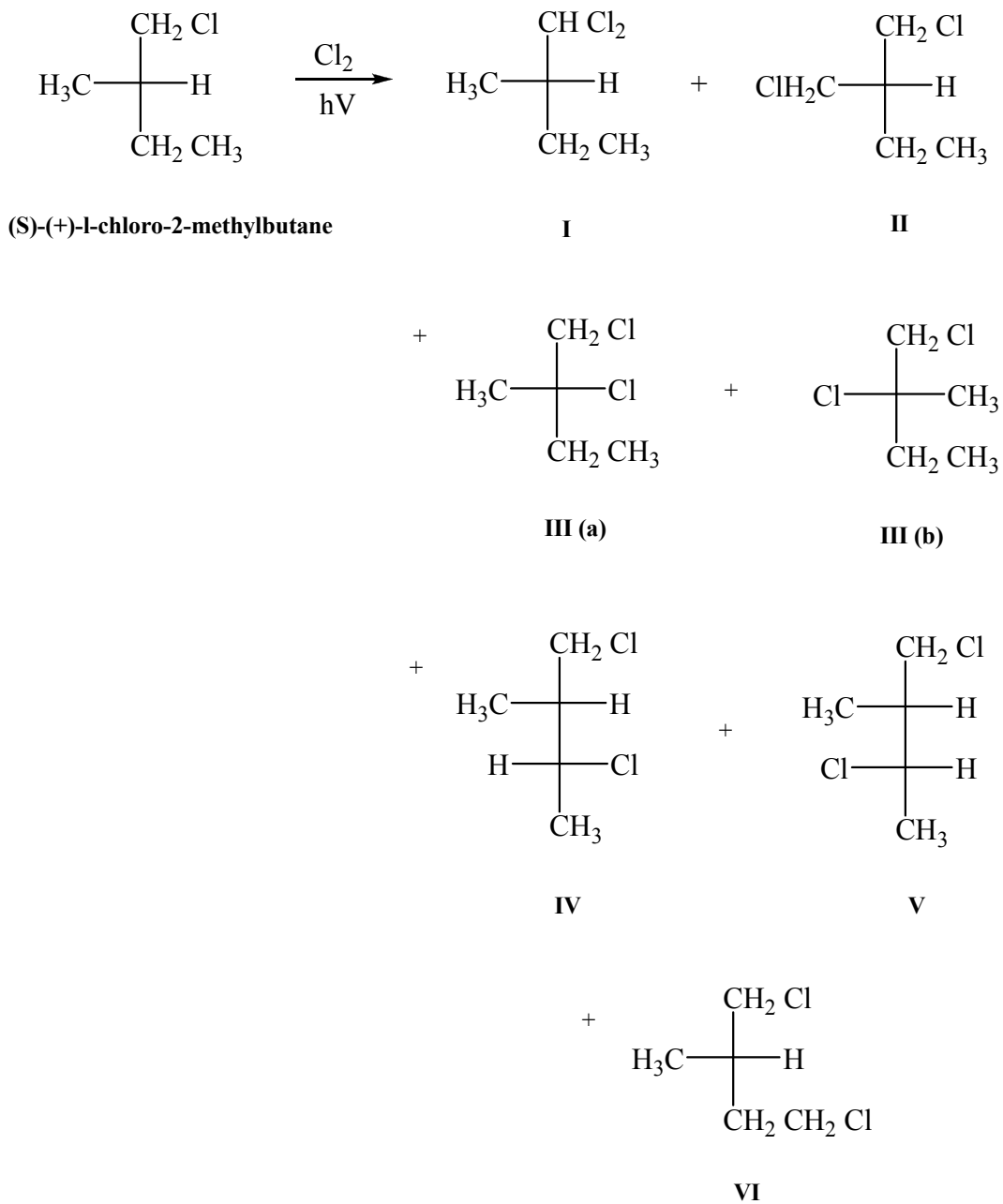


SEM II 08/09 APRIL 2009

1 (a)



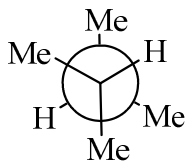
- (b) I = (S)-1,1-dichloro-2-methylbutane is chiral
- II = 1,2-dichloro-2-methylbutane is achiral
- III (a) = (R)-1,2-dichloro-2-methylbutane
- III (b) = (S)-1,2-dichloro-2-methylbutane
- IV = (2R, 3R)-1,3-dichloro-2-methylbutane
- V = (2R, 3S)-1,3-dichloro-2-methylbutane
- VI = (S)-1,4-dichloro-2-methylbutane is chiral
- } pair of enantiomers
- } pair of diastereomers

- 2 (a) $\text{NH}_3 < \text{H}_2\text{O} < \text{HF}$

When determining relative acidity, it is often useful to look at the relative basicity of the conjugate bases. The stronger the acid, the weaker (more stable, less reactive) the conjugate base. In this case, one would look at the relative basicity of F^- , OH^- , and NH_2^- . The relative strengths of these species can be gauged based on the electronegativity of the charged atom in each. Since fluorine is the most electronegative, F^- is the most stable, least reactive base in the group. This means that its conjugate acid, HF, is the strongest.

