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

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 instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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]