Y10 Chemistry core questions

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| 1 | What is an atom? | The smallest particle that has the properties of a chemical element. |
| 2 | Describe the structure of an atom. | A nucleus containing protons and neutrons, surrounded by electrons in shells. |
| 3 | What are the relative charges and masses of protons, neutrons and electrons. | Protons: mass 1, charge +1  Neutrons: mass 1, charge 0  Electrons: mass almost zero, charge -1. |
| 4 | Why do atoms contain the same number of protons and electrons? | Atoms are neutrally charged so they must have the same number of positive particles (protons) as negative particles (electrons) |
| 5 | How would you describe the size of the nucleus relative to the rest of the atom? | Very small |
| 6 | Where is most of the mass of the atom found? | In the nucleus. |
| 7 | What is the mass number of an element? | The total number of protons and neutrons. |
| 8 | What is the atomic number of an element? | The number of protons. |
| 9 | The number of which particle is unique to an element and gives it its identity? | Protons |
| 10 | If an atom contains 12 protons, how many electrons will it have? | 12. |
| 11 | If an atom has a mass number of 23 and an atomic number of 11, how many protons, neutrons and electrons does it contain? | 11 protons  11 electrons  23-11 = 12 neutrons |
| 12 | What is an isotope? | Two or more atoms of the same element (the same number of protons) but with a different number of neutrons. |
| 13 | What is the relative atomic mass, (Ar)? | The average mass of  atoms that make up an element compared to the one twelfth mass of an atom of carbon-12. |
| 14 | Why do some elements have a relative atomic mass that is not a whole number. | The relative atomic mass is an average mass of all the isotopes that make up the element. |
| 15 | What is the formula for calculating relative atomic mass of an element from the relative mass and abundance of its isotopes? | cid:clip_image002.jpg |
| 16 | How did Mendeleev arrange the elements known at the time into a periodic table? | By using the mass number and the properties of the elements and the properties of their compounds of the elements. |
| 17 | How did Mendeleev use his table? | To predict the existence and properties of some elements that were still to be discovered. |
| 18 | Why does Mendeleev’s method of organising elements in order of increasing atomic mass not always work? | When ordering elements by atomic mass Mendeleev noticed some elements properties best fitted the neighbouring group and vice versa. E.g Iodine and Tellurium, in this case he swapped the order. |
| 19 | How are elements in the modern periodic table arranged? | In order of increasing atomic number. In rows called periods and elements with similar properties are placed in the same vertical columns called groups. |
| 20 | Where are the non-metals found in the periodic table? | At the top on the right hand side. |
| 21 | What do all elements in the same row of the periodic table have in common? | They have the same number of shells of electrons. |
| 22 | What do all elements in the same column of the periodic table have in common? | They have the same number of electrons in their outer shell (and therefore have similar chemical properties). |
| 23 | What is an ion? | A charged atom or group of atoms. |
| 24 | Describe how an ionic bond is formed. | A metal loses electron(s) to a non-metal. This results in the metal becoming a positively charged ion (cation) and the non-metal a negatively charged ion (anion). These oppositely charged ions are held in place by electrostatic forces of attraction. |
| 25 | Is a cation positively or negatively charged? | Positive |
| 26 | Is a anion positively or negatively charged? | Negative |
| 27 | What charge do the ions have when formed from elements in group:  a.     1  b.     2  c.      6  d.     7 | a.     +  b.     2+  c.      2-  d.     - |
| 28 | What do the compound endings:  1)     ide  2)     ate  mean? | 1)     ide – a compound of only the named substances  2)     ate – a compound of the named substances and oxygen |
| 29 | What is the formula of the compounds formed from:  a.     Mg2+ and Cl-  b.     Na+ and O2-? | a.     MgCl2  b.     Na2O |
| 30 | Describe the structure of ionic substances. | Ionic substances are a regular arrangement of oppositely charged ions held together in a lattice structure by strong electrostatic forces. |
| 31 | How many electrons does Mg2+ have? Mg has an atomic number of 12 | 10 |
| 32 | Describe what happens in covalent bonding? | Two non-metals overlap their outer electron shells and share at least one pair of electrons. |

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| 33 | What does covalent bonding result in the formation of? | Molecules |
| 34 | Name and explain two physical properties of ionic compounds. | 1. They have high melting and boiling points because there are strong electrostatic forces holding the oppositely charged ions in place, therefore a lot of energy is needed to separate the ions.   2.     They can conduct electricity when molten or in aqueous solution (dissolved in water) because the ions are free to move and carry their charge. |
| 35 | Name and explain two physical properties of covalent, simple molecular compounds. | 1. They have low melting and boiling points because there are weak intermolecular forces of attraction between molecules. Little energy is needed to separate molecules.   2.     They are poor conductors of electricity in all states because there are no delocalised electrons or ions to carry charge.. |
