has a higher melting point than sulfur.

Chemistry Revision Mind Map Unit 1 – Trends in The Periodic Table 2

The covalent radius is a measure of what?	<u>Calculate</u> the energy required for the following reaction; $\text{Na}^+ (\text{g}) \rightarrow \text{Na}^{3+} (\text{g}) + 2\text{e}^-$	Explain why the first ionisation of sodium is much lower than the second ionisation energy
Explain the trend in covalent radius as you go across a period		
Explain the trend in covalent radius as you go down a group	Explain the trend in ionisation energy across a period	
Explain why the covalent radius of sodium is smaller than the ionic radius	Explain the trend in ionisation energy down a group	
Define the term first ionisation energy	Explain why there is a large difference between the third and fourth ionisation energies of aluminium?	Explain the term electronegativity
Write the equation to show the third ionisation energy of chlorine.		Explain the trend in electronegativity across a period
		Explain the trend in electronegativity down a group

Chemistry Revision Mind Map Unit 1 – Structure and Bonding 3

What is a covalent bond	Decide if each of the following are polar or non-polar molecule and explain your answer    $\text{O}=\text{C}=\text{O}$	Explain how London dispersion forces arise
What is a polar covalent bond		
What is a non-polar/pure covalent bond		Explain how permanent dipole- permanent dipole interaction arise
Annotate HCl below to show the partial charge on each atom and the location of electrons. $\text{H}-\text{Cl}$		
If a compound has the greatest ionic character, what does this mean in terms of electronegativity difference?	Name the three types of intramolecular bonding. Are these types of bonding strong?	Explain how Hydrogen bonding arises.
What is a polar molecule	Name the three types of intermolecular bonding. Which is the strongest?	Explain why ethanol is soluble in water.
What is a non polar/pure molecule		

Chemistry Revision Mind Map Unit 1 – Oxidation and Reduction 4

Oxidation involves the _____ of electrons.	Name three compounds which are strong oxidising agents?	In a redox equation what is always cancelled out:
Reduction involves the _____ of electrons.	What is a use of hydrogen peroxide as an oxidising agent ?	Write the ion electron equation for the following equation:
What is an oxidising agent ?	What does the term electronegativity mean?	
What is a reducing agent ?	If an element is very electronegative will it be an oxidising agent or reducing agent?	
Where in your data booklet will you find strong reducing agents ?	In the following equation: $\text{Mg (s) + Zn}^{2+} \text{ (aq) } \rightarrow \text{Mg}^{2+} \text{ (aq) + Zn (s)}$ 1. Write the oxidation reaction 2. Write the reduction reaction 3. Name the oxidising agent 4. Name the reducing agent	For the following redox equation: $\text{C}_6\text{H}_{12}\text{O}_6 + \text{Cu}^{2+} + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_7 + 2\text{Cu}^+ + 2\text{H}^+$ Write the ion-electron equation for the oxidation reaction: Write the ion-electron equation for the reduction reaction:
Where in your data booklet will you find strong oxidising agents ?		
Name a compound which is a strong reducing agent?		

Chemistry Revision Mind Map Unit 2 –Esters 1

An ester is made from which two compounds

What is the name of the reaction in which Esters are formed?

What is the definition of a hydrolysis reaction?

Name and draw the ester made from methanoic acid and propanol.

What is the definition of a condensation reaction?

Draw an ester link and show where is breaks during hydrolysis.

What is the catalyst used in the formation of esters?

What is formed during the acid catalysed hydrolysis of an ester?

Circle the functional group in the above ester.
What is this group called?

What is the purpose of a condenser when making esters?

What is formed during the hydrolysis of ethyl methanoate using sodium hydroxide as a catalyst?

Draw methanoic acid, circle and name the functional group?

Name two observations showing you have produced an ester:

1.

2.

Draw the set up of a hydrolysis condenser under reflux, showing where water goes in and where water goes out.

Draw propanol, circle and name the functional group?

What are esters used for?

Chemistry Revision Mind Map Unit 2 – Fats and Oils 2

Fats and oils belong to which family of compounds?	What is the name of the reaction in which fats and oils are formed?	Will more bromine solution need to be added to fats or oils to decolourise the bromine solution? Why?
Fats and oils are made from which two reactants?	Why do edible oils have a lower melting points than fats? You may wish to use a diagram to aid your explanation, you must use the words, unsaturation and Van Der Waals forces (intermolecular forces).	Is the following compound saturated, unsaturated or polyunsaturated? $C_{17}H_{31}COOH$
Draw the structure for glycerol:		When a fat or oil is hydrolysed what is produced?
What is the systematic name for glycerol?		What is the name of the reaction called when an oil is converted into a fat? (also known as hardening)
How many moles of fatty acids (carboxylic acids) will one mole of glycerol react with?		Fats and oils are important for 2 reasons: 1. 2.
Draw an ester link:	What is the test of unsaturation?	

