Half Yearly 2007

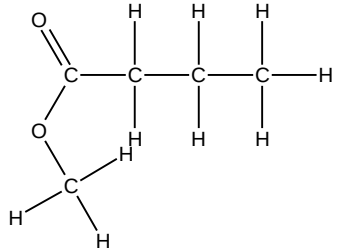
Answers and Marking Scale

Multiple Choice Questions – *1 mark each correct*

1	**B**	2	**C**	3	**D**	4	**B**	5	**C**
6	**D**	7	**C**	8	**C**	9	**D**	10	**C**
11	**D**	12	**C**	13	**A**	14	**B**	15	**B**
16	**C**	17	**A**	18	**D**	19	**C**	20	**D**

Written Responses – *sample answers only some variation is permissible.*

Q	Possible Answer		
	Poor Answer	*Good Answer*	*Best Answer*
21a.	The biomass is fermented by adding yeast to a mixture of water and material.	The biomass is fermented by adding yeast to a mixture of water and material. Oxygen levels are kept low and a suitable temperature is kept.	The biomass must be crushed and dissolved in a fermenter. The oxygen (low) & temperature (25^{o}C) levels are controlled after the yeast is added. The ethanol/water is distilled to purify the ethanol.
21b.	$C_2H_6O_{(l)} \xrightarrow[\text{Refluxing}]{\text{Conc. } H_2SO_4} C_2H_{4(g)} + H_2O_{(l)}$		
21c.	Ethanol is an important solvent, as it will dissolve both polar & non-polar compounds.	Ethanol is an important solvent, as it will dissolve both polar & non-polar compounds. Its structure allows it to dissolve both types of compounds.	Ethanol is an important solvent, as it will dissolve both polar & non-polar compounds. The ethanol molecule has a polar and non-polar end, and this enables it to dissolve both types of compound.
22a.	Sodium hydroxide cannot form a standard solution as it absorbs water from the air.	Sodium hydroxide cannot form a standard solution. Sodium hydroxide solid will absorb water from the air making it impossible to tell how much of the mass is due to the solid.	Sodium hydroxide cannot form a standard solution. Sodium hydroxide solid will absorb water from the air making it impossible to tell how much of the mass is due to the solid. We must standardize it against a standard solution to gain an accurate concentration of the solution.
22b.	Partial set-up for titration procedure including *some* of: • Rinsing • Method • Recording • Averaging • Calculation.	Complete set-up for titration procedure including *most* of: • Rinsing • Method • Recording • Averaging • Calculation.	Complete set-up for titration procedure including *all* of: • Rinsing • Method • Recording • Averaging • Calculation.

23a.	*1 mark* - Correctly identify Anode = Magnesium; plus correct anode / oxidation reaction including states and double arrows $Mg_{(s)}$ à $Mg^{2+}{}_{(aq)} + 2e^-$		
23b.	*1 mark* - Correctly identify Anode = Lead; plus correct anode / reduction reaction including states and double arrows $Pb^{2+}{}_{(aq)} + 2e^-$ à $Pb_{(s)}$		
23c.	*1 mark* - Correctly equation *including states* value OR correct value *Correct value most have appropriate units*	*2 marks* – Correct equation *including states* AND correct value including units $Mg_{(s)} + Pb^{2+}{}_{(aq)}$ à $Mg^{2+}{}_{(aq)} + Pb_{(s)}$ 2.23V	
23d.	Drawing must contain: • Accurate representation • Clear labeling of all components including anode, cathode and salt bridge • Correct charge on the anode (-) and cathode (+) • Clear labeling of electron movement through external circuit *Must not show movement of electrons through salt bridge – incorrect answer negates most understanding*		
23e.	*1 mark* – clear understanding that copper cell will have a lower voltage output than the magnesium cell OR lead will be anode in the cell *Not simply that one cell will have lower voltage output or similar (too general)*	*2 marks* – clear understanding that copper cell will have a lower voltage output than the magnesium cell and lead changes from cathode with magnesium to anode with copper + clear explanation including values to show the differences	
24	*1 mark* – correct equation of self ionization of water including states	*2 marks* – correct equation of self ionization of water including states + water will have increased conductivity at higher temperature due to greater ionization	*3 marks* – correct equation of self ionization of water including states + water will have increased conductivity at higher temperature due to greater ionization + ionization reaction is endothermic and the increased temperature means the [ion] or [product] will increase
25a.			
25b.	Complete set-up for refluxing procedure including: • Heating, use of boiling chips and water bath • Risk assessment – no open flame, boiling chips – identified and explained • Method is logical and sequential • Names of reactants and products should be included • Use of concentrated sulfuric acid catalyst – not just H_2SO_4!		
26a.	*1 mark* – correctly stating pH will decrease OR increase in $[CO_{2(aq)}]$	*2 mark* – correctly stating pH will decrease + relating this increase to increase in $[CO_{2(aq)}]$	*3 mark* – correctly stating pH will decrease + relating this increase to increase in $[CO_{2(aq)}]$ + resulting in higher $[H_3O^+{}_{(aq)}]$
26b.	Since pH = 7.4; $[H_3O^+{}_{(aq)}] = 10^{-7.4} = 3.98 \times 10^{-8}$ M *maximum of 1 for no units for concentration*		