| 36 | Describe the structures of:  1.     Diamond  2.     Graphite | 1.     Each carbon atom is held in place by 4 strong covalent bonds to other carbon atoms. This arrangement is replicated throughout the whole structure creating a giant structure.  2.     Each carbon atom is held in place by 3 strong covalent bonds. This creates flat layers of carbon atoms which stack on top of each other. The unused outer electron on each carbon atom sits between these layers and is delocalised. Delocalised electrons are free to move. |
| 37 | Why is diamond used in cutting tools? | Diamond is very hard because all the carbon atoms are joined by 4 strong covalent bonds. It takes a lot of energy to break these bonds. |
| 38 | Why does diamond have such a high melting point? | In diamond each carbon atom is held in place by 4 strong covalent bonds and it takes a lot of energy to break these bonds. |
| 39 | Why does graphite conduct electricity? | In graphite each carbon forms 3 bonds, this leaves one electron left over from each carbon atom. These delocalised electrons sit between the graphite layers and are free to move and carry a charge. |
| 40 | Why can graphite act as a lubricant? | The layers of carbon atoms in graphite are only very weakly attracted and are therefore free to slide past each other. |
| 41 | What are fullerenes? Give an example, a use and state the type of bonding. | Fullerenes are simple molecules of carbon atoms. They are hollow and can be used to hold other molecules. This makes them useful as drug delivery systems. In the body. C60 is one example where 60 carbons bond together covalently making a spherical structure that looks like a football. These are simple molecules and behave as such. |
| 42 | What is graphene? Explain its properties in terms of its structure and bonding and give a use of graphene. | Graphene has a giant covalent structure. It is a single atom thick layer of carbon graphite (see answer 36). It therefore conducts electricity (see answer 39) and for its thickness is very strong. To break it you would have to break the 3 strong covalent bonds holding each carbon atom in place. This would take a lot of energy. It is used for solar cells and batteries because it conducts electricity and sporting equipment because of its high strength and low density. |
| 43 | Describe polythene’s structure and a use. | Polythene is an example of a polymer. It is a very large molecule containing chains of covalently bonded carbon atoms surrounded by hydrogen. These molecules are bigger than simple molecules and this makes the forces between each polymer molecule much larger than those between simple molecules. Plastics are polymers. They are strong and have low densities. They are useful as bags (polythene), buckets (polypropylene) etc. |
| 44 | Describe the bonding in metals? | Metals have metallic bonding. Metals have a regular arrangement of metal cations (positive ion) surrounded by a sea of delocalised electrons. Delocalised electrons are free to move. |
| 45 | Why do metals conduct electricity? | There are delocalised electrons in the metallic structure that can move and carry electrical charge through the structure. |
| 46 | Why are metals malleable? | They bend because the ions can slide over one another. |
| 47 | Why is it difficult to represent models of compounds on paper? | Compounds are normally 3 dimensional and contain different sized atoms. This can give them particular shapes that are hard to draw clearly in 2 dimensions (on paper). Diagrams showing bonding have to clearly show electrons when they do this they cannot accurately show the shape and relative sizes of the atoms involved. |
| 48 | What are the properties of most metals? | Shiny solid, high melting points, high density and good conductors of electricity. |
| 49 | What is an empirical formula? | The simplest ratio of the elements in a compound. |
| 50 | What is the law of conservation of mass? | During any chemical reaction no particles are created or destroyed. So the overall mass of the reactants must equal the mass of the products. |
| 51 | What 2 units do we use for concentration? | 1)     g dm-3 (grams per decimetre cubed)  2)     mol dm-3 (moles per decimetre cubed) |
| 52 | What is 1 mole of particles? | The Avogadro constant (6.02 x 1023 particles).  This is the number of particles that you must have on a top pan balance for the atomic mass to make up the mass in grams. E.g. 1 mole of 12C has a mass of 12 grams. |
| 53 | What formula links number of atoms, moles and the Avogadro constant? | Number of atoms = number of moles x Avogadro constant. |
| 54 | What is the formula to calculate moles when given the mass of a substance? | Moles = Mass/Relative formula mass |
| 55 | What are the 3 states of matter? | Solid, liquid and gas |
| 56 | Name the interconversion between the:  1.     Solid to the liquid state  2.     Liquid to the gaseous state  3.     gaseous state to the liquid state  4.     Liquid to the solid state | 1.     Melting  2.     Evaporating (or if heated to boiling point – Boiling)  3.     Condensing  4.     Freezing |
| 57 | Describe how the particles arrangement, movement and energy changes during melting. | The particles energy increases on heating causing the vibrations between particles to increase to an extent that they break free from their regular arrangement and start moving over one another. |
| 58 | Describe how the particles arrangement, movement and energy changes during condensing. | The particles energy decreases on cooling causing the particles to slow down and become attracted to other particles. |
| 59 | What is the difference between a pure substance and a mixture? | A pure substance is made of just one thing whereas a mixture is made of more than one substance which are not chemically joined. |
