UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2005 question paper

0620 CHEMISTRY

0620/03 **Paper 3 (Extended Theory), maximum 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 initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

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The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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UNIVERSITY of CAMBRIDGE
International Examinations

Question 1

(a)(i) lattice **[1]**

(ii) high melting point **or** high fixed points
poor conductor as solid
good conductor as liquid, accept either aqueous or molten
hard
soluble in water
Any **TWO** **[2]**

(b)(i) Mg^{2+} **[1]**

(ii) N^{3-} **[1]**

(iii) Mg_3N_2 **[1]**

(iv) opposite charges **[1]**
Do NOT accept "attract" it is in the question
accept <u>electrostatic attraction</u> as a phrase

TOTAL = 7

Question 2

(a)(i) boiling **[1]**

(ii) lower temperature **or**
over temperature range or no plateau **[1]**

(iii) direct continuation of E to F **[1]**

(iv) close **or** touching far apart **[2]**
fast and random **[1]**
cannot move apart can move apart **[2]**

(b)(i) calcium ethanoate + hydrogen **[1]**

(ii) zinc oxide **or** hydroxide **[1]**

(c) $CH_3COOH + NaOH \rightleftharpoons CH_3COONa + H_2O$ **[2]**
reactants **[1]** products **[1]**

TOTAL = 12

Question 3

(a)(i) because concentration of $BiCl_3$ decreases **[2]**
bismuth chloride used up **ONLY [1]**

(ii) products are being formed **or** concentration of products increases. Concentration mark given either **(i) or (ii)** **[1]**

(iii) reaction has come to equilibrium **[1]**
rates equal **or** no change in concentration **[1]**

(iv) equilibrium to left **or** favours backward reaction **or** equilibrium moves to use up hydrochloric acid **[1]**
$BiOCl$ used up **or** $BiCl_3$ formed **[1]**

(b)(i) No change in volume **or** same number of moles on both sides **[1]**

(ii) move to right **[1]**
Increase in pressure favour side with smaller volume **or** smaller number of moles (of gas) **or** moves to side that tends to reduce pressure **[1]**

TOTAL = 10

Question 4

(a)(i) general molecular formula
same functional group
physical properties show trend — bp increase with n
same chemical properties
common methods of preparation
any **TWO** **[2]**

(ii) $C_8H_{17}OH$ Mass of one mole = 130 (g) **[2]**
if formula correct but mass wrong **[1]**

(b) propan-1-ol **or** propan-2-ol **[1]**
corresponding structural formula **[1]**
name and formula must correspond for **[2]** if not **ONLY [1]**

(c)(i) structural formula of isomer **[1]**

(ii) carbon dioxide and water **[1]**
pentene **[1]**
pentanoic acid **[1]**

TOTAL = 10

Question 5

(a)(i) 38p 38e 50n **[1]**
38p 38e 52n **[1]**
30p 28e 35n **[1]**

(ii) Same number of protons and different number of neutrons **[1]**

(iii) 8+ 2 **[1]**

(b)(i) heat zinc blende in air to form oxide **[1]**
reduce oxide with carbon **[1]**

(ii) galvanising
sacrificial protection
alloys
batteries
roofing
Any **ONE** **[1]**

(c)(i) hydrochloric acid **[1]**

(ii) $Sr^{2+} + 2e = Sr$ **[1]**
$2Cl^- - 2e = Cl_2$ **[1]**
or $2Cl^- = Cl_2 + 2e$

(iii) hydrogen **[1]** and strontium hydroxide **[1]** **[2]**

(d)(i) zinc + water = zinc oxide + hydrogen **[1]**
heat **[1]** steam **[1]** **[2]**

(ii) $Sr + 2H_2O = Sr(OH)_2 + H_2$ **[2]**
Not balanced **[1]**
cold water **[1]**

TOTAL = 19

Question 6

(a)(i) moles of $NiCO_3$ reacted = 0.08 **[1]**
mass of nickel carbonate reacted = 9.52 g **[1]**
mass of nickel carbonate unreacted = 2.48 g **[1]**

(ii) maximum number of moles of hydrated salt = 0.08 **[1]**
maximum mass of salt = 0.08 x 281 = 22.48 g **[1]**
percentage yield 10.4/22.48 x 100 = 46.3% **[1]**

(b)(i) sulphuric acid
COND description of titration
repeat without indicator **or** with carbon
evaporation
any **TWO** **[3]**

(ii) suitable reactants calcium chloride and sodium fluoride **[1]**
COND upon correct reagents
filter **[1]**
wash and dry precipitate **[1]**

OR Accept synthesis
calcium **[1]**
fluorine **[1]**
burn **or** heat **[1]** **[3]**

TOTAL = 12

Question 7

(a) from methane **[1]**
and water **[1]**

OR electrolysis **[1]**
suitable electrolyte **[1]**

OR alkane **[1]**
cracking **[1]** **[2]**

(b)(i) iron **[1]**

(ii) lower temperature moves equilibrium to right **[1]**
because forward reaction is exothermic **[1]**

(c)(i) H—H **[1]**
endothermic **[1]**
endothermic **[1]**
exothermic

(ii) More heat given out than taken in **[1]**
–2328 + 945 + 1308 = –75(kJ) **[1]**

OR More heat given out bond forming than taken in bond breaking **[2]**
Must mention bond breaking and forming **[2]**

TOTAL = 10