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**

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UNIVERSITY of CAMBRIDGE
International Examinations

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	**19**	**19**
electrons	**19**	**18**
neutrons	**20**	**20**

[Total: 5]

A3 (a) (i) <u>one</u> characteristic: (1)

e.g. same chemical reactions gradation in physical properties
differ by CH_2

<u>not</u> has a general formula

(ii) formula is C_nH_{2n}
<u>not</u> $(CH_2)_n$ (1)

[2]

(b) (i) equation : $2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$

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: $CaCO_3 \rightarrow CaO + CO_2$ **[1]**

(b) (i) equation: $CaO + H_2O \rightarrow Ca(OH)_2$ (1)

(ii) <u>name</u> 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_r of Ca_3SiO_5 is 228, $Ca(OH)_2$ - 74
- 456 g Ca_3SiO_5 gives 222 g $Ca(OH)_2$ (mark for correct ratio)
- 912 g Ca_3SiO_5 gives 444 g $Ca(OH)_2$

[Total: 7]

A5 (a) formula is SiC **[1]**

(b) graphite has free / delocalised / mobile electrons (1)
SiC does not (1)

[2]

(c) (i) SiC has <u>many</u> strong /covalent bonds (1)

(ii) diamond has strong<u>er</u> bonds (1)

[2]

(d) answer 4.40 g **[1]**

[Total: 6]

A6 (a) <u>two</u> observations at (1) each:
floats/on the surface moves bubbles dissolves/disappears **[2]**

(b) equation: $2\ Li + 2\ H_2O \rightarrow 2\ LiOH + H_2$ **[1]**

(c) electron loss is oxidation or oxidation is an increase in O.N. **[1]**

(d) <u>two</u> observations
explodes/pops burns/flame **[2]**

[Total: 6]

A7 (a) (i) graphs are (roughly) similar
or high CO_2 matches high temperatures (1)

(ii) <u>two</u> effects at (1) each:
melting of polar ice **or** rise in sea levels
desertification/<u>extreme</u> climate changes/effect on animal/plant habitats(2)

[3]

(b) dot and cross for CO_2
all dots (1) only no double bond (0) (2)

[2]

(c) (i) <u>name</u> 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]

Section B

Answer any three questions

B8 **(a)** source is fertilisers *or* detergents **[1]**

(b) any <u>three</u> points from four

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

[3]

(c) **(i)** *either* add A*l* and NaOH and warm
NH_3 turns litmus blue

or add <u>conc.</u> H_2SO_4 and $FeSO_4$
brown ring forms (2)

(ii) nitrate ion too dilute (1)

[3]

(d) calculation

mols of I_2 is 0.508/(2 x 127) = 0.002
mols of O_2 is 0.002/2 = 0.001
conc. of O_2 is 0.001/2 = 0.0005 mol dm^{-3}

[3]

[Total: 10]

B9 (a) ionic equation
$NH_3 + H^+ \rightarrow NH_4^+$
allow full ionic equation showing spectator ions
ignore incorrect state symbols

[1]

(b) preparation of KC*l*

- correct reagents: HC*l*(aq) and KOH(aq) *or* K_2CO_3(aq) *or* $KHCO_3$(aq)
- (description of a) titration
- repeat without the indicator
- evaporate to crystallise *or* to dryness

[4]

(c) M_r K_2CO_3 = 138 + K_2SO_4 = 178 (or moles K_2CO_3 = 3.45/138 = 0.025);
1 x 138g K_2CO_3 → 1 x 178g K_2SO_4 (or moles K_2SO_4 = 0.025);
3.45g K_2CO_3 → 3.45 x 178/ 138g K_2SO_4 = 4.35g
(or mass K_2SO_4 = 0.025 x 174 = 4.35g)

[3]

(d) potassium ion K^+ structure 2.8.8 (1)

chloride ion $C\!l^-$ structure 2.8.8 (1)

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

[2]

[Total: 10]

B10 (a) atoms in brass do not slide as easily **[1]**

(b) (i) colour is blue (1)

(ii) any 5 of:
- blue precipitate;
- $Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$
  ALLOW: full equation
- white precipitate masked by blue one/ ppt lighter blue in colour than with copper hydroxide alone
- $Zn^{2+} + 2OH^- \rightarrow Zn(OH)_2$
  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)

$Zn + 2\ H^+ \rightarrow Zn^{2+} + H_2$

[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)

$-(CH_2 — CHCl)_n—$ *or* full structure

(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]