| 60 | What type of mixtures can be separated by each of these techniques?  1.     Simple distillation  2.     Fractional distillation  3.     Filtration  4.     Crystallisation  5.     Paper chromatography | 1.     A dissolved solid where you want to keep the liquid or 2 liquids with very different boiling points.  2.     A large sample of a mixture of liquids with similar boiling points  3.     An insoluble solid and a liquid.  4.     A dissolved solid where you do not want the liquid.  5.     A small sample of a mixture of liquids. |
| 61 | What is Chromatography? | A separating technique used to separate mixtures of soluble substances by running a solvent (mobile phase) through the mixture on the paper (stationary phase) which causes the substances to move at different rates over the paper. |
| 62 | How can you use paper chromatography to identify a substance? | Each substance will run a specific distance up the paper and have its own unique Rf. |
| 63 | In chromatography, define the Rf value. | Rf   =   distance moved by the component                  distance moved by the solvent |
| 64 | What does potable mean and explain how can ground water be made potable? | Potable – safe to drink.  Sedimentation to let large solids to settle, filtration to remove particulate matter (solids) and chlorination to kill bacteria. |
| 65 | How can sea water be made potable? | Distillation. |
| 66 | Why must water used in analysis not contain any dissolved salts? | Dissolved salts could cause an analysis to give a false positive result. In other words you might get a positive result for something that isn’t really there. |

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| 67 | What are acids and alkalis sources of? | Acids – hydrogen ions (H+)  Alkalis – hydroxide ions (OH-) |
| 68 | Define:  1)     Strong acid  2)     Weak acid  3)     Weak alkali  4)     Strong alkali | 1)     A strong acid fully dissociates (splits apart) in water to give high concentrations of hydrogen ions.  2)     A weak acid partially dissociates in water to give low concentrations of hydrogen ions.  3)     A weak alkali partially dissociates in water to give low concentrations of hydroxide ions.  4)     A strong alkali fully dissociates in water to give high concentrations of hydroxide ions. |
| 69 | What are the colour changes of?  1.     Litmus  2.     Methyl orange  3.     Phenolphthalein  With acid and alkali? | |  |  |  | | --- | --- | --- | |  | Acid | Alkali | | Litmus | red | blue | | Methyl orange | red | yellow | | Phenolphthalein | colourless | pink | |
| 70 | What is the link between hydrogen ion concentration and pH? | The higher the concentration of hydrogen ions the lower the pH (a stronger acid). As the hydrogen ion concentration increases by a factor of 10, the pH of the solution decreases by 1.The higher the concentration of hydroxide solutions the higher the pH. |
| 71 | When calcium hydroxide is added slowly to hydrochloric acid the pH of the resulting solution changes. What would the graph of this look like and explain what happens? | A picture containing text, diagram, line, sketch    Description automatically generated  The hydroxide ions react with hydrogen ions in the acid to form water. When the hydrogen ions have reacted the pH rises first to neutral but when an excess of hydroxide ions have been added the pH rises above 7. |
| 72 | What pH could a dilute acid have? | Anything between 1 and 6. Acid concentration refers to the dilution with water. pH is a measure of acid strength. A strong acid even when dilute will fully dissociate in water to give a low pH. |
| 73 | Which would have a pH of 1?         0.25M Sulphuric acid (a strong acid)         10M Ethanoic acid (a weak acid) | Strong acids will always have low pH regardless of the concentration. |

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| 74 | What is a base? | It is a substance that can react with an acid to make a salt and water. |
| 75 | What is an alkali? | A soluble base. |
| 76 | What type of reaction is it when an acid reacts with a base? | Neutralisation |
| 77 | What are the products of the following neutralisation reactions?  1.     Metal + acid =  2.     Metal oxide + acid =  3.     Metal hydroxide + acid =  4.     Metal carbonate + acid = | 1.     Salt + hydrogen  2.     Salt + water  3.     Salt + water  4.     Salt + water + carbon dioxide |
| 78 | What is the chemical test for?  1.     Hydrogen  2.     Carbon dioxide | 1.     Lit splint gives a squeaky pop.  2.     Bubbling carbon dioxide through limewater turns it milky. |
| 79 | Explain why water is produced when an acid reacts with an alkali? | The hydrogen ions (H+) from the acid react with the hydroxide ions (OH-) from the alkali to form water (H2O).  Ionic equation:  H+   +   OH-      H2O |
| 80 | When preparing a soluble salt from an acid an insoluble reactant how do you ensure the salt is pure? | 1.     Use excess insoluble reactant to neutralise all the acid.  2.     Filter the resulting mixture to remove the excess reactant. |
| 81 | How do you prepare a soluble salt when both the reactants are soluble? | Titration is used to ensure the reactants are mixed in the correct proportions. |

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| 82 | How would you prepare a sample of pure, dry hydrated copper sulfate crystals starting from copper oxide. | 1.     Add excess copper oxide to sulfuric acid and place in a water bath to gently heat.  2.     Filter the mixture to remove excess copper oxide.  3.     Evaporate the mixture, this can be heated to start with but it must be left to crystallise at room temperature to produce hydrated crystals.  4.     Press dry crystals between dry filter paper. |