Chemistry Revision Mind Map Unit 2 – Soaps 3

The alkaline hydrolysis of fats and oils produce what?

Draw the structure of a soap molecule and label the hydrophilic/polar(ionic) part and the hydrophobic/covalent part.

Hydrophilic means

Hydrophobic means

The hydrophilic part of soap dissolves in what?

The hydrophobic part of soap dissolves in what?

Draw a diagram and label the steps to show how soap works.

What term is used to describe water containing high levels of dissolved metal ions?

When soap is used in hard water areas what is produced?

What is used instead of soap in hard water areas? Why?

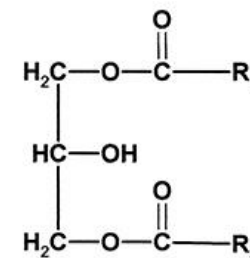
What is an emulsifier?

What is an emulsion?

An emulsifier used in food is made by reacting edible oils with glycerol. The hydroxyl groups are hydro_____ and dissolve in _____ whereas the fatty acid chains are hydro_____ and dissolve in _____.

R₁ and R₂ shows the long fatty acid chain.

Circle and label the hydrophobic and Hydrophilic part



Chemistry Revision Mind Map Unit 2 – Proteins 4

Proteins are important for 2 reasons:

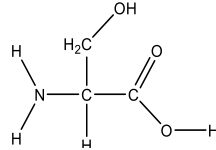
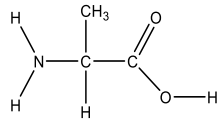
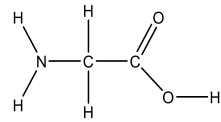
1.

What is the name of the chemical reaction in which proteins are made? What is eliminated?

The body cannot make all amino acids required for protein synthesis. What is the name given to amino acids which must be acquired through the diet?

2.

Draw the section of the protein made from the following 3 amino acids.



During digestion protein can be broken down to amino acids, what is this reaction called?

What bond is broken during protein hydrolysis?

Proteins can form sheets, spirals and complex shapes. What holds these chains in place?

When proteins are heated what happens to the intermolecular bonds?

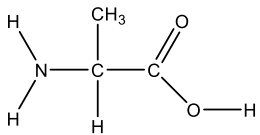
When proteins are heated, the protein changes shape, what is this called?

What causes the texture of food to change when it is cooked?

Proteins which are biological catalysts are called what?

Proteins are made from what building block?

Circle and name the 2 functional groups in the amino acid below:



alanine

Circle the peptide link in the above diagram of the section of protein. Draw a peptide link below

Chemistry Revision Mind Map Unit 2 – Oxidation of Alcohols 5

Draw and name the functional group of an alcohol.

Draw 2,2-dimethylpropan-1-ol

What is a primary alcohol? Draw an example

What is a secondary alcohol? Draw an example

What is a tertiary alcohol? Draw an example

Why does propane-1,2,3-triol have a higher boiling point and is more viscous than ethane-1,2-diol?

Draw the oxidation products of butan-1-ol. (is this primary secondary, or tertiary?)

Draw the oxidation products of butan-2-ol. (is this primary secondary, or tertiary?)

Why can 2-methyl propan-2-ol not be oxidised?

Which two oxidising agents can be used to oxidise primary and secondary alcohols?

Primary alcohols are oxidised to:

Secondary alcohols are oxidised to:

When hot copper (II) oxide is added to a primary or secondary alcohol the observation is:

When acidified potassium dichromate is added to a primary or secondary alcohol the observation is:

You can distinguish between a ketone and carboxylic acid by:

Oxidation has what effect on the oxygen to hydrogen ratio? (O:H)

Chemistry Revision Mind Map Unit 2 – Aldehydes and Ketones 6

Draw and name the functional group of an aldehyde and ketone.

What is the difference between an aldehyde and a ketone?

Draw 4-methylhexan-2-one

Draw 2-methylpropanal

What is an isomer?

Draw an isomer of pentanal

Draw an isomer of 2-methylpropanal

What compound can be oxidised to a carboxylic acid?

