

**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.

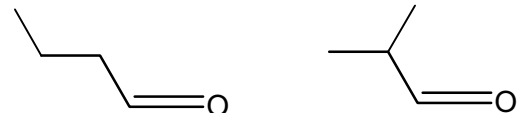
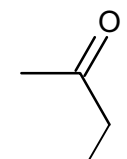
Cambridge will not enter into discussions about these mark schemes.

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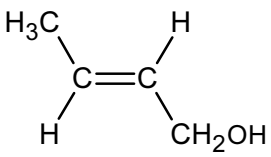
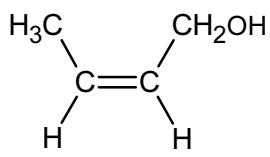
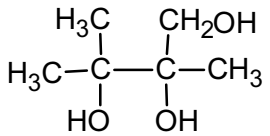
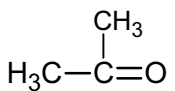
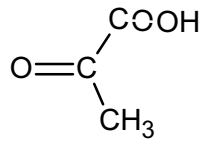
Page 2	Mark Scheme	Syllabus	Paper
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Question	Mark Scheme	Mark	Total
1 (a)	$(1s^2)2s^22p^6$	[1]	[1]
(b) (i)	The amount of energy required/energy change when one electron is removed  from each atom in one mol of gaseous atoms	[1]  [1] [1]	[3]
(ii)	Greater 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 $^{12}\text{C}$ /on a scale where an atom of $^{12}\text{C}$ is (exactly) 12	[1] [1]	[2]
(ii)	$20.2 = \frac{(20 \times 90.48) + (21 \times 0.27) + (9.25y)}{100}$  $\frac{2020 - 1815.27}{9.25} = 22.133$  $y = 22$	[1]   [1]	[2]
(d) (i)	$pV = \frac{mRT}{M_r}$  $M_r = \frac{mRT}{pV} = \frac{0.275 \times 8.31 \times 298}{100 \times 10^3 \times 200 \times 10^{-6}}$  $M_r = 34.05/34.1$	[1]   [1]	[2]
(ii)	(Let % Ne = x so % Ar = 100-x)  $\frac{20.2x + 39.9(100 - x)}{100} = 34.05$  % 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]

Page 3	Mark Scheme	Syllabus	Paper
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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) $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2$	[1]	[1]	
	(iii) Magnesium hydroxide sparingly soluble/insoluble	[1]	[1]	
	(iv) $\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$	[1]	[1]	
	(b) (i) $\text{MgO} + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2\text{O}$	[1]	[1]	
	(ii) (thermal stability) increases down the group	[1]	[1]	
	(iii) $2\text{Mg}(\text{NO}_3)_2 \rightarrow 2\text{MgO} + 4\text{NO}_2 + \text{O}_2$	[1]	[1]	
	(iv) N from (+)5 to (+)3 O from -2 to 0 N is reduced <b>and</b> O is oxidised	[1] [1] [1]	[3]	
	(c) (Very) strong electrostatic attraction/ionic bond High charge (density) of cation and anion/ $\text{Mg}^{2+}$ and $\text{O}^{2-}$	[1] [1]	[2]	
	(d) (i) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$	[1] [1]	[2]	
	(ii) $2\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{CO}_2 + \text{H}_2\text{O}$	[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]	

Page 4	Mark Scheme	Syllabus	Paper
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Question	Mark Scheme	Mark	Total
(b) (i)	<p><b>D</b></p> $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}_2\text{OH}$	[1]	
	<p><b>E</b></p>  <p>trans <b>OR E</b></p>	[1+1]	
	<p><b>E</b></p>  <p>cis <b>OR Z</b></p>	[1]	
	<p><b>F</b></p> $\text{H}_2\text{C}=\text{CHCH}_2\text{CH}_2\text{OH}$	[1]	
(ii)	Hydrogen	[1]	[1]
(c) (i)	$\text{C}_3\text{H}_6\text{O} + [\text{O}] \rightarrow \text{C}_3\text{H}_6\text{O}_2$	[1]	[1]
(ii)	$\text{C}_3\text{H}_6\text{O} + 2[\text{H}] \rightarrow \text{C}_3\text{H}_8\text{O}$	[1]	[1]
			[13]
4 (a) (i)		[1]	[1]
(ii)		[1]	
		[1]	

Page 5	Mark Scheme	Syllabus	Paper
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(b) (i)	<p>M1 = 2 curly arrows M2 = intermediate ion M3 = Br with -ve charge, lone pair and curly arrow to C+</p>	[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]