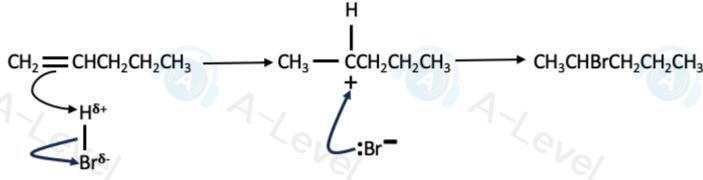


Question Number	Answer	Mark
19	<p>The only correct answer is B</p>  <p><i>A is incorrect because the arrow goes from the carbocation to the bromide ion</i></p> <p><i>C is incorrect because the arrow goes from H^{δ+} to the double bond</i></p> <p><i>D is incorrect because the bromide ion has a partial negative charge</i></p>	(1) Computer

Question Number	Answer	Additional Guidance	Mark
19(a)(i)	An answer that makes reference to the following point: <ul style="list-style-type: none"> electrophilic addition 	Do not award substitution	(1)

Question Number	Answer	Additional Guidance	Mark
19(a)(ii)	An explanation that makes reference to the following points: <ul style="list-style-type: none"> (because) the formation of 2-chloropropane / the major product proceeds via a secondary carbocation (but) the reaction / the formation of 1-chloropropane / the formation of the minor product proceeds via a primary carbocation (and) secondary carbocations are more stable than primary carbocations 	(1) Do not award 2-chloropropane is a secondary carbocation (1) Do not award 1-chloropropane is a primary carbocation (1) Allow TE on incorrect type of carbocations used in M1 and M2 but must be in the correct order of stability (3° more stable than 2° more stable than 1°)	(3)

Question Number	Answer	Additional Guidance	Mark
19(b)	All 9 points scores (4) 7 or 8 points scores (3) 5 or 6 points scores (2) 3 or 4 points scores (1) <ul style="list-style-type: none"> dipole on O–H bond arrow from double bond to correct H or just in front of H arrow from O–H bond to O structure of intermediate carbocation ignoring any charge positive charge on intermediate carbocation structure of intermediate anion single negative charge on intermediate anion lone pair of electrons on relevant O arrow from lone pair of electrons to correct carbon 	Example of diagram: <p>Allow charge on the anion anywhere on the ion including outside a bracket</p>	(4)

(Total for Question 19 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
19(a)	An answer that makes reference to the following point: <ul style="list-style-type: none"> presence of (at least one) carbon to carbon double bond / C = C 	Allow C \equiv C bond Ignore just having a double bond Ignore Hydrocarbon	(1)

Question Number	Answer	Additional Guidance	Mark
19(b) (i)	An answer that makes reference to the following point: <ul style="list-style-type: none"> addition (reaction) 	Ignore electrophilic, bromination, hydration, halogenation Do not award nucleophilic, substitution	(1)

Question Number	Answer	Additional Guidance	Mark
19(b)(ii) Clip with (b)(iii) and (b)(iv)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> x-axis labelled (average) number of C=C (bonds per molecule) (1) and y-axis labelled volume (of 0.0625 mol dm⁻³ bromine water) /cm³ 4 points in the table plotted correctly to within half a small square (1) and plots to cover ½ the grid in both directions with linear scales straight line of best fit (through all 4 points) (1) 	<p>Ignore extrapolation of straight line</p>	(3)
Question	Answer	Additional Guidance	Mark

Number	Answer	Additional Guidance	Mark
19(b) (iii) Clip with (b)(ii) and (b)(iv)	<ul style="list-style-type: none"> calculation of the mean to 3SF 	<p>Example of calculation:</p> $\frac{36.9 + 34.1 + 39.3 + 32.5}{4} = 35.7 \text{ (cm}^3\text{)}$	(1)

Question Number	Answer	Additional Guidance	Mark
19(b) (iv) Clip with (b)(ii) and (b)(iii)	<ul style="list-style-type: none"> average number of C=C bonds derived from their graph and given to 2SF 	<p>Average number of C=C bonds per molecule 1.25 =1.2 or 1.3 Allow TE from an incorrect line of best fit</p>	(1)

Question Number	Answer	Additional Guidance	Mark
19(c) (i)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> dipole on Br-Br arrow from double bond to delta + bromine arrow from bromine bond to delta - bromine carbocation on correct intermediate lone pair on bromide negative charge on bromide ion arrow from lone pair on bromide ion to carbocation correct formula of final product (1,2-dibromoethane) <p>all 8 points 4 marks, 6 or 7 points 3 marks, 4 or 5 points 2 marks, 2 or 3 points 1 mark</p>	<p>Point 1 if H-Br used penalise here only Point 4 carbocation intermediate based on any alkene Point 7 given for the arrow from lone pair if given, or anywhere if lone pair not given.</p>	(4)

Question Number	Answer	Additional Guidance	Mark
19(c) (ii)	<p>An answer that makes reference to the following point:</p> <p>(E- / trans-) 4-methylhex-2-ene</p>	Do not award hexa	(1)

Question Number	Answer	Additional Guidance	Mark
19(d)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> correct skeletal formula (1) trans means that the (alkyl) groups (methyl or R) are on either side of the double bond (1) 	<p>Allow (alkyl) groups point in opposite directions M2 is dependent on the presence of a double bond in M1 or text of M2 Ignore planes as this does not differentiate sufficiently between cis and trans Do not award species or molecules instead of groups</p>	(2)

(Total for Question 19 = 14 marks)