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| Paper 1 Content | | | |
| **C1 Atomic Structure** | **Analysis** | **Revision** | **☺** |
| Can identify elements using the symbol on the periodic table, e.g., O represents an oxygen atom. |  |  |  |
| Can state how compounds are formed and how chemical reactions are identified. |  |  |  |
| Can identify compounds and elements from chemical formula. |  |  |  |
| Can use the periodic table to use the names and symbols of the first 20 elements in the periodic table, particularly groups 1 and 7. |  |  |  |
| Can name compounds when given word or symbol equations. |  |  |  |
| Can write word equations. |  |  |  |
| Can write formulae and balanced symbol equations. |  |  |  |
| **Can write balanced half equations.** |  |  |  |
| Can state what a mixture is. |  |  |  |
| Describe, explain and give examples of the processes of separation of filtration, crystallisation, simple distillation, fractional distillation and chromatography. |  |  |  |
| Can suggest appropriate separation techniques when given information, e.g., how would you separate rock salt. |  |  |  |
| Can state what Niels Bohr and James Chadwick discovered. |  |  |  |
| Can describe the plum pudding model. |  |  |  |
| The alpha particle scattering experiment changed the model of the atom to say the nucleus was a dense charged centre. Later work put the electrons orbiting the nucleus. |  |  |  |
| Can say why the alpha particle scattering led to a change in the atomic model. |  |  |  |
| Can compare the difference between the plum pudding model of the atom and the nuclear model. |  |  |  |
| Can give the charges of protons, neutrons and electrons. |  |  |  |
| Can state why atoms have no overall electrical charge. |  |  |  |
| Can state what the atomic number relates to. |  |  |  |
| Can use the nuclear model of protons, neutrons and electrons to describe atoms. |  |  |  |
| Can state that atoms are very small and have a radius of about 0.1nm or 1 x 10-10 m. |  |  |  |
| Can give the relative masses of the sub-atomic particles. |  |  |  |
| Can state what the mass number is. |  |  |  |
| Can state what isotopes are. |  |  |  |
| Can calculate the number of protons, neutrons and electons in an atom or ion when given its atomic number and mass number. |  |  |  |
| Can use relative abundance of isotopes to explain why Chlorine has a mass of 35.5. |  |  |  |
| Can calculate the relative atomic mass of an element from the percentage abundance of its isotopes. |  |  |  |
| Can describe how electrons are arranged in shells. |  |  |  |
| Can represent the electronic structure of an atom by number or a diagram, e.g., for sodium: or 2, 8, 1 |  |  |  |
| **C2 The Periodic Table** | **Analysis** | **Revised** | **☺** |
| Can state how elements in the periodic table are arranged. |  |  |  |
| Can explain why elements are put in groups. |  |  |  |
| Can link group number to the number of electrons in the outer shell. |  |  |  |
| Can predict possible reactivity of elements from their position in the periodic table, e.g., all group 1 metals will be reactive in a similar way. |  |  |  |
| Can describe how elements were ordered in early versions of the periodic table. |  |  |  |
| Can explain why Mendeleev left gaps and changed the order of some atomic weights. |  |  |  |
| Can describe the development of the periodic table including Newlands and Mendeleev. |  |  |  |
| Can recall that metals form positive ions. Hydrogen also forms a positive ion. |  |  |  |
| Can recall that non-metals form negative ions. |  |  |  |
| Can explain the difference between metals and non-metals on their physical and chemical properties. |  |  |  |
| Can explain how reactions of elements are linked to the outer shell electrons which is shown by the atomic number. |  |  |  |
| Can recall the name of group 0. |  |  |  |
| Can explain they are unreactive and do not easily form molecules because their outer shells are full. |  |  |  |
| Can explain how the boiling point of the noble gases increases as you move down the group (get bigger). |  |  |  |
| Can recall the name of group 1. |  |  |  |
| Can explain how the reactivity of the metals increases down the group. |  |  |  |
| Can describe the reactions of Li, Na, K with oxygen, chlorine and water. |  |  |  |
| Can recall the name of group 7. |  |  |  |
| Can describe the compounds formed when Cl2, Br2 and I2 react with metals and non-metals. |  |  |  |
| Can explain how the melting and boiling point increase down the group because the molecules are bigger. |  |  |  |
