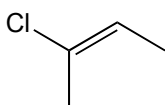


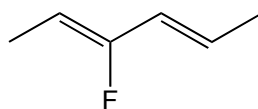
ANSWER KEY

1. Draw line-bond structures for the following molecules (8 points)

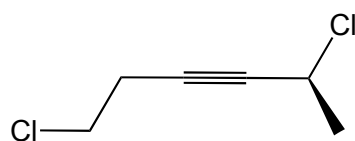
(a) (2*E*)-2-chloro-2-butene



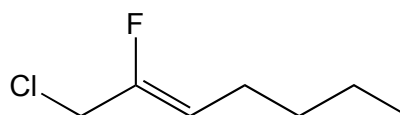
(b) (2*Z*,4*E*)-3-fluoro-2,4-hexadiene



(c) (5*S*)-1,5-dichloro-3-hexyne

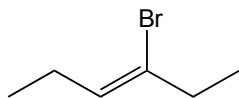


(d) (2*Z*)-1-chloro-2-fluoro-2-heptene



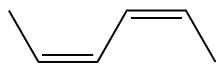
2. Name the following structures according to IUPAC conventions. Include *R*, *S*, *E* and *Z* stereochemistry where appropriate. (8 points)

(a)



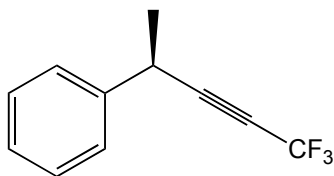
(3*Z*)-3-bromo-3-hexene

(b)



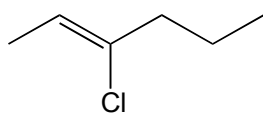
(2*Z*,4*Z*)-2,4-hexadiene

(c)



(4*R*)-1,1,1-trifluoro-4-phenyl-2-pentyne

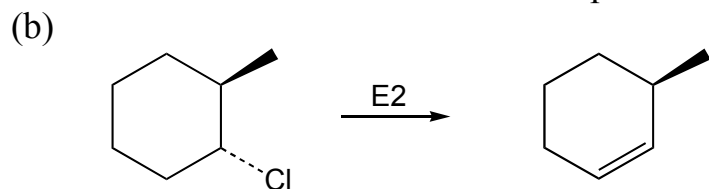
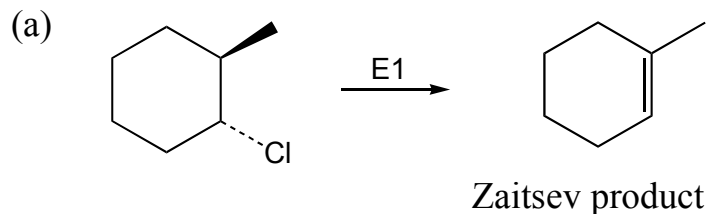
(d)



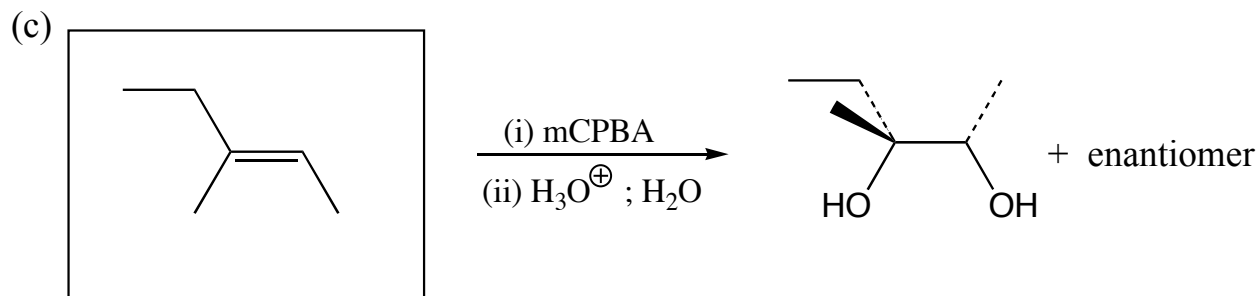
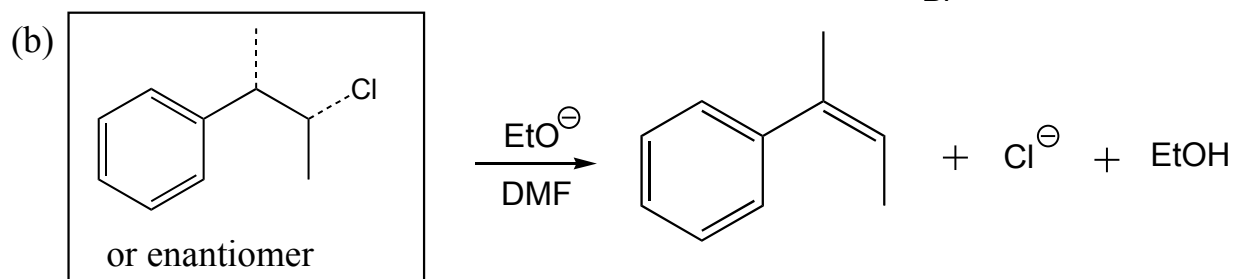
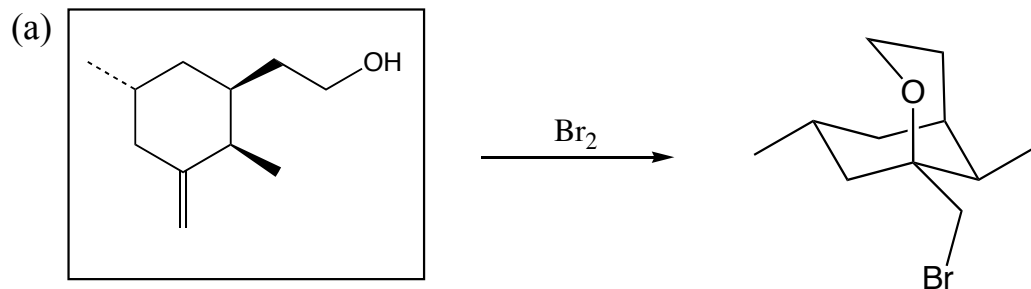
(2*Z*)-3-chloro-2-hexene