| 83 | How do you carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry sample of sodium chloride? | 1. Rinse burette with acid. 2. Fill a burette with hydrochloric acid. 3. Measure 25 cm3 of sodium hydroxide using a pipette and place in a conical flask. 4. Add a few drops of phenolphthalein indicator. 5. Place the conical flask on a white tile underneath the burette. 6. Run in hydrochloric acid fairly quickly at first whilst continually stirring. 7. When the neutralisation point is approaching start to add the acid drop wise. 8. Stop adding the acid the moment the indicator goes clear.   9.     Repeat the titration 2 further times and average results.  10.  Carry out titration one final time, this time without indicator to ensure the salt produced is pure. Stop adding acid when the average quantity previously identified has been added. |
| 84 | Are the common sodium, potassium and ammonium salts soluble or insoluble? | Soluble |
| 85 | Are nitrates soluble or insoluble? | Soluble |
| 86 | Are common chlorides soluble or insoluble? And what is the exception to the rule? | Soluble, except silver chloride and lead chloride. |
| 87 | Are common sulfates soluble or insoluble? And what is the exception to the rule? | Soluble, except lead sulphate, barium sulphate and calcium sulphate. |
| 88 | Are common carbonates and hydroxides soluble or insoluble? And what is the exception to the rule? | Insoluble, except sodium, potassium and ammonium. |
| 89 | What is a precipitate? | A solid formed from two reacting solutions. |
| 90 | What is the name of the insoluble precipitate formed when lead nitrate reacts with potassium chloride? | Lead chloride |
| 91 | How do you prepare a pure, dry sample of an insoluble salt? | Mix reacting solutions together in order to get the precipitate, then filter the precipitate out of the solution, wash it with distilled water and dry it between fresh filter papers. |
| 92 | What is an electrolyte? | An ionic compound in either the molten state or dissolved in water. |
| 93 | What is electrolysis? | A chemical process that decomposes an ionic electrolyte  back into its elements using electrical energy from a direct current (DC) supply. |
| 94 | What are positively charged ions called? | Cations |
| 95 | What are negatively charged ions called? | Anions |
| 96 | What is the positive electrode called? | Anode |
| 97 | What is the negative electrode called? | Cathode |
| 98 | How do the ions move during electrolysis? | The cations migrate to the cathode.  The anions migrate to the anode. |
| 99 | What products are formed in the electrolysis of the following electrolytes:  1.     Copper chloride solution  2.     Sodium chloride solution  3.     Sodium sulfate solution  4.     Water acidified with sulfuric acid  5.     Molten lead bromide | |  |  |  |  | | --- | --- | --- | --- | |  | Anode | Cathode | Left in solution | | 1 | Chlorine | Copper |  | | 2 | Chlorine | Hydrogen | Sodium hydroxide | | 3 | Oxygen | Hydrogen |  | | 4 | Oxygen | Hydrogen |  | | 5 | Bromine | Lead |  | |
| 100 | What is the cathode half equation when water is electrolysed? | 2H+ + 2e- → H2 |
| 101 | What is the anode half equation when water is electrolysed? | 4OH- → O2 +   2H2O   +   4e- |
| 102 | Define oxidation and reduction. | Oxidation is loss of electrons and reduction is gain of electrons. |
| 103 | When water is electrolysed are the hydrogen ions oxidised or reduced? | Reduced (the hydrogen ions (H+) gain electrons) |
| 104 | Does oxidation happen at the anode or cathode? | Anode |
| 105 | When purifying copper using electrolysis would you make the impure copper the anode or the cathode? | Anode |
| 106 | Write the half equation for the formation of copper at the cathode. | Cu2+ + 2e- → Cu |
| 107 | Magnesium produces small bubbles of gas when placed in water; it reacts rapidly with steam and acid. Lithium bubbles fizzes on the surface of water. Which is more reactive? | Lithium. |
| 108 | What is a displacement reaction? | A redox reaction in which a more reactive element displaces a less reactive element from its compound. Both metals and non-metals take part in displacement reactions. |
| 109 | CuSO4 + Zn   ZnSO4 + Cu  Explain what is oxidised and reduced. | OILRIG – Oxidation Is Loss (of electrons) Reduction Is Gain (of electrons)  Zn (zinc metal) loses electrons to form ZnSO4 (ionic zinc sulfate Zn2+SO42-). Zinc is oxidised.  Cu2+ **ions** (in copper sulfate Cu2+SO42-) gain electrons to from Cu. Copper **ions** are reduced. |
| 110 | Where are most metals obtained from? | Ores found in the Earth’s crust. |
| 111 | Name a metal that is not extracted from an ore and explain why. | Gold because it is so unreactive it doesn’t combine with oxygen in the environment. |
| 112 | When metals are extracted are ores oxidised or reduced? | Reduced. The oxygen is removed from the metal oxide. |
| 113 | Describe how iron is extracted from its ore. | Iron ore (iron oxide) is heated with carbon (the carbon displaces the iron. The iron is reduced – loses its oxygen to the carbon). |
| 114 | Describe how aluminium is extracted from its ore. | Aluminium is extracted by electrolysis. |
| 115 | Explain why aluminium is extracted using electrolysis, and not by simply heating it with carbon. | Aluminium is a reactive metal.  Reactive metals bond strongly to the other elements in their ores. It requires a lot of energy to break these chemical bonds. Electrolysis can provide large amounts of electrical energy to separate the metal from the other elements in the ore.  All reactive metals have to be extracted by electrolysis. The disadvantage is that this method is expensive. |
