A Level AQA Chemistry

Chapter 14 – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	A compound made up of hydrogen and carbon only.	The underlined terms are essential.	1	AO1 3.3.2
01.2	Its molecular formula is C_5H_{12}. Relative molecular mass = $5 \times 12 + 12 \times 1 = 72$		1 1	AO2 3.1.2.4
01.3	Isomers have the same molecular formula but different structural formulae.		1	AO1 3.3.1.3
01.4	$CH_3CH_2CH_2CH_2CH_3$ pentane $CH_3CH(CH_3)CH_2CH_3$ 2-methylbutane $C(CH_3)_4$ or $(CH_3)_4C$ 2,2-dimethylpropane	Both formula and name required for each mark. Any order will do. For the 2nd and 3rd isomers = make sure the commas and dashes are correct.	1 1 1	AO2 3.3.1.3
01.5	0.36 g = 0.36/72 mol = 5×10^{-3} mol Number of molecules = $5 \times 10^{-3} \times 6.022 \times 10^{23} = 3.01 \times 10^{21}$ In each molecule there are 17 atoms. ∴ Total number of atoms = $3.01 \times 10^{21} \times 17 = 5.12 \times 10^{22}$	Just the answer with no reasoning shown is 1 mark only.	1 1 1	AO2 and AO3 MS1.4; 3.1.2.2

A Level AQA Chemistry

Chapter 14 – answers

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02.1	I pent-1-ene II 2-methylbut-2-ene III pent-2-ene	Do not allow pentene	1 1 1	AO2 3.3.1.3
02.2	Stereoisomers have the same structural formula Have different arrangement of bonds in space	For 2nd mark allow have different displayed formulae	1 1	AO1 3.3.1.3
02.3	Isomer III 		1 1	AO2 3.3.1.3
02.4	There is no free rotation about the C=C double bond. On each carbon of the C=C bond, there are 2 different atoms or groups.		1 1	AO1 3.3.1.3
02.5	Methylcyclobutane		1	AO2 3.3.1.1
03.1	Use the ideal gas equation $n = \frac{PV}{RT}$ $n = \frac{1.01\times10^{5} \times 85\times10^{-6}}{8.31 \times 450}$ $= 2.2957\ldots \times10^{-3}$ mol $M_r = m/n = 0.20/2.2957\ldots \times10^{-3} = 87$ g mol^{-1}	Some evidence of using the equation is required answer to 2 s.f.	1 1 1 1	AO2 3.1.2.3

A Level AQA Chemistry

Chapter 14 – answers

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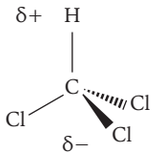
03.2	The last (highest value) significant peak		1	AO1 3.3.6.2
03.3	Error = 100% × |88–87| / 88 1.14%		1 1	AO2 PS2.3
03.4	*a* = 109.5 / 109° *b* = 104.5°	Allow 109°	1 1	AO1 MS4.1; 3.1.3.5
04.1	Chlorine is more <u>electronegative</u> than carbon electrons are not shared equally / The electrons in the covalent bond are attracted to more strongly to the chlorine atom electron cloud distorted towards chlorine		1 1 1	AO2 3.1.3.6
04.2	The molecule is (tetrahedral and) symmetrical (The electrons (electron clouds) are symmetrically distributed)This so the dipoles cancel out		1 1	AO2 3.1.3.6
04.3		The diagram would be reversed showing δ– end of $CHCl_3$ pointing towards the δ+ end of propanone	2	AO3 3.1.3.6
04.4	$CHCl_3$ – it is more polar It interacts more strongly/is attracted more strongly to the polar stationary phase and takes longer to leave the column		1 1	AO3 3.1.3.6; 3.3.16

A Level AQA Chemistry

Chapter 14 – answers

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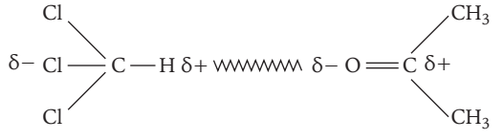
04.5	Both compounds have permanent dipoles Diagram shows the orientation of the molecules as shown below with dipole-dipole forces shown in-between molecules  	The dipoles must be shown correctly	1 2	AO3 3.1.3.7
05.1	$CH_3CH_2CH_2CH_2OH$ $CH_3CH_2CH_2CH_2CH_3$		1 1	AO1 3.3.1.3
05.2	Butan-1-ol has an OH group, which can hydrogen bond to other OH groups on the butan-1-ol molecules. Pentane has only very weak instantaneous dipole-instantaneous dipole forces between the molecules which are transient (temporary). (Butan-1-ol also has these forces.) The hydrogen bonds are stronger than the instantaneous dipole-instantaneous dipole forces between the molecules.		1 1 1	AO2 3.1.3.6 and 3.1.3.7
05.3	Fill both burettes with the two liquids and rub the nylon rod with the silk rag to produce a charged rod. Run each liquid slowly from the burette (into a beaker). Observe any deviation of the liquid stream. The butan-1-ol will be deviated a lot because it is a polar liquid. The pentane stream will not be deviated because it is non-polar and will not be affected by the electrical field.		1 1 1 1 1	AO1 and AO3 PS1.2; 3.1.3.7

A Level AQA Chemistry

Chapter 14 – answers

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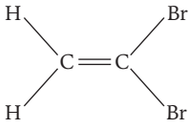
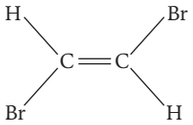
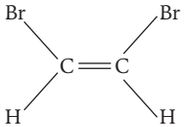
06.1	CH_2BrCH_2Br 1, 2-dibromoethane CH_3CHBr_2 1, 1-dibromoethane	Both correct name and structure required for each mark	1 1	AO2 3.3.1.3
06.2	 1, 1-dibromoethene  *E*-1, 2-dibromoethene  *Z*-1, 2-dibromoethene	Both correct name and structure required for each mark	1 1 1	AO2 3.3.1.3
06.3	1, 1-dibromoethene and Z-1, 2-dibromoethene are polar. The more electronegative bromine atoms are at one end or on one side of the molecule. This leads to an asymmetric distribution of electrons/charge and therefore the molecule is polar.		1 1 1	AO3 3.1.3.6; 3.3.1.3
06.4	In $C_2H_4Br_2$ the bond angle is 109.5° In $C_2H_2Br_2$ the angle is 120°		1 1	AO2 3.1.3.5

A Level AQA Chemistry

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Skills Box answers:

1. $\frac{0.1}{12} \times 100 = 0.83\%$
2. $\frac{0.1}{45} \times 100 = 0.22\%$
3. $\Delta V = 36.75 - 12.50 = 24.25\ \text{cm}^3$

   $\frac{2 \times 0.05}{24.25} \times 100 = 0.41\%$
4. $\Delta T = 45.0 - 22.5 = 22.5$

   $\frac{2 \times 0.05}{22.5} \times 100 = 4.4\%$