

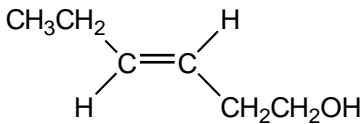

AS

Chemistry

Paper 2 (7404/2): Organic and Physical Chemistry
Mark scheme

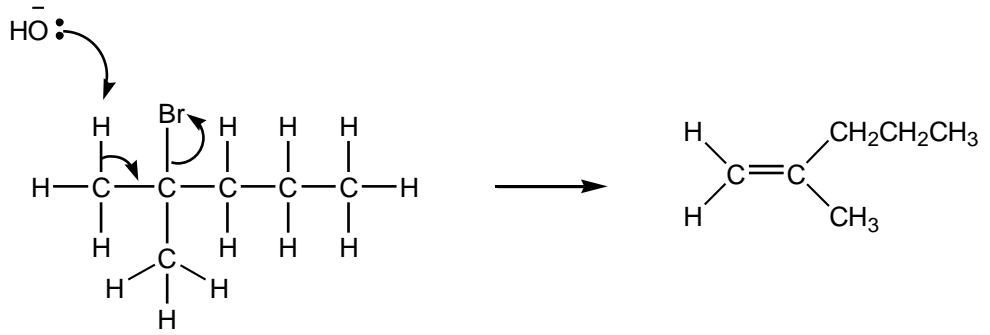
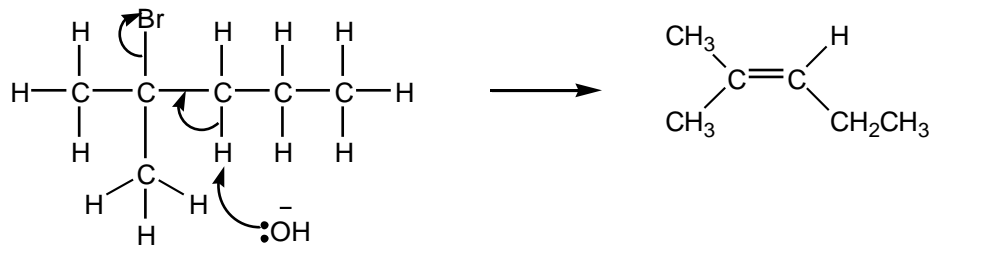
7404
Specimen paper

Version 0.1

Question	Marking guidance	Mark	Comments
01.1		1	
01.2	4-methylpent-4-en-1-ol	1	or 4-methylpent-3-en-1-ol
01.3		1	

Question	Marking guidance	Mark	Comments
02.1	Mass of alcohol burned = 0.50 (g) and temperature rise = 20.1 (°C)	1	Both must be correct for 1 mark
02.2	$q = 50 \times 4.18 \times 20.1$ OR $q = mc\Delta T$ = 4200 (J)	1 1	
02.3	mol of alcohol = $n = 0.50/100 = 0.0050$ $\Delta H = -q/1000n$ OR $-q/n$ = -840 kJ mol^{-1} or $-840\,000 \text{ J mol}^{-1}$	1 1 1	Allow this mark if – sign missing Answer must be negative
02.4	Less negative than the reference Heat loss OR incomplete combustion OR evaporation of alcohol OR heat transferred to beaker not taken into account	1 1	
02.5	Since water has a density of 1 g cm^{-3} A volume of 50 cm^3 could be measured out	1 1	

Question	Marking guidance	Mark	Comments
03.1	(Compounds with the) same molecular formula but different structural / displayed / skeletal formula	1	
03.2	2-methylpent-1-ene or correct structure 2-methylpent-2-ene or correct structure	1 1	Either order

03.3	<p>(basic) elimination</p> <p>Mechanism points:</p> <p>Correct arrow from lone pair on :OH⁻ to H on C adjacent to C–Br</p> <p>Correct arrow from C–H bond to C–C</p> <p>Correct arrow from C–Br bond to Br</p> <p></p> <p>OR</p> <p></p>	1 1 1 1	
------	--	----------------------	--

04.3	<p>Any two from:</p> <ul style="list-style-type: none">• The OH in acids has a (broad) absorption at 2500–3000 cm^{-1}• The C=O in acids has an absorption at 1680–1750 cm^{-1}• Alcohol OH absorption in different place (3230–3550 cm^{-1}) from acid OH absorption	2 max	<p>Allow fingerprint region (or 1500–400 cm^{-1})</p> <p>Apply list principle to extra answers given beyond 2 differences</p>
------	--	-------	---

Question	Marking guidance	Mark	Comments
05.1	UV light	1	1 mark for each radical Allow 1 mark for correct equation forming Cl•
	$\text{CBrClF}_2 \longrightarrow \text{Br}\bullet + \bullet\text{CClF}_2$	2	
05.2	$\text{Br}\bullet + \text{O}_3 \longrightarrow \text{BrO}\bullet + \text{O}_2$	1	Error carried forward – allow full credit for correct equations with Cl•
	$\text{BrO}\bullet + \text{O}_3 \longrightarrow \text{Br}\bullet + 2\text{O}_2$	1	

Question	Marking guidance	Mark	Comments
06.1	C ₆ H ₁₄ (or correct alkane structure with 6 carbons)	1	Allow hexane or any other correctly named alkane with 6 carbons
06.2	(Liquefy and) fractionally distil	1	Allow fractional distillation
06.3	(<i>E</i> or <i>Z</i>) but-2-ene	1	
06.4	High temperature	1	If value given, allow 400–900 °C or 650–1200 K
	High pressure	1	If value given, allow ≥ 1 MPa
06.5	Rate increase	1	
	Greater collision frequency because molecules are closer together	1	
	Yield increase	1	
	Equilibrium shifts to reduce pressure	1	
	Equilibrium moves to right-hand side with fewer moles gas	1	
06.6	Rate increase	1	
	More collisions between molecules with $E > E_a$	1	
	Yield decrease	1	
	Equilibrium shifts to reduce temperature	1	
	In endothermic direction	1	

Question	Marking guidance	Mark	Comments
07.1	Any two from: <ul style="list-style-type: none"> • Rinse burette with bromine water • Fill jet space • Remove funnel 	2 max	
07.2	Drop sizes vary	1	Allow percentage error for amount of oil will be large as the amount used is so small
07.3	Use a larger volume of oil eg 10.0 cm ³ (using a measuring cylinder or pipette) Make up to eg 250 cm ³ (in a volumetric flask) (titrate) samples (eg 5.0 cm ³)	1 1 1	Allow alternatives such as measuring a known mass of oil and making up a standard solution for sampling
07.4	Mass of oil = $0.92 \times (0.05 \times 5)$ = 0.23 (g) Mol of oil = $0.23 / 885$ = 2.6×10^{-4}	1 1 1 1	Allow consequential marking using value from mass of oil
07.5	Mol bromine = 0.020×0.0394 = 7.9×10^{-4} (2 significant figures)	1 2	Allow 1 out of 2 if more or fewer significant figures quoted

07.6	Ratio oil : bromine $2.6 \times 10^{-4} : 7.9 \times 10^{-4}$ 1 : 3 Hence, 3 C=C bonds	1 1	
------	---	--------	--

Section B

In this section, each correct answer is awarded 1 mark.

Question	Key
8	B
9	C
10	D
11	C
12	D
13	B
14	C
15	A
16	D
17	D
18	C
19	C
20	B
21	A
22	C
