OCR Chemistry Checklist

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VIDEO | EXAM Q&A

Topic 1. Particles

Video: **The Particle Model**

- Describe the main features of the particle model in terms of states of matter.
- Explain in terms of the particle model the distinction between physical changes and chemical change.
- (HT) Explain the limitations of the particle model.

Video: **Atomic Structure and Isotopes**

- Recall the typical size of atoms and small molecules.
- Recall the relative charges of protons, neutrons and electrons.
- Recall the relative masses of protons, neutrons and electrons.
- Calculate numbers of protons, neutrons and electrons in atoms and ions, given atomic number and mass number of isotopes.

Video: **Developing the atomic model**

- Describe how and why the atomic model has changed over time.
- Describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with most of the mass in the nucleus.

Topic 2. Elements, compounds and mixtures

Video: **Relative formula mass and empirical formula**

- Calculate relative formula masses of species separately and in a balanced chemical equation.
- Deduce the empirical formula of a compound from the relative numbers of atoms present or from a model or diagram.

Video: **Purity and formulations**

- Define a pure substance.
- Use melting point data to distinguish pure from impure substances.
- Explain that many useful materials are formulations.

Video: **Separation techniques**

- Describe, explain and give examples of filtration, crystallisation, distillation and fractional distillation.
- Suggest suitable separation and purification techniques for mixtures when given appropriate information.

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Video: **Chromatography**

- Describe the similarities and differences between paper, thin layer and gas chromatography.
- Explain how paper chromatography separates mixtures.
- Suggest how chromatographic methods can be used for distinguishing pure substances from impure substances.
- Interpret chromatograms and determine Rf values from chromatograms.

Video: **Electronic Structure**

- Explain how the atomic structure of metals and non-metals relates to their position in the periodic table.
- Explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms.
- Represent the electronic structures of the first twenty elements of the periodic table in both forms.

Video: **The Periodic Table**

- Explain in terms of atomic number how Mendeleev's arrangement was refined into the modern periodic table,
- Explain how the reactions of elements are related to the arrangement of electrons in their atoms and hence to their atomic number,
- Describe metals and non-metals and identify where they are found on the periodic table,

Video: **Ionic Bonding**

- The definition of an ionic bond.
- Describe how ionic bonds form between metals and non-metals.
- Construct dot and cross diagrams for ionic compounds.
- Recognise a compound from its formula or from a 3D diagram.
- Describe key properties of ionic compounds.

Video: **Covalent bonding and simple molecules**

- Describe and compare the nature and arrangement of chemical bonds in simple molecules.
- Draw dot and cross diagrams for simple covalent substances.
- Represent the covalent bonds in small molecules using a line to represent a single bond.
- Describe the limitations of using dot and cross, ball and stick, two and three dimensional diagrams to represent molecules or giant structures.

Video: **Giant covalent structures**

- Describe and compare the nature and arrangement of chemical bonds in giant covalent structure.
- Describe the limitations of particular representations and models to include dot and cross diagrams, ball and stick model and two- and three-dimensional representations.

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Video: **Polymer molecules**

- Describe and compare the nature and arrangement of chemical bonds in polymers.

Video: **Metallic bonding**

- Define a metallic bond.
- Describe and compare the nature and arrangement of chemical bonds in metals.
- Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.

Video: **Changing state**

- Describe and explain in terms of particles what is happening during melting, boiling, freezing and condensing.
- Explain why changes of state occur at different temperatures for different types of substance.
- Use data to predict the states of substances under given conditions.

Video: **Bulk properties of materials**

- Describe the properties of ionic compounds and explain these in terms of strong electrostatic forces of attraction between oppositely charged ions.
- Describe the properties of simple covalent molecules and explain these using the idea that intermolecular forces are weak compared with covalent bonds.
- Recognise giant covalent structures from diagrams showing their bonding and structure and explain their properties in terms of the strong covalent bonds between atoms.
- Describe the properties of metals and alloys in terms of the layers of metal ions held together by a sea of delocalised electrons.

