

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

**MARK SCHEME for the May/June 2006 question paper**

**5070 CHEMISTRY**

**5070/02**

**Paper 2**

**maximum raw mark 75**

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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**Section A**

Maximum 45 marks

**A1** five names at (1) each penalise correct formulae once only

- (a) nickel
- (b) aluminium *or* sodium
- (c) aluminium oxide
- (d) nitrogen *or* phosphorus
- (e) iron *or* nickel

**[Total: 5]**

**A2 (a) C** **[1]**

**(b) C** **[1]**

**(c) D and E both needed for** **[1]**

- (d) six entries to the table:**
- all six correct (2)
  - five correct (1)
  - less than five (0) **[2]**

	atom	ion
protons	<b>19</b>	<b>19</b>
electrons	<b>19</b>	<b>18</b>
neutrons	<b>20</b>	<b>20</b>

**[Total: 5]**

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**A3 (a) (i)** one characteristic: (1)

e.g. same chemical reactions differ by CH<sub>2</sub>      gradation in physical properties

not has a general formula

**(ii)** formula is C<sub>n</sub>H<sub>2n</sub> (1)  
not (CH<sub>2</sub>)<sub>n</sub>

[2]

**(b) (i)** equation : 2C<sub>3</sub>H<sub>6</sub> + 9O<sub>2</sub> → 6CO<sub>2</sub> + 6H<sub>2</sub>O

all symbols correct (1)

correct balance (1)

**(ii)** substitution reaction (1)

[3]

**(c)** name propene *or* propylene (1)

correct structure with double bond shown and all H atoms indicated (1)

[2]

[Total: 7]

**A4 (a)** equation: CaCO<sub>3</sub> → CaO + CO<sub>2</sub> (1)

**(b) (i)** equation: CaO + H<sub>2</sub>O → Ca(OH)<sub>2</sub> (1)

**(ii)** name is calcium carbonate (1)

[2]

**(c)** any one large scale use e.g.

making mortar/ making plaster/ for limewash/ softening water/ reduce soil acidity/  
neutralise acid soil/ manufacture of sodium carbonate/ washing soda/ making bleaching  
powder/ removing acidic gases or removing acidic waste in industry

[1]

**(d)** calculation (3)

- M<sub>r</sub> of Ca<sub>3</sub>SiO<sub>5</sub> is 228, Ca(OH)<sub>2</sub> - 74
- 456 g Ca<sub>3</sub>SiO<sub>5</sub> gives 222 g Ca(OH)<sub>2</sub> (mark for correct ratio)
- 912 g Ca<sub>3</sub>SiO<sub>5</sub> gives 444 g Ca(OH)<sub>2</sub>

[Total: 7]

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- A5** (a) formula is SiC
- (b) graphite has free / delocalised / mobile electrons (1)  
SiC does not (1) [2]
- (c) (i) SiC has many strong /covalent bonds (1)  
(ii) diamond has stronger bonds (1) [2]
- (d) answer 4.40 g [1]
- [Total: 6]
- A6** (a) two observations at (1) each:  
floats/on the surface moves bubbles dissolves/disappears [2]
- (b) equation:  $2 \text{Li} + 2 \text{H}_2\text{O} \rightarrow 2 \text{LiOH} + \text{H}_2$  [1]
- (c) electron loss is oxidation or oxidation is an increase in O.N. [1]
- (d) two observations  
explodes/pops burns/flame [2]
- [Total: 6]
- A7** (a) (i) graphs are (roughly) similar  
or high CO<sub>2</sub> matches high temperatures (1)
- (ii) two effects at (1) each:  
melting of polar ice **or** rise in sea levels  
desertification/extreme climate changes/effect on animal/plant habitats(2) [3]
- (b) dot and cross for CO<sub>2</sub>  
all dots (1) only no double bond (0) (2) [2]
- (c) (i) name methane (1)
- (ii) cow flatulence *or* decay of vegetation (1)
- (iii) two points from  
ozone absorbs u.v. light/protects against u.v. light  
CFC's or chlorine atoms react with ozone  
CFCs deplete the ozone layer/reduce the amount of ozone (2) [4]
- [Total: 9]
- [Total for Section A: 45]

