Year 10 AQA GCSE Chemistry Revision Booklet

Use this booklet to help you with your revision in preparation for your year 10 Chemistry examination.

There are lots of tips and hints to make sure that the time you spend revising is effective.

Exam Technique Pointers……

- Do not overwrite numbers – they become unreadable when scanned. Make sure if you make a mistake you cross out and re-write.
- Avoid repeating the questions and make sure that you add value to the information that the question provides.
- Show your working and make sure it is set out correctly
- Look carefully at the stem word – does it say 'explain, state, describe'
- Where you are asked to explain – state the pattern, then write because/therefore/so that and then carry on…..
- Words to avoid – if.. they..
- Be precise – don't say I would use an 'amount' – are you talking about mass (g), volume (cm^3), concentration (mol/dm^{-3}) force (N)
- If you are asked to 'suggest' then you are likely to need to use knowledge which you are unfamiliar with
- Where asked to plan – remember to write logically – maybe write bullet points in a draft plan – important for questions of 6 marks or more
- If asked to 'evaluate' you often need to write an opinion
- Practise writing paragraphs to describe processes/conclusions
- Get formulae correct carbon dioxide is **CO_2** – not Co2, Co_2, Co^2, CO^2 or CO2.

Revision Schedule**: Use the table below to help you plan your revision. (* = large topics)**

Topic Area	**Pages of the textbook (second edition**	**Pages of textbook(first edition)**	**Studied specification checklist**	**Read through revision guide or textbook or exercise book**	**Made notes or index cards or mind map or spider diagram**	**Revisits of topic area**					
			✓	✓	✓	✓	✓	✓	✓	✓	✓
Atomic Structure and Periodic Table *	30-44 166-180	26-35 58-72									
Particles	6-14	6-14									
Formulae and Equations	66-68	74-75									
Bonding and Structure	46-64	36-56									
Organic Chemistry *	244-255 262-264	238-247 256-259									
Metals *	182-208	172-200									
Rates of Reaction *	130-146	144-158									
Energetics	114-128	160-170									
Experimental Techniques	16-28	14-24									
Acids, Bases, Salts	148-161	114-126									
Moles	76-79 84-91	74-84									

Revision Top Tips

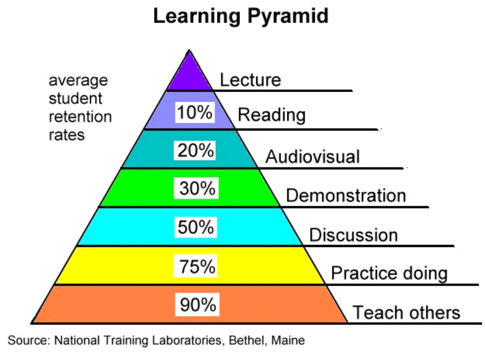
Use your textbook

This book is excellent and covers all the work that you have done this year. It also contains questions to test knowledge and also past paper questions – use these resources rather than spending time browsing the web.

Use your exercise book

Go through the work that you have done in lessons – use your exercise book to remind yourself what you have studied.

Remember the learning Pyramid when you do your revision.



Use the text book and revision book.

Read and write notes or draw a mind map

Condense work or notes

Write, write, write – at least then you have to engage with thinking

Test yourself

Look at the checklist

Use the checklist to guide writing some revision notes

You have been given a checklist which tells you exactly what needs to be learnt. For each topic make some notes, produce a spider diagram? or index cards.

Year 9 Atomic Structure and the Periodic Table	☺	😐	☹
Models of the atom – know the: • plum pudding model of the atom and Rutherford and Marsden's alpha experiments • Niels Bohr adaptation of the plum pudding model • Chadwick's experiments and what they showed			
Atoms, elements and compounds - know • about elements (first 20) and what compounds are • names of compounds given formulae or symbol equations • how to write word equations for the reactions in this specification and how to write formulae and balanced chemical equations • the electrical charges and masses of protons, neutrons and electrons. • know how to calculate the number of protons, electrons and neutrons in an atom or ion given the atomic number and mass number • the size of atoms as very small, having a radius of about 0.1 nm (1 x 10-10 m). • the radius of a nucleus is less than 1/10 000 of the atom (about 1 x 10-14 m). • what an isotope is			
Electronic structure - know • how electrons are arranged in atoms • how to draw electron configuration diagrams			