27a.	*1 mark* – the polymer chains are closer together or more tightly packed in high density polythene than in low density polythene OR the lower density polythene tends to have a greater degree of branching on the polymer chains that the high density polymer chains *No marks if the polymer names are not used à one is more tightly packed than the other*	*2 marks* – the polymer chains are closer together or more tightly packed in high density polythene than in low density polythene + the dispersion forces are higher in the high density +/OR the lower density polythene tends to have a greater degree of branching on the polymer chains that the high density polymer chains
27b.	The answer must contain: An assessment supported by: • Descriptions of appropriate advantages – a simple identification or statement of the advantages is a very low level answer – if they are similar, then the description is really an extended version for one advantage – several different areas should be examined • Descriptions of appropriate disadvantages – a simple identification or statement of the disadvantages is a very low level answer – if they are similar, then the description is really an extended version for one disadvantage	
28a.	<u>Good</u> No, I don't agree because alpha particles have very low penetration power. *1 mark for similar*	<u>Best</u> No, I don't agree because alpha particles have *very low penetration power* and would not be readable / detected on the surface of the soil. He would be much better using a soluble gamma source that would ensure the radiation would be easily detected above ground. *2 marks for similar*
28b.	For full marks the student must include: • An identification and description of factors such as: o Penetration o Solubility in water o Half life and how long the isotope will stay in the environment • There must be an assessment of the factors for 3 marks to be awarded	
29a.	$\Delta H = -mC\Delta T$ $= - 250 \times 4.18 \times 24$ $= -25080J$ or $-25.08kJ$ Moles (ethanol) = 1.6 / 46 = 0.035 $\Delta H\ mol^{-1} = -25.08 / 0.035 = -716.6\ kJmol^{-1}$ *For full marks the correct units must be used. 3 marks are easily allocated to each of the three calculations – working must be shown (as per question) for full marks to be awarded.*	Mass of water = 250g C = 4.18 (data sheet) $\Delta T = +24^oC$ Δ Mass ethanol = 1.6g
29b.	<u>1 mark</u> Students have identified errors in the method that would influence whether the value was near the theoretical value	<u>2 marks</u> Students have identified & explained how errors in the method would influence whether the value was near the theoretical value
30a.	For full (3) marks the students must: • Completely label both axes including units • Correctly plot all points • Use a smooth curve to show how the data changes	
30b.	The pH value of the equimolar (or equivalence) point is clearly shown on the graph – a simple number will not be awarded marks – *the questions specifically asks for the marks on the graph*	
30c.	<u>1 mark</u> The student has made a calculation but has not correctly changed the volume to litres OR a correct calculation is made but no units (or incorrect units) are used for concentration	<u>2 marks</u> The student has made a calculation after correctly changed the volume to litres. Correct units are used for concentrations.