| 116 | Why is iron not extracted from its ore using electrolysis? | It is cheaper to displace it with carbon. |

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| 117 | How does the phyto extraction of copper work? | Some plants absorb copper compounds through their roots, the plant is then burnt and the copper extracted from the ash. |
| 118 | What is bioleaching? | A method of extracting copper that involves bacteria absorbing copper compounds. The bacteria then produce solutions called leachates which contain copper compounds from which the copper can be extracted. |
| 119 | Would you expect a metal low down the reactivity series to be susceptible to oxidation? | No, unreactive metals are much less likely to react with oxygen. |
| 120 | Why do we recycle scrap metal? | 1.     It can often be cheaper to recycle rather than extract new metal from its ore.  2.     Recycling cuts waste which could otherwise harm the environment.  3.     Preserves the remaining raw materials on the planet ad cuts down on the environmental damage of mining them. |
| 121 | What does a lifetime assessment of a product involve? | Evaluating the effect on the environment of:  1.     Manufacturing  2.     Using  3.     Disposing |
| 122 | What does this symbol mean?  ⇌ | It shows a reaction is reversible |
| 123 | What is meant by the term ‘dynamic equilibrium’? | A reversible reaction is said to be in dynamic equilibrium when the rate of the forward reaction is equal to the rate of the backward reaction. |
| 124 | How can you change the equilibrium of a reversible reaction? | By changing the conditions, for example temperature and pressure. |
| 125 | What is the equation for the Haber process? | N2 (g)   +   3H2 (g)   ⇌   2NH3 (g) |
| 126 | Where are the reactants obtained from in the Haber process? | The nitrogen is extracted from air and the hydrogen is obtained from natural gas. |
| 127 | What is the chemical formula for ammonia? | NH3 |

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| 128 | What are the conditions used in the Haber process? |        temperature 450 °C         pressure 200 atmospheres         iron catalyst |
| 129 | How does increasing the temperature affect the yield of ammonia? The production of ammonia is exothermic.  N2   +   3H2   ⇌   2NH3 | Increasing the temperature always moves the equilibrium in the endothermic direction. In the Haber process the backwards reaction is endothermic. Increasing the temperature reduces the yield of ammonia. |
| 130 | If increasing the temperature reduces the yield of ammonia why is a temperature of 450 oC used? | 450 oC is a compromise, the temperature is raised to increase the rate of reaction even though it decreases the yield. |
| 131 | Explain how does increasing the pressure affect the yield of ammonia?  N2   +   3H2   ⇌   2NH3 | Increasing the pressure increases the yield of ammonia.  4 molecules of reactants are needed to make 2 molecules of ammonia. If the pressure is raised more ammonia is produced because that would reduce the number of particles present. |
| 132 | How does adding a catalyst affect the yield of ammonia? | It does not affect the yield it just increases the rate. |
| 133 | How would the position of a dynamic equilibrium be affected by?  1.     temperature?  2.     pressure?  3.     concentration? | 1.     Increasing the temperature will move the dynamic equilibrium in the direction of the endothermic reaction.  2.     Increasing the pressure will move the dynamic equilibrium towards the side where there are less gas molecules.  3.     Increasing the centration of a substance will move the equilibrium to reduce the concentration of that substance. |

Y11 Chemistry core questions

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| 1 | What do we call group 1, group 7 and group 0 in the periodic table? | The alkali metals, the halogens and the noble gases. |
| 2 | In terms of electronic configuration, what do all the elements in:   1. Group 1 have in common? 2. Group 7 have in common? 3. Group 0 have in common? | They have:   1. 1 electron on their outer shell 2. 1 electron is needed to complete their outer shell/ have 7 electrons on outer shell 3. A full outer shell of electrons. |
| 3 | How are the alkali metals different from transition metals? | 1. They are soft (can be cut with a knife). 2. They have comparatively low melting points. |
| 4 | Describe the reaction of sodium with water. | 1. The metal reacts and moves around the surface of the water as a molten ball and gets smaller until it disappears. 2. The reaction gives off a gas/fizzes/bubbles 3. The product of the reaction is soluble in the water. |
| 5 | What two products are formed when alkali metals are added to water? | A metal hydroxide and hydrogen gas. |
| 6 | State the order of reactivity in group one and explain it. | Reactivity increases as you go down the group.  As you down the group there are more shells  The outer electron is further away from the nucleus. Therefore the attraction between the outer electron and nucleus is weaker and therefore the electron is more easily lost. |
| 7 | What are the colours and physical states of the halogens at room temperature? | Fluorine is a pale yellow gas. Chlorine is a yellow/green gas. Bromine is a brown liquid. Iodine is a grey solid. |
| 8 | What is the pattern in:   1. Boiling point 2. Colour intensity 3. Reactivity   As you go down the halogen group? | 1. Boiling point increases 2. Colour intensity increases 3. Reactivity decreases |
| 9 | What is the test for chlorine? | Chlorine turns damp litmus paper red and then bleaches it/turns white |
| 10 | What is formed when halogens react with hydrogen? | Hydrogen halides. These can dissolve in water to form acids e.g. HCl, hydrogen chloride dissolves in water to form hydrochloric acid. |
