Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/22**

Paper 2 Theory **October/November 2017**

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.

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Question	Answer	Marks
A1(a)(i)	Iron / Fe (1)	**1**
A1(a)(ii)	Oxygen / O_2 (1)	**1**
A1(a)(iii)	Hydrogen / H_2 (1)	**1**
A1(a)(iv)	Aluminium / A*l* (1)	**1**
A1(a)(v)	Aluminium / A*l* (1)	**1**
A1(b)	^{41}K electrons 19 (1) neutrons 22 (1) $^{17}O^{2-}$ electrons 10 (1) neutrons 9 (1)	**4**

Question	Answer	Marks
A2(a)	Arrangement: ordered / lattice / regular / layers / uniformly arranged / repeated pattern (1) Type of force: electrostatic (1)	**2**
A2(b)	Crystals: ions cannot move (1) Aqueous: ions can move (1)	**2**
A2(c)	Magnesium ion 2,8 (1) Chloride ion 2,8,8 (1)	**2**
A2(d)(i)	Hydrogen is low<u>er</u> in the reactivity series (than sodium) / sodium more reactive (than hydrogen) / hydrogen ions are reduced more easily (than sodium ions) (1)	**1**
A2(d)(ii)	$2H^+ + 2e^- \rightarrow H_2$ (1)	**1**
A2(d)(iii)	Litmus paper / named indicator paper (1) Bleaches / loses its colour (1)	**2**

Question	Answer	Marks
A2(e)(i)	All four of: H^+, OH^-, Cl^-, Na^+ (1)	**1**
A2(e)(ii)	Hydrogen ions removed (1) Idea of OH^- remaining (causing alkalinity) (1)	**2**

Question	Answer	Marks
A3(a)	1 mark each for any two of: • Shiny / lustrous • Ductile • Malleable	**2**
A3(b)	Iron<magnesium<cerium<sodium (1)	**1**
A3(c)(i)	Mol Fe $= \frac{39.2}{56}$ **OR** 0.7(00) (1) Mol Fe_3O_4 $= \frac{0.7(00)}{3}$ **OR** 0.233 (1) Mass = 0.233 × 232 = 54.1 (1)	**3**
A3(c)(ii)	Moles H_2 = 4 × 0.233 **OR** 0.933 (1) Volume = 0.933 × 24 = 22.4 dm^3 (1)	**2**
A3(d)	CO is poisonous / toxic (1)	**1**

Question	Answer	Marks
A4(a)(i)	$C_{10}H_{18}O$ (1)	**1**
A4(a)(ii)	Alcohol (1)	**1**
A4(b)	Bromine / bromine water (1) Turns colourless (1)	**2**
A4(c)	1 mark each for any three of: • Pigment(s) / dyes / coloured compounds on paper and paper (dipping) in solvent • Spot of dye above solvent level • Measure distance moved by dye and solvent (front) • Calculate R_f value • Compare with known R_f value(s)	**3**
A4(d)	Two correct repeat units with amide link (2 marks) e.g. $-NH-CH_2-\overset{\overset{\displaystyle O}{\Vert}}{C}-NH-CH_2-\overset{\overset{\displaystyle O}{\Vert}}{C}-$ If 2 marks not awarded, 1 mark for two amide links drawn correctly	**2**

Question	Answer	Marks
A5(a)	$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$ Correct formulae (1) Correct balance (1)	**2**
A5(b)	Bond breaking is endothermic and bond making is exothermic (1) Less energy released (in bond making) than absorbed (in bond breaking) (1)	**2**
A5(c)	Solvents / flavourings / perfumes (1)	**1**

Question	Answer	Marks
B6(a)(i)	No effect (1) Equal number of moles (of gases) on each side of the equation / each volumes (of gases) on each side of the equation (1)	**2**
B6(a)(ii)	Equilibrium moves to the left (1) The (forward) reaction is endothermic / backward reaction exothermic / goes in the direction of the exothermic reaction (1)	**2**
B6(b)(i)	Substance which completely dissociates to form H^+ ions / substance which completely ionises to form H^+ ions	**1**
B6(b)(ii)	$HI \rightarrow H^+ + I^-$ (1)	**1**
B6(c)	Addition (1)	**1**
B6(d)(i)	Increases (as the number of C atoms increases) (1)	**1**
B6(d)(ii)	Liquid because –7 °C / it is above its melting point and below its boiling point / liquid because –7 °C / it is between the melting point and boiling point (1)	**1**
B6(d)(iii)	There is no clear trend / the values go up and down / the values go down and up (1)	**1**

Question	Answer	Marks
B7(a)(i)	Magnesium has strong bonding between positive ions / cations and electrons / magnesium is a giant structure (1) Sulfur is a simple molecule / weak forces between sulfur molecules (1)	**2**
B7(a)(ii)	Magnesium has electrons which move (from place to place) (1) Sulfur does not have delocalised electrons / no mobile electrons / electrons don't move (1)	**2**
B7(b)	Giant structure / many covalent <u>bonds</u> (1) Need high temperature / lot of energy to break the <u>bonds</u> (1)	**2**
B7(c)(i)	Mass of sulfur = 19.2 g (1) mol S = $\frac{19.2}{32}$ mol Cl = $\frac{21.3}{35.5}$ **OR** ratio = 0.6 to 0.6 (1) SCl (1)	**3**
B7(c)(ii)	S_2Cl_2 (1)	**1**

Question	Answer	Marks
B8(a)	$\frac{2 \times 39}{174} \times 100$ = 44.8% / 45% (2 marks) If 2 marks not scored correct M_r = 174 (1)	**2**
B8(b)	(Acidified) barium chloride / barium nitrate (1) White precipitate (1)	**2**
B8(c)	Nitrates soluble (in water) / nitrates dissolve (easily) (1)	**1**

Question	Answer	Marks
B8(d)	One mark each for any two of: • (Nitrate causing) excessive growth of algae • Bacterial growth (on dead algae) • Idea of making water deoxygenated so animals / organisms can't live	**2**
B8(e)	Mol KOH = $0.200 \times \frac{12.5}{1000}$ **OR** 2.5×10^{-3} (1) Mol phosphoric acid = $\frac{2.5 \times 10^{-3}}{3}$ **OR** 8.33×10^{-4} (1) Concentration of phosphoric acid = 0.0333 (mol / dm^3) (1) ($8.33 \times 10^{-4} \times 1000 / 25$)	**3**

Question	Answer	Marks
B9(a)(i)	Rate doubles as concentration doubles (or reverse argument) (1)	**1**
B9(a)(ii)	Particles closer together / more particles in a given volume (or reverse argument) (1) Higher collision frequency / more collisions per second (or reverse argument) (1)	**2**
B9(a)(iii)	Increasing temperature increases rate (no marks) Particles move faster / particles have greater kinetic energy (1) Number of particles with energy greater than the activation energy is increased / more successful collisions / more effective collisions (1)	**2**

Question	Answer	Marks
B9(b)(i)	Burning fossil fuels / burning named fossil fuel / volcanoes (1)	**1**
B9(b)(ii)	It is reformed / it is not used up / it is unchanged at the end of the reaction (1)	**1**
B9(c)(i)	Energy humps of both the uncatalysed and catalysed reaction shown and labelled with catalysed reaction below the uncatalysed and hump drawn correctly form reactants line to product line. (2 marks) If 2 marks not scored allow 1 mark for one or two energy humps drawn correctly from reactants line to products line (1)	**2**
B9(c)(ii)	Exothermic because energy of reactant greater than energy of products (or reverse argument) (1)	**1**