

Name of the Student: _____

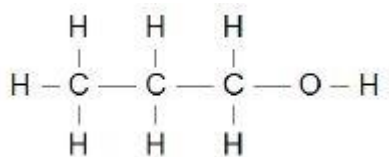
Max. Marks : 24 Marks

Time : 24 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

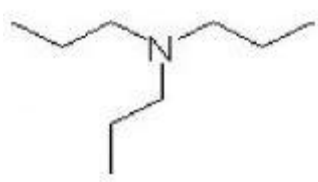
M3

*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)

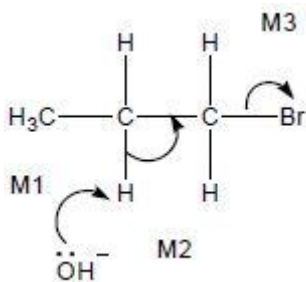
- (e) NaOH/ ethanol or KOH / ethanol (both required)

NOT aqueous

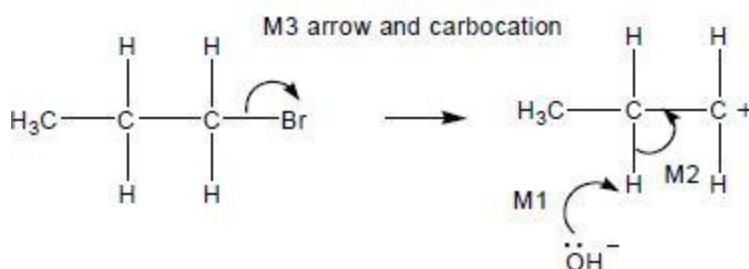
Ignore heat, temp, conc., dil,

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) (Strength depends on availability of) lone pair on N (atom)

M1

E N (next to ring): (lp) delocalised into ring

M2

(lp) less available (to donate to or to accept a H^+)

M3

F or **G**: N (next to alkyl): (positive) inductive effect/electrons pushed to N

M4

(lp) more available (to donate to or to accept a H^+)

M5

order of increasing base strength **E<G<F**

Or **F** is most basic **and E** is least basic

M6

- (b) Intermediate compounds

Product of step 1 $C_6H_5CH_2Cl$

Allow $C_6H_5CH_2Br$

Product of step 2 $C_6H_5CH_2CN$

In steps 2 and 3, only allow marks for reagents/conditions if intermediate compounds are correct or close.

Reagents/conditions

Step 1

Cl_2 & UV

Allow Br_2 & UV

Step 2

KCN alcoholic & aq (both reqd)

Ignore temperature

Step 3

H_2 / Ni or Pt or Pd

Allow $LiAlH_4$ in (dry) ether – (with acid CE, followed by acid allow)

Not $NaBH_4$ and not Sn/HCl or Fe/HCl

2

[11]