

Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Halogenoalkanes

Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Mark Schemes

Q1.

(a) $C_2F_4 = 0.865 \text{ mol}$

Award 1 mark if $HCl = 2 \times C_2F_4$

M1

$HCl = 1.73 \text{ mol}$

M2

(b) $K_c = \frac{[C_2F_4][HCl]^2}{[CHClF_2]^2}$

Penalise round brackets

1

(c) $K_c = \frac{[0.865/23.2][1.73/23.2]^2}{[0.27/23.2]^2}$

Allow ecf for use of their answer(s) to (a) and (b)

M1 for dividing by volume

M1

$K_c = 1.5(3)$ must be at least 2sf Allow 1.53-1.54

If no use of volume allow M2 for 35.5

If upside down can allow all 3 marks as ECF to (b)

Leads to an answer of $0.65(3) \text{ mol}^{-1} \text{ dm}^3$

M2

Units = mol dm^{-3}

M3

(d) Yield would increase

M1

Equilibrium opposes temperature increase

Shifts /moves to reduce temperature

M2

Moves in the endothermic direction

Ignore favours

M3

(e) Causes ozone depletion/decomposition/damage

Accept hole in the ozone layer

M1

Pentane does not have C-Cl bonds

Accept does not produce Cl radicals
Accept does not contain chlorine

M2

[11]

Q2.

- (a) (for alkenes) elimination

Allow base elimination

Not nucleophilic elimination

1

(for alcohols) nucleophilic substitution

1

- (b) (Different molecules/compounds with the) same (molecular and) structural formula

1

Different spatial arrangement of atoms

Allow different spatial arrangement of bonds/groups

1

- (c) **A** = but-1-ene

Not butene

1

two groups/atoms/Hs the same on one of the C=C carbons

Allow two groups/atoms/Hs the same on first C

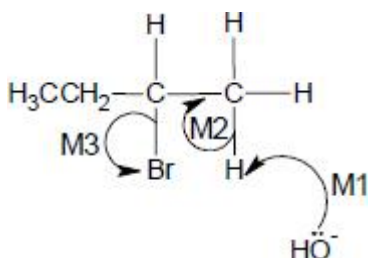
Not two groups the same on one side of C=C

Ignore references to no chiral carbon

Ignore 'priority' i.e. 2 groups with the same priority... gets M2 for '2 groups the same...'

1

- (d)



If wrong halogenoalkane used then max 2/3

M1 lone pair on O, negative charge (anywhere) and curly arrow from lone pair to H on carbon 1

Not if (covalent) NaOH / additional arrows to or from NaOH / additional arrows to or from Na⁺

1

M2 curly arrow from C(1)-H to C(1)-C(2)

M2 is standalone from **M1**

Allow ecf if H on carbon 3 attacked in **M1** for curly arrow from C(3)-H to C(2)-C(3)

Not as ecf if H on carbon 2 attacked in M1 for curly arrow from C(2)-H

1

M3 Curly arrow from C-Br to Br (mark is independent)

Not if any additional arrows / incorrect polarity or formal charges on C-Br

1

Allow ecf for mechanism to form but-2-ene from (c)

Allow E1 mechanism

M1 curly arrow from C-Br bond to the Br

M2 curly arrow from lone pair on O of OH⁻ to a correct H on the correct

C adjacent to C⁺ on the carbocation
M3 curly arrow from a correct C-H bond to a correct C-C bond
penalise M1 for any additional arrow(s) to/from the Br to/from anything else
penalise M2 for any additional arrow(s) on NaOH

(e) Z-but-2-ene **AND** E-but-2-ene

Allow 'cis'/'trans' and **B** and **C** either way round

Allow E/Z but-2-ene, cis/trans but-2-ene

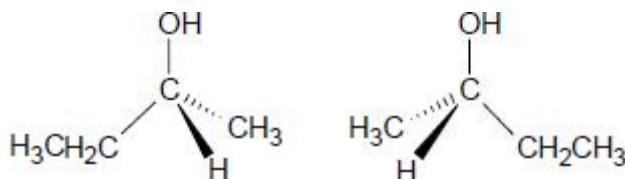
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lack of/restricted/no (free) rotation around C=C/double bond

Allow C=C/double bond cannot rotate

1

(f)



M1 any correct 2D or 3D structure of butan-2-ol

Allow C₂H₅

1

M2 must show at least one wedge bond and one dash bond in each structure from the chiral C and any bonds **in the plane** cannot be at 180° to each other

1

second structure could be drawn as mirror image of first **or** with same orientation of bonds and two groups swapped round

Allow ECF for second structure from incorrect first structure, providing molecule is chiral

(g) Silver iodide then silver bromide then silver chloride

Allow yellow then cream then white

Allow iodide/AgI then bromide/AgBr then chloride/AgCl

Allow iodo(butane) then bromo(butane) then chloro(butane)

Ignore iodine then bromine then chlorine

1

bond strength C-I < C-Br < C-Cl

Ignore incorrect formulae

Allow carbon-halogen bond strength decreases down the group / from Cl to I

1

[15]