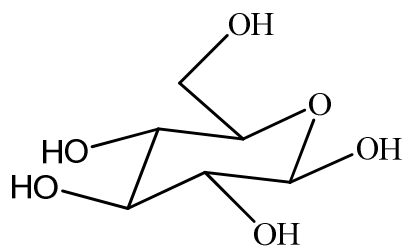
- (b) (i) The single carbon-carbon sigma bond present in CH_3CH_3 is formed by the overlap of two C sp^3 hybrid atomic orbitals. The overlap of these orbitals is not disrupted by rotation about the carbon-carbon bond axis. In the case of $\text{CH}_2=\text{CH}_2$, the carbon-carbon bond is a double bond with both a sigma and pi bond present. Rotation about the carbon-carbon bond axis disrupts the overlap of the two carbon p orbitals forming the pi bond.

(ii)

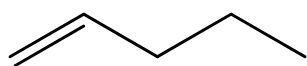


- (c) (i) 2,2-dimethyl-5-(1-methylpropyl)nonane
- (ii) 1-ethyl-2-(2,2-dimethylpentyl)cyclopentane
- (iii) 4,4-dichloro-6-isopropyl-3-methylnonane

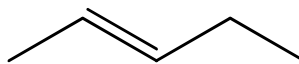
(d)



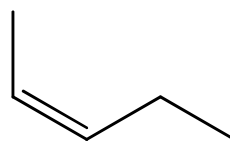
3 (a)



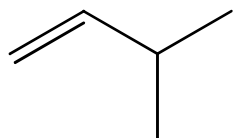
pent-1-ene



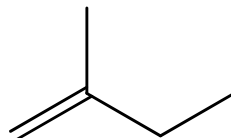
(E)-pent-2-ene



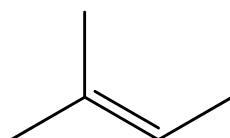
(Z)-pent-2-ene



3-methylbut-1-ene

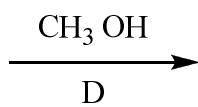
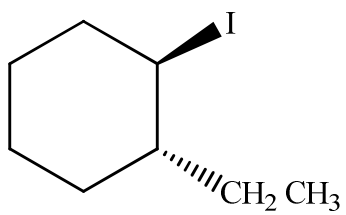


