CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2002

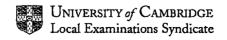## INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK : 80

SYLLABUS/COMPONENT : 0620/3

CHEMISTRY
(EXTENDED)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

In the mark scheme if a word or phrase is underlined it(or an equivalent) is required for the award of the mark.

(......) is used to denote material that is not specifically required.

OR designates alternative and independent ways of gaining the marks for the question.

or indicates different ways of gaining the same mark.

COND indicates that the award of this mark is conditional upon a previous mark being gained.

- Unusual responses which include correct Chemistry that answers the question should always be rewarded-even if they are not mentioned in the marking scheme.

1 (a) (i) vanadium(V) oxide as catalyst - ignore oxidation state
and accept no oxidation state
temperature 300 to 600 ^{0}C
pressure up to 10 atmos, accept atmospheric pressure
volume ratio of gases either 2:1 **or** slight excess of oxygen
ANY three   [3]

(ii) decrease   [1]
COND back reaction is endothermic or same argument based on
forward reaction is exothermic   [1]
or increase in temp favours back reaction

(iii) dissolve in (conc) sulphuric acid **NOT** dilute   [1]
add water **or** dilute   [1]

(b) sodium hydroxide **or** carbonate **or** hydrogencarbonate
                                                                 [1]
zinc oxide **or** hydroxide **or** carbonate   [1]
NOT zinc

barium nitrate **or** chloride **or** hydroxide **or** barium ions   [1]

neutralisation **NOT** acid/base   [1]

(c) (i) copper sulphate **or** anhydrous copper sulphate   [1]
accept "unhydrated"
NOT formula

(ii) goes blue **or** becomes hot **or** steam   [1]

(iii) copper oxide   [1]

      (iv) 5/250 = 0.02 moles   [1]
           $Mr = 80$ [1]
           80 x 0.02 = 1.6 g   [1]
      NB (iv) to be marked **conseq** to (iii)
      Correct answer no working **ONLY** [1]

TOTAL = 17

2   (a) (i)   high densities
                 high fixed points mp or bp
                 coloured compounds
                 hardness
                 complex ions
                 ANY three   [3]

         (ii) 13   [1]

   (b) (i)   manganese chloride   [1]
                 water   [1]

         (ii) <u>manganese(III) **and** (IV) oxides</u>   [1]

   (c) (i)   rate decreases **or** becomes zero   [1]
                 do **NOT** accept rate increases then decreases
                 COND concentration decreases   [2]
                 hydrogen peroxide used up **ONLY** [1]

         (ii) steeper initial gradient   [1]
                 double final volume   [1]

        (iii) initial gradient less   [1]
                 final volume the same   [1]
                 must relate to shape of graph

TOTAL = 14

3   (a) (i)   number of outer electrons increases   [1]
                 or number of electrons more than complete energy level
                 or number of electrons to be lost
                  or accept clear examples
                 NOT just different groups or valencies

         (ii) gain electrons   [1]
                 number of electrons to be gained is less across period   [1]

                 or number of outer electrons increases

(b) Al_2S_3 [1]

                Si_3P_4 [1]

(c) (i)   silicon   [1]

      (ii) sodium   [1]

      (iii) sulphur or chlorine   [1]

(d)   unreactive **or** inert or does not react   [1]

(e)   3Na to 1P   [1]

        COND next two marks

        correct charges   [1]

        8e around P   [1]

        If covalent then only one mark for 3Na to 1P

(f) (i)   11.5/23 = 0.5   [1]

      (ii) 0.25   [1]

          conseq to (i)

      (iii) 0.25 x 32 = 8 g   [1]

          conseq

      (iv) 2.0 g   [1]

          only **conseq** to (iii) if answer to (iii) is less than 10

        NB If (ii) is 0.3(125), no excess is possible, (iv) **ZERO**

TOTAL = 16

4 (a) (i) wiring **NOT** good conductor

             pipes

             utensils

             roofs

             electroplating

             lightning conductor

             bi-metallic strips

             NOT coinage metal or any other use than involves an alloy

             TWO from above   [2]

    (ii) regular array   [1]
           different sizes   [1]
           delocalised **or** mobile **or** free electrons   [1]

(b) (i) copper deposited **or** mass increases   [1]

     (ii) copper goes into solution **or** mass decreases   [1]

     (iii) $Cu^{2+} + 2e^- ==> Cu$ [1]

     (iv) oxygen   [1]
           sulphuric acid accept hydrogen sulphate   [1]

(c) (ii) cells produce electricity **or** exothermic **or** change
           chemical energy into electrical energy   [1]

           electrolysis uses it **or** endothermic **or** change
           electrical energy into chemical energy   [1]

(d) (i) $CuO + C ==> Cu + CO$
         or $2CuO + C ==> 2Cu + CO_2$
         or any other correct reductant – hydrogen or metal   [1]

     (ii) Copper(II) hydroxide = copper oxide + water   [1]
          accept symbols

     (iii) $2Cu(NO_3)_2 ==. 2CuO + 4NO_2 + O_2$ [2]
          unbalanced ONLY [1]
          NOT word equation

TOTAL = 16

5 (a)   molecular formula   [1]
           Must be able to give isomers, need not be alkenes
           two <u>corresponding</u> isomers   [2]
           If do not correspond then MAX [2] out of [3]

  (b) (i) ethanol   [1]
           structure   [1]

     (ii) ethane   [1]
           structure   [1]

  (c) (i) many simple molecules **or** monomers   [1]
           form one large one **or** macromolecule or chain   [1]

    (ii) addition polymer only one product- the polymer   [1]
        condensation - polymer and water etc   [1]

    (iii) correct unit   [1]
        COND evidence of polymer in structure eg shows
        continuation such as terminal bonds   [1]

(d) (i) water proof **or** impervious **or** flexible **or**
        good adhesion **or** non-biodegradable **or** unreactive   [1]

    (ii) steel in contact with water **or** air   [1]

    (iii) zinc more reactive
        oxygen /water reacts with zinc not iron
        sacrificial protection
        zinc anodic
        steel receives electrons from zinc
        zinc forms cations
        cell
        TWO valid points   [3]

TOTAL = 17