Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/21**

Paper 2 Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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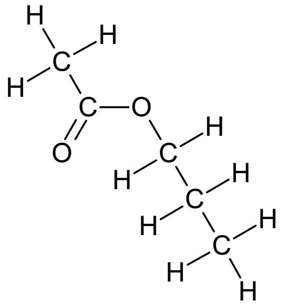
Question	Answer	Marks
A1(a)	Poly(propene) (1)	**1**
A1(b)	PVC (1)	**1**
A1(c)	Protein (1)	**1**
A1(d)	Starch (1)	**1**
A1(e)	*Terylene* / polyester (1)	**1**
	Total:	**5**

Question	Answer	Marks
A2(a)	**1 mark for any one of:** • Low melting point / low boiling point • Does not conduct electricity • Does not conduct heat	**1**
A2(b)(i)	$H_2S \rightarrow H^+ + HS^-$ / $H_2S \rightarrow 2H^+ + S^{2-}$ (1)	**1**
A2(b)(ii)	Incomplete dissociation / partial dissociation (1)	**1**
A2(c)	Moles of H_2S = 0.005 (1) Moles of KOH = 0.010 / moles of KOH = 2 × moles of H_2S (1) Volume = 66.7 cm^3 (1)	**3**
A2(d)(i)	**1 mark each for any two of:** • High melting point • Does not conduct electricity as a solid • Soluble in water • Conducts electricity as a molten liquid	**2**
A2(d)(ii)	Magnesium (atom) loses 2 electrons (1) Sulfur (atom) gains 2 electrons (1)	**2**
	Total:	**10**

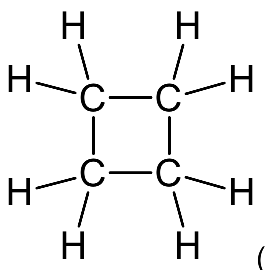
Question	Answer	Marks
A3(a)	Flavouring (1)	1
A3(b)	 (1)	1
A3(c)(i)	(Net) movement of a substance from a region of high concentration to low concentration (1)	1
A3(c)(ii)	Rate of diffusion increases (1) Particles have more energy / particles are moving faster (1)	2
A3(c)(iii)	Methyl methanoate / HCO_2CH_3 (1) Lowest relative formula mass (1)	2
	Total:	7

Question	Answer	Marks
A4(a)	All **three** conditions correct (2 marks) **Two** correct conditions (1 mark) • Temperature: 350 to 500 °C • Pressure: 150 to 1000 atmospheres • Catalyst: iron	2
A4(b)	Rate of reaction increases **AND** particles closer together / more particles per unit volume / more crowded particles (1) More collisions per second / increased collision frequency / collisions more often (1)	2
A4(c)	Lowers the activation energy (1)	1
A4(d)	Percentage of N in ammonium nitrate = 35% (1) Percentage of N in urea = 47% (1) **OR** Both formulae contain two nitrogen atoms (1) Urea has a lower relative formula mass (1)	2
	Total:	7

Question	Answer	Marks
A5(a)	sodium magnesium **X** lead silver Sodium, magnesium, lead and silver in correct order (ignore **X**) (1) **X** directly between magnesium and lead (1)	**2**
A5(b)(ii)	Zinc / iron / tin (1)	**1**
A5(c)	**X**O + Mg $\rightarrow$ MgO + **X** (1)	**1**
A5(d)	**X** + Pb^{2+} $\rightarrow$ **X**$^{2+}$ + Pb (1)	**1**
A5(e)	**Conducts electricity** Electrons can move (1) **High melting point** Attraction between sea of electrons and (positive) ions / forces between sea of electrons and ions (1) Attraction is very strong / force is very strong / it takes a lot of energy to overcome these strong forces (1) (this mark is dependent on attraction between (positive) ions and electrons / forces between ions and electrons)	**3**
	Total:	**8**