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### Section B

Answer any three questions

**B8 (a)** source is fertilisers *or* detergents

**(b)** any three points from four

- algal bloom forms
- this blocks sunlight
- water plants die
- bacteria remove oxygen from the water

[3]

**(c) (i)** *either* add *Al* and NaOH and warm  
NH<sub>3</sub> turns litmus blue

*or* add conc. H<sub>2</sub>SO<sub>4</sub> and FeSO<sub>4</sub>  
brown ring forms

(2)

**(ii)** nitrate ion too dilute

(1)

[3]

**(d)** calculation

$$\begin{aligned} \text{mols of I}_2 \text{ is } & 0.508 / (2 \times 127) = 0.002 \\ \text{mols of O}_2 \text{ is } & 0.002 / 2 = 0.001 \\ \text{conc. of O}_2 \text{ is } & 0.001 / 2 = 0.0005 \text{ mol dm}^{-3} \end{aligned}$$

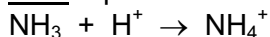
[3]

[Total: 10]

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**B9 (a)** ionic equation



allow full ionic equation showing spectator ions  
ignore incorrect state symbols

[1]

**(b)** preparation of KCl

- correct reagents: HCl(aq) and KOH(aq) or K<sub>2</sub>CO<sub>3</sub>(aq) or KHCO<sub>3</sub>(aq)
- (description of a) titration
- repeat without the indicator
- evaporate to crystallise or to dryness

[4]

**(c)**  $M_r \text{K}_2\text{CO}_3 = 138 + \text{K}_2\text{SO}_4 = 178$  (or moles  $\text{K}_2\text{CO}_3 = 3.45/138 = 0.025$ );  
 $1 \times 138\text{g K}_2\text{CO}_3 \rightarrow 1 \times 178\text{g K}_2\text{SO}_4$  (or moles  $\text{K}_2\text{SO}_4 = 0.025$ );  
 $3.45\text{g K}_2\text{CO}_3 \rightarrow 3.45 \times 178 / 138\text{g K}_2\text{SO}_4 = 4.35\text{g}$   
(or mass  $\text{K}_2\text{SO}_4 = 0.025 \times 174 = 4.35\text{g}$ )

[3]

**(d)** potassium ion  $\text{K}^+$  structure 2.8.8 (1)

chloride ion  $\text{Cl}^-$  structure 2.8.8 (1)

2.8.8 for both with K and Cl shown in centre (1);  
correct charges (1)

[2]

[Total: 10]

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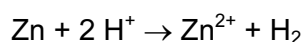
**B10(a)** atoms in brass do not slide as easily

- (b) (i) colour is blue (1)
- (ii) any 5 of:
- blue precipitate;
  - $\text{Cu}^{2+} + 2\text{OH}^- \rightarrow \text{Cu}(\text{OH})_2$   
ALLOW: full equation
  - white precipitate masked by blue one/ ppt lighter blue in colour than with copper hydroxide alone
  - $\text{Zn}^{2+} + 2\text{OH}^- \rightarrow \text{Zn}(\text{OH})_2$   
ALLOW: full equation
  - precipitates are copper hydroxide and zinc hydroxide **or** correct formulae (can be from the equations)
  - part of the precipitate redissolves in excess (sodium hydroxide)/ ppt of zinc hydroxide redissolves in excess (sodium hydroxide)

[6]

- (c) (i) names: **B** is zinc chloride (1)  
**C** is copper (1)

- (ii) ionic equation (1)



[3]

[Total: 10]

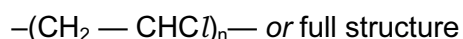
**B11(a)** ester linkage

[1]

- (b) (i) monomers are amino acids (1)
- (ii) nylon is hydrolysed (by the acid) (1)

[2]

- (c) (i) structure of pvc: (1)



- (ii) weak forces between the molecules (1)

allow weak van der Waals forces between molecules

- (iii) (orange) bromine is decolourised (1)  
it is an addition reaction (1)  
pvc has no double bonds (1)

[5]

- (d) two from:
- polythene is not biodegradable (1)
  - causes litter *or* use of land fill sites (1)
  - toxic/poisonous fumes if burnt (1)

[2]

[Total: 10]