ANSWER KEY

3. Draw the products that you would expect from the following reactions. Show stereochemistry where relevant and identify the Zaitsev product. (10 points)

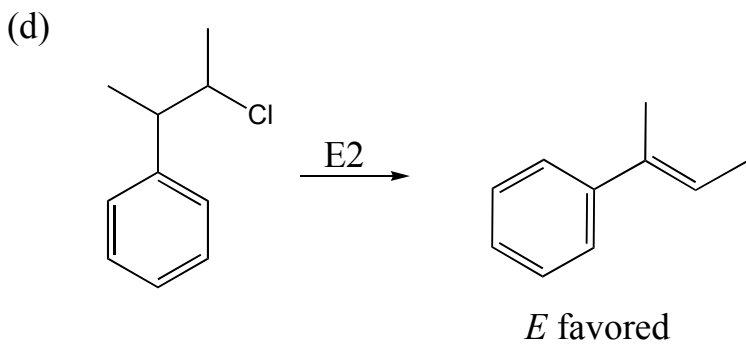
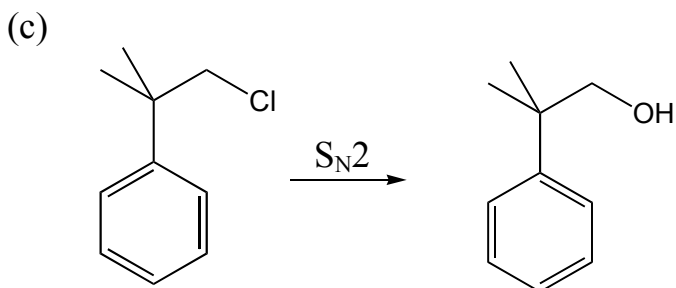
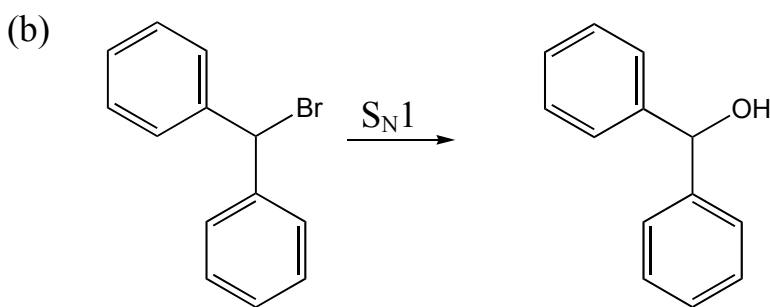
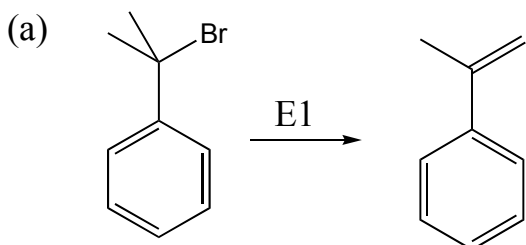


4. Identify the starting materials for the following transformations. Show stereochemistry where relevant. Each box contains only one molecule. (12 points)



