www.XtremePapers.com

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9701 CHEMISTRY

9701/21 Paper 2 (Structured Questions 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.

Cambridge is publishing the mark schemes for the May/June 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

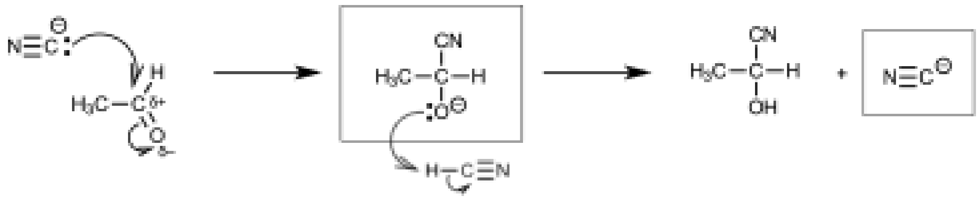
® IGCSE is the registered trademark of Cambridge International Examinations.

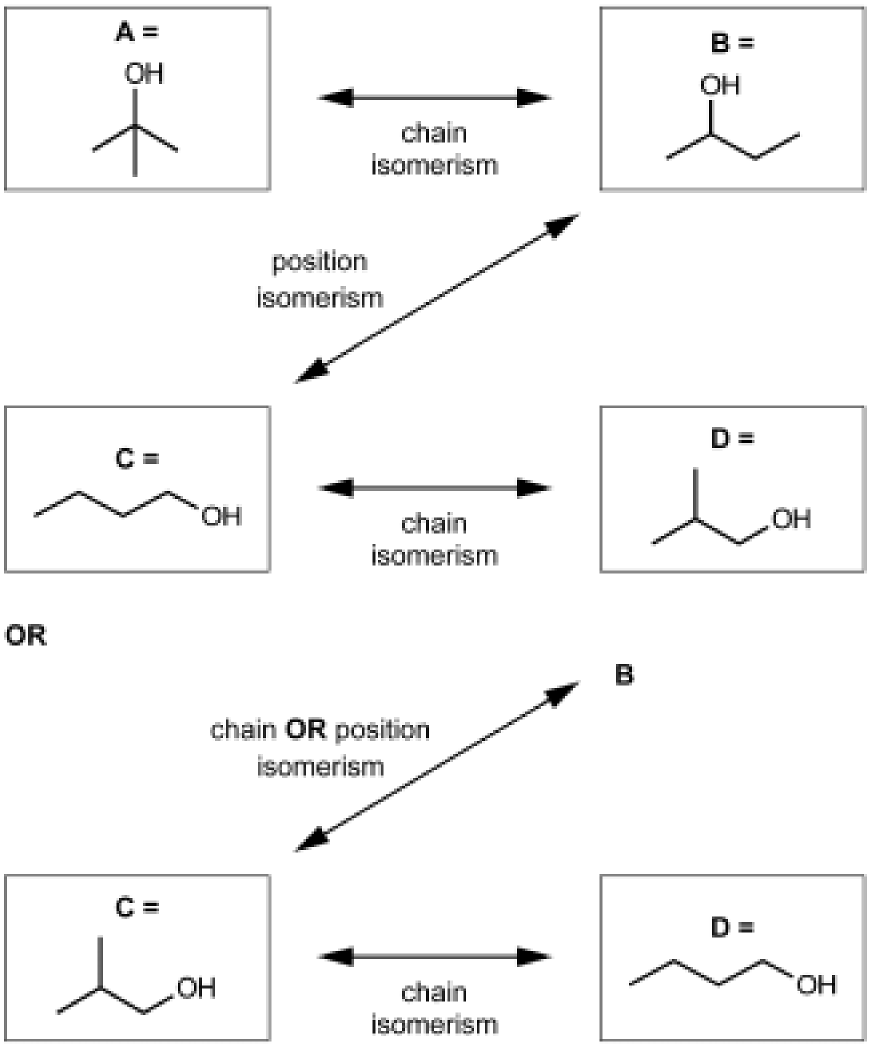
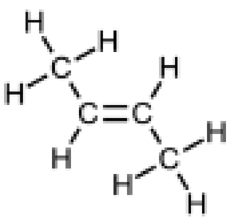
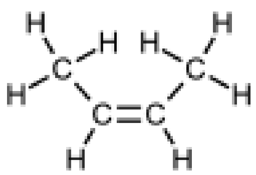
CAMBRIDGE
International Examinations