Video: **Nanoparticles**

- Compare 'nano' dimensions to typical dimensions of atoms and molecules.
- Give examples of some of the applications of these nanoparticulate materials.
- Evaluate the use of nanoparticles for a specified purpose, given appropriate information.

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Topic 3. Chemical reactions

Video: **Chemical formulae**

- Use chemical symbols to write the formulae of elements and simple covalent and ionic compounds.
- Use the formula of common ions to deduce the formula of a compound.

Video: **Conservation of mass and balanced equations**

- Recall the meaning of the law of conservation.
- Write simple word equations.
- Write simple symbol equations.
- Balance symbol equations.

Video: **The mole**

- (HT) Understand that the measurement of amounts in moles can apply to atoms, molecules, ions, electrons, formulae and equations.
- (HT) Calculate the number of moles in a substance using the relative formula mass.

Video: **Mole calculations**

- (HT) Calculate the masses of reactants and products from the balanced symbol equation and the mass of a given reactant or product.
- (HT) Balance an equation given the masses of reactants and products.
- (HT) 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.

Video: **Exothermic and endothermic reactions**

- Distinguish between exothermic and endothermic reactions on the basis of the temperature change of the surroundings.
- Evaluate uses and applications of exothermic and endothermic reactions given appropriate information.
- Investigate the variables that affect temperature changes in reacting solutions such as acid plus metals, acid plus carbonates, neutralisations, displacement of metals.

Video: **Reaction profiles**

- Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions.
- Use reaction profiles to identify reactions as exothermic or endothermic.
- Explain that the activation energy is the energy needed for a reaction to occur.

Video: **Calculating Energy Changes**

- (HT) Calculate the energy transferred in chemical reactions using bond energies supplied.

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Video: **Redox reactions and half equations**

- Explain redox reactions in terms of transfer of oxygen|Identify oxidising and reducing agents.
- (HT) Explain redox reactions in terms of transfer of electrons.
- (HT) Write ionic and half equations to show what is happening in a redox reaction.

Video: **Reactions of acids**

- Recall that acids react with some metals to produce salts and hydrogen.
- Predict and name the salts produced from given reactants.
- Use the formulae of common ions to deduce the formulae of salts.
- (HT) Explain in terms of gain or loss of electrons, that these are redox reactions.
- (HT) Identify which species are oxidised and which are reduced in given chemical equations.

Video: **The pH scale and neutralisation**

- Recall that acids produce hydrogen ions (H+) in aqueous solutions and alkalis contain hydroxide ions (OH−).
- Describe the use of universal indicator or a wide range indicator to measure the approximate pH of a solution.
- Use the pH scale to identify acidic or alkaline solutions.

Video: **Making salts**

- Describe neutralisation as acid reacting with alkali or a base to form a salt plus water.
- (PAG) Safe use of a range of equipment to purify and separate chemical mixtures including evaporation, filtration and crystallisation.
- Explain why reactants are often used in excess.

Video: **Hydrogen ions and pH**

- (HT) Use and explain the terms dilute and concentrated (in terms of amount of substance), and weak and strong (in terms of the degree of ionisation) in relation to acids.
- (HT) Describe neutrality and relative acidity in terms of the effect on hydrogen ion concentration and the numerical value of pH (whole numbers only).

Video: **Electrolysis of molten salts**

- Explain why an ionic compound must be melted or dissolved in water in order to conduct electricity.
- Recall that the metal (lead) is produced at the cathode and the non-metal (bromine) is produced at the anode.
- Predict the name of the products of the electrolysis of a given ionic compound.
- (HT) Write balanced half equations for the reactions occurring at the electrodes during electrolysis.

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Video: **Electrolysis of aqueous salts**

- Predict the products of the electrolysis of aqueous solutions containing a single ionic compound.
- Explain what happens at the cathode and anode in terms of the gain or loss of electrons.
- (HT) Write balanced half equations for the reactions that occur at both electrodes.

