

Alkenes and Addition Reactions

Q1. (2018) – 10b

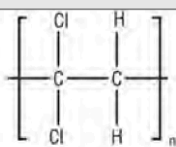
Question Number	Indicative content	Mark
*10(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • (add) sodium carbonate (or any suitable carbonate) / test with blue litmus • carboxylic acid sample effervesces / blue litmus turns red • alkane and alkene sample give no effervescence / does not affect litmus • therefore liquid is butanoic acid • butanoic acid + sodium carbonate → sodium butanoate + carbon dioxide + water • (balanced equation) $2 \text{C}_3\text{H}_7\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2 \text{C}_3\text{H}_7\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$ • (add) bromine water (to separate samples of each liquid) • (bromine water) orange colour • shake • alkene sample changes from orange to colourless • alkane (and carboxylic acid) stay orange • therefore liquid changing is hexene • hexene + bromine → 1,2-dibromohexane (allow any suitable isomer product / ignore numbers) • structural formula of product, e.g. • (balanced equation / addition reaction) $\text{C}_6\text{H}_{12} + \text{Br}_2 \rightarrow \text{C}_6\text{H}_{12}\text{Br}_2$ credit any appropriate test for an acid, e.g. specific indicator with correct colour change(s) • liquid giving negative results with both the test for acids and the bromine water is the alkane/hexane credit any appropriate test which would distinguish between the substances	(6) AO 1 1

Q2. (2020)

A)

Question number	Answer	Additional guidance	Mark
4(a)(i)	A description to include any two from • double bond (in monomer) {breaks/ opens up} (1) • {monomers/ molecules} {link/ join} together (1) • to form a (long) chain (1)	diagrams can score MP1, 2 or 3 ignore mention of addition or condensation	(2)

B)

Question number	Answer	Additional guidance
4(a)(ii)	 B is the only correct answer. A is not correct as it is poly(1,2-dichloroethene) C is not correct as it has a double bond D is not correct as it is poly(1,1,2-trichloroethene)	(1)

C)

Question number	Answer	Additional guidance
4(a)(iii)	B only the dichloroethene and bromine water goes colourless is the only correct answer A is incorrect because the alkene decolourises bromine water C is incorrect because the polymer does not decolourise bromine water but the alkene does D is not correct because the polymer does not decolourise bromine water	(1)

Q3. (2021) – 4b

Question number	Answer	Additional guidance	Mark
4(b)(i)	circle around C=C	or circle around C-Cl	(1) AO1

Q4. (2021) – 6c (ii)

Question number	Answer	Mark
6(c)(ii)	Using tangent drawn on graph eg $\frac{\text{vertical difference}}{\text{horizontal difference}} = \frac{(100 - 52)}{180} = 0.267$ (1) (1) (= 0.267) (cm ³ s ⁻¹) calculation will depend on final graph 2 marks for rate being within a range eg 0.250 – 0.290 1 mark for rate being in range 0.230 – 0.249 or 0.291 – 0.310	(2) AO3

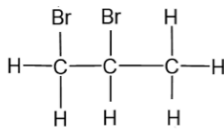
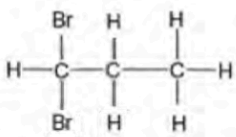
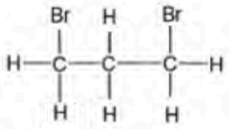
Q5. (2021) – 10a (ii)

Question number	Answer	Mark
10(a)(ii)	An explanation linking - bromine water is yellow (1) - with compound X, yellow colour remains / no change of colour (1) - with compound Y, bromine water turns colourless (1) or - bromine water and compound X – no change in colour of bromine water (1) - bromine water and compound Y – bromine water changes from yellow (1) to colourless (1)	(3) AO2

Q6. (2022) – 10a (ii)

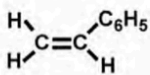
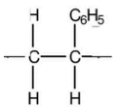
Question number	Answer	Additional guidance	Mark
10(a)(ii)	C ₄ H ₈ + Br ₂ → C ₄ H ₈ Br ₂ fully correct equation (2) if equation not fully correct, then correct formula of product C ₄ H ₈ Br ₂ (1)	reject charges on formulae reject superscript numbers allow incorrect lower and upper case letters	(2) AO2 2

Q7. (2023) – 7a (ii)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	 Br on neighbouring carbon atoms (1) rest of molecule correct with no double bond, two bromines and no extra products (1)	allow $\text{CH}_2\text{BrCHBrCH}_3$ (1) OR  (1) OR  (1) ignore the molecular formula	(2) AO2-1

Q8. (2024) – 10b

A)

Question number	Answer	Additional guidance	Mark
10(b)(i)	 one $\text{C}=\text{C}$ only in any molecule with 8 carbons (1) monomer fully correct (2)	For MP1 all that is required is one, and only one, $\text{C}=\text{C}$ bond and any other 6 C atoms in any structure [but ignore any $\text{C}=\text{C}$ in attempted structure of the phenyl group], even if molecule does not exist. no continuation bonds allowed in fully correct molecule allow 1 mark for correct repeating unit (with or without brackets or continuation bonds but reject if includes n) 	(2) AO3 1

B)

Question number	Answer	Additional guidance	Mark
10(b)(ii)	an explanation to include: (bromine water is) {orange/ yellow} (1) - turns colourless/ decolourises (1) - because double bond present / unsaturated (1)	mark independently reject red or brown ignore clear ignore alkene	(3) AO2 1