

Which is a polar protic solvent?

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- A)  $(\text{CH}_3)_2\text{SO}$  (DMSO)
- B)  $(\text{CH}_3)_2\text{NC(O)H}$  (DMF)
- C) Acetonitrile ( $\text{CH}_3\text{CN}$ )
- D) Hexane
- E) Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ )

Which is a polar aprotic solvent?

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- A) Methanol ( $\text{CH}_3\text{OH}$ )
- B) Methylamine ( $\text{CH}_3\text{NH}_2$ )
- C) Hexane
- D)  $(\text{CH}_3)_2\text{SO}$  (DMSO)
- E) Water

# Why does a polar protic solvent weaken the strength of a nucleophile?

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- A) Such solvents do not dissolve nucleophiles well
- B) The solvents have a high boiling point so they are hard to remove
- C) The solvent hydrogen bond to the nucleophile
- D) The solvents stabilize the nucleophiles through the inductive effect
- E) The solvents destabilize the nucleophile through the inductive effect

Which is true of the S<sub>N</sub>2 reaction?

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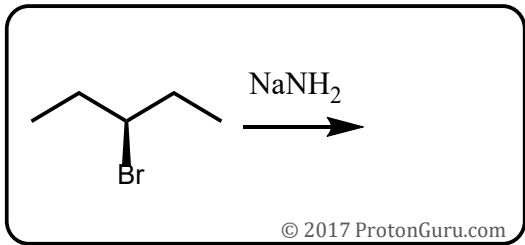
- A) It always produces a chiral product
- B) It is concerted
- C) It requires a strong base
- D) It only works in polar protic solvents
- E) A good leaving group is not needed

Which is true of the  $S_N1$  reaction?

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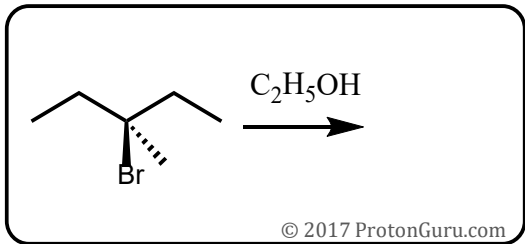
- A) It fails on primary alkyl halides without resonance to stabilize the carbocation intermediate
- B) It is concerted
- C) It requires a good nucleophile
- D) Solvent choice has no effect on the reaction
- E) A good leaving group is not needed

Which substitution mechanism (ignore elimination) leads to the greatest yield of product for the reaction shown?



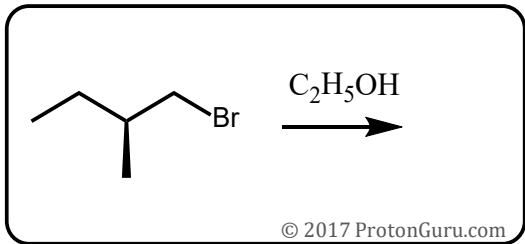
- A)  $\text{S}_{\text{N}}1$
- B)  $\text{S}_{\text{N}}2$
- C) No reaction
- D) Mixture of  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$
- E) Racemic mixture

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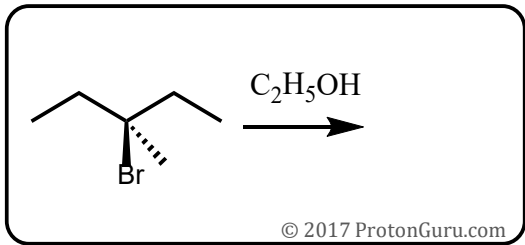
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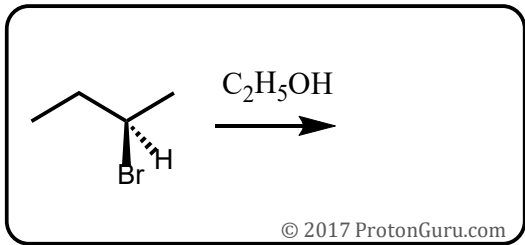


Which describes the stereochemical composition of the product of this  $S_N1$  reaction?



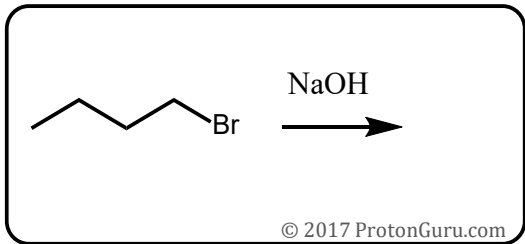
- A) The products are all achiral
- B) Product is predominantly *R*-configuration
- C) Product is predominantly *S*-configuration
- D) Product is a racemic mixture
- E) Product is a meso compound

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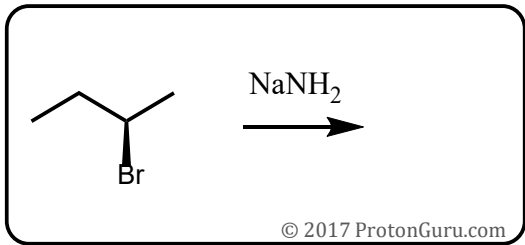
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Which describes the stereochemical composition of the product of this  $S_N2$  reaction?



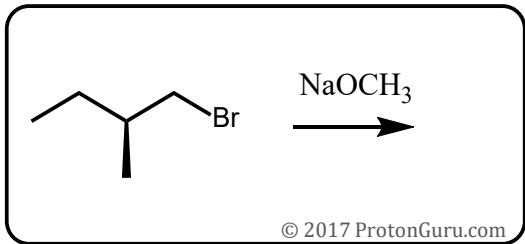
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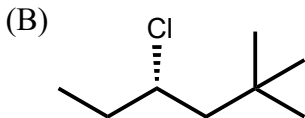
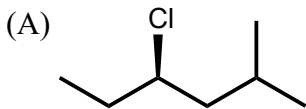
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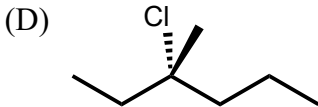
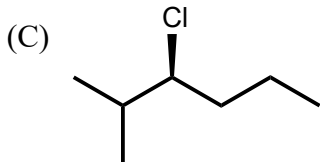


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When an  $S_N1$  reaction is carried out on each of these substrates, which one will have a carbocation rearrangement on the way to the major product?



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(E) none of them or more than one of them