

Name of the Student: _____

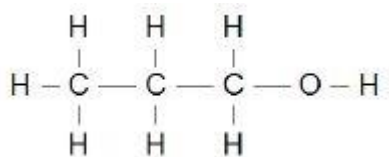
Max. Marks : 26 Marks

Time : 26 Minutes

Mark Schemes

Q1.

(a)

*Must be displayed*

1

(b) Nucleophilic substitution

1

Excess NH₃*Ignore aqueous, alcoholic, conc, dil, temp, heat, pressure*

1

(c) Amount of CH₃CH₂CH₂Br 25.2/122.9 (=0.205) (mol)

M1

Amount of CH₃CH₂CH₂NH₂ M1 × 0.75 (= 0.154) (mol)

M2

Mass CH₃CH₂CH₂NH₂ M2 × 59.0 = 9.07g Must be 3sf

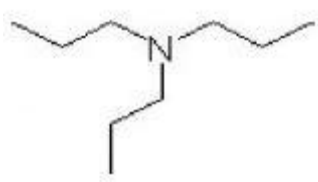
M3

*If either Mr incorrect or used incorrectly then only award 1 mark for 75% yield calculation**(ignore rounding to 123 for CH₃CH₂CH₂Br)*

OR

*Max mass amine = M1 × 59.0 (= 12.1) (g)**Actual mass = M2 × 0.75 = 9.07g Must be 3sf**Allow 9.09 but if 9.08 check for AE**18.9 scores 1 for 75%*

(d)

*Must be skeletal*

tertiary amine or 3° amine (only award if a tertiary amine shown)

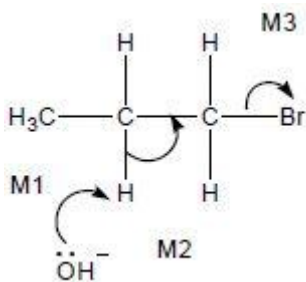
- (e) NaOH/ ethanol or KOH / ethanol (both required)

NOT aqueous

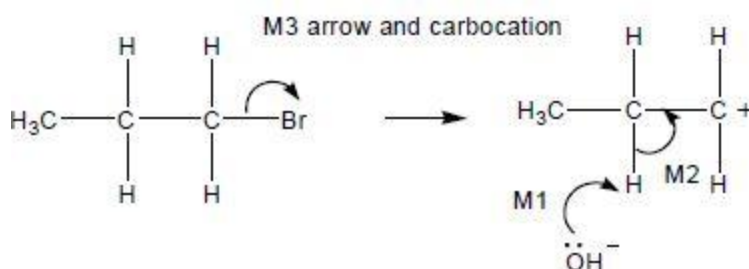
Ignore heat, temp, conc., dil,

Accept alcoholic for ethanol

- (f) (Basic) Elimination



Also credit E1 mechanism



M1 arrow from lone pair on O of hydroxide to correct H (or to space mid way between hydroxide O and H)

M2 arrow from C-H bond to C-C bond following attack by OH⁻ on the correct H

M3 arrow from C-Br bond to Br

If nucleophilic substitution shown then allow M3 only in mechanism

If wrong haloalkane used then Max 2 for mechanism

M3 curly arrow for loss of Br⁻ & structure of carbocation

M1 arrow from lone pair on O of hydroxide to H (or to space mid way between hydroxide O and H) (same as E2)

M2 arrow from C-H bond to C-C bond (same as E2)

Q2.

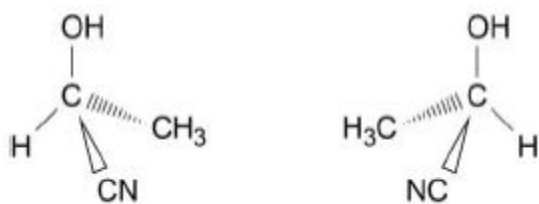
(a) 3

1

(b) Chain.

1

(c)



One 3D enantiomer.

1

Second enantiomer correctly drawn as 3D mirror image of first.

