

Name of the Student: _____

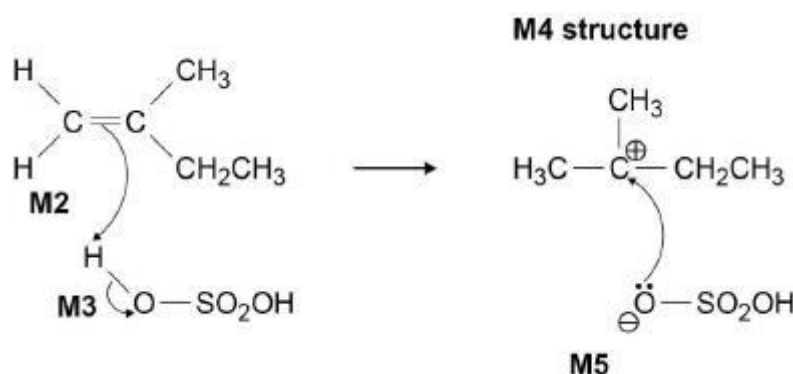
Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

(a) Electrophilic addition



*NB Allow fully displayed or other structural formulae
if H₂O used as electrophile – max 4 ONLY*

M2 must show an arrow from = of C=C towards the H atom of the H-O bond or HO that is part of H-O-S-... on a compound with molecular formula H₂SO₄

M2 could have arrow to H⁺ in which case M3 would be for an independent H-O bond break on a compound with formula H₂SO₄

M3: must use an arrow to show the breaking of the H-O bond
M3 ignore partial charges unless wrong

M4: is for the correct carbocation structure
NOT M4 if primary carbocation shown.

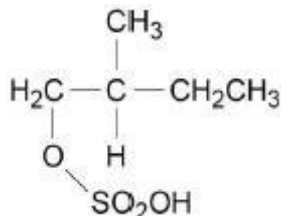
M5: must show an arrow from a lone pair of electrons on the correct oxygen of the negatively charged ion towards the positively charged carbon atom
M5 NOT HSO₄
credit as shown or as: OSO₃H – in which case negative charge can be shown anywhere ECF from H₂SO₃ in M2

NB: The arrows are double-headed

IGNORE subsequent use of water to hydrolyse hydrogensulfate

M1M2M3M4M5

(b)



If tertiary shown here allow as ECF for M1 if primary shown in (a)

M1

(major) product formed via more stable carbocation OR tertiary carbocation more stable (than primary)

Must be clear refers to intermediate and not product

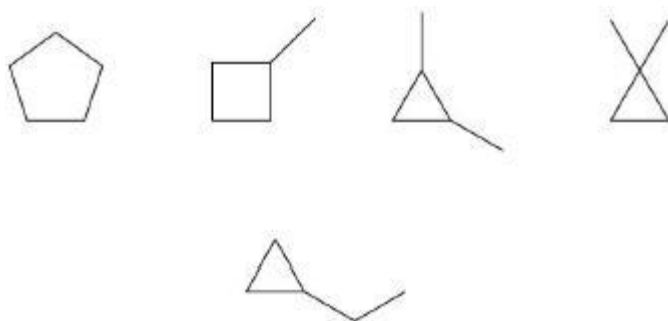
M2

Due to electron-releasing character / (positive) inductive effect of three alkyl groups (as opposed to one)

Primary has one e⁻ donating alkyl group

M3

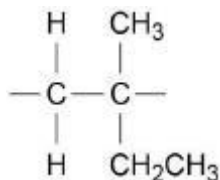
(c) Skeletal formula of cycloalkane



ignore structure of 2-methylbut-1-ene

1

(d) Addition (polymerisation)



Not additional

Penalise incorrect attachment of ethyl group

Must have trailing bonds

Ignore n and brackets

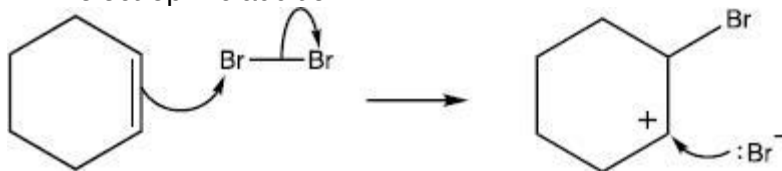
Ignore structure of 2-methylbut-1-ene

M1M2

[11]

Q2.

(a) **M1** electrophilic addition



*All arrows are double-headed. Penalise one mark from the total for **M2-5** if half headed arrows are used.*

Do not penalise the "correct" use of "sticks"

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

1

M2 must show an arrow from the double bond towards a Br atom in a Br–Br molecule

***M2** ignore partial negative charges on the double bond*

1

M3 must show the breaking of the Br–Br bond

***M3** penalise incorrect partial charges on the Br–Br bond and penalise formal charges*

*Penalise **M4** if there is a bond drawn to the positive charge*

1

M4 is for the structure of the correct carbocation

1

M5 must show an arrow from the lone pair of electrons on the Br[–] towards the positively charged atom of their carbocation

***Max 3 of 4 marks (M2-5)** for wrong organic reactant or wrong carbocation (ignore structure of product)*

*For **M5**, credit attack on a partially positively charged carbocation structure, but penalise **M4** for the structure of the carbocation*

1

(b) **M1** C=C electron rich / area of high electron density

***M1** ignore idea that C=C is negative or highly electronegative*

1

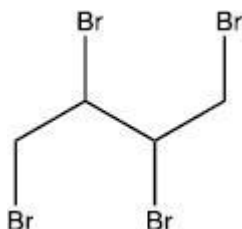
M2 Br-Br becomes polarised

1

M3 δ+ Br attracted to C=C

1

(c)



Must be skeletal structure

1

[9]