What three oxidising agents can be used to differentiate between an aldehyde and a ketone?

- 1.
- 2.
- 3.

What colour change would you observe when you add Fehling's solution to an aldehyde?

What colour change would you observe when you add Tollen's reagent to an aldehyde?

What colour change would you observe when you add acidified dichromate to an aldehyde?

Aldehydes are used for:

Oxidation from the air results in oxidation of food, what is a disadvantage of this?

What are antioxidants:

- 1.
- 2.
- 3.

Chemistry Revision Mind Map Unit 2 – Fragrances 7

Essential oils are **volatile** what does this mean?

Draw the structure of an isoprene unit (2-methylbuta-1,3-diene).

If a terpene contains 40 carbons, how many isoprene units is it made from?

Essential oils are **non-water** soluble, what is another word to describe this?

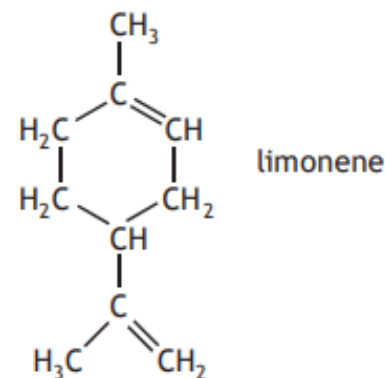
Write the **molecular formula** for a terpene consisting of 4 isoprene units.

List 4 uses of essential oils:

- 1.
- 2.
- 3.
- 4.

Draw apparatus to extract essential oils in a lab and list the key points

Circle an isoprene unit in the terpene below:



What name is given to the **key component** in most essential oils?

What is the general formula for a terpene? What is the isoprene rule?

How many isoprene units make up limonene?

Name the molecule in which Terpenes are based.

Chemistry Revision Mind Map Unit 2 – Skin Care 8

Name the high-energy form of radiation present in sunlight.

Exposure to UV light results in what happening to bonds?

List 3 negative impacts of UV radiation.

- 1.
- 2.
- 3.

How can you prevent skin damage caused by UV radiation?

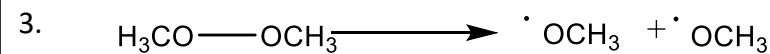
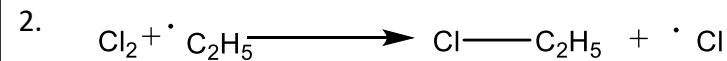
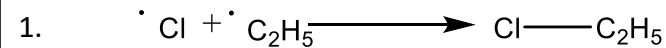
During UV exposure, UV light breaks bonds. What is formed?

What is a free radical?

Free radical chain reactions include which three steps:

- 1.
- 2.
- 3.

Decide if each of the following are initiation, propagation or termination.



H_2 and Cl_2 reacts explosively in the presence of UV ($\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$) write the initiation, propagation and termination reactions.

What is a free radical scavenger?

List three everyday items free radical scavengers are added to:

- 1.
- 2.
- 3.

Chemistry Revision Mind Map Unit 3 – Collision Theory 1

What is a negative impact to industry if reaction rate is too slow?

What is a negative impact to industry if reaction rate is too fast?

For a chemical reaction to occur, which **two requirements** are necessary. You may wish to use diagrams to help with your explanation.

How do you calculate **average rate** of reaction? What are the units?

When would you use an **average rate** of reaction calculation?

How do you calculate **relative rate** of reaction? What are the units?

When would you use a **relative rate** of reaction calculation?

List five factors which effect reaction rate:

- 1.
- 2.
- 3.
- 4.
- 5.

Define the term **activation energy** mean?

Define an **activated complex**?

Why does increasing **pressure** increase reaction rate? You may wish to use a diagram.

Chemistry Revision Mind Map Unit 3 – Collision Theory 2

What is a **homogenous catalyst**?

What is a **heterogeneous catalyst**?

How does a catalyst increase the rate of a reaction?

Is a catalyst used up during a chemical reaction?

Does a catalyst form bonds with reactants?

Does a catalyst provide energy to the reaction?

Use **collision theory** to explain why **decreasing particle size increases reaction rate**. Use any wish to use a diagram.

Use **collision theory** to explain why **increasing concentration increases reaction rate**. Use any wish to use a diagram.

Chemistry Revision Mind Map Unit 3 – Collision Theory and Kinetic energy 3

Use **collision theory** to explain why **increasing temperature increases reaction rate**. Use any wish to use a diagram.

