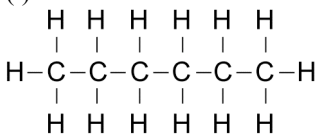
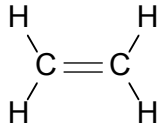
Assessment Schedule – 2008

Chemistry: Describe properties and reactions of carbon and its compounds (90648)

Evidence Statement

Question	Evidence	Achievement	Merit	Excellence
ONE (a)	(i)  (ii)  (iii) ethanol (iv) ethanoic acid	THREE names or structures correct. Must have all hydrogen atoms present.		
(b) (c)	Fermentation / anaerobic respiration. (iii) and (iv) / ethanol and ethanoic acid.	Both answers correct.		
(d)	Either fuel can be justified as having a larger impact Propane: • Incomplete combustion / CO and C / soot (and water) • $C_3H_8 + 2O_2 \rightarrow 3C + 4H_2O$ • $C_3H_8 + 3½O_2 \rightarrow 3CO + 4H_2O$ • Health effect – CO is a poisonous gas that can lead to possible brain damage and death, C can irritate the lungs and lead to respiratory problems. • Reduced energy efficiency. Ethanol: • Complete combustion / CO_2 (and water) • Health – non toxic $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ • CO_2 is a greenhouse gas, CO_2 produced in enclosed spaces can result in asphyxiation for humans • Maximum energy efficiency with complete combustion Accept equations for incomplete combustion in lieu (or as well as) those of complete combustion.	Relates observations to complete and incomplete combustion for both fuels OR Identifies one fuel as having a larger impact E.g. propane due to incomplete combustion (or similar statement) or ethanol due to improved efficiency or increase greenhouse effect.	Identifies one fuel as having a larger impact through observations on complete/ incomplete combustion AND attempts to link to specific issues AND TWO unbalanced equations, with correct reactants and products. OR ONE correctly balanced equation.	Compares BOTH fuels AND TWO correctly balanced equations. AND uses them to link the products to specific issues that would impact people AND Justifies why one fuel causes a greater impact. (Incorrect formula for fuel in **balanced** equation reduces the grade to Merit).

TWO	CO_2 is more soluble in cold water than warm. $CO_2 + H_2O \rightarrow H_2CO_3$ or $CO_2 + 2H_2O \rightarrow HCO_3^- + H_3O^+$ Without ocean carbon stores, there would be more carbon dioxide in the atmosphere which contributes to the greenhouse effect and thus, to global warming. This can mean retreat of glaciers, extreme weather events, change in migration and breeding of species, decreased agricultural yields, increased land / ocean temperatures, change in growth patterns of plants. Acidity of oceans is increased if more CO_2 dissolves (or acidity decreases if less CO_2 dissolves). Changes in pH affect marine ecosystems in different ways e.g. increased acidity can result in carbonate structures in marine organisms dissolving.	Identifies CO_2 is more soluble in cold water than warm OR Balanced equation OR Recognises a valid environmental effect.	TWO of: Identifies CO_2 is more soluble in cold water than warm Balanced equation recognises some valid environmental effect.	Identifies CO_2 is more soluble in cold water than warm AND correct balanced equation AND outlines the impact of more CO_2 with an example.
THREE	A: diamond B: graphite C: C-60 / Buckminster fullerene Allotrope C Buckminster fullerene / $C_{60,}$ is a discrete molecule with a specific number of atoms. Although it has strong covalent bonds within the molecule, it has intermolecular attractions which are weak, thus a low melting point. Allotrope A (diamond) and B (graphite) are both covalent networks and have thousands of strong covalently bonded atoms, thus the energy to break the bonds is a lot higher. Even though graphite has weaker forces between layers, melting requires the strong covalent bonds within layers to be broken.	Identifies all three allotropes correctly AND Recognises some link between bonding / structure and melting point.	Full discussion of structure and bonding of A and B related to melting point OR Recognises C_{60} to be molecular. And therefore has weak forces between the molecules, so the melting point is low.	Recognises C_{60} to be molecular. AND Links melting point to strength of attractions within AND between the structures.
FOUR	Crude oil consists of hydrocarbons of different sizes, and thus different boiling points. The oil is heated and the smaller, lighter gases with lower boiling points are collected at the top of the tower. Other fractions with higher boiling points collect lower down, with the heaviest ones (tar) sinking to the bottom.	Recognises that crude oil is a mixture of different sized hydrocarbons. (not just different oils) OR Recognises that fractions separate on the basis of boiling point.	Describes crude oil. AND Relates size of molecule to where it is collected OR Relates boiling point of molecule / fraction to where it is collected OR links size and boiling point of molecules.	Full discussion of the process linking boiling point to the size of molecules and collection point.

Judgement Statement

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