



Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY**5070/22**

Paper 2 Theory

May/June 2016

MARK SCHEME

Maximum Mark: 75

Published

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

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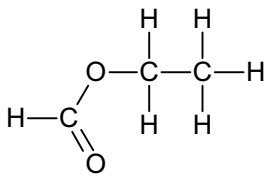
Cambridge is publishing the mark schemes for the May/June 2016 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge O Level – May/June 2016	5070	22

Question	Answer	Marks
A1(a)	C and H (1)	1
A1(b)	B (1)	1
A1(c)	Addition – B/E/F/I AND Condensation – A/C/D/G/H (1)	1
A1(d)	B/E (1)	1
A1(e)	G (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)	$\text{HF} \rightarrow \text{H}^+ + \text{F}^-$	1
A2(b)(ii)	Hydrogen ion(s)/ H^+ present	1
A2(c)	Moles of $\text{HF} = 0.01$ (1) Moles of $\text{Ca(OH)}_2 = 0.005$ / moles of $\text{Ca(OH)}_2 = 0.5 \times$ moles of HF (1) Volume = 33.3 cm^3 (1)	3
A2(d)(i)	1 mark each for any two of: • High melting point/high boiling 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) Fluorine (molecule) gains 2 electrons / each fluorine atom gains an electron (1)	2
Total		10

Page 3	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
A3(a)	 (1)	1
A3(b)(i)	Changing of a liquid into a gas / changing liquid to vapour (happening at any temperature) (1)	1
A3(b)(ii)	Molecules have less energy / molecules move slower (1) Molecules don't have enough energy to overcome force between molecules / molecules don't have enough energy to escape (into the air) (1)	2
A3(b)(iii)	Pentyl ethanoate / $\text{CH}_3\text{CO}_2\text{C}_5\text{H}_{11}$ (1) Highest relative formula mass (1)	2
Total		6

Question	Answer	Marks
A4(a)	All three conditions correct (2 marks) Two correct conditions (1 mark) Temperature 350 to 500 °C Pressure 1 to 10 atmospheres Catalyst vanadium(V) oxide / vanadium pentoxide / V_2O_5	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 / particles collide more often (1)	2
A4(c)	Reduces the cost of the process / (allows reactions to be carried out at) lower temperatures / (allows reactions to be carried out at) lower pressures	1
A4(d)	Relative formula mass = 174 (1) Percentage of K = 44.8% (1)	2
Total		7

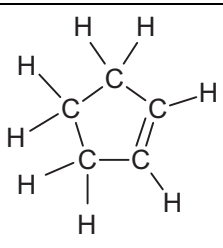
Page 4	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
A5(a)	sodium magnesium zinc cobalt silver Sodium, magnesium, zinc and silver in correct order (ignore cobalt) (1) Cobalt between zinc and silver as shown above (1)	2
A5(b)	$\text{CoO} + \text{Mg} \rightarrow \text{MgO} + \text{Co}$ (1)	1
A5(c)	(Thermally) decomposes / cobalt oxide formed / carbon dioxide formed / $\text{CoCO}_3 \rightarrow \text{CoO} + \text{CO}_2$	1
A5(d)	Attraction between sea of electrons and (positive) ions / forces between sea of electrons and (positive) ions (1) Attraction is very strong / force is very strong / it takes a lot of energy to overcome these strong forces (1) (second mark dependent on attraction between ions and electrons / forces between ions and electrons)	2
A5(e)	$^{59}_{27}\text{Co}$ (1)	1
Total		7

Question	Answer	Marks
A6(a)	Correct 'dot-and-cross' diagram for carbon dioxide (1)	1
A6(b)(i)	From fields / from farms / fertilisers (1)	1
A6(b)(ii)	1 mark each of any three from: - Eutrophication - Increased growth of algae / algal bloom / fast growth of algae - This blocks out sunlight / plants can't photosynthesise - Plants (beneath the surface) die AND get decomposed by bacteria that use up oxygen - Other aquatic organisms die because of lack of oxygen	3
A6(c)	Chlorination – kills bacteria or microbes (1) Filtration – removes insoluble materials / removes solid / removes named solid (1) Use of carbon – removes odours / removes (unpleasant) tastes (1)	3
A6(d)(i)	Weak intermolecular forces / weak forces between molecules / weak intermolecular bonds / weak attractive forces between molecules / not much energy needed to overcome intermolecular forces (1)	1
A6(d)(ii)	Add universal indicator and it will turn green / add full range indicator and it will turn green / add pH paper and it turns green (1)	1
Total		10

