

Name of the Student: _____

Max. Marks : 15 Marks

Time : 15 Minutes

Mark Schemes

Q1.

- (a) 3-chloro-2,4-dimethylpentane

This answer only apart from slips with commas and dashes

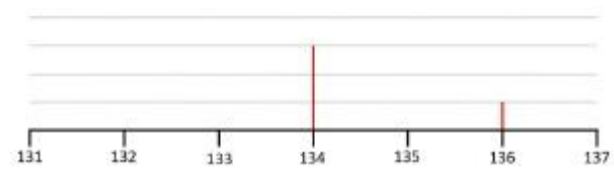
1

- (b) **M1** lines at 134 and 136

M1 is for drawing the correct two lines (if other lines are drawn, penalise **M1** (but ignore any additional very small lines at 135 or 137))

1

- M2** line at 134 to be three times higher than line at 136

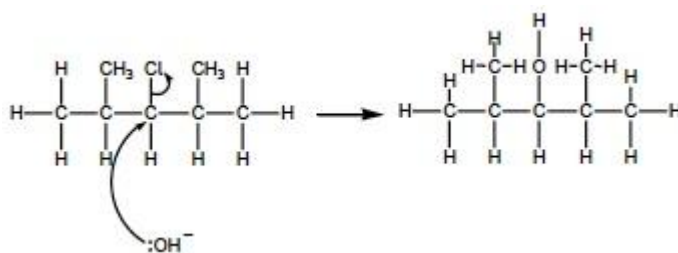


M2 is for the line at 134 being three times as big as the one at 136 (ignore other lines)

Accept cross to represent top of lines; if bars drawn – they should be narrow (less than 10% of division) and clear which value they refer to.

1

- (c) **M1** nucleophilic substitution



1

- M2** curly arrow from lone pair on O of OH⁻ to C of C–Cl

For SN2: penalise **M2** for any additional arrow(s) on NaOH, or for covalent NaOH; penalise **M3** for any additional arrow(s) to/from the Cl to/from anything else

If curly arrows represent an attempt at an elimination mechanism, cannot score **M2** or **M3**

1

- M3** curly arrow from C–Cl bond to the Cl

Penalise **M3** for formal charge on C and/or Cl of C–Cl or incorrect partial charges on C–Cl; ignore other partial charges on uncharged atoms

For SN2: penalise **M2** for any additional arrow(s) on NaOH, or for covalent NaOH; penalise **M3** for any additional arrow(s) to/from the Cl to/from anything else

If curly arrows represent an attempt at an elimination mechanism, cannot score **M2** or **M3**

If SN1 mechanism given (loss of Cl first followed by attack by OH[−]) then:

M2 curly arrow from C–Cl bond to the Cl

M3 curly arrow from lone pair on O of OH[−] to positive C atom of correct carbocation

penalise **M2** for any additional arrow(s) to/from the Cl to/from anything else

penalise **M3** for any additional arrow(s) on NaOH

1

M4 correct structure of alcohol (in any form)

M4 is independent

M4 ignore presence of non-organic products

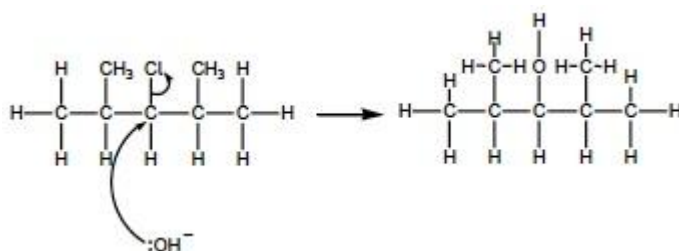
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(d) **M1** elimination

M1 allow base elimination (but nothing else)

1

M2 base



M2 allow proton acceptor

1

M3 curly arrow from lone pair on O of OH[−] to H on one of the C atoms adjacent to the C–Cl
If curly arrows represent an attempt at a substitution mechanism, cannot score **M3** or **M4**

1

M4 curly arrow from a correct C–H bond adjacent to the C–Cl to a correct C–C bond. Only award if an arrow is shown attacking the H atom of a correct adjacent C–H bond in **M3**
If curly arrows represent an attempt at a substitution mechanism, cannot score **M3** or **M4**

1

M5 curly arrow from C–Cl bond to the Cl (mark is independent)

Penalise **M5** for formal charge on C and/or Cl of C–Cl or incorrect partial charges on C–Cl; ignore other partial charges on uncharged atoms

1

M6 correct structure of alkene (in any form)

M6 is independent

M6 ignore presence of non-organic products

If E1 mechanism given (loss of Cl first followed by attack by OH⁻) then:

M3 curly arrow from C-Cl bond to the Cl

M4 curly arrow from lone pair of OH⁻ to a correct H on the correct C adjacent to C⁺ on the carbocation

M5 curly arrow from a correct C-H bond to a correct C-C bond

penalise **M3** for any additional arrow(s) to/from the Cl to/from anything else

penalise **M4** for any additional arrow(s) on KOH

1

- (e) C as C=C 1620-1680 cm⁻¹ OR no O-H 3230-3550 cm⁻¹

need the correct compound and an explanation

full wavenumber range or value(s) within the range

on this occasion candidates do not need to refer to the O-H bond being O-H alcohol as opposed to O-H acid – just reference to O-H with wavenumbers is required

1

- (f) C-Br is weaker than C-Cl or

C-Br has lower bond enthalpy than C-Cl or

C-Br breaks more easily C-Cl

Must compare the C-Br and C-Cl bonds specifically

Ignore references to bond length, size of atoms, shielding, electronegativity and polarity

Penalise idea that bromine is more reactive than chlorine

1

[15]