UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE O Level

MARK SCHEME for the November 2005 question paper

5070 CHEMISTRY

5070/02 **Paper 2 (Theory)** **maximum raw mark 75**

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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1a		metals: C, D. non metals ABE; All 5 correct = 2, 3 or 4 correct = 1	2
b		A	1
c		D	1
d		E	1
e		D; and B;	1
			Total **6**

2a		amide and ester links correctly labelled; circle around all four atoms in each link	2
b		protein	1
c		$HOOC(C_6H_4)COOH$; $HO(CH_2)_2OH$;	2
d		adv e.g. lighter weight (when wet)/ does not rot; disadv e.g. made from non-renewable raw material/ is non biodegradable	2
			Total **7**

3a		5.0 – 5.9/ above 5.0 below 6.0	1
b		mango	1
c		$Ca(OH)_2$ neutralises acidity/ changes or controls soil pH; $(NH_4)_2SO_4$ contains nitrogen; this leads to increased plant growth/ crop yield	3
d	**i**	$CaSO_4$; $2NH_3$;	2
	ii	loss of N from soil occurs	1
			Total **8**

4a		pentanoyl chloride	1
b		propanoyl chloride	1
c		$C_xH_{(2x+1)}OCl$	1
d	**i**	carbon dioxide and water	1
	ii	(No because) it contains chlorine	1
			Total **5**

5a	**i**	reactants: (aq) (s); products: (aq) (l) (g)	1
	ii	25/1000 x 1.5 x 24 = 0.9 dm^3/ 900 cm^3. usual calculation rules apply	3
b		0.75 mol/dm^3; 25 cm^3	2
c	**i**	calcium sulphate	1
	ii	calcium sulp is insoluble/ only sparingly soluble; coating stops reaction	2
	iii	sulphuric acid contains more H^+ ions/ is dibasic	1
			Total **10**

6a	**i**	CuO	1
	ii	+1	1
	iii	132; ÷ 148; x 100 = 89.2 % correct answer scores 3, usual calculation rules apply	3
b		outer shell correct (dots and crosses); charge correct;	2
			Total **7**

7		process 1 makes more ethene; process 2 makes more C_8H_{18} ; (and so using both meets demand)	2 Total **2**

B8 a	**i**	1000 million years	1
	ii	nitrogen; because it is 79 % in air	2
b	**i**	CO_2 falls and then falls more sharply (and then stays constant); O_2 stays constant then increases (and then stays contant); (2)	5
	ii	Use of numbers e.g. 3000 MYA for change in rate of change of CO_2; O_2 increases after plants appear due to photosynthesis; O_2 becomes constant after land animals appear due to respiration; photosynthesis produces O_2/ uses CO_2; respiration used O_2 and produces CO_2; WTTE explanation of a steady state over last 1000 MY; Equations: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ respiration; $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ photosynthesis any 3/6 from list	
c		air is liquified/ cooled to form a liquid then warmed; oxygen boils off (and is collected)	2
			Total **10**

B9			
a		Cl_2 + 2KBr → Br_2 + 2KC*l*; See: solution goes brown; Cl_2 + 2KI → I_2 + 2KC*l*; See: solution goes brown; Br_2 + 2KI → I_2 + 2KBr; See: solution goes brown; Identifies solutions that react but without observations =(1); Negative results important – gives at least 2 experiments that give no change.	7
b		C*l* goes from 0; to +1 and –1; 0 to +1 is oxidation/ 0 to –1 is reduction;	3
			Total **10**

B10 a		apparatus with battery and graphite electrodes; test tubes to collect gases no labels max 1	2
b	i	H^+ OH^- SO_4^{2-};	1
	ii	$2H^+ + 2e^- \rightarrow H_2$ AND $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$; $4H^+ + 4OH^- \rightarrow 2H_2 + 2O_2 + 2H_2O$; oxygen relights a glowing splint; hydrogen pops when lit;	4
	iii	Acid becomes more concentrated	1
c		React with more reactive metal e.g. Mg or Zn; $M + H_2SO_4 \rightarrow H_2 + MSO_4$;	2
			Total **10**

B11			
a		$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$ formulae correct; ss and balanced; iron goes from shiny to dull / turns black or red/orange;	3
b	i	magnesium reacts much faster; forms a white powder.	2
	ii	copper – no reaction	1
b	i	less dense/ lighter/ more resistant to corrosion	1
	ii	metal structure diagram shows cations in sea of electrons; cations and electrons in regular arrangement; conducts electricity because electrons move.	3
			Total **10**