Page 5	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
B7(a)	1 mark each of any four from: - Use of excess lead(II) oxide - Use of nitric acid - Warm the solution / use warm / 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)	$\text{Pb}^{2+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})$ Correct formulae and balance (1) State symbols – dependent on correct formulae (1)	2
B7(c)(i)	Cathode – hydrogen / H_2 (1) Anode – oxygen / O_2 (1)	2
B7(c)(ii)	$2\text{H}^{+} + 2\text{e}^{-} \rightarrow \text{H}_2$	1
B7(d)	$2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$	1
Total		10

Question	Answer	Marks
B8(a)(i)	Contains (one or more) carbon-carbon double bond / contains C=C bond	1
B8(a)(ii)	Contains only carbon and hydrogen / contains carbon and hydrogen and no other element	1
B8(b)	$2\text{C}_6\text{H}_{10} + 17\text{O}_2 \rightarrow 12\text{CO}_2 + 10\text{H}_2\text{O}$ (1)	1
B8(c)(i)	$\text{C}_6\text{H}_{10}\text{Br}_2$ (1)	1
B8(c)(ii)	(bromine / solution) goes colourless / decolourised (1)	1
B8(d)	Moles of $\text{C}_6\text{H}_{14} = 3.0$ (1) Mass of $\text{C}_6\text{H}_{12} = 246$ (1)	2
B8(e)(i)	Mole ratio C: H = 7.35 : 11.8 (1) Idea of dividing by smallest / simplest ratio is 1 : 1.6 AND $\times 5$ (1)	2
B8(e)(ii)	 (1)	1
Total		10

Page 6	Mark Scheme	Syllabus	Paper
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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) Less energy absorbed than released / more energy released than absorbed / endothermic energy change is less than exothermic energy change / exothermic energy change is more than endothermic energy change (1)	2
B9(b)	Moles of methanol = 5 (1) Energy released = 455 kJ (1)	2
B9(c)(i)	Position of equilibrium moves to the right / equilibrium shifts to the product side (1) Fewer moles on product side / more moles on reactant side / greater volume (of gas) on left ORA / greater number of molecules on the left ORA (1)	2
B9(c)(ii)	Position of equilibrium moves to the left / equilibrium shifts to the reactant side (1) Reaction is exothermic / forward reaction is exothermic / backward reaction is endothermic (1)	2
B9(d)(i)	Butanoic acid (1)	1
B9(d)(ii)	(Mineral) acid (1)	1
Total		10

Page 7	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks
B10(a)	Chloride ions lose electrons/oxidation state of chlorine increases or gets more positive/oxidation state (of chlorine) goes from –1 to 0/the chloride loses hydrogen (1)	1
B10(b)	Idea that manganese(IV) oxide is limiting reagent/HCl(aq) is in excess (1) The volume of gas is proportional to the mass of MnO ₂ /As the mass of MnO ₂ increases, the volume of gas increases/There is a positive correlation between (the mass of) MnO ₂ and the (volume of) chlorine (1)	2
B10(c)	1.20 (1)	1
B10(d)	Iron(II) chloride gives a green precipitate/Iron(II) chloride gives a grey-green precipitate (1) Iron(III) chloride gives a brown precipitate (1) $\text{Fe}^{2+} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2/$ $\text{FeCl}_2 + 2\text{NaOH} \rightarrow \text{Fe}(\text{OH})_2 + 2\text{NaCl} (1)$ $\text{Fe}^{3+} + 3\text{OH}^- \rightarrow \text{Fe}(\text{OH})_3/$ $\text{FeCl}_3 + 3\text{NaOH} \rightarrow \text{Fe}(\text{OH})_3 + 3\text{NaCl} (1)$	4
B10(e)	(Moist blue or red) litmus paper (1) Bleached/goes white (1)	2
Total		10