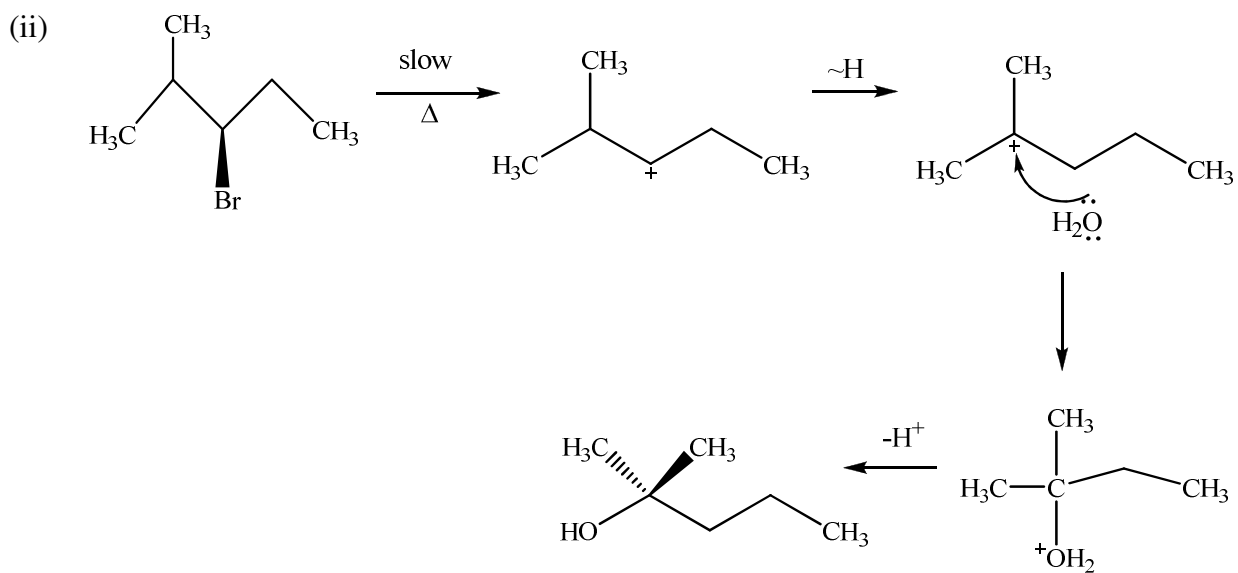
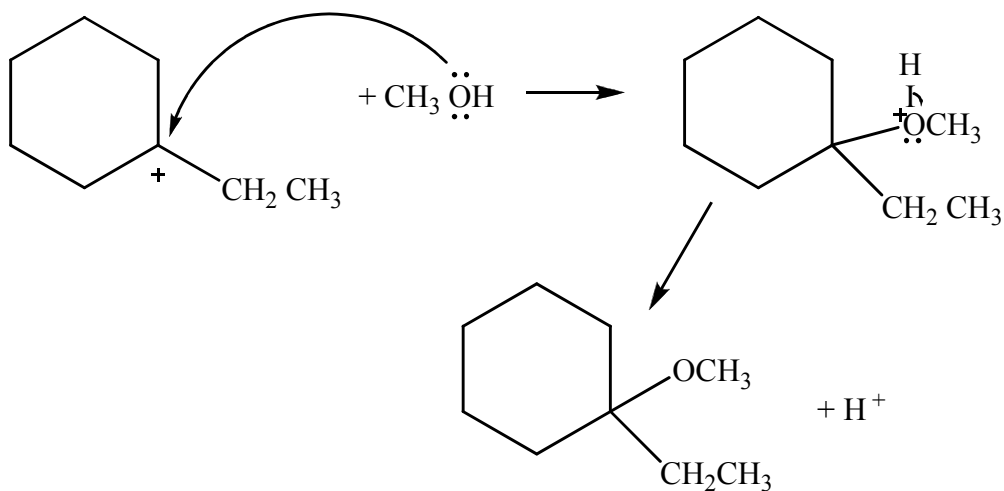
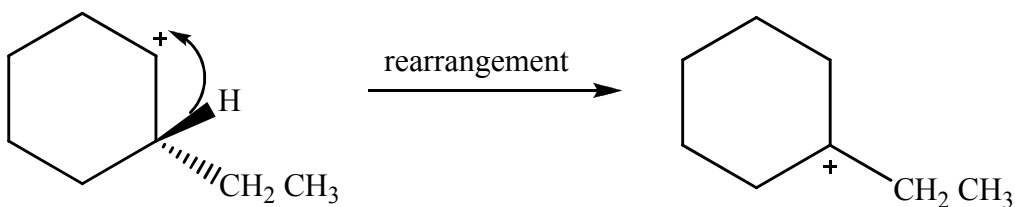
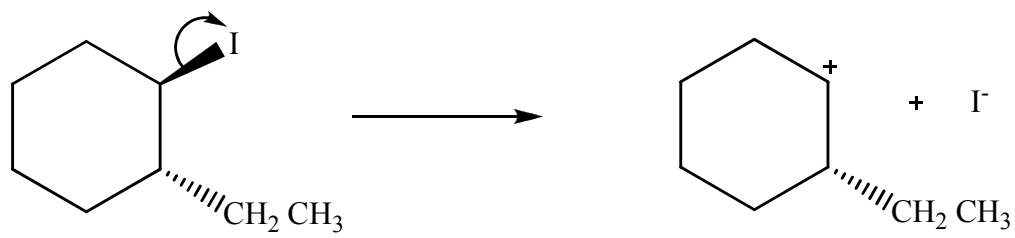
2-methylbut-1-ene

