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 (C_{60}) is covalent molecular

Explain why sulfur has a higher melting point than phosphorus?

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?

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

Explain why chlorine has a higher melting point than argon?

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?

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 why the covalent radius of sodium is smaller than the ionic radius

Define the term first ionisation energy

Write the equation to show the third ionisation energy of chlorine.

Calculate the energy required for the following reaction;

$$Na^{+}(g) \rightarrow Na^{3+}(g) + 2e^{-}$$

Explain the trend in ionisation energy across a period

Explain the trend in ionisation energy down a group

Explain why there is a large difference between the third and fourth ionisation energies of aluminium?

Explain why the first ionisation of sodium is much lower than the second ionisation energy

Explain the term electronegativity

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

What is a **polar covalent bond**

What is a **non-polar/pure covalent bond**

Annotate HCl below to show the partial charge on each atom and the location of electrons.

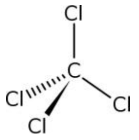
H-Cl

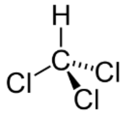
If a compound has the greatest ionic character, what does this mean in terms of electronegativity difference?

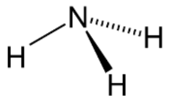
What is a **polar molecule**

What is a **non polar/pure molecule**

Decide if each of the following are polar or non-polar molecule and explain your answer







$O=C=O$

Name the three types of intramolecular bonding. Are these types of bonding strong?

Name the three types of intermolecular bonding. Which is the strongest?

Explain how London dispersion forces arise

Explain how permanent dipole- permeant dipole interaction arise

Explain how Hydrogen bonding arises.

Explain why ethanol is soluble in water.

Chemistry Revision Mind Map Unit 1 – Oxidation and Reduction 4

Oxidation involves the _________ of electrons.

Reduction involves the ____________ of electrons.

What is an **oxidising agent?**

What is a **reducing agent?**

Where in your data booklet will you find **strong reducing agents?**

Where in your data booklet will you find **strong oxidising agents?**

Name a **compound** which is a strong reducing agent**?**

Name **three compounds** which are strong oxidising agents?

What is a use of hydrogen peroxide as an **oxidising agent**?

What does the term electronegativity mean?

If an element is very electronegative will it be an oxidising agent or reducing agent?

In the following equation:

$$Mg\ (s) + Zn^{2+}\ (aq) \rightarrow Mg^{2+}\ (aq) + Zn\ (s)$$

1. Write the oxidation reaction
2. Write the reduction reaction
3. Name the oxidising agent
4. Name the reducing agent

In a redox equation what is always cancelled out:

Write the ion electron equation for the following equation:

For the following redox equation:

$$C_6H_{12}O_6 + Cu^{2+} + H_2O \rightarrow C_6H_{12}O_7 + 2Cu^{+} + 2H^{+}$$

Write the ion-electron equation for the oxidation reaction:

Write the ion-electron equation for the reduction reaction:

Chemistry Revision Mind Map Unit 2 –Esters 1

An ester is made from which two compounds

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

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

Draw methanoic acid, circle and name the functional group?

Draw propanol, circle and name the functional group?

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

What is the definition of a condensation reaction?

What is the catalyst used in the formation of esters?

What is the purpose of a condenser when making esters?

Name two observations showing you have produced an ester:
1.

2.

What are esters used for?

What is the definition of a hydrolysis reaction?

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

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

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

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

Chemistry Revision Mind Map Unit 2 – Fats and Oils 2

Fats and oils belong to which family of compounds?

Fats and oils are made from which two reactants?

Draw the structure for glycerol:

What is the systematic name for glycerol?

How many moles of fatty acids (carboxylic acids) will one mole of glycerol react with?

Draw an ester link:

What is the name of the reaction in which fats and oils are formed?

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 Walls forces (intermolecular forces).

What is the test of unsaturation?

Will more bromine solution need to be added to fats or oils to decolourise the bromine solution? Why?

Is the following compound saturated, unsaturated or polyunsaturated? $C_{17}H_{31}COOH$

When a fat or oil is hydrolysed what is produced?

What is the name of the reaction called when an oil is converted into a fat? (also known as hardening)

Fats and oils are important for 2 reasons:

1.

2.

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 is 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?

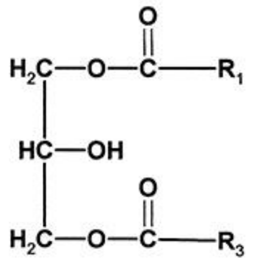
What is an emulsifier?

What is an emulsion?

An emulsifier used in food is made my reacting edible oils with glycerol. The hydroxyl groups are hydro___________ and dissolve in ____________whereas the fatty acid chains are hydro___________ an dissolve in ___________________.

R_1 and R_2 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:

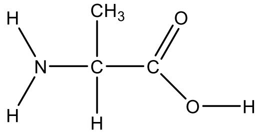
1.

2.

Proteins which are biological catalysts are called what?

Proteins are made from what building block?

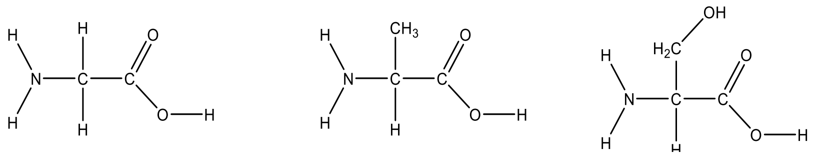
Circle and name the 2 functional groups in the amino acid below:



alanine

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

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



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

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

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 changed shape, what is this called?