Year 9 Particles	☺	😐	☹
The three states of matter - know • The states of matter are solid, liquid and gas and how they are shown in equations • The names of the changes of state • The arrangement of particles in each of the states of matter • How to use particle theory to explain changes of state such as steric acid cooling • What affects the amount of energy needed for a substance to change state • How to use melting and boiling point data to decide the state of a substance			

Formulae and Equations - Stoichiometry	☺	😐	☹
Conservation of mass and balanced chemical equations – know that • no atoms are lost or made during a chemical reaction so the mass of the products equals the mass of the reactants. • mass changes when a reactant or product is a gas • what happens to the mass of reactants and products during reactions such as when a metal reacts with oxygen or during the thermal decompositions of metal carbonates. • how to use the balanced symbol equation and calculations involving the masses of atoms and molecules to make predictions about the changes of mass during a reaction.			
Formulae and valencies – know • the valencies of elements and common ions • how to write the formulae for compounds • how to balance equations.			

Reactions of Acids	☺	😐	☹
Reactions of acids with metals – know the following reactions and be able to apply them to different metals, acid etc • Metal and acid produce salts and hydrogen.			

• Acid and base (alkali) produce salt and water = neutralisation • Metal carbonates and acids produce salt and water and carbon dioxide **Be able to** Predict the salt formed during a reaction between any particular acid and a base or alkali.			
Soluble salts - know • how to make soluble salts by reacting acids with solid insoluble substances, such as metals, metal oxides, hydroxides or carbonates. • how to describe in detail the steps to make a pure, dry sample of a soluble salt from an insoluble oxide or carbonate (base).			
The pH scale and neutralisation – know • how to use the pH scale, from 0 to 14, to measure of the acidity or alkalinity of a solution. • how to describe what a base and alkali are • how to describe what an acid is • how to use universal indicator or a wide range indicator to measure the approximate pH of a solution and then identify acidic or alkaline solutions.			
Strong and weak acids - know • what a strong acid is along with examples • what a weak acid is along with examples • why a particular acid is either strong or weak in terms of dissociation/ionisation • how the hydrogen ion concentration is related to the pH • how to describe the terms dilute and concentrated and understand that these are different to strong and weak			

Year 9 - Structures and Bonding	☺	😐	☹
Ionic bonding – know • in ionic bonding the particles are oppositely charged ions when a metal atom reacts with a non-metal atom electrons in the outer shell of the metal atom are transferred. • how metal atoms become ions either +, 2+ etc • how non metal atoms become ions either -, 2- etc • how to draw dot and cross diagrams to show ionic bonding • that metal atoms lose electrons to become positively charged ions. Non-metal atoms gain electrons to become negatively charged ions. This can be shown with dot and cross diagrams.			
Ionic compounds - know • The structure of an ionic compound such as sodium chloride is a giant structure of ions. Ionic compounds are held together by strong electrostatic forces of attraction between oppositely charged ions. • How to deduce that a compound is ionic from a diagram of its structure • The limitations of using dot and cross, ball and stick, two and three dimensional diagrams to represent a giant ionic structure • How to work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure.			

Properties of ionic compounds - know • How the strong electrostatic forces of attraction in all directions in an ionic compound result in compounds with high melting points and high boiling points • Why ionic compound when melted or dissolved in water, conduct electricity			
Covalent bonding - know • that particles are atoms which share pairs of electrons and that bonds are strong			

