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SCIENCE FUNDAMENTAL KNOWLEDGE QUIZ BOOKLET

Key Stage 4 Paper 1 Chemistry



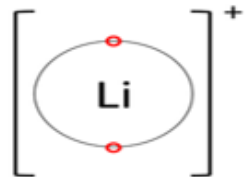
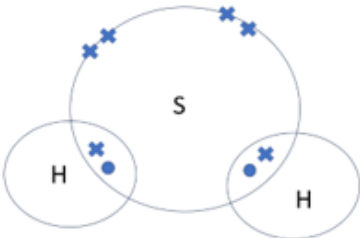
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C1 – Atomic structure

Which separation technique is used to separate an insoluble solid and a liquid? Filtration	Which separation technique is used to separate a soluble solid and liquid? Crystallisation	Which separation technique is used to separate a mixture of two liquids? Distillation	State the 3 subatomic particles found in an atom Give the mass and charge Proton, 1, +1 Neutron, 1, 0 Electron, 0, -1	Calculate the number of protons, electrons and neutrons 48 Ti titanium 22 P= 22, E=22, N=26
Draw the electronic structure of aluminium (13 electrons) 	Which group of the periodic table is aluminium and why? Group 3 3 electrons on the outer shell	Why is sodium in the 3rd period of the periodic table? 3 shells	What is the name of group 1? Alkali Metals	What is the name of group 7? Halogens
What is the name of group 0? Noble gases	How was the early periodic table organised? Atomic weight	How is the modern periodic table organised? Atomic number	State 3 observations when sodium is dropped in <u>water</u>? - Floats, bubbles, dissolves	What happens to the reactivity as you go down group 1? Increases
Why did Mendeleev leave gaps? Undiscovered elements	What is an isotope? Same P + E different number of Neutrons	What happens to the reactivity down group 7? Decreases	State which scientist discovered the following? Electrons: JJ Thompson Nucleus: Rutherford Shells: Bohr Neutrons: Chadwick	Group 1 gets more reactive because the atom gets bigger so the outer electrons are further from nucleus, which means a weaker attraction. <u>So</u> it is easier to lose an electron.

C2 – Bonding

Why do elements react? To get a full outer shell	Which type of bond does Magnesium Oxide form? (Metal + non-metal) Ionic	What type of structure does Magnesium Oxide have? Ionic Lattice	What is the name of the force holding Magnesium Oxides structure together? Strong Electrostatic	State the 2 conditions required for Magnesium Oxide to be able to conduct electricity? Molten or dissolved
For magnesium oxide to be able to conduct the ions must be free to move to carry the Charge	Magnesium is in group <u>2</u>, how does it react? What ion would form? Loses 2 electrons Mg²⁺	Oxygen is in group <u>6</u>, how does it react? What ion forms? Gains 2 electrons O²⁻	What type of bonding does Nitrogen have (Non-metal)? Covalent	What type of structure does Nitrogen have? Simple covalent
What is the name of the force between the Nitrogen molecules? Weak intermolecular	Nitrogen can't conduct electricity as it has no free electrons to carry the charge	Which element are Graphite and Diamond made from? Carbon	Which type of bonding does Diamond have? Covalent	Which structure does Diamond have? Giant Covalent
Graphite is soft because it is in Layers with weak intermolecular forces. <u>So</u> layers can Slide Easily.	Draw a lithium ion. (Lithium has 3 electrons) 	Complete the covalent bond. 	Describe the bonding in metals? Made of Positive ions In neat rows With delocalised electrons	Alloys are stronger than pure metals because they are made of a mixture of metals, so the layers are distorted so they can't Slide As easily

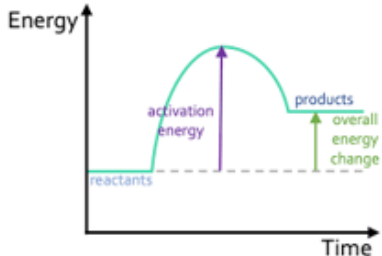
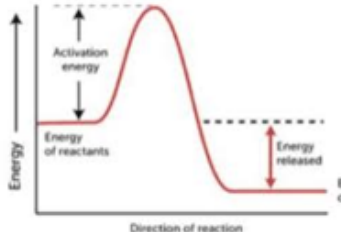
C3 – Quantitative chemistry