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

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?

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

List 4 uses of essential oils:
1.
2.
3.
4.

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

Name the molecule in which Terpenes are based.

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

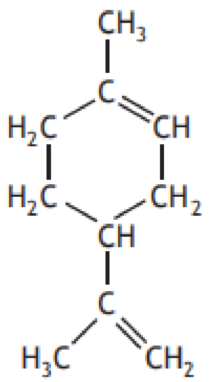
Draw apparatus to extract essential oils in a lab and list the key points

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

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

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

Circle an isoprene unit in the terpene below:



limonene

How many isoprene units make up limonene?

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.

1. $^{\bullet}Cl + {}^{\bullet}C_2H_5 \longrightarrow Cl{-}C_2H_5$

2. $Cl_2 + {}^{\bullet}C_2H_5 \longrightarrow Cl{-}C_2H_5 + {}^{\bullet}Cl$

3. $H_3CO{-}OCH_3 \longrightarrow {}^{\bullet}OCH_3 + {}^{\bullet}OCH_3$

H_2 and Cl_2 reacts explosively in the presence of UV ($H_2 + Cl_2 \rightarrow 2HCl$) 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 ay wish to use a diagram.

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

What is **temperature** a measure of?

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.**

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

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

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

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

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.

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

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

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

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

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

On both potential energy diagrams drawn, annotate the following:

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

Define an **exothermic reaction**

Define an **endothermic reaction**

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.**

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

What happens to **Ea 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?

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

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

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

$$2CO + O_2 \rightarrow 2CO_2$$

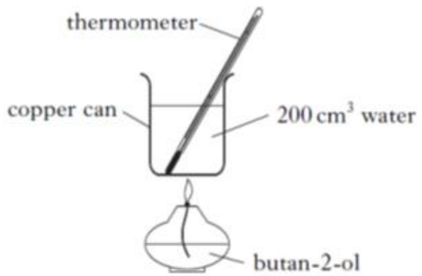
Which **two products** are formed when a hydrocarbon is burned in oxygen.

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

The enthalpy of combustion of methanol (CH_3OH) is -727 kJ mol^{-1}. What mass of methanol has to be burned to produce 72.2 kJ of energy?

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

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.



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

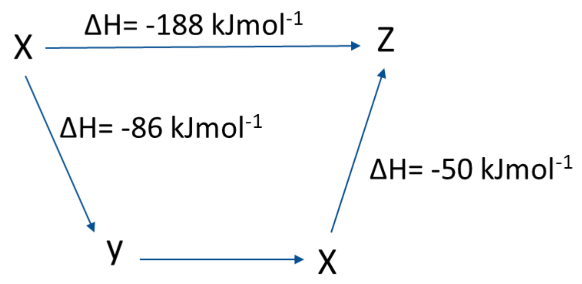
1.

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 CS_2 (l) + $3O_2$ (g) → CO_2 (g) + $2SO_2$ (g)

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

C (s) + O_2 (g) → CO_2 (g) ΔH= -400.4 kJ mol $^{-1}$
S (s) + O_2 (g) → SO_2 (g) ΔH= -299.6 kJ mol $^{-1}$
C (s) + 2S (s) → CS_2 (l) ΔH= 77.8 kJ mol $^{-1}$

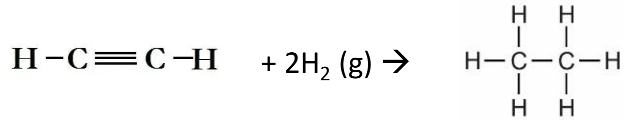
Define the **molar bond enthalpy**

Define the **mean molar bond enthalpy**

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



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

$Br_2(l) + H_2O(l) \rightleftharpoons Br^-(aq) + BrO^-(aq) + 2H^+(aq)$

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:

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \quad \Delta H = -197kJ$

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:

$2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$

What effect will the following have on the equilibrium:

1. Increasing pressure? Why?
2. Decreasing pressure? Why?

In the following equation:

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

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 cm^3 of dilute hydrochloric acid, concentration 1mol l^{-1} Identify the **limiting reagent.**

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

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:

$$C_2H_2 + 2HCl \rightarrow C_2H_4Cl_2$$

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

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

$$CH_4 + H_2O \rightarrow CO + 3H_2$$

What is **molar volume**?

What volume of hydrogen would be produced if 20.0 cm^3 H_2SO_4, concentration 0.5 mol l^{-1} reacts completely with excess zinc? (molar gas volume is 22.4 litres mol $^{-1}$)

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

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)*

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$$

Chemistry Revision Mind Map Unit 3 – Chemical Analysis 10

In paper chromatography what is the:
Mobile phase:
Stationary phase:

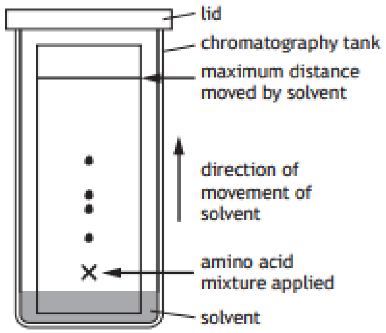
What two factors influence separation by chromatography:
1.

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 0.2cm^3?

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?

Ina 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 20cm^3 of it reacted with 0.02mol l^{-1} potassium permanganate solution. The average volume of potassium permanganate solution used was 10cm^3 The redox equation is:

$$MnO_4^- + 8H^+ + 5Fe^{2+} \rightarrow 5Fe^{3+} + Mn^{2+} + 4H_2O$$