• that covalent bonding occurs in non-metallic elements and in compounds of non-metals. • that covalent bonding can be found in different structures – covalent molecular structures such H_2, Cl_2, O_2, N_2, HCl, H_2O, NH_3 and CH_4 and giant covalent structures such as diamond and silicon dioxide			
Properties of small molecules - know • The properties of covalent small molecules and be able to explain why they are gases using ideas relating to energy and the strength of intermolecular forces. • How the strength of intermolecular forces varies as molecules get bigger and how this affects boiling and melting points.			
Giant covalent structures – know • That diamond and graphite (forms of carbon) and silicon dioxide (silica) are examples of giant covalent structures • The properties of each of these giant covalent structures • How to relate the properties of each of these substanes to their structures eg; melting point, electrical conductivity, hard or soft, shiny??			
Graphene and fullerenes – know • the structure of graphene and fullerenes including a Buckminsterfullerene (C60) and carbon nanotubes • how their properties in terms of strength, electrical and thermal conductivity. • how fullerenes can be used for drug delivery into the body, as lubricants, as catalysts and carbon nanotubes can be used for reinforcing materials, eg in tennis rackets.			
Nanoscience and Nanoparticles – know • That nanoscience refers to structures that are 1–100 nm in size, of the order of a few hundred atoms. Nanoparticles, are smaller than fine particles, which have diameters between 100 and 2500 nm (1 x 10-7 m and 2.5 x 10-6 m). • That coarse particles (PM10) have diameters between 1 x 10-5 m and 2.5 x 10-6 m. Coarse particles are often referred to as dust. • Nanoparticles may have properties different due to their high surface area to volume ratio. • some of the applications in medicine for controlled drug delivery and in synthetic skin; in electronics; in cosmetics and sun creams; in the development of new catalysts for fuel cells materials; in deodorants and in fabrics to prevent the growth of bacteria. • some of the advantages and disadvantages of using nanoparticles are being used in sun creams.			
Metallic bonding and metallic properties - know • How to draw and explain the structure of a metal and an alloy • How to explain the properties of metals and relate these properties (high melting point, shiny, malleability and electrical conductivity) to their structures • Why most metals in everyday use are alloys			

Year 9 and Year 10 – Further Atomic Structure	☺	😐	☹
The Periodic Table - know • How elements in the periodic table in terms of atomic number groups and periods • How to use the periodic table to draw electronic configuration diagrams and to predict the reactivities and properties of a given element. • how to describe the steps in the development of the Periodic Table including the work of Mendeleev and why the discovery of isotopes enabled us to explain why the order based on atomic weights was not always correct.			
Metals and non-metals – be able to explain.. • the differences in the physical and chemical properties of metals and non-metals. • how the electron configuration affects the reactivity of elements.			

Group 1 – The Alkali Metals know • the physical properties of alkali metals • the chemical properties of alkali metals – how they react, what they react with etc. • how to explain and predict the change in reactivity down the group using ideas about electron shield and size of atom			
Group 7 – The Halogens know • The physical and chemical properties of the halogens • How to explain the change in melting and boiling points down the group • How to explain and predict the change in reactivity of the halogens • How to write equations for halogen displacement reactions and be able to relate this to the colour changes and reactivity of the halogens			

Year 10 Metals	☺	😐	☹
Metallic bonding – know The structure of metals and non metals – recap from year 9			
Properties of transition metals - know • the properties of transition elements such as Cr, Mn, Fe, Co, Ni, Cu – be able to compare their boiling points, densities, strength, reactivity with water and oxygen compared to group 1 metals • that many transition elements have ions with different charges, form coloured compounds and are useful as catalysts.			
Metal oxides - know • that metals react with oxygen to produce metal oxides via oxidation reactions. • how to explain these reactions in terms of reduction and oxidation in terms of loss or gain of oxygen.			
The reactivity series – know • the reactivity series eg potassium, sodium, lithium, calcium, magnesium, zinc, iron and copper and how it can be established by looking at the reactivity with acid and water and is linked to the tendency to form positive ions • where hydrogen and carbon are in the reactivity series. • how to explain and write metal displacement reactions • the reactions, if any, of the metals in series with water (not steam) at room temperature or dilute acids • how to use experimental data to deduce an order of reactivity			
Extraction of metals and reduction – know • how to relate the metal extraction process to the reactivity of the metal • that unreactive metals such as gold are found in the Earth as the metal itself • that metals less reactive than carbon can be extracted from their oxide by reduction/ removal of oxygen with carbon and be able to identify the substances which are oxidised or reduced in terms of gain or loss of oxygen.			
Oxidation and reduction in terms of electrons – know • that oxidation is the loss of electrons and reduction is the gain of electrons. • how to write ionic equations for displacement reactions and to idenfify what has been oxidised or reduced			
Alternative methods of extracting metals - know • how we use phytomining and bioleaching to extract copper from low-grade ores • know the advantages and disadvantages of phytomining and bioleaching and be able to evaluate data on these alternative extraction methods.			
Properties and use of alloys - know • why we used alloys rather than pure metals – know how their structures differ • know what alloys such as bronze, gold alloys, steel alloys and aluminium alloys are, what they are made of and their properties.			