Question	Answer	Marks
A6(a)(i)	Global warming / ice caps melting / sea level rising (1)	**1**
A6(a)(ii)	Rotting vegetation (1)	**1**
A6(a)(iii)	Ozone depletion (1)	**1**
A6(b)	Correct 'dot-and-cross' diagram for $CFCl_3$(1)	**1**
A6(c)(i)	Reaction of nitrogen with oxygen / $N_2 + O_2 \rightarrow 2NO$ (1)	**1**
A6(c)(ii)	NO (is reduced) to make N_2 / $2NO \rightarrow N_2 + O_2$ (1) CO (is oxidised) to make CO_2 / $2CO + O_2 \rightarrow 2CO_2$ (1)	**2**
A6(d)	HNO_2 (1)	**1**
	Total:	**8**

Question	Answer	Marks
B7(a)	**1 mark each of any four from:** • Use of **excess** silver oxide • Use of nitric acid • Warm the solution / use warm nitric acid / use hot nitric acid • Filter mixture to get the solution • Evaporate some of the solution and leave / leave to crystallise / warm to crystallisation point / leave on window sill (to crystallise) / evaporate solution then cool	4
B7(b)(i)	White precipitate (1)	1
B7(b)(ii)	$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ Correct formulae (1) Correct state symbols dependent on the correct formulae (1)	2
B7(c)(i)	Silver (1)	1
B7(c)(ii)	$4OH^- \rightarrow O_2 + 2H_2O + 4e^-$ (1)	1
B7(d)	$4AgNO_3 \rightarrow 2Ag_2O + 4NO_2 + O_2$ (1)	1
	Total:	**10**

Question	Answer	Marks
B8(a)(i)	Contains only carbon-carbon single bonds (1)	1
B8(a)(ii)	Contains only carbon and hydrogen (1)	1
B8(b)	$C_6H_{12} + 9O_2 \rightarrow 6CO_2 + 6H_2O$ (1)	1
B8(c)	HCl (1) $C_6H_{11}Cl$ (1)	2
B8(d)	Moles of C_6H_{14} = 3.0 (1) Mass of C_6H_{12} = 252 (g) (1)	2
B8(e)(i)	Mole ratio C : H = 7.14 : 14.3 **or** 85.7 / 12 and 14.3 / 1(1) Divide by 7.14 to get empirical formula (1)	2
B8(e)(ii)	 (1)	1
	Total:	**10**

Question	Answer	Marks
B9(a)	Bond breaking absorbs energy **and** bond making releases energy / bond breaking is endothermic **and** bond making is exothermic (1) More energy absorbed than released / less energy released than absorbed / endothermic energy change is more than exothermic energy change / exothermic energy change is less than endothermic energy change (1)	2
B9(b)	Moles of H_2 = 10 (1) Energy absorbed = 1310 (kJ) (1)	2
B9(c)(i)	Position of equilibrium moves to the left / equilibrium shifts to the reactant side (1) More moles of **gas** on product side / fewer moles of **gas** on reactant side / less volume (of gas) on left (or reverse argument) / fewer molecules of gas on the left (or reverse argument) (1)	2
B9(c)(ii)	Position of equilibrium moves to the right / equilibrium shifts to the product side (1) Reaction is endothermic / backward reaction is exothermic (1)	2
B9(d)(i)	Produces carbon monoxide which is toxic or poisonous gas / reaction involves a very high temperature (1)	1
B9(d)(ii)	Saves crude oil / crude oil can be used to make other chemicals / coal or coke is less of a finite resource than crude oil (1)	1
	Total:	**10**

Question	Answer	Marks
B10(a)(i)	Moles of Zn and H_2 = 0.01 (1) Volume of H_2 = 0.24 dm^3 (1)	**2**
B10(a)(ii)	The number of moles of iron is different (1)	**1**
B10(b)	**One mark each for any two observations from:** Solution gets warmer / heat given off (1) White precipitate formed (1) which redissolves in excess (1) Green precipitate formed (1) With excess the green precipitate remains (1) **One mark each for any two explanations from** Acid is neutralised (1) Green precipitate is iron(II) hydroxide (1) White precipitate of zinc hydroxide (1) which will redissolve in excess (1)	**4**
B10(c)(i)	Oxidation number of iron increases / oxidation number of iron becomes more positive / iron(II) ions lose electrons (1)	**1**
B10(c)(ii)	Use (filter paper dipped into acidified) potassium manganate(VII) (1) Purple colour changes to colourless (1)	**2**
	Total:	**10**