M1.B

[1]

M2.C

[1]

M3.D

[1]

M4.C

[1]

M5.B

[1]

M6. **Penalise missing • once only**

(i) $Cl_2 \rightarrow 2\ Cl\bullet$ **(1)**

(ii) $CH_2Cl_2 + Cl_2 \rightarrow CHCl_3 + HCl$ **(1)**

(iii) $CH_2Cl_2 + Cl\bullet \rightarrow CHCl_2\bullet + HCl$ **(1)**
$CHCl_2\bullet + Cl_2 \rightarrow CHCl_3 + Cl\bullet$ **(1)**

Can reverse order

(iv) Effect on rate: increases **(1)** **If decrease given C.E zero marks**
Explanation: more Cl• radicals formed **(1)**

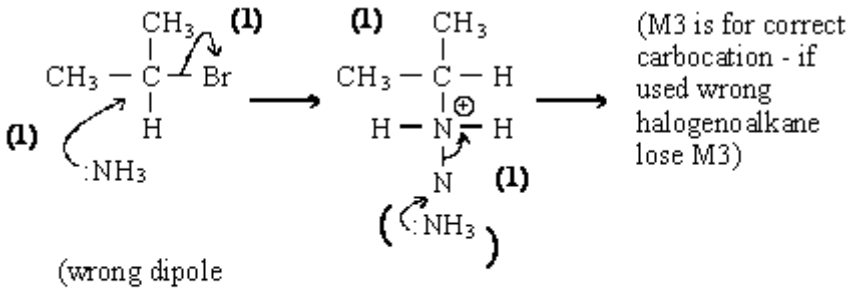
More Cl atoms, more Cl—Cl or Cl_2 bonds broken, more Cl_2 have

E_A, increased rate of Cl• production

[6]

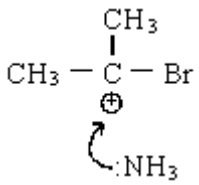
M7. (a) *Name of mechanism*: nucleophilic substitution **(1)**

Mechanism:



(wrong dipole $\overset{\delta-}{C}-\overset{\delta+}{Br}$ or $\overset{+}{C}-Br$ loses C — Br mark)

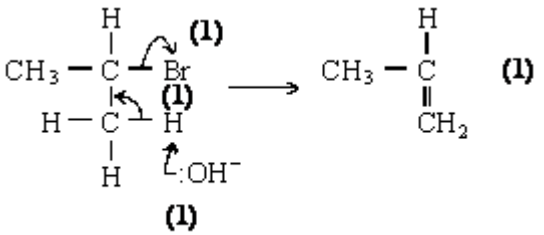
Marks S_N1 using same points
∴ M2 requires



5

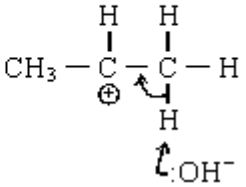
(b) *Role of potassium hydroxide*: Base **(1)**

Mechanism:



Mark E1 using same points

∴ M2/M3



5

[10]

M8. (a) *Condition:* U.V. light or sunlight or 450°C or high temp **(1)**

Explanation: U.V. light etc. provides energy to break(Cl - Cl) bond **(1)**

Do not accept reference to E_a or wrong bond or 'to make Cl radicals'

2

(b) (i) (Free) radical substitution **(1)**

(ii) *Step 1:* initiation **(1)**
Step 2: propagation **(1)**
Step 3: termination **(1)**

Any order
Don't be too harsh on spelling

4

(c) (i) *Equation 1:* $CH_3 + Cl\bullet \rightarrow CH_2Cl\bullet + HCl$ **(1)**
Equation 2: $CH_2Cl\bullet + Cl_2 \rightarrow CH_2Cl_2 + Cl\bullet$ **(1)**

or $CH_2Cl\bullet + Cl\bullet \rightarrow CH_2Cl_2$
Mark equ independently
any order

(ii) $CH_2Cl\bullet + CH_3\bullet \rightarrow CH_3CH_2Cl$ **(1)**
or $CH_3CH_2\bullet + Cl_2 \rightarrow CH_3CH_2Cl + Cl\bullet$
or $CH_3CH_2\bullet + Cl\bullet \rightarrow CH_3CH_2Cl$

Equ must have CH_3CH_2Cl as product
Accept C_2H_5Cl
Penalise absence of • once only

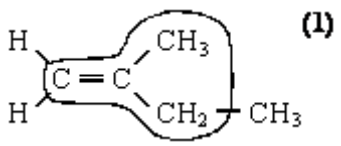
3

[9]

M9. A

[1]

M10. (a)

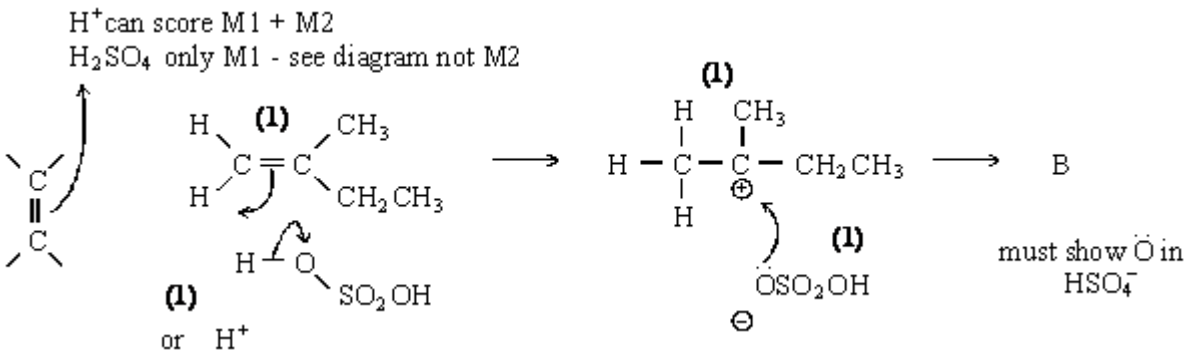


(1)

May circle 4 C's separately

1

(b)



Ignore δ+ and δ- unless wrong

4

(c) *Reagent*: H_2O or water **OR steam, Or dilute sulphuric acid (1)**

Condition: heat, or warm, or boil or reflux [50-100°C] **(1)**
*Name of compound **C***: 2-methylbutan-2-ol **(1)**

Allow 2-methylbutan<u>e</u>-2-ol
Penalise hydroxy-2-methylbutane and 2-methylbut-2-ol once only in the paper

3

(d) *Identity of alcohol D*: 2-methylbutan-1-ol **(1),**
OR its structure, could describe
structure

Explanation: C formed via t-carbocation; D via p-carbocation, **(1)**
tertiary more stable than primary **(1)**

If have wrong carbocation can still score stability mark

3

[11]