Year 10 Moles I – Quantitative Chemistry			
Relative formula mass – know • How to calculate the relative formula mass of a compound • What a mole is and Avagadro's number • How to use the relative formula mass of a substance to calculate the number of moles in a given mass of that substance and vice versa.			
Amounts of substances in equations- be able to: • calculate the masses of substances shown in a balanced symbol equation • calculate the masses of reactants and products from the balanced symbol equation and the mass of a given reactant or product • balance an equation given the masses of reactants and products.			
Limiting reactants – know • Often in a reaction one of the reactants is not used up totally as it is excess • That the reactant that is completely used up is called the limiting reactant because it limits the amount of products. • How to explain the effect of a limiting quantity of a reactant on the amount of products it is possible to obtain in terms of amounts in moles or masses in grams.			
Percentage yield – know • That a reaction may not go to completion because it is reversible • some of the product may be lost when it is separated from the reaction mixture • some of the reactants may react in ways different to the expected reaction. • how to calculate the theoretical amount of a product from a given amount of reactant and the balanced equation for the reaction • how to calculate the percentage yield of a product from the actual yield of a reaction.			
Atom economy - know • the atom economy is a measure of the amount of starting materials that end up as useful products and it is important when considering sustainable development/economics. • how to calculate the percentage atom economy • how to calculate the atom economy of a reaction from the balanced equation • how to explain why a particular reaction is chosen to produce a product given appropriate data such as atom economy, yield, rate, equilibrium position and usefulness of by-products.			

Year 10 - Rates of Reaction			
Calculating rates of reactions - know • calculate the mean rate of a reaction from given information about the quantity of a reactant used or the quantity of a product formed and the time taken • the units of rate • how to draw, and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time • how to draw tangents to the curves and use gradient of the tangent to calculate rate.			
Factors which affect the rates of chemical reactions - know • the how different factors affect the rates of chemical reactions include: the concentrations of reactants in solution, the pressure of reacting gases, the surface area of solid reactants, the temperature and the presence of catalysts. • how to investigate factors which affect the rate of chemical reactions by measuring the loss in mass of reactants, the volume of gas produced or the time for a solution to become opaque or coloured. • How to predict and explain the effects of changing conditions on the rate of a reaction using simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction			

Collision theory and activation energy - know • how to use Collision theory to explain how various factors affect rates of reactions using ideas of reacting particles colliding with each other and with sufficient energy. • Know what that the minimum amount of energy that particles must have to react is called the activation energy.			
Catalysts – know • that catalysts change the rate of chemical reactions but are not used up during the reaction but increase the rate of reaction by providing a different pathway for the reaction that has a lower activation energy • that different reactions need different catalysts. • that enzymes act as catalysts in biological systems. • how to show the effect of a catalyst on a reaction profile diagram.			

