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| **I can** | | **Year 12 Chemistry 2022 Unit 3 & 4 Exam Revision** | Check | Teacher initial |
| * the reversibility of chemical reactions can be explained in terms of the activation energies of the forward and reverse reactions |  |  |
| * the effect of changes of temperature on chemical systems initially at equilibrium can be predicted by considering the enthalpy changes for the forward and reverse reactions; this can be represented on energy profile diagrams and explained by the changes in the rates of the forward and reverse reactions |  |  |
| * collision theory can be used to explain and predict the effects of concentration, temperature, pressure, the presence of catalysts and surface area of reactants on the rates of chemical reactions |  |  |
| * Calcification is the process which results in the formation of calcium carbonate structures in marine organisms. Acidification shifts the equilibrium of carbonate chemistry in seawater, decreasing the rate and amount of calcification among a wide range of marine organisms. The United Nations Kyoto Protocol and the Intergovernmental Panel on Climate Change aim to secure a global commitment to reducing greenhouse gas emissions over the next few decades. * acid-base indicators are weak acids, or weak bases, in which the acidic form is a different colour from the basic form * the pH scale is a logarithmic scale and the pH of a solution can be calculated from the concentration of hydrogen ions using the relationship pH = - log10 [H+] * data obtained from acid-base titrations can be used to calculate the masses of substances and concentrations and volumes of solutions involved |  |  |
| * the relationship between acids and bases in equilibrium systems can be explained using the Brønsted-Lowry model and represented using chemical equations that illustrate the transfer of protons between conjugate acid-base pairs * the hydrolysis of salts of weak acids and weak bases can be represented using equations; the Brønsted-Lowry model can be applied to explain the acidic, basic and neutral nature of salts derived from bases and monoprotic and polyprotic acids |  |  |
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| * organic molecules have a hydrocarbon skeleton and can contain functional groups, including alkenes, alcohols, aldehydes, ketones, carboxylic acids, esters, amines and amides; functional groups are groups of atoms or bonds within molecules which are responsible for the molecule’s characteristic chemical properties |  |  |
| * oxidation-reduction (redox) reactions involve the transfer of one or more electrons from one species to another * the species being oxidised and reduced in a redox reaction can be identified using oxidation numbers * electrochemical cells, including galvanic and electrolytic cells, consist of oxidation and reduction half-reactions connected via an external circuit through which electrons move from the anode (oxidation reaction) to the cathode (reduction reaction) * galvanic cells produce an electric current from a spontaneous redox reaction * the electric potential difference of a cell under standard conditions can be calculated from standard electrode potentials; these values can be used to compare the voltages generated by cells constructed from different materials * electrochemical cells can be described in terms of the reactions occurring at the anode and cathode, the role of the electrolyte, salt bridge (galvanic cell), ion migration, and electron flow in the external circuit * corrosion of iron is an electrochemical process that can be prevented by a range of techniques, including by exclusion of oxygen and/or water and through cathodic protection and sacrificial anodes |  |  |
| * all alcohols can undergo complete combustion; with oxidising agents, including acidified MnO4- or Cr2O72- oxidation of primary alcohols produces aldehydes and carboxylic acids, while the oxidation of secondary alcohols produce ketones; these reactions have characteristic observations and can be represented with equations * organic compounds display characteristic physical properties, including boiling point and solubility in water and organic solvents; these properties can be explained in terms of intermolecular forces (dispersion forces, dipole-dipole interactions and hydrogen bonds) which are influenced by the nature of the functional groups |  |  |
| * understand the structure of soaps contains a non-polar hydrocarbon chain and a carboxylate group; the structure of the anionic detergents derived from dodecylbenzene contains a non-polar hydrocarbon chain and a sulfonate group * α-amino acids undergo condensation reactions to form polypeptides (proteins) in which the α-amino acid monomers are joined by peptide bonds * the sequence of α-amino acids in a protein is called its primary structure * secondary structures of proteins, (-helix and -pleated sheets) result from hydrogen bonding between amide and carbonyl functional groups; hydrogen bonding between amide and carbonyl functional groups within a peptide chain leads to -helix structures while hydrogen bonding between adjacent polypeptide chains leads to -pleated sheets * empirical and molecular formulae can be determined by calculation and the structure of an organic compound established from the chemical reactions they undergo, and other analytical data      * addition reactions can be used to produce polymers, including polyethene and polytetrafluoroethene * the structure of an addition polymer can be predicted from its monomer and the structure of an addition polymer can be used to predict the monomer from which it was derived |  |  |
| * explain the cleaning action of soaps and detergents in terms of their non-polar hydrocarbon chain and charged group. * explain the properties of soaps and detergents in hard water in terms of the solubilities of their calcium salts. * Surfactants |  |  |
| * recognise that industry produces a vast range of plastics, including addition polymers (for example polyethene, polytetrafluoroethene) and condensation polymers (for example, nylon and polyethylene terephthalate [PET]) which have different properties and uses |  |  |
| * explain the varied structures of different plastics due to characteristics, including cross-linking, chain length, and intermolecular forces leads to a range of distinct properties and consequent uses * Properties of LDPE and HDPE including diagrams of LDPE and HDPE   -Addition reactions can be used to produce polymers, including polyethene and polytetrafluoroethene   * condensation reactions can be used to produce polymers, including polyamides and polyesters * α-amino acids undergo condensation reactions to form polypeptides (proteins) in which the α-amino acid monomers are joined by peptide bonds   - the different structures, properties and related uses for polyethene,polytetrafluoroethene, nylon and polyethylene terephthalate [PET]) |  |  |
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