| Can explain why the reactivity decreases going down the group because of the distance between the outer electrons and the nucleus. |  |  |  |
| Can write equations to show how a more reactive halogen displaces a less reactive halogen from its salt solution. |  |  |  |
| The transition elements are metals with similar properties but different to the properties of group 1 metals. |  |  |  |
| Can compare the difference between the transition and group 1 metals in melting points, densities, strengths, hardness and reactivity with oxygen, water and halogens using Cr, Mn, Fe, Co, Ni and Cu. |  |  |  |
| **C3 Bonding, Structure and the Properties of Matter** | **Analysis** | **Revised** | **☺** |
| Can identify states of matter from diagrams. |  |  |  |
| Can predict the states of substances at different temperatures when given data. |  |  |  |
| **Can explain the limitations of particles theory where particles are represented by spheres with nor forces shown.** |  |  |  |
| Can explain why substances change state linking to energy and the breaking of intermolecular forces. |  |  |  |
| Can use the state symbols of (s), (l), (g) and (aq). |  |  |  |
| Recognise the three types of strong chemical bond: ionic, covalent and metallic. |  |  |  |
| In ionic bonding the particles are oppositely charged ions. |  |  |  |
| In covalent bonding the particles are atoms that share electrons. |  |  |  |
| In metallic bonding the particles are positively charged ions held together by delocalised electrons. |  |  |  |
| Can identify the types of atoms that would form ionic bonds. |  |  |  |
| Can identify the types of atoms that would form covalent bonds. |  |  |  |
| Can describe metallic bonding in words and using a diagram. |  |  |  |
| Can describe bonding using the terms electrostatic forces, transfer or sharing of electrons. |  |  |  |
| Can draw dot and cross diagrams of ionic bonds between elements in group 1 and 7 and 2 and 6. Try Na and Cl, Mg and O, Ca and Cl and Na and O. |  |  |  |
| Can draw these remembering: full outer shell, Square brackets and charge. |  |  |  |
| Give the charge on ions using the group number above the column on the periodic table for group 1 and 2 and 6 and 7. |  |  |  |
| Describe how ionic compounds are held together. |  |  |  |
| Can recognise diagrams of ionic bonds. |  |  |  |
| Can describe limitations of dot and cross diagrams, ball and stick diagrams and 2 and 3D diagrams of giant ionic structures, particularly NaCl |  |  |  |
| Can describe and explain the properties of ionic compounds in terms of high melting point and whether the conduct electricity. |  |  |  |
| Give the empirical (simplest whole number) formula of an ionic compound from the diagram, particularly NaCl. |  |  |  |
| Can recognise simple covalent molecules from diagrams or formulas (hint – only a few atoms, e.g., CO2, H2O, C2H4 |  |  |  |
| Can describe the properties of simple covalent molecules in terms of low melting and boiling point and not conducting electricity. |  |  |  |
| Can give the difference between covalent bonds and intermolecular forces and link them to melting and boiling point. |  |  |  |
| Can recognise polymers as large covalent molecules from diagrams. |  |  |  |
| Can used intermolecular forces to explain why polymers are usually solids at room temperature. |  |  |  |
| Can recognise giant covalent structures of diamond, graphite, silicon dioxide and fullerenes from diagrams of their bonding and structure. |  |  |  |
| Can explain why giant covalent structures are solid at room temperature and have high melting points. |  |  |  |
| Can describe and explain in detail the properties of graphite in terms of being slippery and conducting electricity linking to bonding between carbon atoms and delocalised electrons. |  |  |  |
| Can compare graphite to metals. |  |  |  |
| Can describe and explain in detail the properties of diamond in terms of being hard, having a high melting point and not conducting electricity. |  |  |  |
| Can describe and explain the structure and properties of graphene. |  |  |  |
| Can recognise fullerenes from diagrams and descriptions of their structure and bonding. |  |  |  |
| Can give examples of the uses of fullerenes including carbon nanotubes. |  |  |  |
| Can describe the structure of metallic bonding and use this to explain the properties. |  |  |  |
| Give a definition of an alloy. |  |  |  |
| Can describe how alloys are harder than pure metals. |  |  |  |
| Can describe the size and scale of nanoparticles in terms of numbers of atoms ad standard form and compare to coarse particles. |  |  |  |