Year 10 – Organic Chemistry	☺	😐	☹
Crude oil, hydrocarbons and alkanes - know • crude oil is a mixture of a large number of compounds, mainly hydrocarbons called alkanes • alkanes are a homologous series with a general formula of CnH2n+2 • the names of the first four members of the alkanes			
Fractional distillation and petrochemicals - know • what a fraction is and how fractional distillation is used to separate fractions • that fractions are processed to produce fuels +feedstock for the petrochemical industry. • that fuels on which we depend for our modern lifestyle, such as petrol, diesel oil, kerosene, heavy fuel oil and liquefied petroleum gases, are produced from crude oil. • that many useful materials on which modern life depends are produced by the petrochemical industry, such as solvents, lubricants, polymers, detergents.			
Properties of hydrocarbons - know • how boiling point, flammability and viscosity of hydrocarbons is affected by the molecular size of a hydrocarbon molecule which affects its use as a fuel • and write equations for the complete combustion of a hydrocarbon fuel			
Cracking and alkenes - know • what cracking is, how it happens and why it is used • how to balance cracking equations and know the products of a cracking reaction • the test for alkenes • Cracking produces small molecules which have high demand for use in fuels and as a starting material for polymerisation			
Structure, formulae and reactions of alkenes - know • what an alkene is and the first 4 members of the homologous series • how to describe and write equations to show an alkene reacting with oxygen hydrogen, water and the halogens by the addition of atoms across the carbon-carbon double bond			
Polymers - know • what a polymer is, its bonding and how it is formed • know that the intermolecular forces between polymer molecules are relatively strong and so these substances are solids at room temperature.			
Addition polymerisation - know • that many small molecules (monomers) join together to form large molecules (polymers). • how poly(ethene) and poly(propene) are made by addition polymerisation. • be able to recognise addition polymers and monomers from diagrams in the forms shown and from the presence of the functional group C=C in the monomers • be able to draw diagrams to show a polymer formed from a given alkene monomer in addition to identifying the monomer from polymers			

Ceramics, polymers and composites - know • how glass is made • how clay ceramics (pottery and bricks) are made. • how low density (LD) and high density (HD) poly(ethene) are produced from ethene using different catalysts and reaction conditions. • what thermosoftening polymers and thermosetting polymers are and relate their properties to their structures • what a composite is and be able to give examples • be able to compare quantitatively the physical properties of glass and clay ceramics, polymers, composites and metals • be able to explain how the properties of materials relate to their uses			

Year 10 Energetics	☺	😐	☹
Energy transfer during exothermic and endothermic reactions - know • that an exothermic reaction transfers energy to the surroundings so the surrounding temperature increases eg: combustion, many oxidation reactions and neutralisation. • Some everyday uses of exothermic reactions eg: self heating cans and hand warmers. • that an endothermic reaction takes in energy from the surroundings so the temperature of the surroundings decreases eg: thermal decompositions and the reaction of citric acid and sodium hydrogencarbonate. Some sports injury packs are based on endothermic reactions. • be able to distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings and to be able to evaluate uses and applications of exothermic and endothermic reactions given appropriate information.			
Reaction profiles -know • that reaction profiles can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction. • be able to draw energy level diagrams for exothermic and endothermic			
The energy change of reactions know • that during a chemical reactionenergy must be supplied to break bonds in the reactants and energy is released when bonds in the products are formed. • be able to calculate the overall energy transferred during a reaction using bond energies supplied. • in an exothermic reaction, the energy released from forming new bonds is greater than the energy needed to break existing bonds. • in an endothermic reaction, the energy needed to break existing bonds is greater than the energy released from forming new bonds.			
Cells and batteries - know • cells contain chemicals which react to produce electricity and that the voltage produced is dependent upon a number of factors including the type of electrode and electrolyte. • how to make a simple cell and the a battery • in non-rechargeable cells and batteries the chemical reactions stop when one of the reactants has been used up. Alkaline batteries are non-rechargeable.			
Fuel cells - know • Fuel cells are supplied by an external source of fuel (eg hydrogen) and oxygen or air. The fuel is oxidised electrochemically within the fuel cell to produce a potential difference. • in a hydrogen fuel cell involves the oxidation of hydrogen to produce water. Hydrogen fuel cells offer a potential alternative to rechargeable cells and batteries. • how to evaluate the use of hydrogen fuel cells in comparison with rechargeable cells/batteries and to be able to write the half equations for the electrode reactions in the hydrogen fuel cell.			