Draw an **energy distribution diagram** and draw a line to show **activation energy**.

Draw an **energy distribution diagram** and draw a line to show **activation energy**.

On the diagram draw a second curve to show an **increase in temperature**.

On the diagram draw a line to **show the effect of adding a catalyst**.

Explain why a **small increase in temperature results in a large increase in reaction rate**.

Explain why **adding a catalyst** results in an **increase in reaction rate**.

What is **temperature** a measure of?

Chemistry Revision Mind Map Unit 3 – Collision Theory and Kinetic energy 4

Sketch a graph to show the **effect of increasing concentration on relative rate of reaction.**

The straight line shows that rate is **directly proportional to concentration.**

If you **double the concentration**, you _____ the **rate of reaction.**

Sketch a graph to show the **effect of increasing temperature on relative rate of reaction.**

The curved line shows that a **small increase in temperature** results in a _____

increase in rate if reaction.

Chemistry Revision Mind Map Unit 3 – Reaction pathways 5

Draw a **potential energy diagram** to show the energy pathways for an **exothermic** reaction.

How do you **calculate enthalpy change** (ΔH)

Define an **endothermic reaction**

Is **enthalpy change** positive or negative for exothermic reactions?

Is **enthalpy change** positive or negative for endothermic reactions?

Draw a **potential energy diagram** to show the energy pathways for an **exothermic** reaction and draw a line to show the addition of a **catalyst**.

Draw a **potential energy diagram** to show the energy pathways for an **endothermic** reaction.

How do you calculate **activation energy** (E_a)?

On both potential energy diagrams drawn, annotate the following:

1. Activated complex
2. Activation energy (E_a)
3. Enthalpy change (ΔH)

Define an **exothermic reaction**

Explain why the addition of a **catalyst increases reaction rate**.

What happens to **E_a** when a **catalyst** is added?

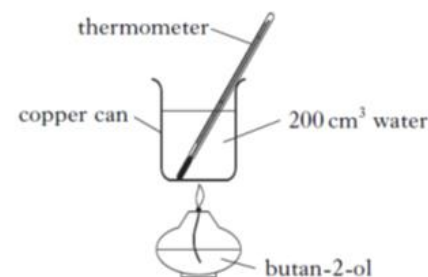
What happens to **ΔH** when a **catalyst** is added?

Chemistry Revision Mind Map Unit 3 – Chemical Energy 6

In industry **exothermic reactions** may require heat to be removed, why?

Which **two products** are formed when a hydrocarbon is burned in oxygen.

1g of butan-2-ol was burned and the temperature rose from 12°C to 44 °C. Use these results to calculate the **enthalpy of combustion** of butan-2-ol.



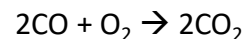
In industry **endothermic reactions** may cost more, why?

One mole of substance is the same as the what of the substance?

What is the definition of **enthalpy of combustion**?

The enthalpy of combustion of methanol (CH₃OH) is -727 kJ mol⁻¹. What mass of methanol has to be burned to produce 72.2 kJ of energy?

Why is the below equation not an **enthalpy of combustion equation**?



Write the equation used to calculate **heat energy** and specify what each part of the equation is.

State two improvements to the experiment above and an explanation of the improvement.

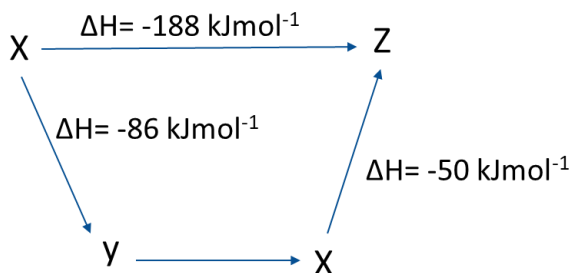
1.

2.

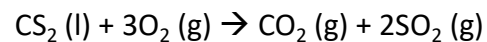
Chemistry Revision Mind Map Unit 3 – Hess's Law and Bond Enthalpy 7

Hess's Law states:

According to Hess's Law, calculate the ΔH value from Y to Z.



T.E



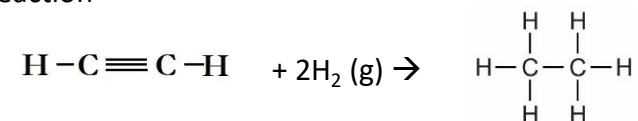
Calculate the enthalpy change, for this reaction using the following information



Which **phase** must the reactants be in when calculating **bond enthalpy**?

