Assessment Schedule – 2012

Chemistry: Demonstrate understanding of aspects of selected elements (90933)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	Mg is 2,8,2 Al is 2,8,3 S is 2,8,6 (may draw electron arrangements)	• Writes or draws correct electron arrangements for 2 elements.		
(b)(i)	Mg is a metal. S is a non-metal	• Identifies an element correctly as a metal or non-metal.		
(ii)	Magnesium reacts with sulfur to form magnesium ions and sulfide ions. Magnesium loses (2) electrons to form magnesium ions and sulfur gains (2) electrons to form sulfide ions, resulting in the compound magnesium sulfide.	• Identifies that metals lose electrons.	• Links the formation of MgS to electron transfer and Mg^{2+} and S^{2-} ions.	• Explanation links the formation of the ions Mg^{2+} / S^{2-} to electron transfer & the ratio of Mg:S.
(c)	A grey strip of magnesium ribbon reacts with the colourless gas oxygen by burning with a bright white light. White smoke is given off and a white ash remains after the reaction. Yellow solid sulfur powder burns in oxygen (colourless gas) with a blue flame releasing a white pungent gas. The magnesium is reacting with oxygen to form the (ionic) compound magnesium oxide. $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ The sulfur atoms react with oxygen atoms to form molecules of sulfur dioxide. $S(s) + O_2(g) \rightarrow SO_2(g)$ (States are not required in balanced equations.)	• Identifies that non-metals gain or share electrons. • States ONE observation of either Mg or S reacting with oxygen. • Writes a word equation.	• Links observations of Mg or S burning in oxygen to the relevant products. • Writes unbalanced symbol equations for both reactions. (Correct formulae.)	• Explanation links observations of Mg and S burning to the relevant chemical species. • TWO balanced symbol equations.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	2m	3m	2e	3e

TWO (a)	ammonium chloride + calcium hydroxide → ammonia + calcium chloride + water $2NH_4Cl(s) + Ca(OH)_2(s) \rightarrow 2NH_3(g) + CaCl_2(s) + 2H_2O(g)$	• Writes a correct word equation from either (a) or (c), OR correctly identifies the three products of this reaction.	• Writes an unbalanced symbol equation that has correct formulae for each chemical species for (a) or (c).	• Writes a balanced equation for the reaction of either ammonium chloride and calcium hydroxide or ammonia with water.
(b)	Ammonia gas is less dense than air, so can be collected by air displacement in an upside down test tube.			
(c)	Ammonia is very soluble in water, so when exposed to water, the gas quickly dissolves in water, the amount of gas present is reduced, so pressure inside the test tube is reduced and outside air pressure pushes the level of water up into the test tube. $NH_3(g) + H_2O(\ell) \rightarrow NH_4^+(aq) + OH^-(aq)$ OR $NH_3(g) + H_2O(\ell) \rightarrow NH_4OH(aq)$ (States are not required.)	• Identifies NH_3 gas as less dense than air/ lighter • Correctly identifies the solubility of ammonia.	• Links solubility of ammonia in water to the rise in water level.	• Elaborates on solubility of ammonia in water and how it causes the water level to rise, and discusses reduced amount of gas being replaced by water.
(d)(i)	A piece of damp litmus paper would turn blue in ammonia gas.	• Identifies damp litmus paper will turn blue.	• Links blue litmus paper to basic/alkaline nature of NH_3	• Justifies answer by linking to basic nature of solution and presence of increased concentration of OH^-.
(ii)	pH > 7. Ammonia reacts with water to form OH^- ions which means there is a higher concentration of OH^- than H_3O^+ so the solution is an alkali / basic and has a pH > 7.	• Identifies NH_3 gas as basic / alkaline / pH > 7.		