Video: **Applications of electrolysis**

- Describe the technique of electrolysis using non-inert electrodes.

Topic 4. Predicting and identifying reactions

Video: **Group 1 - The Alkali Metals**

- Recall the simple properties of Group 1.
- Describe the reactions of the first three alkali metals with water.
- Explain how properties of the elements in Group 1 depend on the outer shell of electrons of the atoms.
- Predict properties from given trends down the group.
- Explain how the reactivity of metals with water is related to the tendency of the metal to form its positive ion.

Video: **Group 0 - The Noble Gases**

- Recall the simple properties of Group 0.
- Explain how properties of the elements in Group 0 depend on their full outer shell of electrons.
- Predict properties such as boiling points from given trends down the group.

Video: **Group 7 - Halogens**

- Recall the main properties of group 7 halogens, such as chlorine, bromine, iodine.
- Explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms.
- Predict properties from given trends down the group.
- Deduce an order of reactivity of halogens based on experimental results.

Video: **Transition metals**

- Recall the general properties of transition metals and their compounds
- Describe the main differences in melting points, densities, strength, hardness and reactivity between transition metals and group 1 metals.
- Recall that transition elements have ions with different charges form coloured compounds and are useful as catalysts.

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Video: **Reactivity of elements**

- Predict possible reactions and probable reactivity of elements from their positions in the periodic table.
- Explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion.
- Deduce an order of reactivity of metals based on experimental results|Write balanced chemical equations for displacement reactions.
- (HT) Identify in a given reaction or symbol equation, which species are oxidised and which are reduced.

Video: **Gas tests**

- Describe the test for hydrogen.
- Describe the test for oxygen.
- Describe the test for carbon dioxide.
- Describe the test for chlorine.

Video: **Tests for cations**

- Identify lithium, sodium, potassium, calcium and copper ions from the results of flame tests.
- Identify zinc, calcium, copper(II), iron(II) and iron(III) ions from the results of test tube tests with sodium hydroxide solution.
- Write balanced equations for the reactions to produce the insoluble hydroxides.
- (HT) Write ionic equations for these reactions.

Video: **Tests for anions**

- Identify carbonate ions from their reaction with dilute acids.
- Identify halide ions from their reactions with acidified silver nitrate solution.
- Identify sulfate ions from their reaction with acidified barium chloride solution.
- Use chemical tests to identify the ions in unknown ionic compounds.

Video: **Instrumental methods of analysis**

- Describe the advantages of instrumental methods of analysis.
- Interpret an instrumental result from flame emission spectroscopy, given appropriate data and accompanied by a reference set of data in the same form.

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Topic 5. Monitoring and controlling chemical reactions

Video: **Yield and atom economy**

- Calculate the percentage yield of a product from the actual yield of a reaction.
- (HT) Calculate the theoretical amount of a product from a given amount of reactant and the balanced equation for the reaction.
- Calculate the atom economy of a reaction to form a desired product from the balanced equation.
- (HT) Explain why a particular reaction pathway is chosen to produce a specified product given appropriate data such as atom economy, yield and usefulness of by-products.

Video: **Concentration of a solution**

- (HT) Explain the meaning of concentration and the unit mol per dm^3.
- (HT) Calculate the concentration of a solution in mol per dm^3.
- Convert cm^3 into dm^3.
- (HT) Convert g per dm^3 into mol per dm^3.

Video: **Titrations**

- Describe how to carry out titrations using strong acids and strong alkalis only (sulfuric, hydrochloric and nitric acids only) to find the reacting volumes accurately.
- (HT) Calculate the chemical quantities in titrations involving concentrations in mol/dm^3 and in g/dm^3.

Video: **Gas calculations**

- (HT) Calculate the volume of a gas at room temperature and pressure from its mass and relative formula mass.
- (HT) Calculate volumes of gaseous reactants and products from a balanced equation and a given volume of a gaseous reactant or product.

