

**M1.** (a) Alcohol: Reaction = Substitution (/ hydrolysis) **(1)**  
*Ignore reference to nucleophilic, but electrophilic give zero*

Alcohol: Role = nucleophile (/ lone pair donor) **(1)**

Alkene: reaction = elimination **(1)**  
*Ignore ref to nucleophilic or electrophilic*

Alkene: base (/ proton acceptor) **(1)**  
*If no indication of order in (a) assume as in question.  
 If order is wrong can still score 'role' mark.*

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(b) Alcohol: Role = butan-2-ol **(1)**  
*Not 2-hydroxybutane or but-2-ol*

Appropriate structure for  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$  **(1)**  
*Brackets not essential*

$\text{S}_{\text{N}}2$  version

$\delta^+ \delta^-$   
 $\text{C}-\text{Br}$  bond is polar

Lone pair of  $\text{OH}^-$

Attacks the  $\text{C}^{\delta+}$

$\text{S}_{\text{N}}1$  version

$\text{C}-\text{Br}$  bond is polar **(1)**

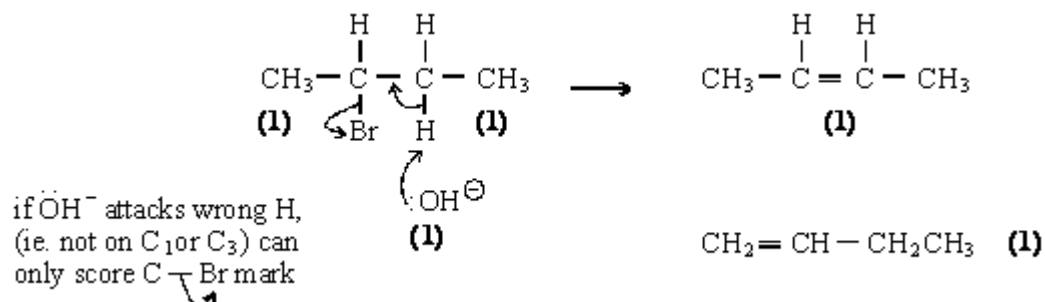
$\text{C}-\text{Br}$  bond breaks **(1)**

forming carbocation / carbonium ion **(1)**

*M1 can be scored from a diagram, M2 and M3 from written explanation only*

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(c)



*If but-2-ene not given here it may be obtained from cis / trans isomer*

H lost from different carbon atoms (1)  
 H removes from C<sup>1</sup> and C<sup>3</sup> to give two isomers (1)  
 Draws clear Cis and trans isomers for but-2-ene

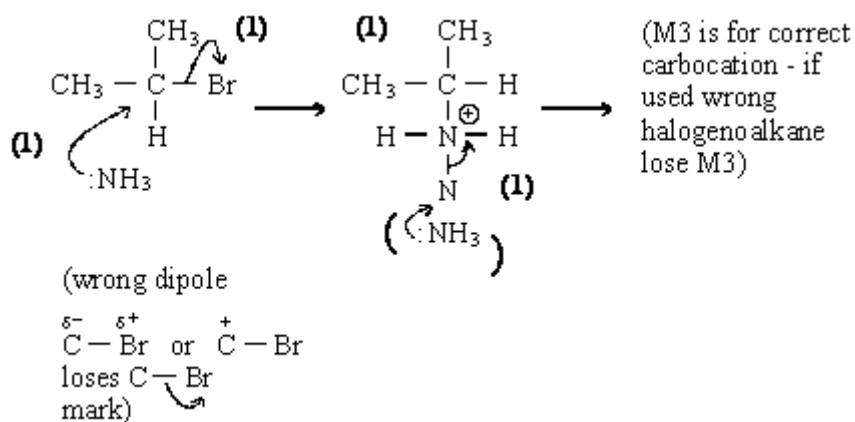
Can score these marks from a diagram



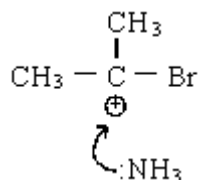
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**M2.** (a) Name of mechanism: nucleophilic substitution (1)  
 Mechanism:

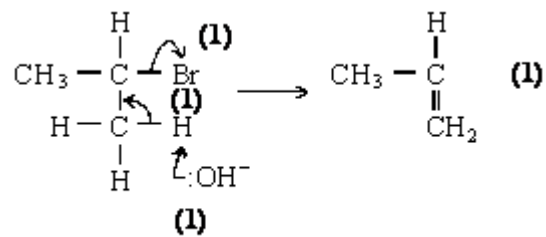


Marks S<sub>N</sub>1 using same points  
 ∴ M2 requires



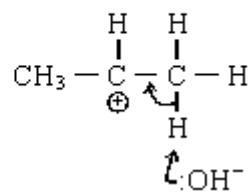
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(b) Role of potassium hydroxide: Base (1)  
 Mechanism:



Mark E1 using same points

∴ M2/M3



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