CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2014 series

5070 CHEMISTRY

5070/22 Paper 2 (Theory), maximum raw mark 75

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.

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

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CAMBRIDGE
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A1 **ALLOW:** name but correct chemical formulae take precedence

(a) O_2 (1) [1]

(b) CH_4 (1) [1]

(c) $CCl F_3$ (1) [1]

(d) H_2 (1) [1]

[Total: 4]

A2 **(a)** 28.2 (1) **ALLOW:** 28 [1]

(b) **(i)** $OH^- + H^+ \rightarrow H_2O$ (1) **IGNORE:** state symbols [1]

(ii) Ammonia formed (1)

(Ammonia) is a gas / (ammonia) escapes into air / (ammonia) escapes from soil (1)
NOTE: 2nd marking point dependent on 1st marking point being correct. [2]

(c) **(i)** Mol of $H_3PO_4 = 1.25 \times \frac{25}{1000} = 0.03125$ (1) (mark for working or correct answer)

Moles of ammonia = $0.03125 \times 3 = 0.09375$ (1) (mark for working or correct answer)
ALLOW: answer from 1st marking point $\times$ 3

Concentration of ammonia = 2.07 (1)
ALLOW: $\frac{\text{answer from second marking point}}{0.0453}$ with correctly evaluated answer [3]

(ii) Mass = 0.03125×149 (1)
NOTE: Mark for the working out, not the answer. [1]

(iii) 62.9 (1) [1]

[Total: 9]

A3 **(a)** Amide / peptide (1) [1]

(b) Nylon / Kevlar (1)
ALLOW: polyamide [1]

(c) Chromatography paper dipped into the solvent (1)
ALLOW: chromatography paper just touching solvent (there should be no space between the solvent and the bottom of the paper)

Spot of mixture on paper above the level of the solvent labelled appropriately e.g. mixture / amino acid / amino acids / spot of amino acid / drop from sample (1)

Use of a locating agent to view the spots / amino acids / use of ninhydrin to view spots / amino acids (1)
NOTE: this must be after the chromatography

Comparing R_f values with known amino acids / compare with height of spots from known amino acids run at the same time (1) [4]

(d) (simple) sugars / monosaccharides (1) [1]

(e) **(i)** Has <u>many</u> <u>C=C bonds</u> / has <u>many</u> <u>carbon-carbon double bonds</u> (2)

If two marks not scored, award 1 mark for <u>has C=C double bond</u>. [2]

(ii) Bromine / bromine water (1)
Decolourised / goes colourless (1)
IGNORE: goes clear / discoloured / fades
NOTE: second mark dependent on correct reagent [2]

(iii) Polyester / *Terylene* / other named polyester (1) [1]

[Total: 12]

A4 **(a)** oxygen copper
bromine lead

All four correct (3)
Three correct (2)
Two correct (1)
ALLOW: correct formulae [3]

(b) **(i)** $2Cl^- \rightarrow Cl_2 + 2e^-$ (1)
ALLOW: e for e^- [1]

(ii) Hydrogen is low(er) down in the reactivity series (or reverse) / hydrogen is less reactive (than sodium) (or reverse) (1) [1]

(c) Aluminium / calcium / sodium / potassium / lithium / barium / magnesium (1) [1]

[Total: 6]

A5 **(a)** Haematite – is iron ore / contains the iron / is reduced to form iron (1)

Limestone – (decomposes to) form calcium oxide which removes impurities (1)
ALLOW: lime (in place of calcium oxide)

Coke – forms carbon monoxide / reduces the iron ore (1) [3]

(b) Positive ions in regular layers (1)
NOTE: 2 layers of ions is the minimum required in a diagram.

Electrons shown interspersed between the particles drawn (1)

NOTE: Marks can be scored from correct description in writing or from a labelled diagram. [2]

(c) Softer / more malleable / more ductile (1) [1]

(d) **(i)** Iron(II) ions gain electrons / iron ions gain electrons / it gains electrons (1) [1]

(ii) Green solution becomes paler / green solution fades / green solution becomes colourless / magnesium becomes coated with a dark solid (1) [1]

[Total: 8]

A6 **A** iron (1)

B iron(II) chloride (1)

C hydrogen (1)

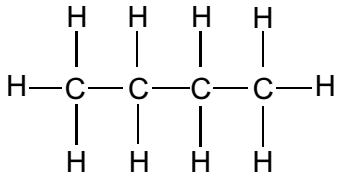
D iron(II) hydroxide (1)

E iron(III) chloride (1)

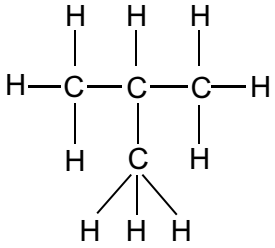
F iron(III) hydroxide (1) [6]

[Total: 6]

B7 **(a)**



(1)



