

CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2012 series

5070 CHEMISTRY

5070/22

Paper 2 (Theory), maximum raw mark 75

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Page 2	Mark Scheme	Syllabus	Paper
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A1 (a) (substance containing) two or more elements bonded / joined [1]

(b) (i) carbon dioxide / CO₂ [1]

(ii) zinc oxide / ZnO [1]

(iii) calcium carbonate / CaCO₃ [1]

(iv) carbon dioxide / CO₂ [1]

(v) methane / CH₄ [1]

(vi) carbon monoxide / CO [1]

(c) one pair of electrons between each H and O; (1)

rest of structure is correct; (1) [2]

[Total: 9]

A2 (a) (i) lead < iron < zinc < magnesium [1]

(ii) Fe₂O₃ + 3Zn → 3ZnO + 2Fe [1]

(b) (i) (forms an) oxide layer / has a coat of oxide; (1)

which is strongly fixed to the surface / which is not easily removed / which is unreactive; (1) [2]

(ii) low density [1]

(iii) protons = 13 and neutrons = 14 [1]

[Total: 6]

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A3 NOTE: for parts **A3a(i)** and **A3a(ii)** answers must be comparative

- (a) (i) speed increases with increase in bromine concentration (no mark alone)
because
(bromine) molecules closer together / more (bromine) molecules (in a given volume) / more (bromine) particles (in a given volume) / more crowded molecules; (1)
- therefore frequency of collisions greater / more particles collide per second / greater chance of collisions / collide more often; (1) [2]

- (ii) increasing temperature increases rate (no mark alone)
because
particles move more rapidly / particles have more energy ; (1)
- therefore more energetic collisions / more effective collisions / more successful collisions / more vigorous collisions; (1)

NOTE: more particles have energy greater than activation energy = 2 marks [2]

- (iii) measure colour of the solution / bromine (over time) / use a colorimeter / measure absorbance / measure how much light goes through the solution / measure (electrical) conductivity [1]

- (b) (i) $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$ (1)
- $\text{Br}_2 + 2\text{e}^- \rightarrow 2\text{Br}^-$ (1) [2]

- (ii) reactants on the left and products on the right and reactant level above product level; (1)

ΔH correctly labelled with arrow going downwards; (1)

activation energy correctly labelled with arrow / line going upwards or double-headed arrow; (1) [3]

[Total: 10]

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- A4 (a)** carbon dioxide and water (required); (1)
 (in presence of) sunlight / chlorophyll; (1)
 to form glucose / $C_6H_{12}O_6$ / sugars / carbohydrate; (1) [3]
- (b) (i)** calcium ethanoate [1]
(ii) boiling point [1]
(iii) C = 54.5/12 H = 9.1/1 O = 36.4/ 16
 or
 4.54 9.1 2.275 / 2.28 (1)
 ratio = 2 4 1 (1) [2]
- (c) (i)** formula completed correctly e.g. – OCH_2CH_3 [1]
(ii) solvent / flavouring / perfumes / making polyesters / making terylene /
 plasticisers / making fuels (transesterification) / nail varnish remover [1]

[Total: 9]

Page 5	Mark Scheme	Syllabus	Paper
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- A5 (a) (i)** evaporates easily / easily form a gas [1]
- (ii) by heating / high temperature [1]
- (iii) impurities remain as solids / impurities do not evaporate / only the nickel carbonyl evaporates / nickel reacts and leaves impurities behind [1]
- (b)** 4 [1]
- (c)** two electrodes dipping into liquid and power pack or battery; (1)
 (pure) nickel and impure nickel electrodes labelled; (1)
 impure nickel is the anode / + electrode and pure nickel is the cathode / - electrode; (1)
 electrolyte labelled as nickel salt / named nickel salt / aqueous nickel compound; (1) [4]
- (d)** any **three** from:
 conducts heat / conducts electricity (1)
 malleable / can be hammered into shape / can be bent into shapes (1)
 ductile / can be stretched (1)
 shiny / lustrous (1) **IGNORE:** silvery [3]

[Total: 11]

