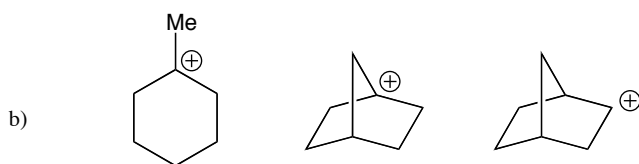
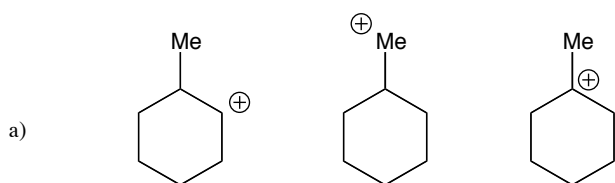
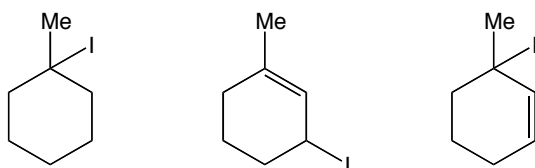


Problem Set 7b

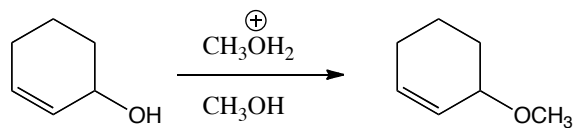
Question 1. Rank the following sets of carbocations from **most to least** stable. *Careful, part (c) is tricky!*



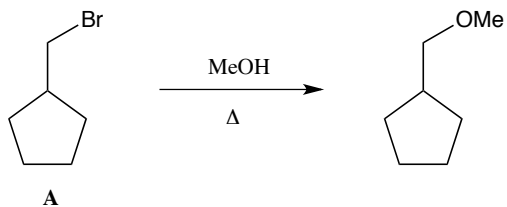
c) The carbocation formed from ionization of the following iodides:



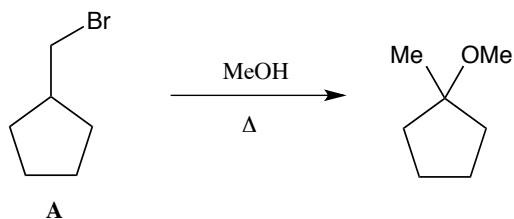
Question 2. Provide a complete mechanism (curved arrows showing electron movement) for the following reaction that takes place in acidic methanol. Include all intermediates and resonance structures. *Don't skip any steps!*



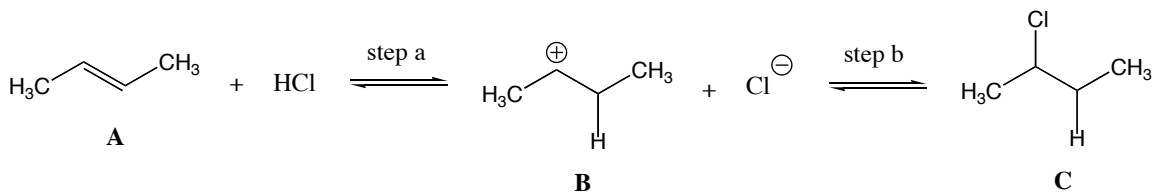
Question 3. a) Explain why heating in primary bromide **A** in methanol does not produce the direct substitution product:



b) When the reaction above is carried out, a complex mixture of products results. One of the products is the ether shown. Provide a mechanism for the formation of this product.

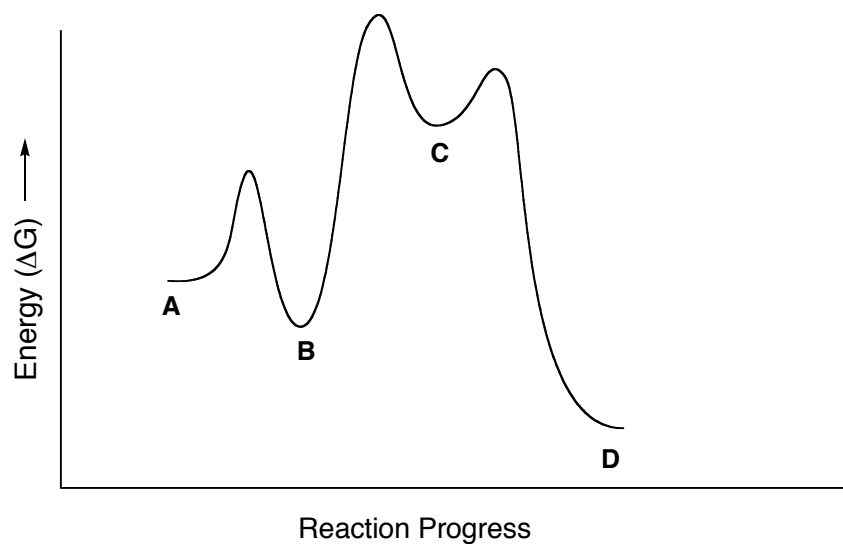
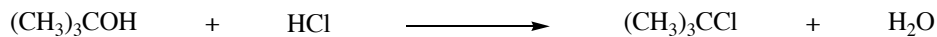


Question 4. Hydrochloric acid can be added across the carbon-carbon double bond of **A** to produce product **C** as detailed below.



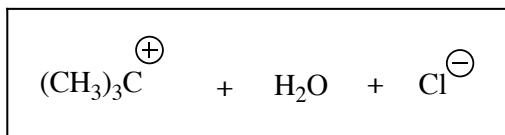
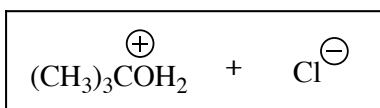
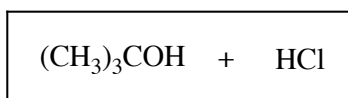
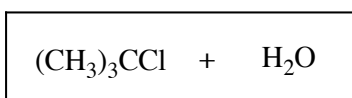
Sketch the energy diagram for the reaction above.

Question 5. The following energy diagram depicts the reaction of *tert*-butanol with hydrochloric acid.



a) Is the overall reaction endergonic or exergonic?

b) Match the following four species below with the labels **A–D** on the energy diagram.



On the energy diagram, label the following:

- The energy of activation for the reaction
- ΔG for the overall reaction
- ΔG^{\ddagger} for each of the following: **A** \rightarrow **B**, **D** \rightarrow **C**, **B** \rightarrow **C**, and **C** \rightarrow **B**