Name: Form:

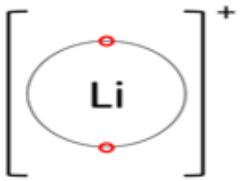
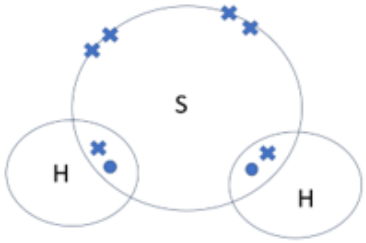
SCIENCE FUNDAMENTAL KNOWLEDGE QUIZ BOOKLET

Key Stage 4
Paper 1
Chemistry

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 water? - **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. So 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 Latice**	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 2, how does it react? What ion would form? **Loses 2 electrons** **Mg^{2+}**	Oxygen is in group 6, how does it react? What ion forms? **Gains 2 electrons** **O^{2-}**	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. So 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

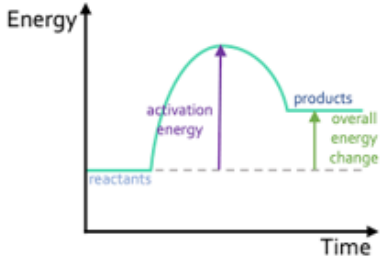
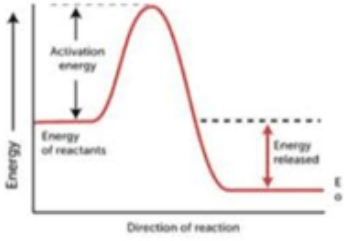
C3 – Quantitative chemistry

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=24 , S= 32 O=16) **24 + 32 + 64 = 120**	Calculate Mr of $Al(OH)_3$ (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 = 0.25dm^3**	Convert 140cm^3 into dm^3 **140 / 1000 = 0.14dm^3**	Convert 0.7kg into grams **0.7 x 1000 = 700g**
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 = 50g/dm^3**	Calculate the mass dissolved in 200cm^3 of a 5.7g/dm^3 solution **5.7 = Mass / 0.2** **5.7 x 0.2 = 1.14 g**	Calculate the percentage of O in H_2O (Ar: H=1, O=16) **(16 / 18) x 100 = 88.9%**	Calculate the percentage of O in $Mg(OH)_2$ (Ar: H=1, O=16, Mg=24) **(32 / 58) x 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 x moles** **15/18 = 0.83**	**HT- Only** How many molecules is in 15g of H_2O. Avogadro's constant 6.02x10^{23} **0.83 x 6.02 x 10^{23} =4.99x10^{23}**	**HT- Only** How many moles are in 20g of $MgSO_4$ (Ar: Mg=24, S=32, O=16) **20 = 120 x moles** **20/120 = 0.17**	**HT- Only** How many molecules are in 20g of $MgSO_4$ (Ar: H=1, O=16) Avogadro's constant 6.02x10^{23} **0.17 x 6.02x10^{23} = 1.02x10^{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? **$H^+ + OH^- \rightarrow H_2O$**	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 Dissolved**
Which electrode will Ca^{2+} 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** From 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 Activation energy and change in energy 	Draw an energy diagram for an exothermic reaction, Label Activation energy 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**  Some bond dissociation energies are given in the table. **Bond** / **Bond dissociation energy in kJ per mole** C–H: 413 C–Cl: 327 Cl–Cl: 243 H–Cl: 432	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