| Can calculate the surface area of a nanocrystal (cube). |  |  |  |
| Can give the properties of nanoparticles in terms of surface area to volume ratio. |  |  |  |
| Can describe applications of nanotechnology use in medicine, electronics, sun creams, deodorants and catalysts. |  |  |  |
| Can evaluate the uses and risks of the use of nanoparticles. |  |  |  |
| **C4 Quantitative Chemistry** | **Analysis** | **Revised** | **☺** |
| Can give the law of conservation of mass. |  |  |  |
| Can explain why equations must be balanced. |  |  |  |
| Understand what the big number before a formula mean and what the subscript numbers mean. |  |  |  |
| Can explain why some reactions appear to have a change in mass by using state symbols to identify a gas. |  |  |  |
| Can calculate uncertainty. |  |  |  |
| **Can recall and define the Avogadro constant.** |  |  |  |
| **Can use Mr of a substance to calculate the number of moles and vice versa.** |  |  |  |
| **Can state what one mole of a substance means relating to atoms, molecules and ions.** |  |  |  |
| **Can identify the number of moles of each substance in a balanced equation.** |  |  |  |
| **Can use Mr moles to calculate the masses of reactants and products from balanced symbol equations.** |  |  |  |
| **Can use Mr moles to balance equations by changing the subject of an equation.** |  |  |  |
| **Can explain why, in reactions, an excess of one of the reactants is used.** |  |  |  |
| **Can identify the limiting reactant from information given.** |  |  |  |
| **Can explain the effect of a limiting quantity of a reactant on the amount of product it is possible to obtain.** |  |  |  |
| Can give the units for concentration. |  |  |  |
| Can calculate the mass of solute in a volume of solution when you know the concentration. |  |  |  |
| **Can explain how the mass of a solute and volume of a solution is related to the concentration.** |  |  |  |
| Explain why it is often not possible to obtain 100% yield in a chemical reaction. |  |  |  |
| Can calculate the percentage yield of a product from the actual yield of a reaction. |  |  |  |
| **Can use Mr moles to calculate the theoretical mass of a product from the balanced symbol equation.** |  |  |  |
| Can calculate the atom economy of a reaction to form a desired product from the balanced symbol equation. |  |  |  |
| **Can explain why a particular pathway for a reaction is chosen to produce a product given data.** |  |  |  |
| **Can give the units for concentration of a solution.** |  |  |  |
| **Can use nuns can’t vote to calculate an unknown concentration from two known volumes and one known concentration. (Titrations)** |  |  |  |
| **Can calculate the volume of a gas at room temperature and pressure from mass and Mr.** |  |  |  |
| **Can calculate gas volumes from balanced equations and given volumes.** |  |  |  |
| **C5 Chemical Changes** | **Analysis** | **Revised** | **☺** |
| Can state what is produced when metals reacts with Oxygen. |  |  |  |
| Can explain reduction and oxidation in terms of Oxygen. |  |  |  |
| Can link reactivity of metals to number of outer shell electrons and how easily they form ions. |  |  |  |
| Can describe the reactions of metals (K, Na, Li, Ca, Mg, Zn, Fe, Cu) with water and dilute acids and put the metals in order of reactivity. |  |  |  |
| Can describe what a displacement reaction is and write equations. |  |  |  |
| Can explain why metals less reactive than carbon can be extracted using reduction. |  |  |  |
| Can identify where oxidation and reduction has occurred in terms of Oxygen. |  |  |  |
| **Use OILRIG to explain oxidation and reduction in terms of electrons.** |  |  |  |
| **Can write ionic equations for displacement reactions.** |  |  |  |
| **Can identify which species have been oxidised and reduced in half equations.** |  |  |  |
| Can state what is produced when acids react with metals that are reactive enough. |  |  |  |
| **Can explain why acid and metal reactions are redox reactions.** |  |  |  |
| **Can identify which species have been oxidised and reduced in equation.** |  |  |  |
| Can recall what alkalis and bases are. |  |  |  |
| Can give the products when acids are neutralised by alkalis. |  |  |  |
| Can give the products when acids are neutralised by metal oxides. |  |  |  |
| Can give the products when acids are neutralised by metal carbonates. |  |  |  |
| Can name salts made from hydrochloric acid (HCl), nitric acid (HNO3) and sulfuric acid (H2SO4) and the metal in the base, alkali or carbonate. |  |  |  |
