Assessment Schedule

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Elements form ions to full up their valence electron shell and become stable. The formation of magnesium ions and sulfide ions differs because magnesium is a metal in group 2 of the periodic table, and sulfur is a non-metal in group 16 of the periodic table. Mg has two valence electrons, which it loses to form magnesium ions with a charge of 2+, Mg^{2+}, since the ions have two more +ve protons than –ve electrons. Electron arrangement of Mg^{2+} is 2,8. Sulfur has 6 valence electrons, so it gains 2 electrons to form sulfide ions with a charge of 2–, S^{2-}, since the ions have two more –ve electrons than +ve protons. Electron arrangement of S^{2-} is 2,8,8.	• Identifies that Mg loses 2 electrons / forms a 2+ ion • Identifies that S gains electrons / forms a 2– ion. • Correct e-arrangement for Mg^{2+} • Correct e-arrangement for S^{2-}.	• Links position on the periodic table to the loss / gain of electrons. OR The number of valence electrons to the charge on the ion formed.	• 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. AND
(b)	Sodium floats on the surface of water fizzing with enough heat given off to melt the sodium. It forms silvery balls that dash around the surface, being pushed by the hydrogen being formed. Magnesium reacts in steam to produce white magnesium oxide and hydrogen gas.	• An observation for one reaction.	• Two observations for one reaction linked to the species.	Two observations for each reaction linked to the species.
(c)	Both magnesium and sulfur react with oxygen to form oxides. Magnesium can be heated using a Bunsen burner to allow it to react with oxygen. Sulfur can be set alight on a deflagration spoon and placed in a jar of oxygen to allow a reaction to occur. Magnesium produces a bright, white light when heated and forms a white / grey powdery solid of magnesium oxide. Sulfur burns with a blue light in oxygen and produces the colourless gas sulfur dioxide. $2Mg + O_2 \rightarrow 2MgO$ $S + O_2 \rightarrow SO_2$	• An observation for one reaction.	• Observations for Mg reaction linked to species • An unbalanced symbol equation. • Observations for S reaction linked to species	• Compares and contrasts, including two observations and conditions for magnesium and for sulfur, and gives both balanced symbol equations.

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

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(i) (ii)	Alloys contain a mixture of metals / elements that can give them desired characteristics. The process of alloying is used to change the chemical composition of gold and improve its properties. Alloying metals increases the hardness, as alloys contain atoms of different sizes, which makes it harder for the layers to slide over each other. Different alloying elements each have their own effect on the properties of gold. Copper could increase the strength. Other elements, such as silver, may be alloyed to add shine or whiteness. Neither copper nor silver are very reactive, so are suitable as alloys for use in dentistry.	• Describes the nature of an alloy. • Identifies a property of the gold alloy.	• Explains how a desirable property can be obtained by alloying. • Gives an example of a physical **or** chemical property of silver or copper (or other metal) linked to its usefulness for dentistry.	• Gives an example of a physical **and** chemical property of silver or copper (or other metal) linked to its usefulness for dentistry.
(b)	• Aluminium's low density makes it a good choice for long distance powerlines and aeroplanes where less weight is an advantage. Whereas iron has a much higher density. • Aluminium is malleable, which fits with all three uses, because it can be moulded into a sheet and bent. Iron is less malleable and is harder to bend. • Aluminium is corrosion-resistant due to its oxide layer that is formed because of aluminium's reactivity with oxygen in the air, so it will withstand the conditions of the outside (air and moisture) which fits with all three uses because it prevents corrosion. Iron corrodes / rusts easily so would wear away / lose strength. • Aluminium is ductile, so easy to draw into wires and a good electrical conductor, which makes it useful for long distance wires. Iron is not as ductile and more difficult to draw into wires.	• Identifies a relevant physical property of aluminium. • Identifies a relevant physical property of iron. • Identifies a relevant chemical property of aluminium. • Identifies a relevant chemical property of iron.	• Links TWO named and relevant properties to uses for aluminium. • Links TWO properties of iron to disadvantage for the uses given. • Links ONE property of aluminium that is an advantage and ONE property of iron that is a disadvantage.	• Links both aluminium and iron's chemical and physical properties to the uses and justifies why aluminium is used rather than iron.

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Uses of nitrogen: It is used to make fertilisers, nitric acid, nylon, dyes, food preservation and explosives.	• Gives two uses of nitrogen.		
(b)(i) (ii)	Ammonia is very soluble in water, so when exposed to water, the gas quickly dissolves in water, the amount of gas present is reduced. A piece of damp litmus paper would turn blue in ammonia gas. The 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. $NH_3(g) + H_2O(l) \rightarrow NH_4^+(aq) + OH^-(aq)$ OR $NH_3(g) + H_2O(l) \rightarrow NH_4OH(aq)$ (States are not required.)	• Describes ammonia dissolving into the water. • Identifies damp litmus paper will turn blue. • Identifies NH_3 gas as basic / alkaline / pH > 7.	• Links solubility of ammonia in water to the rise in water level. • unbalanced equation. • Links blue litmus paper to basic / alkaline nature of NH_3.	• Elaborates on solubility of ammonia in water, including balanced symbol equation and how it causes the water level to rise. AND Justifies answer by linking to basic nature of solution and presence of increased concentration of OH^-.
(c)(i) (ii) (iii)	Graphite / Diamond / Graphene Graphite and graphene can conduct electricity because each C atom is bonded to three other C atoms, which means each C atom has a free electron which is able to carry charge. Diamond cannot conduct electricity because each C atom is bonded to 4 other C atoms so there are no free electrons. Graphene is made up of one layer of carbon atoms which will make it easier to mould into different shapes, compared with the 2D structure of graphite. Whereas graphite is made up of layers which slip over each other (due to weak attractions between them) so it cannot be molded as easily.	• Correct. • One correct description for one allotrope. • Description of graphene more useful than graphite.	• Explains why graphite and graphene can conduct electricity. • Explains why graphene more useful than graphite.	• Explains why graphite and graphene can conduct electricity and diamond cannot, and why graphene is more useful for making wires than graphite.

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

Cut Scores

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