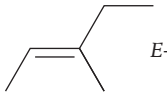
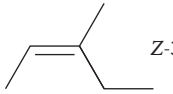
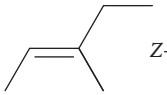
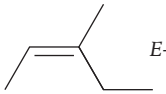
A Level AQA Chemistry

Chapter 17 – answers

Question	Answers	Extra information	Mark	AO Spec reference
01.1	 *E*-3-methylpent-2-ene  *Z*-3-methylpent-2-ene correct skeletal formulae correct names the ethyl group having priority over the methyl group	If the methyl group is given priority over the ethyl group (see below), then 2 marks only.  *Z*-3-methylpent-2-ene  *E*-3-methylpent-2-ene If the number of carbons is wrong then zero marks.	1 1 1	AO2 3.3.1.3
01.2	There is no free rotation about the C=C double bond Each carbon in the C=C bond is attached to 2 different groups or atoms $(CH_3)_2C=C(CH_3)_2$ Each carbon in the C=C is attached to 2 identical groups.	No alternatives except atoms only or groups is acceptable	1 1 1	AO2 3.3.1.3
01.3	Optical A and D *E*-*Z* B and D	Both letters essential for each mark	1 1	AO2/AO3 3.3.1.3; 3.3.7
01.4	*E*-3-chloropent-2-ene Give 1 for *E* and 1 for 3-chloropent-2-ene		1 1	AO2 3.3.1.1

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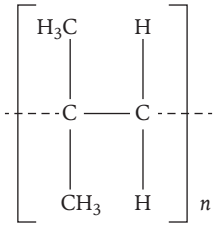
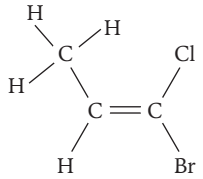
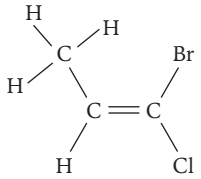
02.1	C—C single bond and dotted lines on either side Correct groups on both carbons 	The '*n*' outside the brackets is not essential as the question asks only for the repeat unit.	1 1	AO2 3.3.4.3
02.2	Alkene: from orange to colourless Polymer: No change	Allow brown and clear	2	AO3 3.3.4.2; PS4.1
02.3	The 2-methylpropene is unsaturated the polymer is saturated so no reaction $(CH_3)_2C{=}CH_2 + Br_2 \rightarrow CH_3)_2CBrCH_2Br$	Displayed or skeletal formulae are acceptable	1 1 1	AO1 3.3.4.3
02.4	 *E*-1-bromo-1-chloropropene  *Z*-1-bromo-1-chloropropene mark for correct alkene i.e. 1-bromo-1-chloropropene mark for identifying that they are *E*/*Z* isomers mark for correct use of Cahn-Ingold-Prelog prioritising 1 mark for each correct name	Reject 1-chloro-1-bromopropene (alphabetical order)	 1 1 1 1 + 1	AO3 3.3.4.3

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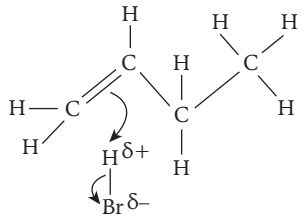
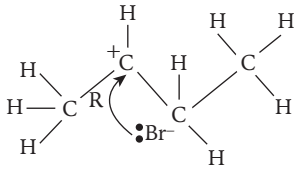
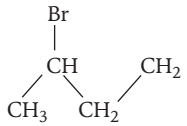
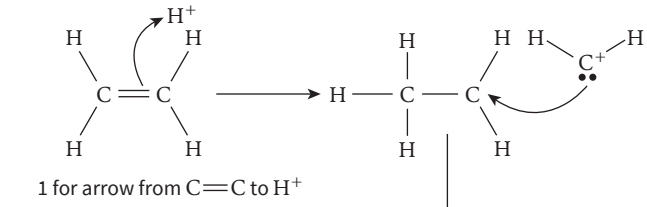
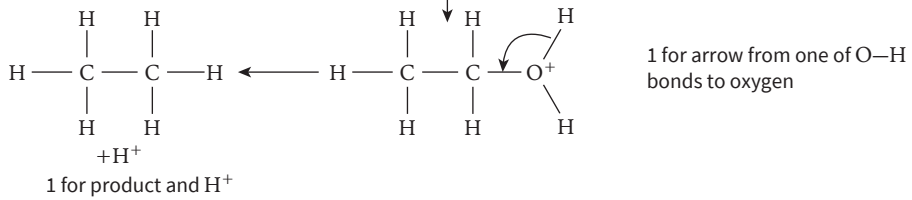
03.1	 1 for dipoles 1 for curly arrows  1 for curly arrow from lone-pair of Br^- or from negative charge 1 for carbocation  1 for correct product	Marks given on diagram. The arrows must be as shown.	5	AO2 3.3.4.2
03.2	In the tertiary carbocation there are 3 alkyl groups; in the primary there is just 1 The electron-releasing alkyl groups tend to stabilise the positive charge The greater the number of alkyl groups the greater the stability	Accept methyl groups for alkyl for the 3° cation Accept delocalise positive charge Accept greater delocalisation	1 1 1	AO1 3.3.4.2
03.3	$CH_3CH_2CH_2^+$ and $CH_3C^+HCH_3$	Do not accept $C_3H_7^+$	1 + 1	AO3 3.3.4.2
04.1	 1 for arrow from C=C to H^+ 1 for arrow from long pair 1 for carbocation  1 for arrow from one of O–H bonds to oxygen 1 for product and H^+		5	AO1 3.3.4.3; 3.3.5.1

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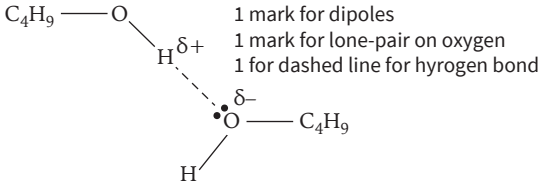
04.2	$K_p = \frac{pC_2H_5OH}{pH_2O \times pC_2H_4}$		1	AO2 3.1.10
04.3	$P_{ethanol} = 0.15 \times 5000$ kPa $= 750$ kPa $P_{ethene} = 0.23 \times 5000$ kPa $= 1150$ kPa $P_{steam} = 0.62 \times 5000$ kPa $= 3100$ kPa	2 marks for all 3 1 mark for 2 out of 3	2	AO2 3.1.10
04.4	$K_p = 750/(1150 \times 3100) = 2.10 \times 10^{-4}$ kPa^{-1} OR $K_p = 750 \times 10^3/(1150 \times 10^3 \times 3100 \times 10^3) = 2.10 \times 10^{-7}$ Pa^{-1}	1 for correct value and 1 for the units	1 + 1	AO2 MS0.0; 3.1.10
05.1	A methyl-propan-2-ol 3° B dimethylpropan-1-ol 1° C methylpropan-1-ol 1°	Both name and classification required for each mark	1 1 1	AO1/AO2 3.3.5.2
05.2	A and C $(CH_3)_2C{=}CH_2$		1	AO2 3.3.5.3
05.3	B It has no hydrogen atoms on the carbon adjacent to the C attached to the -OH group.		1 1	AO2 3.3.5.3
05.4	Either $CH_3CH(OH)CH_2CH_3$ Butan-2-ol OR $CH_3CH_2CH_2CH_2OH$ Butan-1-ol		1 1 1 1	AO2 3.3.1.3;
05.5		1 mark for dipoles 1 mark for lone-pair on oxygen 1 for dashed line for hyrogen bond Each component is a separate mark.	3	AO2 3.1.3.7

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06.1	Warm both alcohols (separately) with acidified potassium dichromate solution With E the solution changes from orange to green	Allow $H^+/Cr_2O_7^{2-}$	1 1 1	AO1 3.3.5.2
06.2	Refluxing will return the products to the reaction flask. Oxidising the aldehyde to the carboxylic acid		1 1	AO3 3.3.5.2
06.3	Distillation will remove the products from the reaction vessel Any aldehyde formed **cannot be** oxidised further to the carboxylic acid (if it has already been removed)		1 1	AO3 3.3.5.2
06.4	Group I $CH_3CH_2CH_2CH_2CH_2OH + [O] \rightarrow CH_3CH_2CH_2CH_2CHO + H_2O$ Group II $CH_3CH_2CH_2CH_2CH_2OH + 2[O] \rightarrow CH_3CH_2CH_2COOH + H_2O$		1 1	AO2 3.3.5.2
06.5	Warm with Tollen's reagent A silver precipitate/silver mirror confirms presence of aldehyde OR Warm with Fehling's solution Brick-red precipitate confirms presence of aldehyde		1 1	AO1 3.3.5.2

Skills box answers:

1. To ensure the liquid boils calmly without splashing into the exit tube. / They provide a site for nucleation of bubbles and thus prevent flash boiling. (Reject 'It is safer' or 'to stop bumping'.)
2. Filling from the bottom prevents bubbles of air becoming trapped in the condenser. Air is an insulator / stops heat from being transferred effectively / prevents condensation of the distillate.
3. Add Tollen's reagent/Fehling's solution to the product and warm gently. If propanal is present then a silver mirror (or grey precipitate) or a brick-red precipitate will form, but if only propan-1-ol is present there will be no change as the alcohol is oxidised by the weak oxidising agents in these tests.
4. Propene is a gas so will leave the reaction vessel anyway