| 11 | What is formed when halogens react with metals? | Metal halides. E.g. 2Fe + 3Cl2 = 2FeCl3 (iron(III)chloride) |
| 12 | State the order of reactivity of the halogens | Reactivity decreases as you go down the group. |
| 13 | If chlorine is added to sodium bromide solution what happens? | A displacement reaction takes place forming sodium chloride solution and bromine. This is because the chlorine is more reactive than the bromine. |
| 14 | When chlorine reacts with sodium bromide what type of reaction is it? | Displacement reaction which is a redox reaction. |
| 15 | When chlorine reacts with sodium bromide, what is oxidised and what is reduced? Explain your answer in terms of electrons. | The chlorine will gain electrons and therefore be reduced.  The bromide ion will lose electrons and is therefore oxidised. |
| 16 | Why do the halogens become less reactive as you go down the group? | The halogens all need to gain an electron to complete their outer shells. As you down the group the atom has more shells. The positive nucleus attracts the electron the halogens need to fill the outer shell. The attractive force of the nucleus is much weaker as the distance is larger which makes it harder to gain an electron and less reactive. |
| 17 | Why are the noble gases unreactive? | They already have a full outer shell of electrons. |
| 18 | What are the properties of the noble gases? | 1. Inertness (so used in welding and filament lamps). 2. Low density (used in balloons). 3. non-flammability. |
| 19 | What is the trend in density and boiling point as you go down the noble gas group? | Both the densities and the boiling points of the noble gases increase as you go down the group. |
| 20 | How could you monitor the rate of a reaction? | By looking at how quickly a product like a gas is produced, this could be done by collecting the gas in a syringe. Alternatively, by seeing how quickly a reactant is used up, this could be done by monitoring the mass of solid reactant. |
| 21 | If a reaction is to occur what 2 things need to happen between reacting particles? | The particles must collide and they must collision with a minimum amount of energy (Activation energy). |
| 22 | Explain why increasing the temperature speeds up a reaction. | It gives the particles more energy and they move faster so there are more frequent collisions and a higher proportion of collisions have at least the activation energy to react when they collide |
| 23 | Explain why increasing the concentration of a solution speeds up a reaction. | It means there are more particles in the same volume present so it will increase the frequency of collisions. |
| 24 | Explain why increasing the pressure on reactions involving gases speeds up the rate of reaction. | Increasing the pressure increases the number of gas particles present in the same volume. This increases the frequency of collisions between reacting particles, which increases the rate of reaction. |
| 25 | Explain how breaking up a solid reactant increases the rate of reaction. | Breaking up a solid increases the surface area. This means that there is a greater area of solid and therefore the number of particles exposed for other particles to collide with. This increases frequency of collisions and therefore speeds up the reaction. |
| 26 | What happens to the rate as a reaction progresses and what would a rate of reaction graph look like? | Reactions start quickly and slow down as they progress.  This is because there are fewer reacting particles left as the reaction progresses resulting in lower frequency of collisions  A rate curve will start off steep and the gradient will continually decrease to reflect the changing rate. |
| 27 | What is a catalyst? | A catalyst is a substance that speeds up the rate of a reaction without altering the products of the reaction, being itself unchanged chemically and in mass at the end of the reaction. It is not used up. |
| 28 | How does a catalyst speed up a reaction? | A catalyst provides an alternative route which requires less activation energy. |
| 29 | What are enzymes and what are they used for? | Enzymes are biological catalysts and they are used in the production of alcoholic drinks. |
| 30 | What is an exothermic reaction and give an example? | A reaction that gives out/ releases heat energy to the surroundings from the reaction. For example combustion. |
| 31 | What is an endothermic reaction and give an example? | A reaction that takes in/ absorbs heat energy from the surroundings to the reaction. For example photosynthesis. |
| 32 | Is the breaking of bonds exothermic or endothermic? | Endothermic. Energy is absorbed |
| 33 | Is the making of bonds exothermic or endothermic? | Exothermic. Energy is released |
| 34 | Why is a reaction exothermic? | In an exothermic reaction less heat energy is absorbed to break bonds than is released when new bonds are made. |
| 35 | Why is a reaction exothermic? | In an endothermic reaction less energy is released in forming bonds in the products than is absorbed in breaking bonds in the reactants. |
| 36 | How do you calculate the energy change in a reaction? | Subtract the energy created when bonds are made from the energy needed to break the bonds in the reactants.  Bond breaking – Bond making  If the answer is negative then the reaction is giving out energy and is exothermic. |
| 37 | What is the unit for measuring the energy change in reactions? | KJ mol-1 (kilojoule per mole) |
| 38 | What is meant by the term activation energy? | The minimum amount of energy needed for a reaction to start. This is equal to the energy needed to break all the reactants’ bonds. |