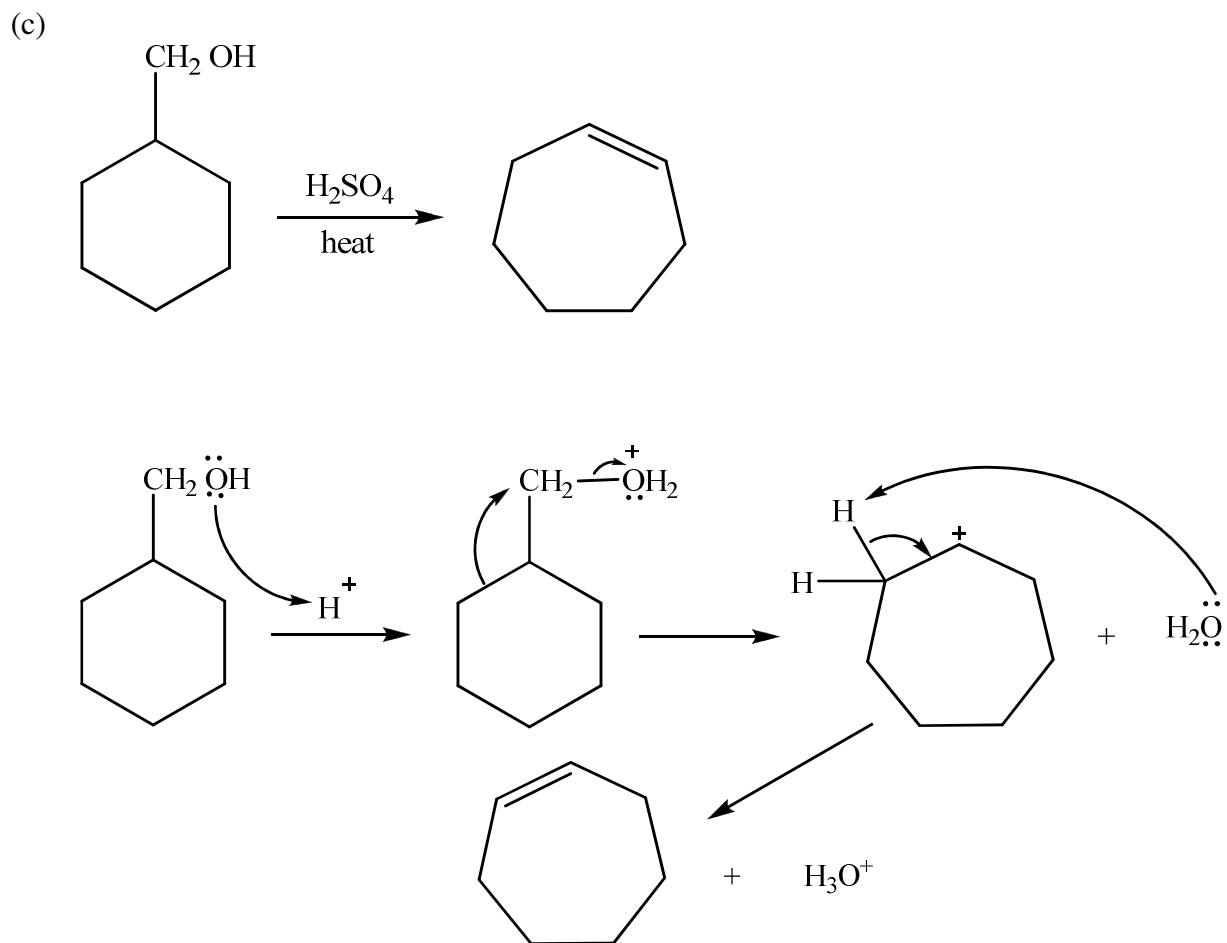
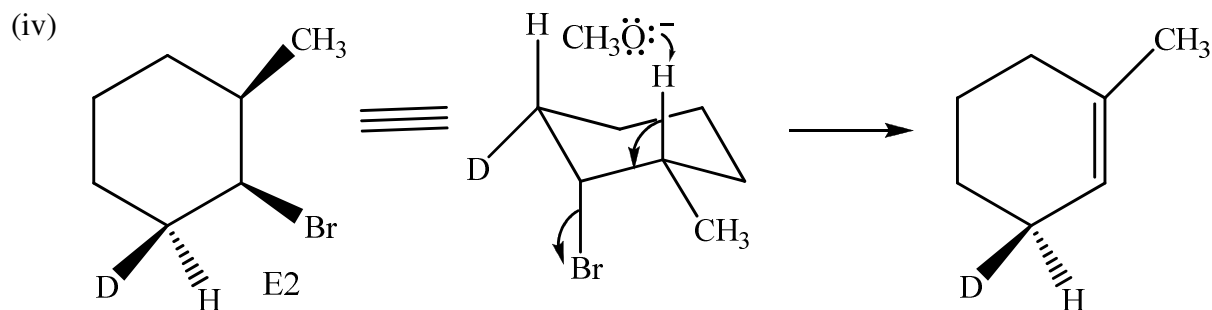
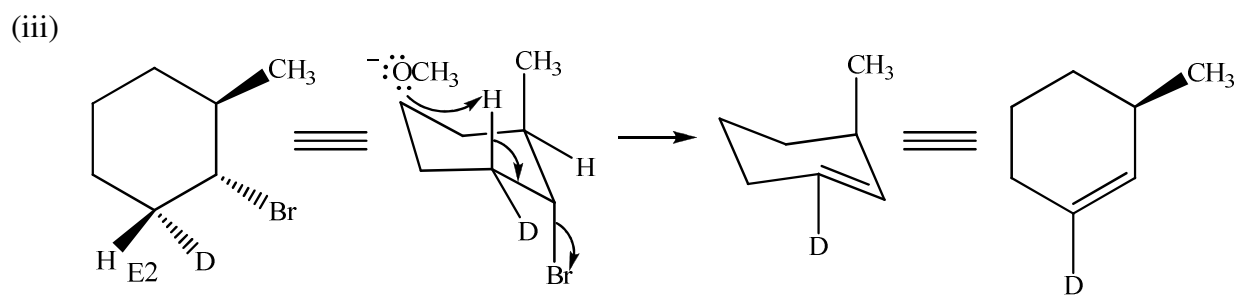


