Cambridge
O Level

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Cambridge Ordinary Level

CHEMISTRY **5070/21**

Paper 2 Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 75

Published

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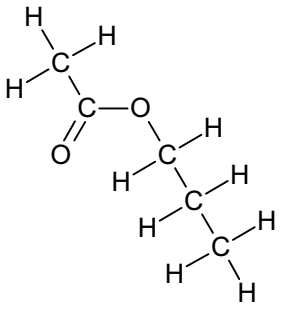
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Question	Answer	Marks
A1(a)	Poly(propene) (1)	1
A1(b)	PVC (1)	1
A1(c)	Protein (1)	1
A1(d)	Starch (1)	1
A1(e)	*Terylene* / polyester (1)	1
	Total:	5

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

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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

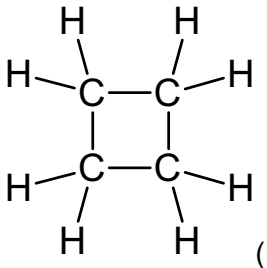
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Question	Answer	Marks
A5(a)	sodium magnesium **X** lead silver Sodium, magnesium, lead and silver in correct order (ignore **X**) (1) **X** directly between magnesium and lead (1)	**2**
A5(b)(ii)	Zinc / iron / tin (1)	**1**
A5(c)	**X**O + Mg → MgO + **X** (1)	**1**
A5(d)	**X** + Pb^{2+} → $\mathbf{X}^{2+}$ + 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**

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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**

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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**

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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**

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