Video: **Measuring rates of reaction**

- Describe the main methods used to measure the rate of a reaction.
- Suggest practical methods for determining the rate of a given reaction.

Video: **Measuring rates of reaction (PAG)**

- Investigate how changes in concentration affect the rates of reactions by an appropriate method.
- 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.
- Draw graphs showing the quantity of product formed or quantity of reactant used up against time.

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Video: **Interpreting rate graphs**

- Interpret graphs showing the quantity of product formed or quantity of reactant used up against time.
- Draw tangents to the curves on these graphs and use the slope of the tangent as a measure of the rate of reaction.
- (HT) Calculate the gradient of a tangent to the curve on these graphs as a measure of rate of reaction at a specific time.

Video: **Factors affecting rates of reaction**

- Recall how changing the temperature affects the rate of chemical reactions.
- Recall how changing the concentrations of reactants in solution affects the rate of chemical reactions.
- Recall how changing the pressure of reacting gases affects the rate of chemical reactions.
- Recall how changing the surface area of solid reactants affects the rate of chemical reactions.
- Recall how adding a catalyst affects the rate of chemical reactions.

Video: **Collision theory and activation energy (including catalysts)**

- Predict and explain using collision theory the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction.
- Predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio.
- Identify catalysts in reactions from their effect on the rate of reaction and because they are not included in the chemical equation for the reaction.
- Explain catalytic action in terms of activation energy.

Video: **Reversible reactions and equilibrium**

- Explain what is meant by a reversible reaction.
- Recall that in every reversible reaction, the reaction in one direction will be exothermic, while the reaction in the opposite direction will be endothermic.
- Explain the term equilibrium.

Video: **Equilibrium position**

- (HT) Recall Le Chatelier's Principle in relation to closed systems at equilibrium.
- (HT) Make predictions about the effect of changes on systems at equilibrium, when given appropriate information.
- (HT) Interpret data to predict the effect of concentration, temperature and pressure changes on given reactions at equilibrium.

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Topic 6. Global Challenges

Video: **Fertilisers**

- Recall the importance of nitrogen, phosphorus and potassium compounds in agricultural production.
- Describe the industrial production of fertilisers.
- Compare the industrial production of fertilisers with laboratory syntheses of the same products.

Video: **The Haber process**

- Describe the reaction that takes place in the Haber process.
- Explain the trade-off between rate of production of a desired product and position of equilibrium in some industrially important processes.
- Interpret graphs of reaction conditions versus rate.
- Explain the importance of the Haber process in agricultural production.

Video: **The Contact process**

- Describe the Contact process as the industrial method for producing sulfuric acid.
- Explain the trade-off between rate of production of a desired product and position of equilibrium in some industrially important processes.

Video: **Making Ethanol**

- Describe the process of making ethanol by fermentation.
- Describe the process of making ethanol by hydration of ethene.
- Explain how the commercially used conditions for an industrial process are related to the availability and cost of raw materials and energy supplies, control of equilibrium position and rate.

Video: **Extracting metals**

- Recall that reduction involves the loss of oxygen.
- Describe how carbon is used to reduce metal oxides.|Explain, using the position of carbon in the reactivity series, the principles of industrial processes used to extract metals.
- (HT) Explain how this takes place in terms of movement of electrons.

Video: **Extracting Iron (The Blast furnace)**

- Describe how iron may be extracted from iron oxide.

Video: **Extracting Aluminium**

- Explain why and how electrolysis is used to extract some metals from their ores.
- (HT) Write balanced half equations for the reactions that happen at the anode and the cathode.

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Video: **Biological metal extraction**

- (HT) Describe the processes of phytomining and bioleaching.
- (HT) Evaluate alternative biological methods of metal extraction, given appropriate information.

Video: **Corrosion**

- Describe experiments and interpret results to show that both air and water are necessary for rusting.
- Explain sacrificial protection in terms of relative reactivity.

Video: **Choosing materials**

- Recall a use of each of the alloys: bronze, brass, gold, aluminium, steel.
- Compare quantitatively the physical properties of glass and clay ceramics, polymers, composites and metals.
- Explain how the properties of materials are related to their uses and select appropriate materials.

Video: **Recycling materials**

- Describe the basic principles in carrying out a life-cycle assessment of a material or product|Interpret data from a life-cycle assessment of a material or product.
- Describe a process where a material or product is recycled for a different use, and explain why this is viable.
- Evaluate factors that affect decisions on recycling.

Video: **Alkanes from Crude Oil**

- Explain how fractional distillation works in terms of evaporation and condensation.
- Recall how boiling point changes with increasing molecular size.

Video: **Cracking oil fractions**

- Describe the production of materials that are more useful by cracking.
- Describe the process of cracking, including the conditions used.
- Write balanced symbol equations for the cracking of alkanes.

Video: **Reactions of Alkanes**

- Recall that combustion of alkanes release energy.
- Describe combustion as an oxidation reaction.
- Write balanced equations for the complete combustion of hydrocarbons with a given formula.

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Video: **Alkenes**

- Recognise substances as alkenes given their chemical and displayed formulae.
- Name and draw the displayed formula for ethene, propene, butene and pentene.
- Explain the term unsaturated.
- Describe and write equations for the addition reactions between alkenes and hydrogen, and alkenes and halogens.
- Describe the bromine test for the presence of alkenes.

Video: **Alcohols**

- Be able to recognise alcohols from their names or from given formulae.
- Describe what happens when any of the first four alcohols react with burn in air.
- Describe what happens alcohols react with an oxidising agent to for carboxylic acids.

Video: **Carboxylic Acids**

- Name and draw the displayed formulae of the first four members of the carboxylic acid homologous series.
- Describe what happens when any of the first four carboxylic acids dissolve in water.
- Describe what happens when any of the first four carboxylic acids react with carbonates.

Video: **Addition Polymers**

- Recognise addition polymers and monomers from diagrams and from the presence of the functional group -C=C- in the monomers.
- Draw diagrams to represent the formation of a polymer from a given alkene monomer.
- Deduce the structure of an addition polymer from a simple alkene monomer and vice versa.

Video: **Biological Polymers**

- Name the types of monomers from which naturally occurring polymers such as sugars and amino acids are made.
- Recall that DNA is a polymer made from four different monomers called nucleotides.

Video: **Condensation Polymers**

- (HT) Describe what takes place during condensation polymerisation.
- (HT) Identify monomers, polymers and repeating units.
- (HT) Recall that a small molecule is always formed alongside the polymer.

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Video: **Producing electricity using Chemistry**

- Recall that a chemical cell produces a potential difference until the reactants are used up.
- Evaluate the advantages and disadvantages of hydrogen/oxygen and other fuel cells for given uses.
- (HT) Write the half equations for the electrode reactions in the hydrogen fuel cell.

Video: **Forming the atmosphere**

- Interpret evidence for how it is thought the atmosphere was originally formed.
- Describe how the composition of the atmosphere has changed over time.
- Describe how it is thought an oxygen-rich atmosphere developed over time.

Video: **Pollution and the atmosphere**

- Describe the major sources of carbon monoxide, sulfur dioxide, oxides of nitrogen and particulates in the atmosphere.
- Explain the problems caused by increased amounts of these substances.

Video: **Climate Change**

- Describe the greenhouse effect in terms of the interaction of radiation with matter within the atmosphere.
- Evaluate the evidence for human related causes of climate change.
- Describe the potential effects of increased levels of carbon dioxide and methane on the Earth's climate and how these effects may be reduced.

Video: **Water for drinking**

- Distinguish between potable water and pure water.
- Describe how clean drinking water is produced from ground water and waste water.
- Describe how salty water such as sea water is treated to make it safe to drink.