UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2006 question paper

0620 CHEMISTRY

0620/03   Paper 3 (Extended Theory), maximum raw mark 80

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 **(i)** noble gas   argon
   (ii) acidic oxide   carbon dioxide
  (iii) can be polymerised   ethene
  (iv) active component   oxygen
   (v) treatment of water   chlorine
  (vi) product of respiration   carbon dioxide

[TOTAL = 6]

2 More than required number of answers – [0]
   (i) **A**, **B**, **D**   [1]
  (ii) **D**   [1]
  (iii) **F**   [1]
  (iv) **C** and **E**   [1]
   (v) **A**   [1]
  (vi) **E**   [1]

[TOTAL = 6]

3 **(a)** limestone **or** marble **or** chalk or coral or calcite or aragonite   [1]

    (b) **(i)** 100   [1]
                         56   ignore units in both cases   [1]

          (ii) 7.00kg is 1/8 of 56   [1]
                      1/8 of 100kg is 12.5kg   [1]
                      Give both marks for correct answer without explanation. Ignore missing units
                      but penalise wrong units

          (c) **(i)** Any reasonable explanation
                      Plants prefer soil pH about 7
                      Plants do not grow (well) in acidic soils/plants grow better
                      To increase crop yields
                      Any **ONE**   [1]
                      Do **NOT** accept in acidic soils plants die

                 (ii) With calcium carbonate, pH cannot go above 7   [1]
                      It is not washed away by the rain/remains longer in the soil
                      It is not absorbed by the plant   [1]
                      OR
                      With calcium oxide, pH can go above 7   [1]
                      It is washed away by the rain   [1]

                (iii) Any correct use - making steel/iron, making cement, making glass,   [1]
                      disposing of acid wastes, removing sulphur dioxide from flue
                      gases, (stone in) building, indigestion tablets, toothpaste, cosmetics etc

[TOTAL = 9]

4 **(a)** **(i)** $CH_4 + 2O_2 = CO_2 + 2H_2O$ [2]
                   Not balanced [1] **ONLY**

                 (ii) carbon monoxide is formed   [1]
                      COND it is poisonous   [1]
                      NOT incomplete combustion

    (b) Burns to form sulphur dioxide   [1]
         Comment about acid rain/lung disease e.g. bronchitis   [1]

(c) **(i)** Transition elements/metals **or** d block elements [1]

(ii) carbon monoxide is changed into carbon dioxide [1]
hydrocarbons to carbon dioxide and water (by reacting with the oxygen) [1]

[TOTAL = 9]

5 (a) **(i)** iron [1]

(ii) advantage   higher yield [1]
explanation   lower temperature favours the exothermic reaction
(that is the forward reaction) [1]

(b) **(i)** Sent over the catalyst again **or** used to make more ammonia [1]
NOT just reused

(ii) It has the highest boiling point [1]

(c) **(i)** $CO_2 + 2NH_3 = CO(NH_2)_2 + H_2O$ [2]
Not balanced [1]

(ii) Any comment based on deficiency of PK/or ONLY provides Nitrogen as a
nutrient [1]
NOT soil pH

(d) Correct diagram for urea [3]
one error   ONLY [2]
two errors   ONLY [1]
three errors   0

[TOTAL = 11]

6 (a)

	copper	iron	sulphur	
composition by mass/g	(4.80)	(4.20)	4.8	[1]
number of moles of atoms	0.075	0.075	0.15	[1]
simplest mole ratio of atoms	1	1	2	[1]

[3]
The empirical formula is $CuFeS_2$ [1]

(b) **(i)** impure copper/blister copper/boulder copper etc [1]
(pure) copper [1]
copper sulphate **or** nitrate **or** chloride **or** contains $Cu^{2+}aq$ [1]

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

(iii) Zinc [1]

(c) Copper has delocalised electrons [1]
In sulphur the electrons are localised **or** cannot move in the piece of sulphur [1]

In copper there are layers of copper atoms/ions
Which can slip [1]
In sulphur there are no layers [1]

[TOTAL = 13]

7 (a) (i) greater initial slope or levels off later [1]
          Twice final volume [1]

      (ii) smaller slope [1]
           same final volume [1]

  (b) more particles in same volume/particles closer together [1]
      greater collision rate [1]

      molecules move faster [1]
      greater collision rate [1]

      OR molecules have more energy [1]
      so more will have sufficient energy to react [1]

  (c) (i) glucose [1]
          oxygen [1]

      (ii) chlorophyll [1]

                                                              [TOTAL = 11]

8 (a) (i) biological catalyst [1]

      (ii) linkage ----O----
           same unit as in glucose as on question paper that is rectangles [1]

      (iii) chromatography [1]

  (b) (i) --NHCO—linkage
          different units
          -NH and -CO on same monomer unit
          All three [2] two points [1] [2]

      (ii) amino acids [1]

  (c) (i) propanol + ethanoic acid = propyl ethanoate + water [2]
          reactants [1] products [1]

      (ii) ester linkage correct [1]
           rest of molecule correct [1]

      (iii) bromine water [1]
            fat 1   orange **or** yellow **or** brown to colourless [1]
            fat 2   remains orange **or** yellow **or** brown [1]
            Accept Potassium Manganate(VII) with corresponding colour changes

      (iv) soap or sodium salts (of carboxylic acids)/sodium stearate [1]
           alcohol/glycerol [1]
                                                              [TOTAL = 15]

                                        [6+6+9+9+11+13+11+15 = 80]