1

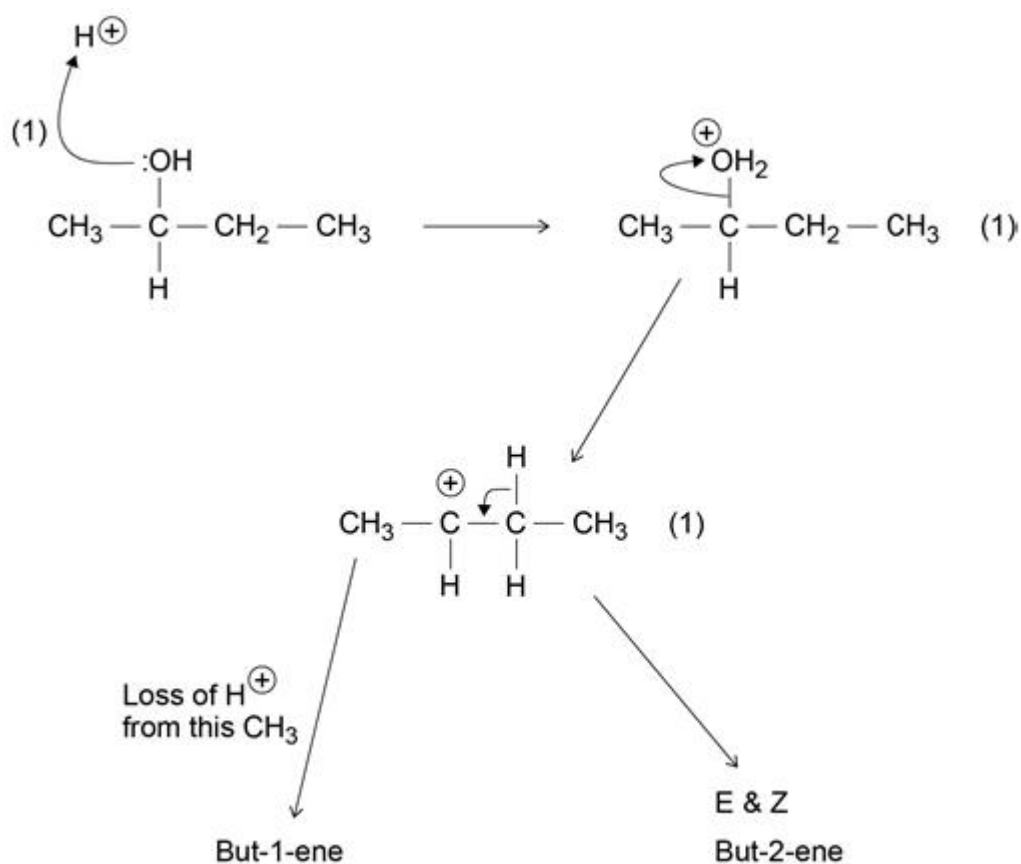
(d) Plane-polarised light.

1

Rotated in opposite directions.

1

(e) Elimination



Extended response question

M1

Mechanism (3 marks)

M2 arrow from lone pair on O to H^+

M3 1st intermediate **and** arrow from $\text{C}-\text{O}^+\text{H}_2$ bond to O (with loss of H_2O)

M4 2nd intermediate (carbocation) **and** arrow from $\text{C}-\text{H}$ bond to $\text{C}-\text{C}$ (with loss of H^+) to form $\text{C}=\text{C}$

M3 and M4 can be scored in one step (see alternative mechanism below).

If carbocation incorrect then answer cannot score maximum marks.

Explanation of formation of 3 alkenes

M5 loss of H^+ from C (in carbocation) adjacent to ^+C (to which $-\text{OH}$ was attached)

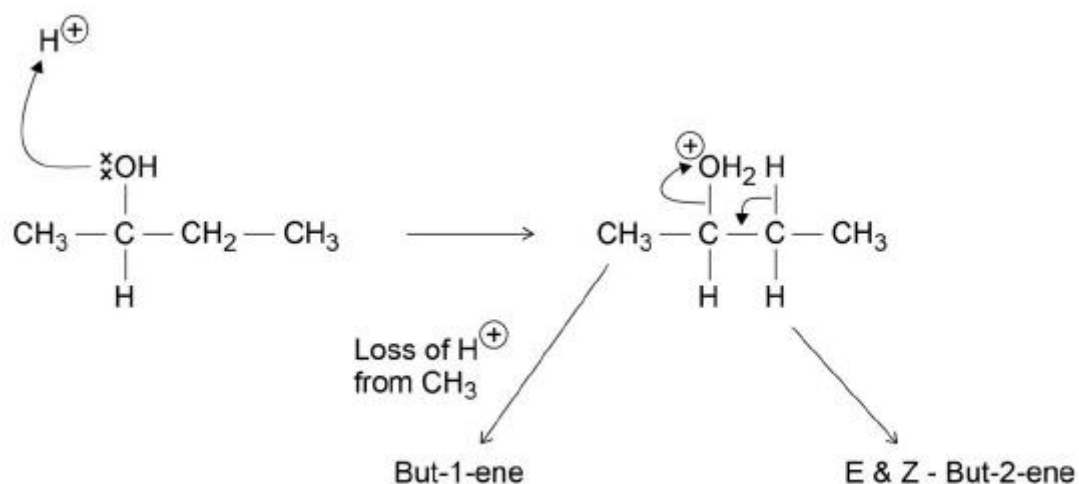
M6 From $^1\text{C}-^2\text{C}^+-^3\text{C}-^4\text{C}$ leads to but-1-ene

M7 From $^1\text{C}-^2\text{C}^+-^3\text{C}-^4\text{C}$ leads to but-2-ene

M8 But-2-ene formed as mixture of *E-Z* isomers

7

Alternative mechanism



[13]