

Reaction of 2-Methylpropene to Form Alcohols

<https://gemini.google.com/app/9da5b80c96cbb924>

Response: Based on the reaction scheme given:

Step 1: Formation of Compound X

When 2-methylpropene ($\text{CH}_3 - \text{C}(\text{CH}_3) = \text{CH}_2$) reacts with cold concentrated sulfuric acid (cold conc. H_2SO_4), an electrophilic addition reaction occurs according to Markovnikov's rule:

1. Protonation of the alkene double bond yields the more stable tertiary carbocation: $(\text{CH}_3)_3\text{C}^+$.
2. The hydrogen sulfate anion (OSO_2OH^- or OSO_3H^-) attacks the carbocation via its oxygen atom to form an alkyl hydrogen sulfate:



(Note: It forms a C-O-S bond (-OSO₂OH), not a direct C-S sulfonic acid bond).

Step 2: Formation of Compound Y

When the alkyl hydrogen sulfate (**X**) is heated with water in acidic medium ($\text{H}^+/\text{H}_2\text{O}$, Δ), it undergoes hydrolysis:

- The hydrogen sulfate group is replaced by a hydroxyl group (-OH), forming a tertiary alcohol and regenerating sulfuric acid:



Conclusion

matching the structures above:

- **x** is $\text{CH}_3 - \text{C}(\text{CH}_3)_2 - \text{OSO}_2\text{OH}$
- **Y** is $\text{CH}_3 - \text{C}(\text{CH}_3)_2 - \text{OH}$

Correct Answer: (4)