| Can use the formulae of common ions to give the formula of salts. |  |  |  |
| Can describe a method to produce a soluble salt from insoluble metals, metal oxides, metal hydroxides and carbonates including the specific marking points of:   * Add base in excess. * Filter excess. * Crystallisation   Giving reasons for these. |  |  |  |
| *Can give details of RP1 preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate.* |  |  |  |
| Can state what ion makes an aqueous solution acidic. |  |  |  |
| Can state what ion makes an aqueous solution alkaline. |  |  |  |
| Can use the pH scale of universal indicator to identify solutions which are acidic, alkali and neutral. |  |  |  |
| Can use an equation to show how hydrogen ions and hydroxide ions form water to show how neutralisation happens. |  |  |  |
| Can describe a method to carry out a titration. |  |  |  |
| **Can use results from titrations to calculate concentrations using nuns can’t vote.** |  |  |  |
| *Can give details of RP2: determination of the reacting volumes of solutions of a strong acid and a strong alkali.* |  |  |  |
| **Can give examples of strong and weak acids.** |  |  |  |
| **Can explain what a weak acid is using degree of ionisation of hydrogen ions.** |  |  |  |
| **Can explain what a strong acid is using degree of ionisation of hydrogen ions.** |  |  |  |
| **Can use the terms dilute and concentration and weak and strong in relation to acids.** |  |  |  |
| **Can link hydrogen ion concentration to pH.** |  |  |  |
| **C6 Electrolysis** | **Analysis** | **Revised** | **☺** |
| Can explain why solid ionic compounds cannot conduct electricity but molten or dissolved (aq) can. |  |  |  |
| Can describe the process and aim of electrolysis. |  |  |  |
| Can explain the terms cathode, anode and electrolyte. |  |  |  |
| Can explain why graphite electrodes are used. |  |  |  |
| Can predict the products of electrolysis of molten compounds such as lead bromide and other simple compounds. |  |  |  |
| Can explain why electrolysis is used to extract some metals from their molten compounds. |  |  |  |
| Can explain the problems with using electrolysis to extract metals. |  |  |  |
| Can explain how aluminium is extracted from aluminium oxide including why the electrolyte is a mixture and why the anode needs constantly replacing. |  |  |  |
| Can state how the products of electrolysis are different from aqueous solutions (aq). |  |  |  |
| Can predict the products of the electrolysis of aqueous solutions such as NaCl and CuSO4 |  |  |  |
| *Can give details of RP3: Investigate what happens when aqueous solutions are electrolysed using inert electrodes.* |  |  |  |
| **Can write half equations for what happens at the electrodes.** |  |  |  |
| **C7 Energy Changes** | **Analysis** | **Revised** | **☺** |
| Can explain what an endothermic reaction is in terms of energy. |  |  |  |
| Can explain what an endothermic reaction is in terms of energy. |  |  |  |
| Can identify exothermic and endothermic reactions from energy changes. |  |  |  |
| Can state examples of both exothermic and endothermic reactions. |  |  |  |
| Can give and evaluate everyday applications of exothermic and endothermic reactions. |  |  |  |
| Can plan how to investigate energy changes remembering the specific marking points of:   * Using an insulated beaker or polystyrene cup to prevent energy loss. * Using a thermometer with a high resolution to monitor temperature changes. |  |  |  |
| *Can give details of RP4: Investigate the variables that affect temperature changes in reacting solutions such as acid + metal, Acid + carbonate, neutralisation and displacement.* |  |  |  |
| Can draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions. |  |  |  |
| Can identify activation energy on these diagrams. |  |  |  |
| Can use a reaction profile to identify if the reaction is exothermic or endothermic. |  |  |  |
| **Describe energy in a reaction relating to energy to break bonds and energy released when making bonds.** |  |  |  |
| **Can calculate the energy transferred in reactions using bond energies supplied.** |  |  |  |
| Can state what chemical cells and batteries are. |  |  |  |
| Can describe how to set up a simple chemical cell. |  |  |  |
| Can explain how some batteries are rechargeable and some are not. |  |  |  |
| Can identify the most reactive metal from data given. |  |  |  |
| Can describe hydrogen oxygen fuel cells. |  |  |  |
| Can evaluate the use of hydrogen fuel cells compared to rechargeable batteries. |  |  |  |
| **Can write equations for the electrodes in hydrogen fuel cells.** |  |  |  |