Calculate the relative formula mass (Mr) of H_2O (Ar: H= 1, O=16) $2 + 16 = 18$	Calculate the relative formula mass (Mr) of MgSO_4 (Ar: Mg=<u>24</u>, S= 32 O=16) $24 + 32 + 64 = 120$	Calculate Mr of $\text{Al}(\text{OH})_3$ (Ar: Al=27, H=1, O=16) $27 + 48 + 3 = 78$	What is the chemical formula of Magnesium Oxide? (Mg^{2+} and O^{2-}) MgO	What is the chemical formula of Aluminium Chloride? (Al^{3+} and Cl^-) AlCl_3
If 10g of Hydrogen reacted with Oxygen to make 15g of water. How much Oxygen reacted? 5g	Calculate the relative atomic mass if you 40% of Carbon- 13 and 60% Carbon -12? $5.2 + 7.2 = 12.4$	Convert 250cm^3 into dm^3 $250 / 1000 = 0.25\text{dm}^3$	Convert 140cm^3 into dm^3 $140 / 1000 = 0.14\text{dm}^3$	Convert 0.7kg into grams $0.7 \times 1000 = 700\text{g}$
Which equation links Mass, Volume and Concentration. Mass = Mr x Moles	Calculate the concentration if 5g is dissolved in 100cm^3 $100 / 1000 = 0.1$ $5 / 0.1 = 50\text{g/dm}^3$	Calculate the mass dissolved in 200cm^3 of a 5.7g/dm^3 solution $5.7 = \text{Mass} / 0.2$ $5.7 \times 0.2 = 1.14\text{g}$	Calculate the percentage of O in H_2O (Ar: H=1, O=16) $(16 / 18) \times 100 = 88.9\%$	Calculate the percentage of O in $\text{Mg}(\text{OH})_2$ (Ar: H=1, O=16, Mg=24) $(32 / 58) \times 100 = 55.1\%$
HT- Only Which equation links Moles, Mass and Mr Mass = Mr x Moles	HT- Only How many moles are in 15g of H_2O (Ar: H=1, O=16) $15 = 18 \times \text{moles}$ $15/18 = 0.83$	HT- Only How many molecules is in 15g of H_2O. Avogadro's constant 6.02×10^{23} $0.83 \times 6.02 \times 10^{23} = 4.99 \times 10^{23}$	HT- Only How many moles are in 20g of MgSO_4 (Ar: Mg=24, S=32, O=16) $20 = 120 \times \text{moles}$ $20/120 = 0.17$	HT- Only How many molecules are in 20g of MgSO_4 (Ar: H=1, O=16) Avogadro's constant 6.02×10^{23} $0.17 \times 6.02 \times 10^{23} = 1.02 \times 10^{23}$

C4 – Chemical changes

Tin Oxide + Carbon → Tin + Carbon Dioxide What was oxidised? Carbon	Tin Oxide + Carbon → Tin + Carbon Dioxide What was reduced? Tin Oxide	Why can carbon be used to extract some metals? Carbon is more reactive	Name an acid to make Tin Chloride Hydrochloric Acid	Name an acid to make Tin Nitrate Nitric Acid
Name an acid to make Tin Sulphate Sulphuric Acid	Why is an oxide added to excess? To ensure all the acid has reacted	How is the excess removed from the beaker? Filtration	Why is the salt solution left in a drying oven? To evaporate the water	Which ions are in the following: Acids: H⁺ Alkali: OH⁻
Write an ionic equation for neutralisation? H⁺ + OH⁻ → H₂O	What indicator can be used to identify Acids and Alkali? Universal Indicator	What colour will the following go in universal indicator? Acid: Red Alkali: Purple Neutral: Green	What piece of apparatus can be used to identify pH more accurately? pH Probe	What conditions are needed to do electrolysis? Molten or <u>Dissolved</u>
Which electrode will Ca²⁺ ions go to? Why? Cathode → Opposite charges attract	Which electrode will F⁻ ions go to? Why? Anode → Opposite charges attract	What is formed at the cathode in the electrolysis of Sodium Chloride solution. Why? Hydrogen, Sodium more reactive than Hydrogen	What is formed at the anode in the electrolysis of Sodium Chloride solution. Why? Chlorine, Chlorine is in group 7	What is formed at the following electrodes in the electrolysis of Copper Nitrate solution? Anode: Oxygen Cathode: Copper

C5 – Energy changes

In an exothermic reaction the temperature Increase	In an exothermic reaction energy is released to the surroundings	State an example of an exothermic reaction Combustion	In an endothermic reaction the temperature decreases	In an endothermic reaction energy is absorbed <u>From</u> the surroundings.										
Which piece of apparatus is used to measure temperature? Thermometer	Which piece of apparatus can be used to stop energy escaping out of the sides? Polystyrene cup	Which piece of apparatus can be used to stop energy escaping out of the top? Plastic lid	Adding different volumes of sodium hydroxide to hydrochloric acid and measure the maximum temperature IV: Volume of NaOH DV: Max Temp CV: Conc NaOH, Vol HCl	Describe how a Catalyst works? Lowers the activation energy, by providing an alternative pathway										
Draw an energy diagram for an endothermic reaction, Label <u>Activation energy</u> and change in energy 	Draw an energy diagram for an exothermic reaction, Label <u>Activation energy</u> and change in energy 	HT Only In terms of bonds why is a reaction endothermic More energy is absorbed for bond breaking then is released in bond making	HT Only- Calculate the overall energy change $ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} + \text{Cl}-\text{Cl} \longrightarrow \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{Cl} \\ \\ \text{H} \end{array} + \text{H}-\text{Cl} $ Some bond dissociation energies are given in the table. <table border="1"> <thead> <tr> <th>Bond</th> <th>Bond dissociation energy in kJ per mole</th> </tr> </thead> <tbody> <tr> <td>C-H</td> <td>413</td> </tr> <tr> <td>C-Cl</td> <td>327</td> </tr> <tr> <td>Cl-Cl</td> <td>243</td> </tr> <tr> <td>H-Cl</td> <td>432</td> </tr> </tbody> </table> 4 x 413 = 1652 1 x 327 = 243 1895 3 x 413 = 1239 1 x 327 = 327 1 x 432 = 432 = 1998 1895 - 1998 = -103		Bond	Bond dissociation energy in kJ per mole	C-H	413	C-Cl	327	Cl-Cl	243	H-Cl	432
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