Page 6	Mark Scheme	Syllabus	Paper
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- B6 (a) (i)** chlorine gains electrons, so is reduction; (1)
- bromide loses electrons, so is oxidation; (1) [2]
- (ii)** use of universal indicator / pH paper **and** comparison with colour chart / use of pH meter / use of pH electrode [1]
- (iii)** iodine is less reactive (than bromine) ORA iodine is lower in the reactivity series (than bromine) [1]
- (b)** C and D because they have low boiling points/
C and D because they do not conduct (when molten) [1]
- (c)** $Cl_2 + 2NaOH \rightarrow NaClO + NaCl + H_2O$ [1]
- (d) (i)** 0.05 (mol dm⁻³) [1]
- (ii)** mol thiosulfate = $0.05 \times 23.6/1000$ / 1.18×10^{-3} (mol); (1)
- mol iodine = 5.9×10^{-4} (mol); (1)
- concentration of iodine = $(5.9 \times 10^{-4} \times 1000 / 12.5) = 0.0472$ (mol dm⁻³) (1)
(mark is for correct answer) [3]

[Total: 10]

Page 7	Mark Scheme	Syllabus	Paper
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- B7 (a) (i)** (both have) tetrahedral arrangement of atoms / (both have) hexagonal arrangement of atoms; (1)
- (both are) giant structures / giant molecular (structures) / macromolecules / covalent lattices; (1) [2]
- (ii)** many (covalent) bonds / giant structure / macromolecule / all atoms joined together / network of bonds / lattice; (1)
- takes a lot of energy to break bonds / hard to break bonds / high temperature needed to break bonds / bonds are strong; (1) [2]
- (iii)** no free electrons / no delocalised electrons / no sea of electrons / all electrons in covalent bonds / electrons can't move / electrons in fixed positions; [1]
- (b) (i)** idea of random movement of molecules or particles / movement of molecules or particles in any direction;
NOTE: answer must refer to particles, of any kind [1]
- (ii)** they have different masses / they have different sizes / hydrogen (ion) is lighter / hydrogen (ion) is smaller [1]
- (c)** 8 valency electrons in both sodium and oxide ions; (1)
- charges correct Na^+ and O^{2-} ; (1)
- 2 sodium ions and 1 oxide ion / Na_2O / ratio of 2 Na to 1 O from diagram of covalent structure; (1) [3]

Page 8	Mark Scheme	Syllabus	Paper
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- B8 (a)** improve (crop) growth / improve (crop) yield / increase crop (growth) / increase crop (yield) / bigger crop (growth) / better crop (yield) [1]
- (b)** so that the roots can absorb them / so the plant can absorb them [1]
- (c) (i)** $2N = 28$; (1)
 RFM of ammonium nitrate = 80; (1)
 % by mass = 35%; (1) [3]
- (c) (ii)** add sulfuric acid (to aqueous ammonia); (1)
 titration; (1)
 use of indicator then repeat without indicator; (1)
 heat (solution obtained) to crystallisation point / evaporate some of the water (from the solution) / heat (solution) then leave (solution) to cool / leave (solution) to crystallise / solution concentrated by heating (1) [4]
- (d)** 3- [1]

[Total: 10]

Page 9	Mark Scheme	Syllabus	Paper
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- B9 (a) (i)** sulfur dioxide / hydrogen peroxide [1]
- (ii) kills bacteria [1]
- (b) (i)** correct structure with
two or more units and single bonds between carbon atoms; (1)
- continuation bonds present; (1) [2]
- (ii)** bromine water / (aqueous) bromine / bromine; (1)
- turns colourless / decolourised; (1) [2]
- (c) (i)** correct formula for ethanoate ion showing all atoms and bonds including
negative charge on the single bonded oxygen
- $$\begin{array}{c}
 \text{H} \quad \text{O} \\
 | \quad || \\
 \text{H}-\text{C}-\text{C}-\text{O}^- \\
 | \\
 \text{H}
 \end{array}$$
- [1]
- (ii)** $\text{CH}_3\text{COOH} + \text{OH}^- \rightarrow \text{CH}_3\text{COO}^- + \text{H}_2\text{O}$ [1]
- (d) (i)** (hydroxide reacts with ammonium salts) to form ammonia [1]
- (ii)** $\text{OH}^- + \text{NH}_4^+ \rightarrow \text{NH}_3 + \text{H}_2\text{O}$ [1]

[Total: 10]