| 39 | What does the reaction profile for an exothermic reaction look like? Add arrow |  |
| 40 | What does the reaction profile for an endothermic reaction look like?  Add arrow |  |
| 41 | What is a hydrocarbon? | A hydrocarbon is a compound that contains hydrogen and carbon ONLY. |
| 42 | What is crude oil? | Crude oil is a complex mixture of hydrocarbons. Some of these hydrocarbons contain molecules in which carbon atoms are in chains and some where they are in rings. Crude oil is an important source of useful substances and a finite resource. |
| 43 | With respect to crude oil, what is a “fraction”? | A fraction is a simpler, more useful mixture of hydrocarbons with a similar boiling point, e.g. petrol or bitumen. |
| 44 | What is the name of the process used to separate crude oil into its fractions? | Fractional distillation. |
| 45 | How does the fractional distillation of crude oil work? | The crude oil is heated and evaporated. The vapour is then passed into a cooling tower. The hot vapours rise up the tower and they cool and condense. This happens at different heights depending on the fraction boiling points. |
| 46 | The fractions come off the fractionating column in the following order (starting from the top of the column). Name the uses of each fraction:   1. Refinery gases 2. Petrol 3. Kerosene 4. Diesel oil 5. Fuel oil 6. Bitumen | 1. domestic heating and cooking 2. fuel for cars 3. fuel for aircraft 4. fuel for some cars and trains 5. fuel for large ships and in some power stations 6. used to surface roads and roofs |
| 47 | How the following properties differ as the chain length gets shorter:  boiling point  melting point  ignition  viscosity  flammability  volatility  density | boiling point: lower  melting point: lower  ignition: easy / easier  viscosity: Less viscous/ runnier  flammability: higher  volatility: higher  density: lower |
| 48 | What is a homologous series? | A homologous series is a series of compounds that have similar properties and the same general formula. A compound will differ by CH2 in molecular formulae from neighbouring compounds. There will be a gradual change in physical properties as the carbon chain gets longer. |
| 49 | What are the reactants and products of the complete combustion of hydrocarbons? | Reactants – hydrocarbon and oxygen.  Products - carbon dioxide and water ONLY.  (Energy is released, but it is not a product, because it is not a chemical substance.) |
| 50 | What are the products of the incomplete combustion of hydrocarbons? Why are they different from the products of complete combustion? | Products – carbon monoxide and/or carbon and water. Incomplete combustion produces a mixture of carbon compounds.)  Carbon monoxide (CO) and/or carbon (C) are produced because there is not enough oxygen available to form carbon dioxide (CO2). |
| 51 | Why are we concerned about incomplete combustion? | Incomplete combustion can cause the release of carbon monoxide, which is toxic. The soot (carbon) produced can damage appliances. |
| 52 | What effect does carbon monoxide have on the body? | Carbon monoxide is toxic. It binds to heamoglobin and doesn’t let go. It therefore reduces the amount of oxygen that’s transported around the body by the blood depriving vital organs of oxygen. Unconsciousness and death follows. |
| 53 | What is “acid rain”, and how does it arise? | Acid rain is rain that is more acidic than normal.  Sulfur impurities in coal, gas and crude oil react with oxygen when heated to form sulphur dioxide gas.  When water vapour in the atmosphere condenses the sulfur dioxide gas dissolves in it to form an acidic solution. This can then fall as rain and because it is more acidic than normal rainwater it is called “acid rain”. |
| 54 | What are the problems associated with acid rain? | Acid rain makes rivers, lakes and soils acidic, harming the organisms living there.  Acid rain damages the leaves and roots of plants and trees.  Acid rain can speed up the weathering of limestone (rocks or buildings) and marble. |
| 55 | How are nitrogen oxides produced? | Nitrogen and oxygen in the air react at high temperatures arising from engines running. |
| 56 | What is a nonrenewable fuel? | A non-renewable energy resource is one that has a finite supply and it will run out at some stage. They are used faster than they can be replaced. |
| 57 | What is the cause of a sooty flame? | Incomplete combustion. (Not enough oxygen present to convert all the carbon in the hydrocarbon fuel to carbon dioxide, so carbon particles are one of the products of the reaction.) |
| 58 | Give an advantage and a disadvantage of combining hydrogen and oxygen in a fuel cell¸ rather than petrol, as a fuel for cars. | Advantage – hydrogen is a clean fuel. The only product of the combination of hydrogen and oxygen is water. Therefore no carbon dioxide, nitrogen oxide or acid rain would be produced.  Disadvantage – hydrogen can be explosive/hydrogen is not readily available in filling stations at present /the process needed to produce the hydrogen fuel results in the production of carbon dioxide. |
| 59 | Are alkanes saturated or unsaturated? | Saturated.  (They have no carbon-carbon double bonds that can open up to bond with any more hydrogen atoms – they are saturated with hydrogen.) |