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	2m	3m	2e	3e

THREE (a) (b)	Blue litmus paper will turn red and then white. When chlorine gas reacts with water, it forms an acidic solution (with pH < 7), so the blue litmus paper turns red. The litmus paper is then bleached white as the chlorine water reacts with the substances that cause colour, to decolourise them. $Cl_2(g) + H_2O(\ell) \rightarrow HOCl(aq) + HCl(aq)$ Disinfectants are used to destroy micro-organisms. The chlorine solution is acidic in nature and contains both HOCl and HCl. This denatures the enzymes in the microbes $HOCl$ /OCl^- kill micro-organisms by attacking their cell walls (through an oxidation process) and destroying enzymes and structures inside the cell. The chlorine based solutions are useful in hospitals because they stop (slow down) the spread of infectious disease.	• Describes how chlorine reacts with water. • Describes a colour change in the blue litmus paper. • States chlorine water is acidic or a bleach. • Identifies ONE correct product of the reaction between water and chlorine. • States that the chlorine solution kills micro-organisms.	• Links a chemical property of chlorine water to a colour change in the litmus paper. • Correctly identifies both products of the reaction between water and chlorine. • Links a chemical property of the chlorine solution to its use as a disinfectant.	• Links a chemical property of chlorine water to BOTH colour changes in blue litmus paper. • Writes a balanced equation for the reaction between chlorine and water. • Explains a chemical property of the chlorine-based solutions to its use as a disinfectant and links it specifically to its use in hospitals.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	2m	3m	2e	3e

FOUR (a)	An alloy is a metal made by combining two or more elements (usually metals) to give improved properties such as greater strength or greater resistance to corrosion.	• An alloy is a metal made by combining/ mixing two or more elements (usually metals) *and then insinuates different properties achieved. Or gives an example*		
(b)	The structure of a metal would show the atoms are neatly packed together. The atoms can slide past each other relatively easily. This makes the metal malleable so it can be shaped without breaking. By alloying this metal, another element has been added and its atoms do not sit neatly within the metal structure. Now these atoms are not easily able to slide across each other so the metal is harder and it is not as easy to change its shape.	• Describes how atoms in a pure metal are perfectly aligned, but not in an alloy.	• Explains how the structure of an alloy makes it harder than the pure metal.	
(c)(i)	Silver is an attractive metal that is a lustrous white and malleable so can be turned into jewellery or other precious objects. Silver is quite unreactive, so will not readily react with oxygen in the air, water, food or beverages, making it useful to use in jewellery or other precious objects.	• Describes a physical or a chemical property of silver.		
(ii)	Sterling silver is an alloy made up of mostly silver (92.5%) and some copper (7.5%). Silver is attractive and lustrous white in colour. It has a high melting point (962^{o}C) but is not very hard (2.5 on the Moh scale of hardness). Copper is also an attractive metal but pink-brown in colour. Copper has a higher melting point than silver (1084^{o}C) and is a little harder (3.0 on Moh's scale). Neither metal readily reacts with acid but silver is less reactive than copper. Advantages of sterling silver over pure silver: • Alloy is stronger/harder because the copper atoms are smaller than the silver ones so the atoms don't move across each easily as the atoms in pure silver metal can, making sterling silver stronger/harder than pure silver. (Silver is more expensive than copper so using an alloy with 92.5% silver compared to pure silver is cheaper – not linked to a property, so **cannot** be used as evidence for A, M or E.) Disadvantages of sterling silver over pure silver: • Alloy is more brittle and/or more difficult to shape/bend than the pure metal because the atoms in an alloy can't move across each other as easily as those in a pure metal. (Less malleable and ductile than pure silver.) • Since copper is more reactive than silver, by adding it to silver as an alloy it will make the alloy less resistant to corrosion than the pure metal. (The copper will oxidise more readily.)	• Describes a physical or chemical property of copper. • Describes an advantage of alloying sterling silver. • Describes a disadvantage of alloying sterling silver.	• Links ONE physical or chemical property to ONE **advantage** of alloying silver and copper to make sterling silver. • Links ONE physical or chemical property to ONE **disadvantage** of alloying silver and copper to make sterling silver.	• An advantage and a disadvantage of alloying silver and copper to make sterling silver, linked to a chemical or physical property.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1a	2a	3a	4a	2m	3m, but links to only physical OR chemical property.	Explains how one property of each metal links to an advantage and disadvantage.	Links and explains how more than one property of either metal links to an advantage and disadvantage.

Judgement Statement

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 11	12 – 18	19 – 24	25 – 32