Assessment Schedule – 2008

Chemistry: Describe selected non-metals and their compounds (90173)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	Colourless, gas at room temperature, slightly soluble in water, low melting point and low boiling point, denser than air, odourless, tasteless.	TWO correct.		
(b)	Nitrogen is extracted from air. Hydrogen is extracted from methane / natural gas / water. An iron catalyst is required. The catalyst is required because the reaction is not efficient enough without one. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	Correctly identifies ONE raw material for the process AND the catalyst is correctly identified OR a balanced equation.	Identifies the raw materials, the conditions and catalyst AND why the catalyst is required AND writes the balanced equation. States are not required. (Could be represented in a diagram or flow chart.)	
TWO	Water is chlorinated to make it safe for human consumption. The chlorine reacts with the water to form an acidic solution because it is soluble in water. $Cl_2(g) + H_2O(l) \rightarrow HCl(aq) + HOCl(aq)$ The solution is acidic due to the increase in the concentration of H_3O^+ ions in the solution. However, the chlorine only needs to be added in very small amounts so there is no harm to humans. The HOCl, hypochlorous acid, acts as a disinfectant and kills any bacteria in the water. Only very small amounts of chlorine are required for this to be effective. The hypochlorous acid acts as an oxidant on the bacteria, destroying them.	Describes the formation of an acidic solution OR describes HOCl ability to act as oxidant / disinfectant on pathogens.	Recognises that chlorine reacts with water to form an acidic solution AND writes balanced equation. (States are not required.) OR links formation of HOCl to properties of acting as disinfectant / oxidant on pathogens.	Recognises that chlorine reacts with water to form an acidic solution AND applies properties of chlorine to do this OR qualifies that the concentration is not harmful to humans AND writes balanced equation. (States are not required.) AND applies knowledge of HOCl properties with its actions on pathogens.

THREE	$SO_2(g) + H_2O(l) \rightarrow H_2SO_3(aq)$ The resulting solution of sulfurous acid or sulfuric acid is acidic in nature and has a pH of less than 7. Impact of acid rain on people and the environment could include: **People:** • lung disorders in people including asthma. Can be caused by acid rain irritating the respiratory system • irritate skin and eyes. **Environment** • lowered pH in soil and water can kill plants and animals • acid rain (fog, hail and snow) is deposited on land and water – lakes, streams, oceans have their pH affected. Heavy metals can be leached into the waterways • destroys buildings and statues made of carbonate compounds, eg limestone, marble, because the acid rain reacts with the carbonates – affects paint on vehicles, allowing cars to rust more than in areas that do not have acid rain.	Describes TWO effects of acid rain on either people or the environment OR writes an equation forming sulfurous or sulfuric acid.	Writes an equation forming sulfurous or sulfuric acid and links to nature of solution (lower pH or increased acidity) AND explains TWO impacts of acid rain.	Writes an equation forming sulfurous or sulfuric acid and links to nature of solution AND discusses ONE impact of acid rain on people and ONE impact on the environment.
FOUR (a)	Allotropes are made up of atoms of the same element but the atoms are arranged differently so they form different substances. Oxygen has two allotropes, oxygen, O_2, and ozone, O_3.	Correct definition of allotropes, using O_2 and O_3 as examples.		

(b) and (c)	Most of the ozone is found in the stratosphere. This higher level of ozone has positive effects for people as it blocks harmful UV rays from striking the Earth's surface. These rays can cause skin cancer in people and animals. **people** can help protect from skin cancer protects DNA from damage and possible negative mutations. **environment** protects UV from damaging sensitive crops and reducing yields protects phytoplankton which in turn protects human food supplies in ocean. At lower levels, ozone is part of photochemical smog due to chemical reactions of oxygen and nitrogen oxides, which has a negative effect on both people and the environment. **People and animals** Photochemical smog can cause respiratory problems, asthma, unconsciousness and death in people. Breathing ozone can cause chest pains and reduce lung function. It is toxic in low concentrations. **Environment** At lower levels, photochemical smog can damage leaves and reduce crop yields, inhibit plant growth, increased susceptibility to disease reduces air quality degrade plastics, cause visual pollution.	Recognises that the lower level ozone causes negative effects OR the higher level ozone has positive effects AND Describes at least ONE effect for people OR the environment for the ozone level correctly described.	Recognises that the lower level ozone causes negative effects AND the higher level ozone has positive effects AND Explains at least ONE effect for EACH ozone level.	Recognises that the lower level ozone causes negative effects AND the higher level ozone has positive effects AND Discusses at least TWO effects, ONE for people and ONE for the environment for EACH ozone level.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of FOUR opportunities answered at Achievement level or higher. $4 \times A$	Total of at least FIVE opportunities answered with TWO at Merit level or higher. $2 \times M + 3 \times A$	Total of at least FIVE opportunities answered with TWO at Excellence level and ONE at Merit level or higher. $2 \times E + 1 \times M + 2 \times A$