

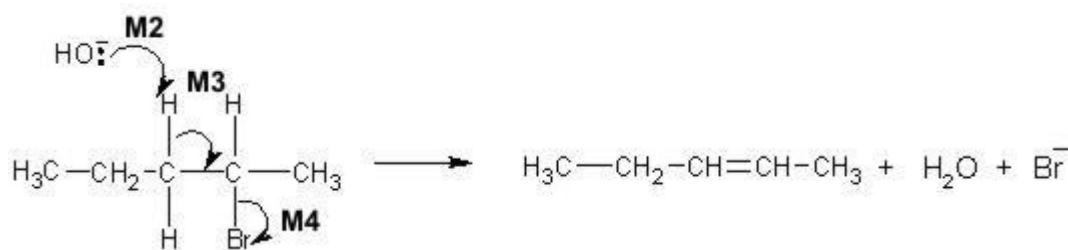
Name of the Student: \_\_\_\_\_

Max. Marks : 25 Marks

Time : 25 Minutes

## Mark Schemes

Q1.

(a) (i) **M1** Elimination

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

**M3** must show an arrow from a C-H bond adjacent to the C-Br bond towards the appropriate C-C bond.  
Only award if a reasonable attempt has been made at the attack on the H atom of the appropriate adjacent C-H

**M4** is independent provided it is from their original molecule

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

**N.B. These are double-headed arrows**

For **M1**, accept "Base elimination" but no other prefix.

Penalise **M2** if covalent KOH

Penalise **M4** for formal charge on C of C-Br or incorrect partial charges on C-Br

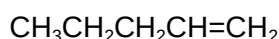
Ignore other partial charges

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

Max any 2 of 3 marks for the mechanism for wrong reactant (or wrong product if shown).

Accept the correct use of "sticks" for the molecule except for the C-H being attacked

4

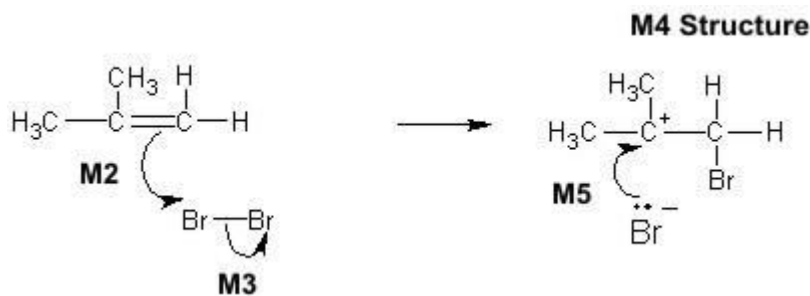
(ii) **Structure for pent-1-ene**

Penalise  $\text{C}_5\text{H}_7$

Accept correct "sticks"

1

(b) **M1 Electrophilic addition**



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

**M3** must show the breaking of the Br-Br bond.

**M4** is for the structure of the tertiary carbocation with Br on the correct carbon atom.

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

**N.B. These are double-headed arrows**

*For M1, both words required.*

**For the mechanism**

**M2** Ignore partial negative charge on the double bond.

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

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

Max any 3 of 4 marks for the mechanism for

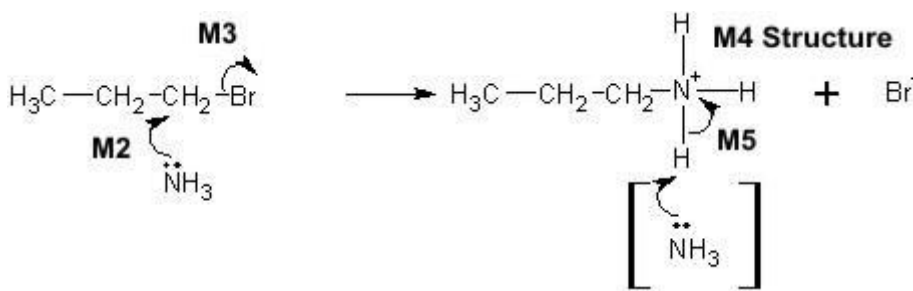
*wrong organic reactant or wrong organic product (if shown) or primary carbocation.*

*If HBr is used, max 2 marks for their mechanism*

*Accept the correct use of "sticks"*

5

(c) **M1 Nucleophilic substitution**



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

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

**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.

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

Award full marks for an S<sub>N</sub>1 mechanism in which M2 is the attack of the ammonia on the intermediate carbocation.

**N.B. These are double-headed arrows**

*For M1, both words required.*

*Penalise M2 if NH<sub>3</sub> is negatively charged.*

*Penalise M3 for formal charge on C or incorrect partial charges*

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

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

*Max any 3 of 4 marks **for the mechanism** for wrong organic reactant (or wrong organic product if shown)*

*Accept the correct use of “sticks”*

5

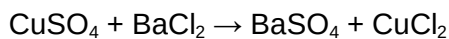
[15]

Q2.

(a) Hydrochloric acid = **C** 1

Barium chloride = **A** 1

(b) Barium sulfate is insoluble 1



*Accept multiples.*

*Accept ionic equation.*

*Do not penalise lack of state symbols, but if used they must be correct.*

1

(c) CO<sub>2</sub> / Carbon dioxide 1

(d) Reagent 1 silver nitrate (solution)  
*Ignore lack of reference to acidifying prior to addition of silver nitrate solution.* 1

Observation 1 White precipitate 1

Reagent 2 (dilute) ammonia solution / aqueous ammonia  
*Do not accept addition of **ammonia** only.* 1

Observation 2 (Colourless) solution  
*Allow ppt dissolves.*  
*Do not allow 'goes colourless' or 'goes clear'.*  
*Chlorine and no visible change or solution does not become orange scores M3 and M4.* 1

(e) Gloves / wash hands after use  
*Ignore 'eye protection'.*  
*Do not accept 'do not ingest the chemicals', 'wipe up spillages', 'use a fume cupboard', 'wear a lab coat' (list principle).* 1

[10]