| 60 | What is the formula for   1. methane 2. ethane 3. propane   Draw the structures of these molecules | 1. CH4 2. C2H6 3. C3H8   [http://t1.gstatic.com/images?q=tbn:ANd9GcRHV8YBDoVrMTNTFQq5O0GWnNfLSh2CqmUJW4qXIV9w1acfDqy9A3myUig:4.bp.blogspot.com/_NvQHHJRdJ9o/SY_WhQbFMEI/AAAAAAAAAGc/A0QAjg8-m7o/s400/methane.bmp](http://www.google.co.uk/imgres?imgurl=http://4.bp.blogspot.com/_NvQHHJRdJ9o/SY_WhQbFMEI/AAAAAAAAAGc/A0QAjg8-m7o/s400/methane.bmp&imgrefurl=http://thestephenation.blogspot.com/2009/02/lewis-structures.html&usg=__7oNgkdisXVk1uGY35JQA5CCu7-Q=&h=300&w=400&sz=5&hl=en&start=1&sig2=Ks4W1DCpO3rCwxMpGcqFSQ&zoom=1&tbnid=pPkBOOqwVFcaJM:&tbnh=93&tbnw=124&ei=oCUhT-7cDMTpOaG57agI&prev=/search?q=structure+of+methane&hl=en&safe=active&biw=1280&bih=836&gbv=2&sout=1&tbm=isch&itbs=1)[http://t2.gstatic.com/images?q=tbn:ANd9GcS_1NHbOMEiIKBKaSj1WtW1ijsLuKjedIxg0Fz-Y8Ht5p9ZV9PiIoEdlow:4.bp.blogspot.com/-Rhn6lTRfM9Q/TVZvFsrgwPI/AAAAAAAAAAo/l5Ig30ohHo4/s1600/Ethane-flat.png](http://www.google.co.uk/imgres?imgurl=http://4.bp.blogspot.com/-Rhn6lTRfM9Q/TVZvFsrgwPI/AAAAAAAAAAo/l5Ig30ohHo4/s1600/Ethane-flat.png&imgrefurl=http://intrestingthings4u.blogspot.com/2011_02_01_archive.html&usg=__1htOdJasotGwpF1fn-JyHDsBZ4w=&h=830&w=1100&sz=10&hl=en&start=4&sig2=GCpW0xxqN-YHskBulpOrYg&zoom=1&tbnid=YCdSuaZTUmnHpM:&tbnh=113&tbnw=150&ei=ySUhT5O9BYeSOoDpyL4I&prev=/search?q=structure+of+ethane&hl=en&safe=active&sa=G&biw=1280&bih=836&gbv=2&sout=1&tbm=isch&itbs=1) [http://t0.gstatic.com/images?q=tbn:ANd9GcQqZ2HRWFR67Xh669jiqxuhnP1puFMTohiY3N4Hx9f_T3rgawyuW2ikkCw:2.bp.blogspot.com/_5LxcnpPlBl4/Sdszr0VFaiI/AAAAAAAAAB8/jUn6JIlbTao/s320/propane.jpg](http://www.google.co.uk/imgres?imgurl=http://2.bp.blogspot.com/_5LxcnpPlBl4/Sdszr0VFaiI/AAAAAAAAAB8/jUn6JIlbTao/s320/propane.jpg&imgrefurl=http://sars-4a.blogspot.com/&usg=__IMW3nfB_MmTUwlvuMCIRW96cgZo=&h=192&w=320&sz=8&hl=en&start=14&sig2=EnjkJXF5B4sg-xXrxuhKBQ&zoom=1&tbnid=X_6EAqsRHqhvRM:&tbnh=71&tbnw=118&ei=DCYhT5vkI4HpOcbOubkI&prev=/search?q=structure+of+propane&hl=en&safe=active&sa=G&biw=1280&bih=836&gbv=2&sout=1&tbm=isch&itbs=1) |
| 61 | What is the formula for the alkenes   1. ethene 2. propene | 1. C2H4 2. C3H6 |
| 62 | a) Explain what “cracking” is, and what products are made.  b) Why do oil companies bother to carry out this reaction? | a) Cracking is the splitting (using heat and a catalyst) of a long chain saturated hydrocarbon (an alkane) to form a shorter chained alkane and an alkene.  b) Shorter chained hydrocarbons make better fuels. Crude oil contains too many of the longer chained molecules, so oil companies crack them to i) **make more of the useful fuels**, and ii) **make** **alkenes** (which can be used to make polymers). |
| 63 | How was the earth’s first atmosphere formed? | From gases including carbon dioxide and water produced by volcanic activity. |
| 64 | What are thought to be the relative proportions of the gases that formed the early atmosphere? | Little or no oxygen, large amounts of carbon dioxide, large amounts of water vapour and small amounts of other gases. (Like Mars and Venus today) |
| 65 | Why can’t we be certain about how the earth’s atmosphere formed? | There is only limited evidence (e.g. from rocks and ice cores) about the earth’s early atmosphere. |
| 66 | How were the earth’s oceans formed? | Water vapour, released by volcanoes, condensed to form the oceans as Earth cooled. |
| 67 | How did the amount of oxygen in the atmosphere gradually increase? | Green plants evolved. The growth of these primitive plants absorb carbon dioxide and released oxygen by photosynthesis. |
| 68 | What is a chemical test for oxygen? | Oxygen will relight a glowing splint. |
| 69 | Describe the processes, other than photosynthesis, that reduced the amount of carbon dioxide in the atmosphere. | 1. Carbon dioxide dissolved into the oceans. 2. Dissolved carbon dioxide was incorporated into the shells of marine organisms. When marine organisms die their shells can eventually form carbonate rocks. |
| 70 | What is the greenhouse effect? | This is when various gases are added to the atmosphere, including carbon dioxide, methane and water vapour. These gases absorb heat radiated from the Earth and subsequently release the energy back into the atmosphere keeping the Earth warm. |
| 71 | What evidence do we have for global warming and why can we not be absolutely certain about it? | Scientists have discovered a correlation between historical global temperature and carbon dioxide levels. They also know how much carbon dioxide we are presently adding to the atmosphere.  We cannot be certain about this because of historical accuracy of the temperature and carbon dioxide levels and also due to uncertainties caused by the location where measurements are taken. |
| 72 | List the percentages of the gases in our modern atmosphere. | Nitrogen 78%, oxygen 21%, 1% other gases (argon, carbon dioxide and water vapour). |
| 73 | What are the potential effects on the climate of increased levels of carbon dioxide and methane caused by human activity? | The climate will warm up although we cannot be certain by how much. It is also suspected we will have a long term change in weather (e.g. more/less rain) and more extreme weather events. |
| 74 | How might the greenhouse effect be mitigated? | We would need to reduce the consumption of fossil fuels by looking at alternative sources of energy e.g. nuclear or renewables. Also, a different fuel for transport e.g. electricity or fuel cells. |
| 75 | Why can we not just stop burning fossil fuels to generate electricity? | Nuclear power is not liked by all and the waste is a risk and can be a problem for the environment. Solar and wind don’t produce that much electricity so you would need thousands of solar and wind farms and this would take too much space and be extremely expensive. Generation from solar and wind is not always continuous. |
| 76 | How has human activity affected the gasses in the atmosphere? | Burning fossils fuels and agriculture has increased CO2.  Deforestation has resulted in less carbon dioxide absorbed.  Reforestation resulted in more carbon dioxide absorbed and more oxygen produced |