CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9701 CHEMISTRY

9701/23 Paper 2 (Structured Question AS Core), maximum raw mark 60

This mark scheme is published as an aid to teachers and candidates, 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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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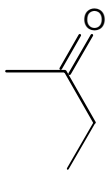
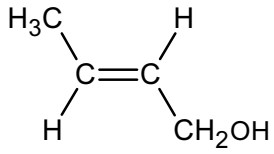
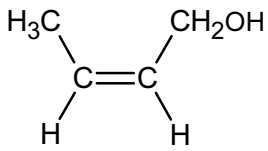
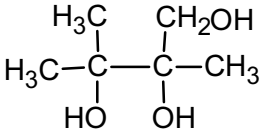
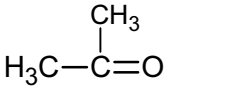
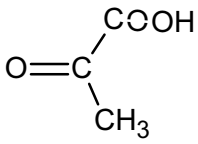
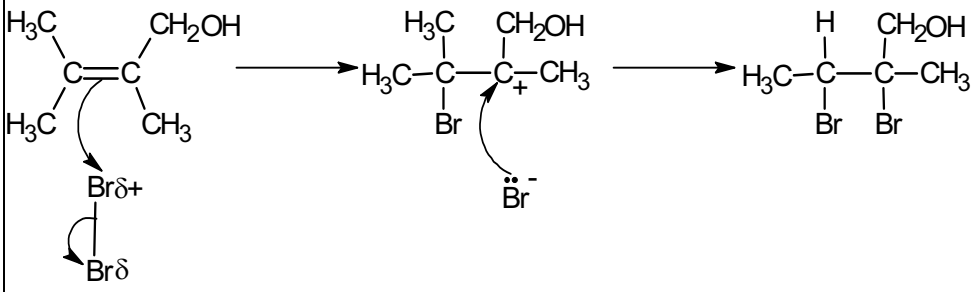
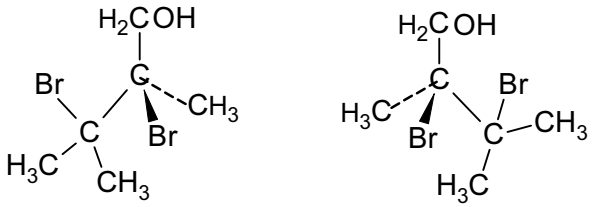
CAMBRIDGE
International Examinations

Question	Mark Scheme	Mark	Total
1 (a)	$(1s^2)2s^2 2p^6$	[1]	[1]
(b) (i)	The amount of energy required/energy change when one electron is removed from each atom in one mol of gaseous atoms	[1] [1] [1]	[3]
(ii)	Greater nuclear charge/number of protons Same shielding/number of shells/energy level	[1] [1]	[2]
(c) (i)	mean/average mass of the isotopes/an atom(s) relative to 1/12 of the mass of an atom of ^{12}C/on a scale where an atom of ^{12}C is (exactly) 12	[1] [1]	[2]
(ii)	$20.2 \quad \frac{(20 \times 90.48) + (21 \times 0.27) + (9.25y)}{100}$ $\frac{2020 \quad 1815.27}{9.25} \quad 22.133$ y = 22	[1] [1]	[2]
(d) (i)	$pV \quad \frac{mRT}{M_r}$ $M_r = \frac{mRT}{pV} = \frac{0.275 \times 8.31 \times 298}{100 \times 10^3 \times 200 \times 10^{-6}}$ M_r = 34.05/34.1	 [1] [1]	[2]
(ii)	(Let % Ne = x so % Ar = 100-x) $\frac{20.2x + 39.9(100 - x)}{100} \quad 34.05$ % Ne = 29.7	 [1]	[1]
1 (e) (i)	Van der Waal's/London/dispersion Uneven electron distribution/temporary dipole Induced dipole-dipole attraction	[1] [1] [1]	[3]
(ii)	more electrons more polarisable/greater attraction/stronger IMFs	[1] [1]	[2]
			[18]

Question	Mark Scheme	Mark	Total
2 (a) (i)	Reactivity increases down the group **OR** reference to observations that indicate trend Outer electrons lost more easily down group Due to increased distance/shielding of outer electrons from nucleus	[1] [1] [1]	[3]
(ii)	$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$	[1]	[1]
(iii)	Magnesium hydroxide sparingly soluble/insoluble	[1]	[1]
(iv)	$Mg + H_2O \rightarrow MgO + H_2$	[1]	[1]
(b) (i)	$MgO + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2O$	[1]	[1]
(ii)	(thermal stability) increases down the group	[1]	[1]
(iii)	$2Mg(NO_3)_2 \rightarrow 2MgO + 4NO_2 + O_2$	[1]	[1]
(iv)	N from (+)5 to (+)3 O from –2 to 0 N is reduced **and** O is oxidised	[1] [1] [1]	[3]
(c)	(Very) strong electrostatic attraction/ionic bond High charge (density) of cation and anion/Mg^{2+} and O^{2}	[1] [1]	[2]
(d) (i)	$CaCO_3 \rightarrow CaO + CO_2$ $CaO + H_2O \rightarrow Ca(OH)_2$	[1] [1]	[2]
(ii)	$2H^+ + CO_3^{2} \rightarrow CO_2 + H_2O$	[1]	[1]
(iii)	$1 \times 10^{4} \times 8000 = 0.8\,\text{mol}\ H^+$ $\frac{0.8}{2} \times 100.1 = \text{mass}\ CaCO_3 = 40\,\text{g}$	[1] [1]	[2]
			[19]
3 (a) (i)	**A/B** =  **C** = 	[1] [1] [1]	[3]
(ii)	Chain	[1]	[1]
(iii)	Silver mirror/ppt/solid (black/grey)	[1]	[1]

Question	Mark Scheme	Mark	Total
(b) (i)	**D** $CH_2=C(CH_3)CH_2OH$	[1]	[5]
	E  trans **OR** *E*	[1+1]	
	E  cis **OR** *Z*	[1]	
	F $H_2C=CHCH_2CH_2OH$	[1]	
(ii)	Hydrogen	[1]	[1]
(c) (i)	$C_3H_6O + [O] \rightarrow C_3H_6O_2$	[1]	[1]
(ii)	$C_3H_6O + 2[H] \rightarrow C_3H_8O$	[1]	[1]
			[13]
4 (a) (i)		[1]	[1]
(ii)	 	[1] [1]	[2]

Question	Mark Scheme	Mark	Total
(b) (i)	 M1 = 2 curly arrows M2 = intermediate ion M3 = Br with –ve charge, lone pair and curly arrow to C+	[1] [1] [1]	[3]
(ii)	dipole is <u>induced</u> by proximity to C=C	[1]	[1]
(iii)	Optical	[1]	[1]
(iv)		[1+1]	[2]
			[10]