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 <u>names</u> 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 stron<u>ger</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)
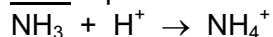
[3]

(d) calculation

mols of I_2 is $0.508/(2 \times 127)$ =   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) <u>ionic</u> equation
$NH_3 + H^+ \rightarrow NH_4^+$
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_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   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]

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

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

        (ii) any 5 of:
- <u>blue</u> <u>precipitate</u>;
- $Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$
  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)
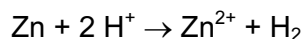- part of the precipitate redissolves in excess (sodium hydroxide)/ ppt of zinc hydroxide redissolves in excess (sodium hydroxide)

                                                                                [6]

    (c) (i) <u>names</u>: **B** is zinc chloride   (1)
                    C is copper   (1)

        (ii) <u>ionic</u> equation   (1)

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

                                                                                [3]

                                                                              [Total: 10]

B11(a) ester linkage   **[1]**

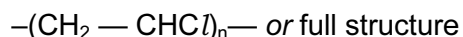   **(b) (i)** monomers are amino acids   (1)

        (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 <u>between</u> the <u>molecules</u>   (1)

                  allow weak van der Waals forces <u>between</u> <u>molecules</u>

        (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]