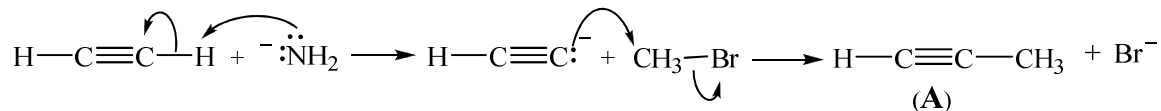
2-methylbut-2-ene

(b) (i)





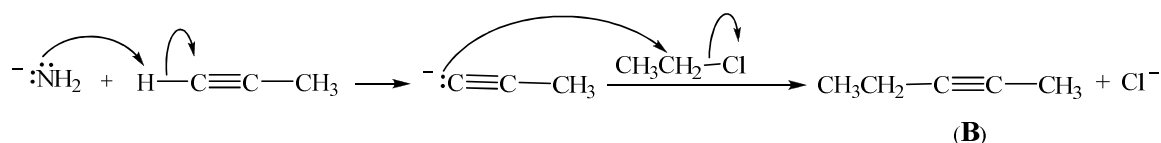




Therefore,

Compound A is a terminal alkyne named as:
propyne or methyl acetylene or prop-1-yne

- ii. The second two-step reaction sequence forms the internal alkyne **B** by nucleophilic attack of the acetylide anion on $\text{CH}_3\text{CH}_2\text{Cl}$.



Therefore,

Compound B is an internal alkyne, named as:

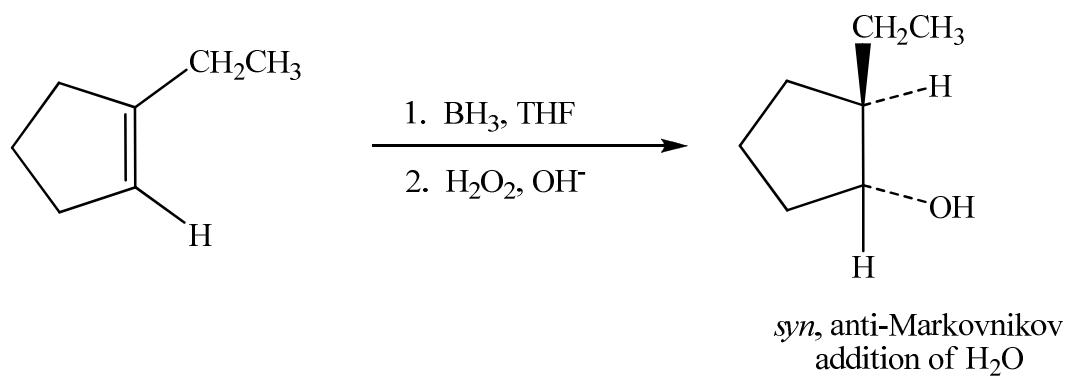
2-pentyne or ethylmethylacetylene or pent-2-yne.

- (c) The expected product from the reaction of 1-ethylcyclopentene with:

- (a) BH_3 , THF followed by H_2O_2 , OH^-
 (b) $\text{Hg}(\text{OAc})_2$, H_2O followed by NaBH_4

Apparently, the two methods are about the hydration-hydroboration/oxidation and oxymercuration, and both will give complimentary products. Hydroboration/oxidation occurs with *syn* stereochemistry and gives the non-Markovnikov addition product, while oxymercuration gives the Markovnikov products.

The first reaction:



The second reaction:

