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

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) (i) Splitting/breaking C— X/bond(s) using/by (adding)/with water

OR

Splitting/breaking the molecule/substance/compound using/by (adding)/with water

NOT simply the reaction of/with water
NOT simply the addition or adding of water.
NOT the "splitting of water"
Accept any halogen bond, but penalise other specified bonds

1

(ii) **M1** yellow ONLY

M2 $Ag^+ + I^- \rightarrow AgI$ ($Ag^+ I^-$)
For M1, penalise cream(y) OR white
Ignore pale or light or dark (yellow)
For M2, ignore state symbols

2

(iii) **M1** AgF OR silver fluoride is soluble/dissolves (in water)

M2 No result
OR no precipitate
OR no (visible) change would occur
OR colourless solution
Accept "silver flouride"
Mark independently
Ignore reference to C – F bond breakage in M1
Ignore "no reaction" and "nothing"

2

(b) The bond that takes less energy to break/the lower bond enthalpy (energy)/weaker bond means the precipitate/reaction/hydrolysis occurs faster/quicker/takes less time

OR

The bond that takes more energy/the higher bond enthalpy (energy)/stronger bond means the precipitate/reaction/hydrolysis occurs slower/takes longer/takes more time

Insist on comparative on both bond strength and rate of reaction

Downloaded from www.merit-minds.com

1

(c) (i) An <u>electron pair donor</u>

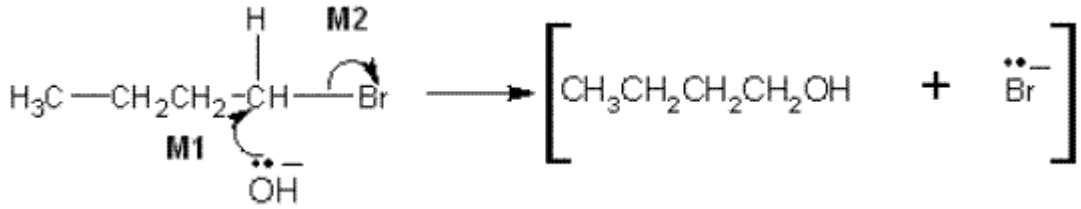
OR

Forms a covalent or co-ordinate or dative bond by <u>donating a pair of electrons</u>

1

Answer must refer to an electron pair.
Credit "lone pair"
"Attracted" does not equal "donated"

(ii)



M1 must show an arrow from the lone pair of electrons on the oxygen atom of the negatively charged hydroxide ion to the central C atom.

M2 must show the movement of a pair of electrons from the C─Br bond to the Br atom. Mark M2 independently.

NB The arrows here are double-headed

Penalise M1 if covalent NaOH is used
Penalise M2 for formal charge on C or incorrect partial charges
Penalise once only for a line and two dots to show a bond.
Max 1 mark for the wrong reactant
Award 1 mark only for C-Br bond breakage if ***<u>an S_N1 mechanism</u>*** *is used.*
Do not penalise the use of "sticks"

2

(d) (i) Structure of tertiary carbocation $(CH_3)_3C^+$ or drawn out

Insist on <u>a full positive charge</u> on the <u>central</u> C atom.
Penalise a bond to the positive charge.
Be lenient on vertical C-C bonds

1

(ii) <u>Tertiary carbocation/carbonium ion</u> (from 2-bromo-2-methylpropane) is <u>more stable</u> (than the primary carbocation/carbonium ion)

OR

<u>Primary carbocation/carbonium ion</u> (from 2-bromo-2-methylpropane) is <u>less stable</u> (than the tertiary carbocation/carbonium ion)

QoL

Ignore reference to the alleged relative stability of haloalkanes

1

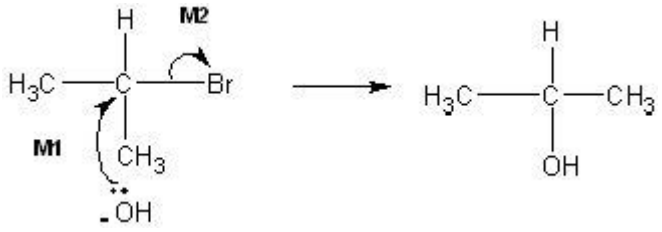
[11]

Downloaded from www.merit-minds.com

Q2.

(a) (i) Nucleophilic substitution

1



2

M1 must show an arrow from the lone pair of electrons on the oxygen atom of the negatively charged hydroxide ion to the central C atom.
M2 must show the movement of a pair of electrons from the C-Br bond to the Br atom. Mark M2 independently.

Penalise M1 if covalent KOH is used

Penalise M2 for formal charge on C or incorrect partial charges

Penalise once only for a line and two dots to show a bond.

*Max 1 mark **for the mechanism** for the wrong reactant and/or "sticks"*

Ignore product

Award full marks for an S_N1 mechanism in which M1 is the attack of the hydroxide ion on the intermediate carbocation.

(ii) 2-bromopropane ONLY

1

(iii) Polar C–Br ***OR*** polar carbon–bromine bond ***OR*** dipole on C–Br
OR δ+ (δ–)
C atom of carbon–bromine bond is δ+/electron deficient ***OR*** C—Br

(Credit carbon–halogen bond as an alternative to carbon–bromine bond)

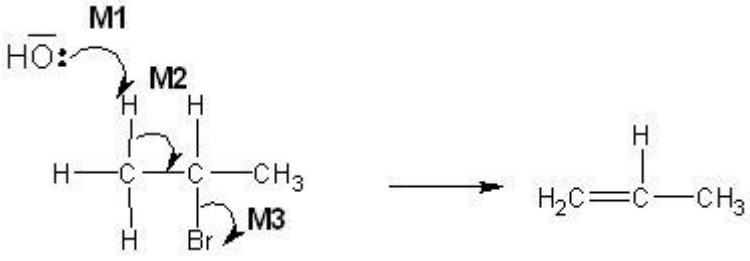
It must be clear that the discussion is about the carbon atom of the C–Br bond. NOT just reference to a polar molecule.
Ignore X for halogen

1

(b) Elimination

Credit "base elimination" but NOT "nucleophilic elimination"
No other prefix.

1



3

M1 must show an arrow from the lone pair on oxygen of a negatively charged hydroxide ion to the correct H atom
M2 must show an arrow from the correct C-H bond to the C-C bond

Downloaded from www.merit-minds.com

and should only be awarded if an attempt has been made at M1
M3 is independent.

Mechanism
Penalise M1 if covalent KOH
Penalise M3 for formal charge on C or incorrect partial charges
Penalise once only for a line and two dots to show a bond.
*Max 2 marks **for the mechanism** for wrong reactant and/or "sticks"*
Ignore product

Award full marks for an E1 mechanism in which M2 is on the correct carbocation.

(c) *Any one condition from this list to favour elimination*;
Apply the list principle

- alcohol(ic)/ethanol(ic) (solvent)
- high concentration of KOH/alkali/hydroxide ***OR*** concentrated KOH/hydroxide
  Ignore "aqueous"
- high temperature or hot or heat under reflux or T = 78 to 100°C
  Ignore "excess"

1

(d) (i) Addition (polymerisation) ONLY
Penalise "additional"

1

(ii) But-2-ene ONLY (hyphens not essential)
Ignore references to cis and trans or E/Z
Ignore butane

1

[12]

Downloaded from www.merit-minds.com