

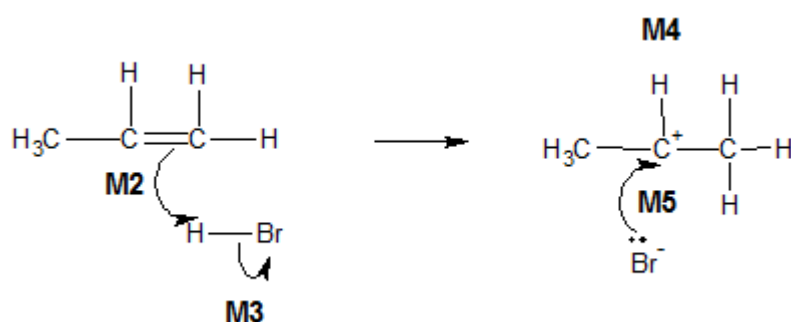
Name of the Student: _____

Max. Marks : 26 Marks

Time : 26 Minutes

Mark Schemes

Q1.

(a) **M1 electrophilic addition***For M1, both words required**Accept phonetic spelling***For the mechanism****M2** Ignore partial negative charge on the double bond

M2 must show an arrow from the double bond towards the H atom of the H-Br molecule

M3 Penalise partial charges on H-Br bond if wrong way and penalise formal charges

M3 must show the breaking of the H-Br bond

Penalise once only in any part of the mechanism for a line and two dots to show a bond

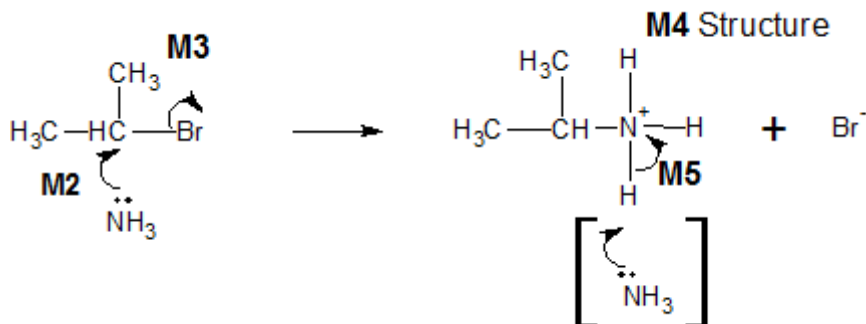
M5 must show an arrow from the lone pair of electrons on the negatively charged bromide ion towards the correct (positively charged) carbon atom

Maximum any 3 of 4 marks for the mechanism for
wrong (organic) reactant OR wrong organic product (if shown)
OR primary carbocation

*Accept the correct use of sticks***NB These are double-headed arrows**

5

(b) **M1 Nucleophilic substitution***For M1, both words required**Accept phonetic spelling*



For the mechanism

Penalise **M2** if NH_3 is negatively charged

M2 must show an arrow from the lone pair of electrons **on the nitrogen atom** of an ammonia molecule to the correct C atom

Penalise **M3** for formal charge on C of the C-Br or incorrect partial charges on C-Br

Penalise **M3** for an additional arrow from the Br to something else

M3 must show the movement of a pair of electrons from the C-Br bond to the Br atom. Mark **M3** independently provided it is from their original molecule

The second mole of ammonia is not essential for **M5**; therefore ignore any species here

M4 is for the structure of the alkylammonium ion, which could be a condensed formula. A positive charge **must** be shown on / or close to, the N atom

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

M5 is for an arrow from the N-H bond to the N atom

Maximum any 3 of 4 marks for the mechanism for wrong organic reactant **OR** wrong organic product if shown

Award full marks for an $\text{S}_{\text{N}}1$ mechanism in which **M2** is the attack of the ammonia on the intermediate carbocation

Accept the correct use of "sticks"

NB These are double-headed arrows

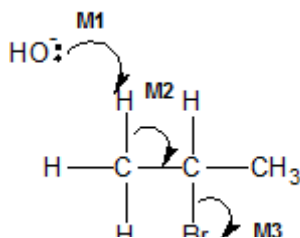
5

- (c) M1 (addition) polymerisation OR poly-addition
Ignore "additional"
Credit polyprop-1-ene and polypropylene

M2 poly(propene) / polypropene
Penalise "condensation polymerisation"

2

(d)



Penalise **M1** if covalent KOH

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

Penalise **M3** for formal charge on C of C–Br or incorrect partial charges on C–Br.

M2 must show an arrow from a correct C–H bond adjacent to the C–Br bond to the appropriate C–C bond. Only award if an arrow is shown attacking the H atom of a correct C–H bond in **M1**

Ignore other partial charges

Penalise once only in any part of the mechanism for a line and two dots to show a bond

M3 is independent provided it is from their original molecule, but **CE=0** if nucleophilic substitution

Maximum any 2 of 3 marks for wrong organic reactant

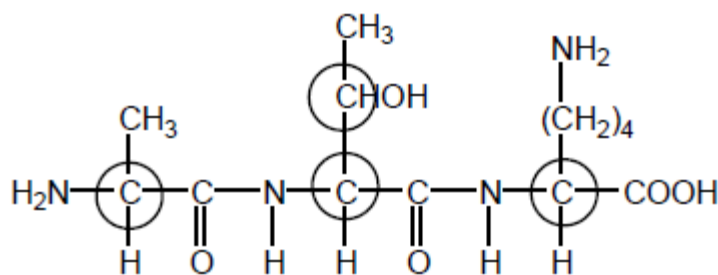
Award full marks for an E1 mechanism in which **M3** is on the correct carbocation.

Accept the correct use of “sticks” for the molecule except for the C–H being attacked

NB These are double-headed arrows

Q2.

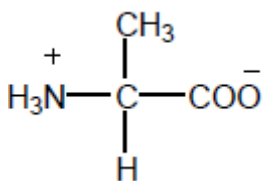
(a) (i)



These four only

1

(ii)



Allow -NH₃⁺ and ⁺NH₃-

1

(iii) 2-amino-3-hydroxybutanoic acid

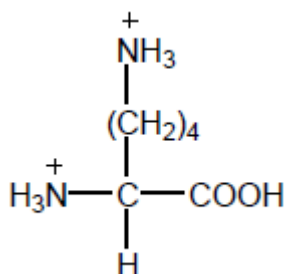
Ignore 1 in butan-1-oic acid

Do not penalise commas or missing hyphens

Penalise other numbers

1

(iv)



Allow -NH₃⁺ and ⁺NH₃-

1

(b) (i) Condensation

Allow polyester

1

(ii) propane-1,3-diol

Must have e

Allow 1,3-propanediol

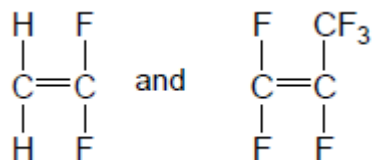
1

(c) (i) Addition

Not additional

1

(ii)

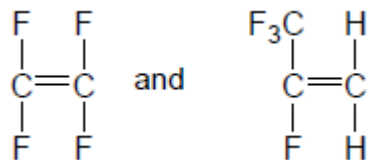


Allow monomers drawn either way round

Allow bond to F in CF₃

1

OR



1 for each structure within each pair

1

(d) c

If wrong, CE = 0

1

C-C or C-F bonds too strong

1

[11]