Question	Mark Scheme	Mark	Total
1 (a)	sub-atomic particle / relative mass / relative charge		
	neutron / **1** / 0	[1]	
	electron / 1/1836 / **–1**	[1]	
	proton / **1** / **+1**	[1]	[3]
(b) (i)	RAM = mean / average mass of the isotopes / an atom(s)	[1]	
	relative to 1/12 the mass of an atom of ^{12}C / on a scale where an atom of ^{12}C is (exactly) 12 (units)	[1]	
	isotope = atoms with the same number of protons / atomic number / proton number with different mass numbers / numbers of neutrons / nucleon number	[1]	[3]
(ii)	$\frac{(0.89\times74)+(9.37\times76)+(7.63\times77)+(23.77\times78)+(49.61\times80)+(8.73\times82)}{100}$	[1]	
	= 79.04 (2 d.p.) **AND** Se	[1]	[2]
(c) (i)	**Te** **C*l***		
	$\frac{47.4}{128}$ $\frac{52.6}{35.5}$	[1]	
	$\frac{0.370}{0.370}$ $\frac{1.48}{0.370}$		
	1 4 so EF = $TeCl_4$	[1]	
	Empirical Formula Mass = 270 so MF = $TeCl_4$	[1]	[3]
(c) (ii)	Covalent **AND** simple / molecular	[1]	
	low melting point / reaction with water	[1]	[2]
(iii)	$TeCl_4 + 3H_2O \rightarrow H_2TeO_3 + 4HCl$		
	OR $TeCl_4 + 2H_2O \rightarrow TeO_2 + 4HCl$	[1]	[1]
(d) (i)	Yellow / orange flame	[1]	
	White fumes / solid	[1]	
	Yellow / green gas disappears	[1]	[max 2]

Question	Mark Scheme	Mark	Total
(ii)	NaC*l* giant / lattice **AND** ionic SiCl_4 simple / molecular **AND** covalent For NaC*l* large difference in electronegativity (of sodium / Na and chlorine / C*l* / Cl_2) (indicates electron transfer/ions) For SiCl_4 smaller difference (indicates sharing/covalency) with (weak) van der Waals' / IM forces (between molecules) ora	[1] [1] [1] [1]	[4]
			[20]
2 (a) (i)	Straight line drawn horizontally from same intercept	[1]	[1]
(ii)	T_1 because it shows greatest deviation/furthest from ideal	[1]	[1]
(iii)	reducing *T* (reduces KE of particles) so intermolecular forces of attraction become more significant	[1]	[1]
(iv)	greatest deviation is at high pressure increasing pressure decreases volume so volume of particles becomes more significant ora	[1] [1]	[2]
(b)	Mass of air = 100 × 0.00118 = 0.118 g Mass of flask = 47.930 – 0.118 = **47.812** g Mass of **Y** = 47.989 – 47.812 = **0.177** g $pV = nRT = \frac{m}{M_r} RT$ $M_r = \frac{mRT}{pV} = \frac{0.177 \times 8.31 \times 299}{1 \times 10^5 \times 100 \times 10^{-6}}$ = **44.0** (43.979 to 2 or more sf)	 [1] [1] [1] [1]	[4]
(c) (i)	strong <u>triple</u> bond	[1]	[1]
(ii)	high temperature (needed for reaction between N_2 and O_2)	[1]	[1]
(iii)	$2NO + 2CO \rightarrow N_2 + 2CO_2$ **OR** $2NO + C \rightarrow N_2 + CO_2$	[1]	[1]
(iv)	$4NO_2 + 2H_2O + O_2 \rightarrow 4HNO_3$	[1]	[1]
(v)	$NO + ½O_2 \rightarrow NO_2$ $NO_2 + SO_2 \rightarrow NO + SO_3$ **OR** $NO_2 + SO_2 + H_2O \rightarrow NO + H2SO_4$	[1] [1]	[2]
			[15]

© Cambridge International Examinations 2015

Question	Mark Scheme	Mark	Total
3 (a)	Bond breaking = C=O = 740 C–H = 410 = 1150 kJ	[1]	
	Bond forming = C–C = 350 C–O = 360 O–H = 460 = 1170 kJ	[1]	
	Enthalpy change = 1150 – 1170 = **–20** kJ mol^{-1}	[1]	[3]
(b) (i)	Stereoisomerism = (molecules with the same molecular formula and) same structural formula but different spatial arrangements of atoms	[1]	
	Chiral centre = atom with four different atoms/groups attached	[1]	[2]
(ii)	(Planar) carbonyl so (equal chance of nucleophile) attacking either side	[1]	[1]
3 (c) (i)			
	M1 = lone pair **AND** curly arrow from lone pair to carbonyl C	[1]	
	M2 = partial charges on C=O **AND** curly arrow from bond (=) to O$^{\delta-}$	[1]	
	M3 = structure of intermediate including charge	[1]	
	M4 = lone pair **AND** two correct curly arrows (from lone pair to H **AND** from H—C to C)	[1]	
	M5 = CN$^-$	[1]	[5]
(ii)	(CN$^-$ regenerated so) catalyst	[1]	[1]
			[12]

Question	Mark Scheme	Mark	Total
4 (a)		[1] [1] [1] [1] [1] [1] [1]	[7]
(b) (i)	but-1-ene / 1-butene but-2-ene / 2-butene	[1] [1]	[2]
(ii)	but-2-ene **AND** two different groups on each carbon (of C=C) double bond means no free rotation	[1] [1]	[2]
(iii)	 and  (either way round)	[1+1]	[2]
			[13]

© Cambridge International Examinations 2015