Cambridge
O Level

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Cambridge Ordinary Level

CHEMISTRY **5070/22**

Paper 2 Theory **May/June 2016**

MARK SCHEME

Maximum Mark: 75

Published

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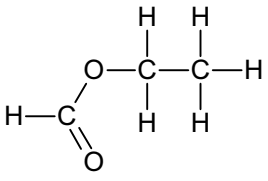
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Question	Answer	Marks
A1(a)	**C** and **H** (1)	**1**
A1(b)	**B** (1)	**1**
A1(c)	Addition – **B** / **E** / **F** / **I** **AND** Condensation – **A** / **C** / **D** / **G** / **H** (1)	**1**
A1(d)	**B** / **E** (1)	**1**
A1(e)	**G** (1)	**1**
	Total	**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)	$HF \rightarrow H^+ + F^-$	**1**
A2(b)(ii)	Hydrogen ion(s) / H^+ present	**1**
A2(c)	Moles of HF = 0.01 (1) Moles of $Ca(OH)_2$ = 0.005 / moles of $Ca(OH)_2$ = 0.5 × 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**

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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 / $CH_3CO_2C_5H_{11}$ (1) High**est** 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

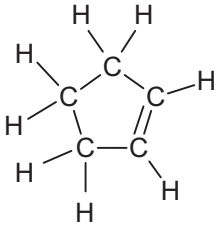
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Question	Answer	Marks
A5(a)	sodium magnesium zinc **cobalt** silver Sodium, magnesium, zinc and silver in correct order (ignore cobalt) (1) **Cobalt** between zinc and silver as shown above (1)	**2**
A5(b)	$CoO + Mg \rightarrow MgO + Co$ (1)	**1**
A5(c)	(Thermally) decomposes / cobalt oxide formed / carbon dioxide formed / $CoCO_3 \rightarrow CoO + CO_2$	**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)	$^{59}_{27}Co$ (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**

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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)	$Pb^{2+}(aq) + 2I^{-}(aq) \rightarrow PbI_2(s)$ 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)	$2H^{+} + 2e^{-} \rightarrow H_2$	**1**
B7(d)	$2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$	**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)	$2C_6H_{10} + 17O_2 \rightarrow 12CO_2 + 10H_2O$ (1)	**1**
B8(c)(i)	$C_6H_{10}Br_2$ (1)	**1**
B8(c)(ii)	(bromine / solution) goes colourless / decolourised (1)	**1**
B8(d)	Moles of C_6H_{14} = 3.0 (1) Mass of C_6H_{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** × 5 (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) 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**

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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 / HC*l*(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) $Fe^{2+} + 2OH^- \rightarrow Fe(OH)_2$ / $FeCl_2 + 2NaOH \rightarrow Fe(OH)_2 + 2NaCl$ (1) $Fe^{3+} + 3OH^- \rightarrow Fe(OH)_3$ / $FeCl_3 + 3NaOH \rightarrow Fe(OH)_3 + 3NaCl$ (1)	4
B10(e)	(Moist blue or red) litmus paper (1) Bleached / goes white (1)	2
	Total	**10**

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