(1)

[2]

(b) **(i)** $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ (1)
ALLOW: correct multiples / fractions
IGNORE: state symbols [1]

(ii) Produces carbon monoxide / produces poisonous gas / produces toxic gas / produces lots of soot (1) [1]

(c) $C_4H_{10} + Cl_2 \rightarrow C_4H_9Cl + HCl$ (1)
ALLOW: correct equation with further substitution of H by Cl [1]

(d) **(i)** Cracking (1) [1]

(ii) (% H is) 16 (%) (1)

Moles C: $\frac{84}{12}$ Moles H: $\frac{16}{1}$ **or** mole ratio 7:16 (1)

Molecular formula is C_7H_{16} (1) [3]

(iii) C_2H_4 (1)
ALLOW: appropriate formula based on incorrect answer to **(c)(ii)** [1]

[Total: 10]

B8 (a) $2CH_3CH_2CH_2CH_2OH + 2K \rightarrow 2CH_3CH_2CH_2CH_2OK + H_2$ (1)
ALLOW: any correct multiple / fraction
IGNORE: state symbols [1]

(b) Pops with lighted splint / (small) explosion with lighted splint (1) [1]

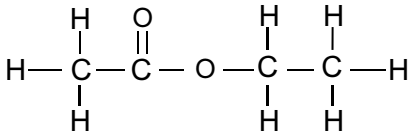
(c) Moles of hydrogen = $\frac{400}{24\,000}$ = 0.01667 (1) (mark for working or correct answer)

Moles of alkali metal = 0.01667 × 2 = 0.03334 (1) (mark for working or correct answer)

A_r = 7 (1)

Lithium / Li (1)
ALLOW: appropriate answer based on incorrect A_r in step 3 [4]

(d)



(1)

[1]

(e) $C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH$ (1)
IGNORE: state symbols

Any two (1 mark each) from

- Yeast
- Warm / quoted temperature of 20–45 °C
- Absence of air / absence of oxygen / anaerobic
- pH neutral / pH near neutral
- Distil to get final product [3]

[Total: 10]

B9 (a) heat taken in / heat absorbed / heat energy taken in / heat energy absorbed (1) [1]

(b) Reaction rate increases

Particles have more energy / particles moving faster / particles have more (kinetic) energy (1)

More particles have energy above activation energy / more effective collisions / more successful collisions / more energetic collisions / more fruitful collisions (1) [2]

(c) Position of equilibrium does not change (1)
Same number moles of gas on both sides / same number of gas molecules on both sides / same volume of gas on both sides (1) [2]

(d) Moles of iron = $\frac{2.80}{56}$ = 0.05 (1) (mark for working or correct answer)

Moles of Fe_3O_4 = $\frac{0.05}{3}$ = 0.01667 (1) (mark for working or correct answer)

Mass of Fe_3O_4 = (0.01667 × 232) = 3.87 g (1)

OR

168 g of Fe makes 232 g of Fe_3O_4 (1)
ALLOW: M_r = 232

2.8 g of Fe makes 232/168 × 2.8 (1)

Mass = 3.867 (1) [3]

(e) **NOTE:** must be reference to zinc somewhere in the answer. If not max 1 mark.

Zinc coating / barrier / layer / covering (1)

Stops water getting to iron / stops oxygen getting to iron (1)

OR

Zinc is more reactive / zinc is above iron in the reactivity series / zinc more likely to be oxidised (1)

Zinc reacts in preference to iron (1) [2]

[Total: 10]

B10 (a) (i)

	protons	electrons	neutrons	
$^{210}_{85}At$	**85**	**85**	**125**	(1)
$^{211}_{85}At$	**85**	**85**	**126**	(1)

[2]

(ii) Atoms with same atomic number and different mass number / atoms with same number of protons and different number of neutrons / atoms with same atomic number and different nucleon number / atoms of the same element with different numbers of neutrons / nucleons (1) [1]

(b) Correct 'dot-and-cross' diagram (1)
IGNORE: inner shell electrons
ALLOW: electrons to be all dots or all crosses [1]

(c) (i) Magnesium loses electrons and astatine gains electrons / magnesium transfers electrons to astatine (1)

Correct numbers lost / gained: 2 electrons (lost from magnesium) 1 electron gained (by astatine) (1) [2]

(ii) Any two (1 mark each) from:
- High melting point / high boiling point
- Does not conduct electricity as a solid
- Conducts electricity when molten / conducts electricity in solution
- **ALLOW:** Soluble in water [2]

(d) (i) $Br_2 + 2At^- \rightarrow 2Br^- + At_2$ (1)
ALLOW: correct multiples / fractions
IGNORE: state symbols [1]

(ii) Astatine is less reactive (than iodine) (or reverse) / iodide ions are more difficult to oxidise (than astatide ions) (or reverse) (1) [1]

[Total: 10]