Year 10, Air, Water and Environmental Chemistry	🙂	😐	🙁
Chemistry of the atmosphere know • the Earth's atmosphere is dynamic and forever changing and know the causes of these changes are sometimes man-made and sometimes part of many natural cycles. For 200 million years, the proportions of different gases in the atmosphere • the composition of the earth's atmosphere			
The Earth's early atmosphere - know • the theories and evidence about what was in the Earth's early atmosphere and how the atmosphere was formed have changed and developed over time. • be able to, given appropriate information, interpret evidence and evaluate different theories about the Earth's early atmosphere. • what has caused the amount of oxygen to change since the early atmosphere • what has caused the amount of the carbon dioxide to change since the early atmos-phere			
Greenhouse gases - know • how a greenhouse gas maintains temperatures on Earth high enough to support life. • how human activities contribute to an increase in greenhouse gases in the atmosphere incluidng combustion of fossil fuels to release carbon dioxide, deforestation, methane release from cows and paddy fields, more animal farming (digestion, waste decomposi-tion) and decomposition of rubbish in landfill sites. • that the increase in the percentage of carbon dioxide in the atmosphere over the last 100 years correlates with the increased use of fossil fuels and what the predictions are for the future. • that it is difficult to model such complex systems as global climate change. • be able to evaluate the quality of evidence about global climate change given infor-mation including describing uncertainties in the evidence base			
Global climate change -know • that an increase in average global temperature is a major cause of climate change. • be able to discuss the scale, risk and environmental implications of global climate change.			
The carbon footprint and its reduction - know • that the carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event. • the actions to reduce the carbon footprint include • the problems of reducing the carbon footprint • be able to describe how emissions of carbon dioxide and methane can be reduced			
Atmospheric pollutants from fuels - know • that combustion of fuels is a major source of atmospheric pollutants. • All of the gases released into the atmosphere when a fuel is burned • The problems/effects of releasing all of these pollutants into the atmosphere			
Using resources – know • industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, energy consumption, waste and environmental impact in the manufacture of these products. • Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.			
Corrosion and its prevention – know • that rusting is an example of corrosion. Both air + water are necessary for iron to rust. • how to prevent corrosion			

• why zinc is used to galvanise iron and when scratched provides sacrificial protection because zinc is more reactive than iron. • Know why magnesium blocks can be attached to steel ships to provide sacrificial protection.			
Using the Earth's resources and sustainable development - know • that natural resources, supplemented by agriculture, provide food, timber, clothing and fuels. Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials. • Be able to state examples of natural products that are supplemented or replaced by agricultural and synthetic products • Be able to distinguish between finite and renewable resources and evaluate the significance of data.			
Potable water - know • the features and importance of potable water which is different to pure water • the methods used to produce potable water depend on available supplies of water and local conditions. In the United Kingdom (UK), rain provides water with low levels of dissolved substances (fresh water) that collects in the ground and in lakes and rivers, and most potable water is produced by choosing an appropriate source of fresh water, passing the water through filter beds to remove any solids, sterilising to kill microbes. • that sterilising agents used for potable water include chlorine, ozone or ultraviolet light. • that if supplies of fresh water are limited, desalination of salty water or sea water may be required. Know how desalination works • be able to describe the differences in treatment of ground water and salty water.			
Waste water treatment - know • how sewage and agricultural waste water is treated by screening and grit removal, sedimentation to produce sewage sludge and effluent, anaerobic digestion of sewage sludge, aerobic biological treatment of effluent. • How to comment on the relative ease of obtaining potable water from waste, ground and salt water.			
Life cycle assessment - know • Life cycle assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages: extracting and processing raw materials, manufacturing and packaging, use and operation during its lifetime • disposal at the end of its useful life, including transport and distribution at each stage. • energy, water, resource consumption and production of some wastes can be fairly easily quantified. • that allocating numerical values to pollutant effects is less straightforward and requires value judgements, so LCA is not a purely objective process. • selective or abbreviated LCAs can be devised to evaluate a product but these can be misused to reach pre-determined conclusions, eg in support of claims for advertising purposes. • be able to carry out simple comparative LCAs for shopping bags made from plastic and paper.			
Ways of reducing the use of resources - know • why it is good to reduce use, reuse or recycle – be able to give examples • that metals, glass, building materials, clay ceramics and most plastics are produced from limited raw materials and use energy also in their manufacture • quarrying and mining causes environmental impacts.			