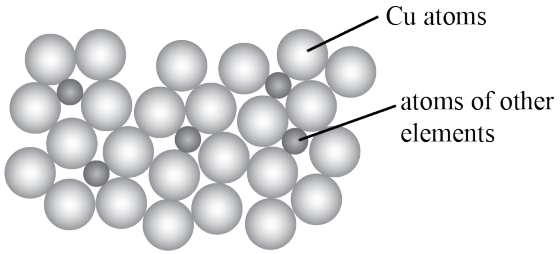
Assessment Schedule – 2019

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Copper is used for water pipes as it is malleable and unreactive with water. Copper is used to make electrical wires as it is ductile and unreactive with oxygen in the air.	• Gives one use of copper. • Gives one relevant physical or chemical property of copper.	• One use of copper linked to a physical or chemical property.	• Two uses of copper linked to physical and chemical properties.
(b)(i)	Alloying metals increases the hardness and strength, as alloys contain different metal atoms, which makes it harder for the layers to slide over each other. In brass, some copper atoms are replaced with zinc atoms, and so the layers of atoms cannot slide over each other as easily, so this makes it harder, which makes brass more suitable than copper for door knobs.  	• Brass is harder and / or stronger than pure copper. • Diagram.	• Links alloys to being harder due to substitution of some copper atoms with zinc atoms.	• Correct explanation linked to substitution of some copper atoms with zinc atoms, including a diagram.
(ii)	Lead would increase the malleability. Aluminium would increase the corrosion resistance.	• Correct property for lead or aluminium.	• Correct reasons (increase) for both metals linked to their properties.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	3a	4a	2m	3m	2e with minor error	2e

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Elements form ions to fill up their valence electron shell and become stable. The formation of potassium ions and chloride ions differs because potassium is a metal in group 1 of the periodic table, and chlorine is a non-metal in group 17 of the periodic table. Electron arrangement of K^+ is 2,8,8; K is 2,8,8,1. K has one valence electron, which it loses to form potassium ions with a charge of 1+, K^+, since the ions have one more +ve proton than –ve electron. Electron arrangement of Cl^- is 2,8,8; Cl is 2,8,7. Chlorine has 7 valence electrons, so it gains 1 electron to form chloride ions with a charge of 1–, Cl^-, since the ions have one more –ve electron than +ve protons.	• Identifies that K loses 1 electron / forms a 1+ ion. • Identifies that Cl gains 1 electron / forms a 1– ion. • Correct e-arrangement for K^+. OR Correct e-arrangement for Cl^-.	• Links position on the periodic table to the loss / gain of electrons for one element. OR The number of valence electrons to the charge on the ion formed for one element.	• Explains why ions form (stability via a full valence shell) and the differences in the formation of each ion with respect to position on periodic table. AND Electron gain / loss and the charge of the ion formed for both elements.
(b)	Lithium floats on water and gently fizzes, giving off hydrogen gas until it disappears. Less heat is produced, so Li does not melt / burn. A colourless solution of LiOH is formed. $2Li(s) + 2H_2O(\ell) \rightarrow 2LiOH(aq) + H_2(g)$ Sodium also floats on the surface, but enough heat is given off to melt the sodium (sodium has a lower melting point than lithium and the reaction produces heat faster) and it melts almost at once to form a small silvery ball that dashes around the surface, being pushed by the hydrogen being formed. A colourless solution of sodium hydroxide is formed. Sometimes the hydrogen may catch fire to burn with an orange flame. (The colour is due to sodium compounds.) The reaction of sodium with water is more vigorous than the reaction with lithium.	• Two observations for one reaction.	• Two observations for one reaction linked to the species. • Unbalanced equation.	• Compare and contrast observations linked to the species. AND Correct balanced equation (from either b or c).
(c)(i) (ii)	Lithium + hydrochloric acid → lithium chloride + hydrogen $2Na + H_2SO_4 \rightarrow Na_2SO_4 + H_2$	• Word equation completed.	• Unbalanced equation completed.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence	1a	2a	3a	4a	2m	3m	2e with minor error	2e

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Ozone is an unstable gas comprised of three oxygen atoms. The cell is damaged as oxidation occurs. Therefore, the food is preserved, as the bacteria are killed / inhibited. Sulfur dioxide is often used to preserve foods such as dried fruit, sausages, and wine because it slows down the growth of bacteria and mould (accept kill). SO_2 is a reductant; it removes oxygen from cells in plant materials to help soften the cell walls to help food dry more easily. It also removes oxygen from microbes, causing an environment in which the microbes cannot reproduce or grow, so food is less likely to spoil. SO_2 destroys enzymes that darken foods that have been cut. (It also has fungicidal and insecticidal properties.) (Or accept other relevant reaction of sulfur dioxide.) Essentially, both ozone and sulfur dioxide react with the microorganisms to kill or inhibit them, so they can't reproduce or grow, therefore the food is preserved.	• Recognises that ozone OR SO_2 reacts with / impacts on microorganisms. • Describes one property of sulfur dioxide or ozone.	• Explains how ozone affects microorganisms. • Explains one way sulfur dioxide affects microorganisms.	• Comprehensive answer comparing and contrasting ozone and sulfur dioxide as food preservatives.
(b)	Sulfur is a yellow powder. To react with oxygen, it must be heated on a deflagrating / metal spoon until it melts, and it will turn into a red liquid. This must then be placed in a jar of oxygen. It will burn with a blue flame and a pungent / smelly, colourless gas that is choking. Sulfur dioxide is produced. $S(s) + O_2(g) \rightarrow SO_2(g)$	• One condition / observation described.	• Observations linked to species and equation correct. *must have heat, oxygen, pungent gas in explanation*	• Full elaboration with observations linked to species, conditions and balanced equation.
(c)	To conduct electricity, a solution must contain charged particles. Water molecules are electrically neutral, so cannot conduct electricity. When sulfuric acid forms a solution with water, ions are formed. Ions are charged particles and, therefore, can conduct electricity. [$H_2SO_4(\ell) + 2H_2O(\ell) \rightarrow 2H_3O^+(aq) + SO_4^{2-}(aq)$ OR $H_2SO_4(\ell) + 2H_2O(\ell) \rightarrow H_3O^+(aq) + HSO_4^-(aq)$ OR $H_2SO_4(\ell) \rightarrow 2H^+(aq) + SO_4^{2-}(aq)$]	• Recognises that charged particles conduct electricity OR that ***electrically*** neutral water molecules do not.	• Links sulfuric acid to forming ions in solution.	• Comprehensive understanding of the nature of conductivity of water and of sulfuric acid solution.

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

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 12	13 – 18	19 – 24