What is the equation to **calculate bond enthalpy**?

Using **bond enthalpies**, calculate the **enthalpy change** for the following reaction



Define the **molar bond enthalpy**

Define the **mean molar bond enthalpy**

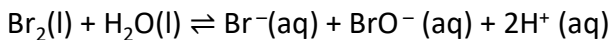
Chemistry Revision Mind Map Unit 3 – Equilibrium 8

At equilibrium, the **rates** of the forward and reverse reaction are _____.

At equilibrium, the **concentration** of reactants and products are _____.

What is *Le Chatelier's* Principle?

In the following equation



What effect will the following have on equilibrium:

1. Sulfuric acid was added? Why?

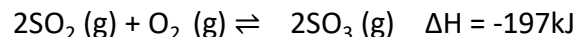
2. Sodium hydroxide was added? Why?

3. Sodium bromide was added? Why?

Enthalpy change for an exothermic reaction is:

Enthalpy change for an endothermic reaction is:

In the following equation:



What effect will the following have on the equilibrium:

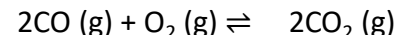
1. Increasing the temperature? Why?

2. Decreasing the temperature? Why?

3. What would you need to do to the temperature to increase the yield of products?

What state does a change in pressure effect?

In the following equation:

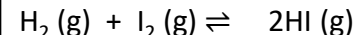


What effect will the following have on the equilibrium:

1. Increasing pressure? Why?

2. Decreasing pressure? Why?

In the following equation:

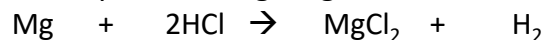


What effect will the following have on the equilibrium:

1. Increasing pressure? Why?

Chemistry Revision Mind Map Unit 3 – Calculations 9

2.45g of magnesium is added to 100 cm³ of dilute hydrochloric acid, concentration 1mol l⁻¹. Identify the **limiting reagent**.

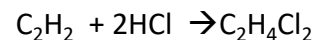


How would you choose a reagent to be in excess?

What is **percentage yield**?

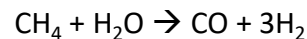
List factors which would influence industrial design.

Excess ethyne was reacted with 0.1 mol of hydrogen chloride and 4.1 g of the product, 1,1-dichloroethane was obtained. Calculate the **% yield** using the equation:



What does **100% atom economy** mean?

Calculate the **atom economy** for this reaction where hydrogen is the desired product.

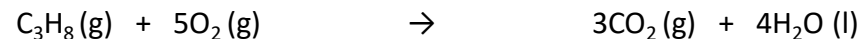


What is **molar volume**?

What volume of hydrogen would be produced if 20.0 cm³ H₂SO₄, concentration 0.5 mol l⁻¹ reacts completely with excess zinc? (molar gas volume is 22.4 litres mol⁻¹)



What volume of oxygen has been used when burning propane, if 3.6 litres of carbon dioxide is produced? (*all gases being at the same temperature and pressure*)



Chemistry Revision Mind Map Unit 3 – Chemical Analysis 10

In paper chromatography what is the:

Mobile phase:

Stationary phase:

What two factors influence separation by chromatography:

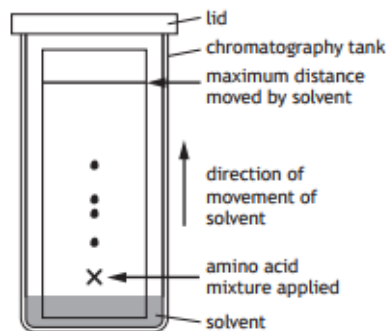
1.

2.

Larger molecules move _____ in chromatography.

How do you calculate Rf value?

Calculate the Rf Value of spot 3 in the chromatogram below.



In gas chromatography why is a gas such as helium used as the mobile phase?

The peak in a chromatogram indicates what?

If the peak is off the scale what does this indicate?

How could you make the peak in scale?

Which two pieces of equipment are used for accurate measurements in chemistry

What name is given to titres between 0.2cm³?

Why is the first titre never used when calculating the average titre?

What is a standard solution?

How do you make up a standard solution? (3 marks)

Why is an indicator used?

Why is a white tile used?

In a redox titration using acidified permanganate, why is an indicator not required?

Why is an acid added?

Calculate the concentration of Iron (II) sulfate solution given that 20cm³ of it reacted with 0.02mol l⁻¹ potassium permanganate solution. The average volume of potassium permanganate solution used was 10cm³ The redox equation is:

