**OCR A - AS Physics Checklist**

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| Unit |  |  |
| 2 | Can you describe isotopes as atoms of the same element with different numbers of neutrons and different masses? |  |
|  | Can you describe atomic structure in terms of the numbers of protons, neutrons and electrons for atoms and ions, given the atomic number, mass number and any ionic charge? |  |
|  | Can you explain the terms *relative isotopic mass* (mass compared with 1/12th mass of carbon-12) and *relative atomic mass* (weighted mean mass compared with 1/12th mass of carbon-12), based on the mass of a 12C atom, the standard for atomic masses? |  |
|  | Can you use mass spectrometry to determine isotopic masses and relative abundances, and calculate the relative atomic mass of an element from the relative abundances of its isotopes? |  |
|  | Can you write formulae of ionic compounds from ionic charges? |  |
|  | Can you predict ionic charge from the position of an element in the periodic table? |  |
|  | Can you recall the names and formulae for the following ions: NO3–, CO32, SO42–, OH–, NH4+, Zn2+, and Ag+? |  |
|  | Can you construct balanced chemical equations (including ionic equations), including state symbols, for reactions studied and for unfamiliar reactions given appropriate information? |  |
| 3 | Can you use the terms *relative molecular mass*, *Mr*, and *relative formula mass* and their calculation from relative atomic masses? |  |
|  | Can you explain and use the term *amount of substance*, and explain and use the term *mole*? |  |
|  | Can you explain and use the term the *Avogadro constant*, *N*A (the number of particles per mole, 6.02 × 1023 mol–1)? |  |
|  | Can you explain and use the term *molar mass* (mass per mole, units g mol–1) |  |
|  | Can you explain and use the terms molar gas volume (gas volume per mole, units dm3 mol–1)? |  |
|  | Can you use the terms: empirical formula (the simplest whole number ratio of atoms of each element present in a compound) and molecular formula (the number and type of atoms of each element in a molecule)? |  |
|  | Can you calculate empirical and molecular formulae, from composition by mass or percentage compositions by mass and relative molecular mass? |  |
|  | Can you explain the terms *anhydrous*, *hydrated* and *water of crystallisation*? |  |
|  | Can you calculate the formula of a hydrated salt from given percentage composition, mass composition or based on experimental results? |  |
|  | Can you perform calculations, using **amount of substance** (in moles), involving **mass, gas volume**, and **solution volume with concentration**? |  |
|  | Can you give the ideal gas equation: *pV = nRT*? |  |
|  | Can you use stoichiometric relationships in calculations? |  |
|  | Can you use calculations to determine the **percentage yield** of a reaction or related quantities, and to determine **atom economy**? |  |
|  | Can you describe the techniques and procedures required during experiments requiring the measurement of mass, volumes of solutions and gas volumes? |  |
|  | Can you describe the benefits for sustainability of developing chemical processes with a high atom economy? |  |
| 4 | Can you give the formulae of the common acids (HCl, H2SO4, HNO3 and CH3COOH)? |  |
|  | Can you give the formulae of the common alkalis (NaOH, KOH and NH3)? |  |
|  | Can you explain that acids release H+ ions in aqueous solution and alkalis release OH– ions in aqueous solution? |  |
|  | Can you explain strong and weak acids in terms of relative dissociations? |  |
|  | Can you describe neutralisation as the reaction of H+ and OH– to form H2O? |  |
|  | Can you describe neutralisation as the reaction of acids with bases, including carbonates, metal oxides and alkalis (water-soluble bases), to form salts, including full equations? |  |
|  | Can you describe the techniques and procedures used when preparing a standard solution of required concentration and carrying out acid–base titrations? |  |
|  | Can you describe structured and non-structured titration calculations, based on experimental results of familiar and non-familiar acids and bases? |  |
|  | Can you give and explain the rules for assigning and calculating oxidation number for atoms in elements, compounds and ions, and write formulae using oxidation numbers? |  |
|  | Can you use Roman numerals to indicate the magnitude of the oxidation number when an element may have compounds/ions with different oxidation numbers? |  |
|  | Can you describe oxidation and reduction in terms of electron transfer, and oxidation number? |  |
|  | Can you describe redox reactions of metals with acids to form salts, including full equations? |  |
|  | Can you interpret redox equations and unfamiliar redox reactions, to make predictions in terms of oxidation numbers and electron loss/gain? |  |
| 5 | Can you give the number of electrons that can fill the first four shells? |  |
|  | Can you describe atomic orbitals as a region around the nucleus that can hold up to two electrons, with opposite spins, and describe the shapes of **s-** and **p-** orbitals? |  |
|  | Can you describe atomic orbitals the number of orbitals making up s-, p- and d-sub-shells, and the number of electrons that can fill s-, p- and d-sub-shells? |  |
|  | Can you describe filling of orbitals for the first three shells and the 4s and 4p orbitals in order of increasing energy? |  |
|  | Can you describe filling of orbitals for orbitals with the same energy, occupation singly before pairing? |  |
|  | Can you deduce the electron configurations of **atoms**, and **ions**, given the atomic number, up to *Z* = 36? |  |
|  | Can you describe ionic bonding as electrostatic attraction between positive and negative ions, and the construction of '*dot-and-cross*' diagrams? |  |
|  | Can you explain the solid structures of giant ionic lattices, resulting from oppositely charged ions strongly attracted in all directions (e.g. NaCl)? |  |
|  | Can you explain the effect of structure and bonding on the physical properties of ionic compounds, including melting and boiling points, solubility and electrical conductivity in solid, liquid and aqueous states? |  |
|  | Can you describe covalent bond as the strong electrostatic attraction between a shared pair of electrons and the nuclei of the bonded atoms? |  |
|  | Can you construct ‘*dot-and-cross*’ diagrams of molecules and ions to describe **single**, **multiple** and **dative** covalent bonding? |  |
|  | Can you use the term *average bond enthalpy* as a measurement of covalent bond strength? |  |
| 6 | Can you describe the shapes of, and bond angles in, molecules and ions with up to six electron pairs (including lone pairs) surrounding the central atom as predicted by electron pair repulsion, including the relative repulsive strengths of bonded pairs and lone pairs of electrons? |  |
|  | Can you use electron pair repulsion to explain the following shapes of molecules and ions: linear, non-linear, trigonal planar, pyramidal, tetrahedral and octahedral? |  |
|  | Can you describe electronegativity as the ability of an atom to attract the bonding electrons in a covalent bond; interpretation of Pauling electronegativity values? |  |
|  | Can you explain a polar bond and permanent dipole within molecules containing covalently- bonded atoms with different electronegativities? |  |
|  | Can you explain a polar molecule and overall dipole in terms of permanent dipole(s) and molecular shape? |  |
|  | Can you describe intermolecular forces based on permanent dipole–dipole interactions and induced dipole–dipole interactions? |  |
|  | Can you describe hydrogen bonding as intermolecular bonding between molecules containing N, O or F and the H atom of –NH, –OH or HF? |  |
|  | Can you explain anomalous properties of H2O resulting from hydrogen bonding, and compare properties of ice and water as a result? |  |
|  | Can you explain the solid structures of simple molecular lattices, as covalently bonded molecules attracted by intermolecular forces (e.g. I2, ice)? |  |
|  | Can you explain the effect of structure and bonding on the physical properties of covalent compounds with simple molecular lattice structures including melting and boiling points, solubility and electrical conductivity? |  |
| 7 | Can you describe the periodic table as the arrangement of elements by increasing atomic (proton) number, and explain how it allows the identification of repeating patterns (periodicity)? |  |
|  | Can you describe the periodic table as the arrangement of elements in groups having similar chemical properties? |  |
|  | Can you explain the periodic trend in electron configurations across Periods 2 and 3? |  |
|  | Can you classify elements into s-, p- and d-blocks? |  |
|  | Can you describe first ionisation energy (removal of 1 mol of electrons from 1 mol of gaseous atoms) and successive ionisation energies? |  |
|  | Can you explain the trend in first ionisation energies across Periods 2 and 3, and down a group, in terms of attraction, nuclear charge and atomic radius? |  |
|  | Can you predict from successive ionisation energies of the number of electrons in each shell of an atom and the group of an element? |  |
|  | Can you explain metallic bonding as strong electrostatic attraction between cations (positive ions) and delocalised electrons |  |
|  | Can you explain a giant metallic lattice structure (e.g. all metals)? |  |
|  | Can you explain solid giant covalent lattices of carbon (diamond, graphite and graphene) and silicon as networks of atoms bonded by strong covalent bonds? |  |
|  | Can you describe the physical properties of giant metallic and giant covalent lattices, including melting and boiling points, solubility and electrical conductivity in terms of structure and bonding? |  |
|  | Can you explain the variation in melting points across Periods 2 and 3 in terms of structure and bonding? |  |
| 8 | Can you describe the outer shell s2 electron configuration and the loss of these electrons in redox reactions to form 2+ ions? |  |
|  | Can you describe the relative reactivities of the Group 2 elements Mg → Ba shown by their redox reactions with **oxygen, water** and **dilute acids**? |  |
|  | Can you explain the trend in reactivity in terms of the first and second ionisation energies of Group 2 elements down the group? |  |
|  | Can you describe the action of water on Group 2 oxides and the approximate pH of any resulting solutions, including the trend of increasing alkalinity? |  |
|  | Can you describe uses of some Group 2 compounds as bases, including equations, for example (but not limited to) Ca(OH)2 in agriculture to neutralise acid soils, and Mg(OH)2 and CaCO3 as ‘antacids’? |  |
|  | Can you explain the existence of halogens as diatomic molecules and explanation of the trend in the boiling points of C*l*2, Br2 and I2, in terms of induced dipole–dipole interactions (London forces)? |  |
|  | Can you describe the outer shell s2p5 electron configuration and the gaining of one electron in many redox reactions to form 1– ions? |  |
|  | Can you explain the trend in reactivity of the halogens C*l*2, Br2 and I2, illustrated by reaction with other halide ions? |  |
|  | Can you explain the trend in reactivity from the decreasing ease of forming 1– ions, in terms of attraction, atomic radius and electron shielding? |  |
|  | Can you explain the term *disproportionation* as oxidation and reduction of the same element, illustrated by the reaction of chlorine with water as used in water purification, **and** by the reaction of chlorine with cold, dilute aqueous sodium hydroxide, as used to form bleach, alongside other analogous reactions? |  |
|  | Can you list and describe the benefits of chlorine use in water treatment contrasted with associated risks? |  |
|  | Can you describe the precipitation reactions, including ionic equations, of the aqueous anions C*l*–, Br– and I– with aqueous silver ions, followed by aqueous ammonia, and their use as a test for different halide ions? |  |
|  | Can you analyse ions on a test-tube scale? |  |
|  | Can you list and describe the processes and techniques needed to identify the following **anions and cations** in an unknown compound?* CO32–, by reaction with H+(aq) forming CO2(g)
* SO42– , by precipitation with Ba2+(aq) forming CO2(g)
* Cl–, Br–, I–
* NH4+, by reaction with warm NaOH(aq) forming NH3
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| 9 | Can you explain that some chemical reactions are accompanied by enthalpy changes that are exothermic (∆*H*, negative) or endothermic (∆*H*, positive)? |  |
|  | Can you construct enthalpy profile diagrams to show the difference in the enthalpy of reactants compared with products? |  |
|  | Can you explain the term *activation energy*, including use of enthalpy profile diagrams? |  |
|  | Can you explain and use the terms *standard conditions* and *standard states* (physical states under standard conditions)? |  |
|  | Can you explain and use the term *enthalpy change of* ***reaction***(enthalpy change associated with a stated equation, ∆r*H*), *enthalpy change of* ***formation*** (formation of 1 mol of a compound from its elements, ∆f*H*), *enthalpy change of* ***combustion*** *combustion* (complete combustion of 1 mol of a substance, ∆c*H*), *enthalpy change of* ***neutralisation*** (formation of 1 mol of water from neutralisation, ∆neutH)? |  |
|  | Can you determine enthalpy changes directly from appropriate experimental results, including use of the relationship *q = mc∆T*? |  |
|  | Can you explain the term *average bond enthalpy* (breaking of 1 mol of bonds in gaseous molecules)? |  |
|  | Can you explain exothermic and endothermic reactions in terms of enthalpy changes associated with the breaking and making of chemical bonds? |  |
|  | Can you use average bond enthalpies to calculate enthalpy changes and related quantities? |  |
|  | Can you describe Hess’ law for construction of enthalpy cycles and calculations to determine indirectly an enthalpy change of reaction from enthalpy changes of **combustion, formation,** and **unfamiliar enthalpy cycles**? |  |
|  | Can you list and describe the techniques and procedures used to determine enthalpy changes directly and indirectly? |  |
| 10 | Can you describe the effect of concentration, including the pressure of gases, on the rate of a reaction, in terms of frequency of collisions? |  |
|  | Can you calculate reaction rate from the gradients of graphs measuring how a physical quantity changes with time? |  |
|  | Can you explain the role of a catalyst in increasing reaction rate by allowing a reaction to proceed via a different route with a lower activation energy without being used up by the overall reaction? You should be able to show this on enthalpy profile diagrams |  |
|  | Can you explain the terms *homogeneous* and *heterogeneous* catalysts? |  |
|  | Can you explain that catalysts have great economic importance and benefits for increased sustainability by lowering temperatures and reducing energy demand from combustion of fossil fuels with resulting reduction in CO2 emissions? |  |
|  | Can you list and describe the techniques and procedures used to investigate reaction rates including the measurement of mass, gas volumes and time? |  |
|  | Can you explain the Boltzmann distribution and its relationship with activation energy, and explain the effect that changes of temperature, and use of a catalyst, has on a Boltzmann distribution that affects rate of reaction? |  |
|  | Can you explain that a dynamic equilibrium exists in a closed system when the rate of the forward reaction is equal to the rate of the reverse reaction and the concentrations of reactants and products do not change? |  |
|  | Can you explain le Chatelier’s principle and its application for homogeneous equilibria to deduce qualitatively the effect of a change in temperature, pressure or concentration on the position of equilibrium? |  |
|  | Can you explain that a catalyst increases the rate of both forward and reverse reactions in an equilibrium by the same amount resulting in an unchanged position of equilibrium? |  |
|  | Can you list and describe the techniques and procedures used to investigate changes to the position of equilibrium for changes in concentration and temperature? |  |
|  | Can you explain the importance to the chemical industry of a compromise between chemical equilibrium and reaction rate in deciding the operational conditions? |  |
|  | Can you give expressions for the equilibrium constant, *K*c for homogeneous reactions and calculations of the equilibrium constant, *K*c from provided equilibrium concentrations? |  |
|  | Can you estimate the position of equilibrium from the magnitude of *K*c? |  |
| 11 | Can you apply IUPAC rules of nomenclature for systematically naming organic compounds? |  |
|  | Can you interpret and use the term ***general formula***(the simplest algebraic formula of a member of a homologous series), ***structural formula***(the minimal detail that shows the arrangement of atoms in a molecule), ***displayed formula***(the relative positioning of atoms and the bonds between them), and ***skeletal formula***(the simplified organic formula, shown by removing hydrogen atoms from alkyl chains, leaving just a carbon skeleton and associated functional groups)? |  |
|  | Can you interpret and use the term *homologous series* (a series of organic compounds having the same functional group but with each successive member differing by CH2)? |  |
|  | Can you interpret and use the term *functional group* (a group of atoms responsible for the characteristic reactions of a compound)? |  |
|  | Can you interpret and use the term *alkyl group* (formula C*n*H2*n*+1)? |  |
|  | Can you interpret and use the term *aliphatic* (a compound containing carbon and hydrogen joined together in straight chains, branched chains or non-aromatic rings)? |  |
|  | Can you interpret and use the term *alicyclic* (an aliphatic compound arranged in non-aromatic rings with or without side chains)? |  |
|  | Can you interpret and use the term *aromatic* (a compound containing a benzene ring)? |  |
|  | Can you interpret and use the term *saturated* (single carbon–carbon bonds only) and *unsaturated* (the presence of multiple carbon–carbon bonds, including C=C, C≡C and aromatic rings)? |  |
|  | Can you use the general formula of a homologous series to predict the formula of any member of the series? |  |
|  | Can you explain the term *structural isomers* (compounds with the same molecular formula but different structural formulae) and determine possible structural formulae of an organic molecule, given its molecular formula? |  |
|  | Can you describe homolytic fission (in terms of each bonding atom receiving one electron from the bonded pair, forming two radicals)? |  |
|  | Can you describe heterolytic fission (in terms of one bonding atom receiving both electrons from the bonded pair)? |  |
|  | Can you describe the term *radical* (a species with an unpaired electron) and use of ‘dots’ to represent species that are radicals in mechanisms? |  |
|  | Can you explain a ‘curly arrow’ described as the movement of an electron pair, showing either heterolytic fission or formation of a covalent bond? |  |
|  | Can you describe reaction mechanisms, using diagrams, to show clearly the movement of an electron pair with ‘curly arrows’ and relevant dipoles? |  |
| 12 | Can you describe alkanes as saturated hydrocarbons containing single C–C and C–H bonds as σ-bonds (overlap of orbitals directly between the bonding atoms), with free rotation of the σ-bond? |  |
|  | Can you explain the tetrahedral shape and bond angle around each carbon atom in alkanes in terms of electron pair repulsion? |  |
|  | Can you explain the variations in boiling points of alkanes with different carbon-chain length and branching, in terms of induced dipole–dipole interactions (London forces)? |  |
|  | Can you describe the low reactivity of alkanes with many reagents in terms of the high bond enthalpy and very low polarity of the σ-bonds present? |  |
|  | Can you describe complete combustion of alkanes, as used in fuels, and the incomplete combustion of alkane fuels in a limited supply of oxygen with the resulting potential dangers from CO? |  |
|  | Can you describe the reaction of alkanes with chlorine and bromine by radical substitution using ultraviolet radiation, including a mechanism involving homolytic fission and radical reactions in terms of initiation, propagation and termination? |  |
|  | Can you describe the limitations of radical substitution in synthesis by the formation of a mixture of organic products, in terms of further substitution and reactions at different positions in a carbon chain? |  |
| 13 | Can you describe alkenes as unsaturated hydrocarbons containing a C=C bond comprising a π-bond (sideways overlap of adjacent p-orbitals above and below the bonding C atoms) and a σ-bond (overlap of orbitals directly between the bonding atoms); with restricted rotation of the π-bond? |  |
|  | Can you explain the trigonal planar shape and bond angle around each carbon in the C=C of alkenes in terms of electron pair repulsion? |  |
|  | Can you explain the term *stereoisomers* (compounds with the same structural formula but with a different arrangement in space)? |  |
|  | Can you explain the term *E*/*Z isomerism* (an example of stereoisomerism, in terms of restricted rotation about a double bond and the requirement for two different groups to be attached to each carbon atom of the C=C group)? |  |
|  | Can you explain the term *cis*–*trans isomerism* (a special case of *E*/*Z* isomerism in which two of the substituent groups attached to each carbon atom of the C=C group are the same)? |  |
|  | Can you use Cahn–Ingold–Prelog (CIP) priority rules to identify the *E* and *Z* stereoisomers? |  |
|  | Can you determine possible *E/Z* or *cis–trans* stereoisomers of an organic molecule, given its structural formula? |  |
|  | Can you describe the reactivity of alkenes in terms of the relatively low bond enthalpy of the π-bond? |  |
|  | Can you describe addition reactions of alkenes with: hydrogen in the presence of a suitable catalyst (e.g. Ni) to form alkanes? |  |
|  | Can you describe addition reactions of alkenes with halogens to form dihaloalkanes, including the use of bromine to detect the presence of a double C=C bond as a test for unsaturation in a carbon chain? |  |
|  | Can you describe addition reactions of alkenes with hydrogen halides to form haloalkanes? |  |
|  | Can you describe addition reactions of alkenes with steam in the presence of an acid catalyst (e.g. H3PO4) to form alcohols? |  |
|  | Can you define and use the term *electrophile* (an electron pair acceptor)? |  |
|  | Can you explain the mechanism of electrophilic addition in alkenes by heterolytic fission? |  |
|  | Can you use Markownikoff’s rule to predict formation of a major organic product in addition reactions of H–X to unsymmetrical alkenes (e.g. H–Br to propene) in terms of the relative stabilities of carbocation intermediates in the mechanism? |  |
|  | Can you describe addition polymerisation of alkenes and substituted alkenes, including the repeat unit of an addition polymer deduced from a given monomer? |  |
|  | Can you describe addition polymerisation of alkenes and substituted alkenes, including identification of the monomer that would produce a given section of an addition polymer? |  |
|  | Can you list and describe the benefits for sustainability of processing waste polymers by combustion for energy production? |  |
|  | Can you list and describe the benefits for sustainability of processing waste polymers by use as an organic feedstock for the production of plastics and other organic chemicals? |  |
|  | Can you list and describe the benefits for sustainability of processing waste polymers by removal of toxic waste products formed during disposal by combustion of halogenated plastics (e.g. PVC)? |  |
|  | Can you list and describe benefits to the environment of development of biodegradable and photodegradable polymers? |  |
| 14 | Can you describe the polarity of alcohols and explain, in terms of hydrogen bonding, the water solubility and the relatively low volatility of alcohols compared with alkanes? |  |
|  | Can you classify alcohols into primary, secondary and tertiary alcohols? |  |
|  | Can you explain combustion of alcohols? |  |
|  | Can you explain oxidation of alcohols by an oxidising agent (e.g. Cr2O72–/H+), including the oxidation of primary alcohols to form aldehydes and carboxylic acids; and the control of the oxidation product using different reaction conditions? |  |
|  | Can you explain oxidation of alcohols by an oxidising agent (e.g. Cr2O72–/H+), including the oxidation of secondary alcohols to form ketones? |  |
|  | Can you explain oxidation of alcohols by an oxidising agent (e.g. Cr2O72–/H+), including the resistance to oxidation of tertiary alcohols? |  |
|  | Can perform an experiment in which you eliminate H2O from alcohols in the presence of an acid catalyst (e.g. H3PO4 or H2SO4) and heat to form alkenes? |  |
|  | Can perform an experiment in which you substitute with halide ions in the presence of acid (e.g. NaBr/H2SO4) to form haloalkanes? |  |
| 15 | Can you describe hydrolysis of haloalkanes in a substitution reaction by aqueous alkali? |  |
|  | Can you describe hydrolysis of haloalkanes in a substitution reaction by water in the presence of AgNO3 and ethanol to compare experimentally the rates of hydrolysis of different carbon–halogen bonds? |  |
|  | Can you define and use of the term *nucleophile* (an electron pair donor)? |  |
|  | Can you describe the mechanism of nucleophilic substitution in the hydrolysis of primary haloalkanes with aqueous alkali? |  |
|  | Can you explain the trend in the rates of hydrolysis of primary haloalkanes in terms of the bond enthalpies of carbon–halogen bonds (C–F, C–C*l*, C–Br and C–I)? |  |
|  | Can you explain the production of halogen radicals by the action of ultraviolet (UV) radiation on CFCs in the upper atmosphere and the resulting catalysed breakdown of the Earth’s protective ozone layer, including equations to represent the production of halogen radicals? |  |
|  | Can you explain the production of halogen radicals by the action of ultraviolet (UV) radiation on CFCs in the upper atmosphere and the resulting catalysed breakdown of the Earth’s protective ozone layer, including equations to represent the catalysed breakdown of ozone by Cl• and other radicals (e.g. •NO)? |  |
| 16 | Can you list and describe the techniques and procedures for use of Quickfit apparatus including for distillation and heating under reflux? |  |
|  | Can you describe preparation and purification of an organic liquid including the use of a separating funnel to remove an organic layer from an aqueous layer? |  |
|  | Can you describe preparation and purification of an organic liquid including drying with an anhydrous salt (e.g. MgSO4, CaCl2)? |  |
|  | Can you describe preparation and purification of an organic liquid including redistillation? |  |
|  | Can you describe an organic molecule containing several functional group identification of individual functional groups |  |
|  | Can you describe an organic molecule containing several functional groups prediction of properties and reactions |  |
|  | Can you describe an organic molecule containing several functional groups two-stage synthetic routes for preparing organic compounds? |  |
| 17 | Can you describe how infrared (IR) radiation causes covalent bonds to vibrate more and absorb energy? |  |
|  | Can you explain absorption of infrared radiation by atmospheric gases containing C=O, O–H and C–H bonds (e.g. H2O, CO2 and CH4), the suspected link to global warming and resulting changes to energy usage? |  |
|  | Can you use an infrared spectrum of an organic compound to identify an alcohol from an absorption peak of the O–H bond? |  |
|  | Can you use an infrared spectrum of an organic compound to identify an aldehyde or ketone from an absorption peak of the C=O bond? |  |
|  | Can you use an infrared spectrum of an organic compound to identify a carboxylic acid from an absorption peak of the C=O bond and a broad absorption peak of the O–H bond? |  |
|  | Can you interpret and predict an infrared spectrum of familiar or unfamiliar substances using supplied data? |  |
|  | Can you use infrared spectroscopy to monitor gases causing air pollution (e.g. CO and NO from car emissions) and in modern breathalysers to measure ethanol in the breath? |  |
|  | Can you use a mass spectrum of an organic compound to identify the molecular ion peak and hence to determine molecular mass? |  |
|  | Can you analyse fragmentation peaks in a mass spectrum to identify parts of structures? |  |
|  | Can you deduce the structures of organic compounds from different analytical data including elemental analysis? |  |
|  | Can you deduce the structures of organic compounds from different analytical data including mass spectra? |  |
|  | Can you deduce the structures of organic compounds from different analytical data including IR spectra? |  |