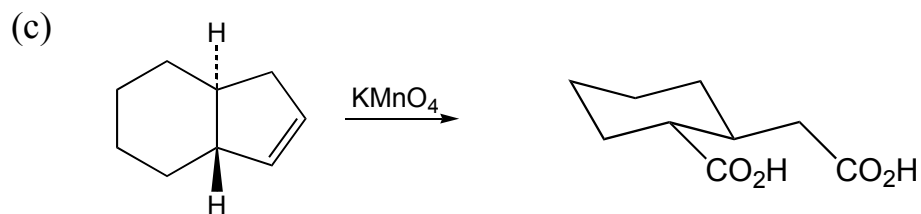
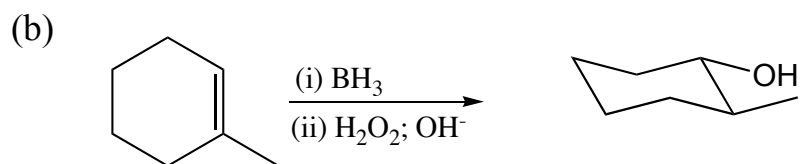
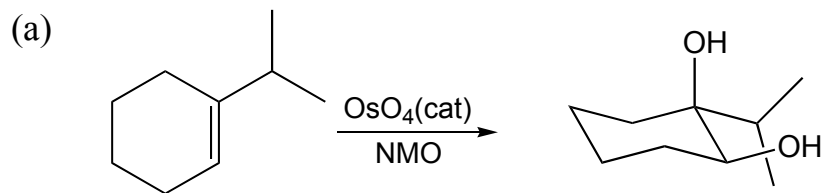
ANSWER KEY

5. All the following molecules react with hydroxide ion by **different** mechanisms. Identify the most likely mechanism for each (S_N1 , S_N2 , E1 or E2) and draw the products. It is not necessary to show transition states, intermediates or stereochemistry. (12 points)

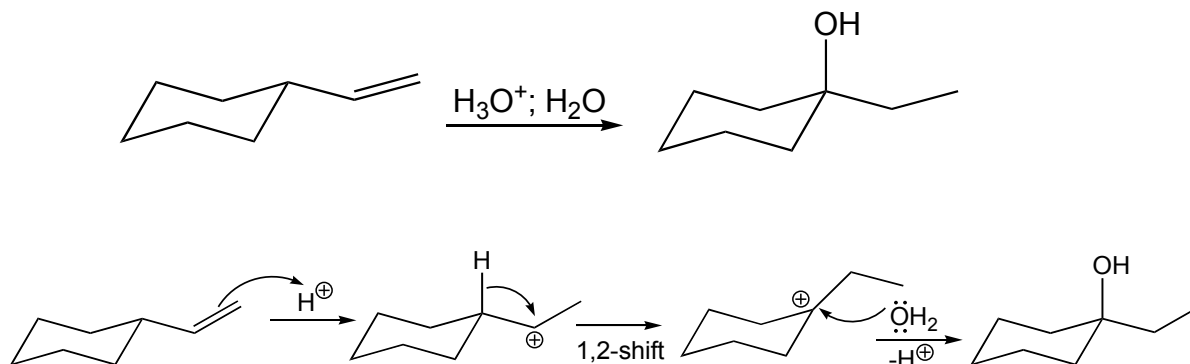


ANSWER KEY

6. Draw the products of the following reactions in their lowest energy conformations. (12 points)

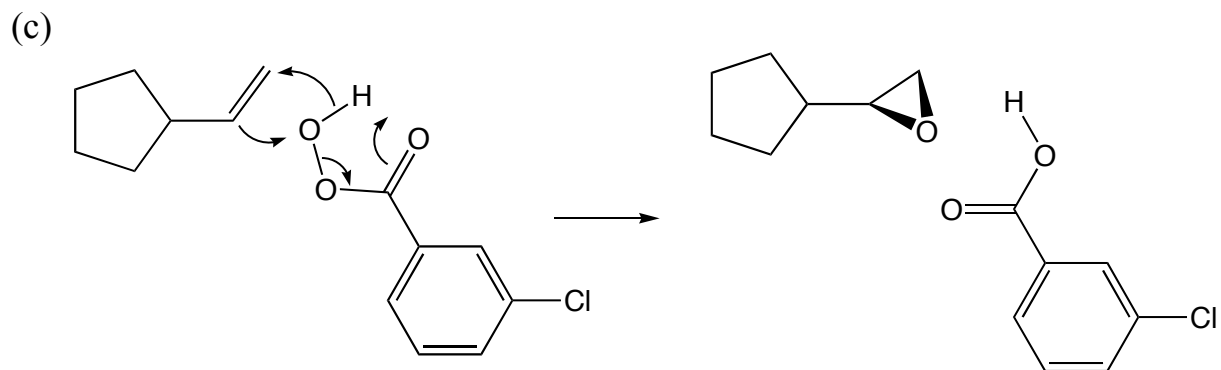
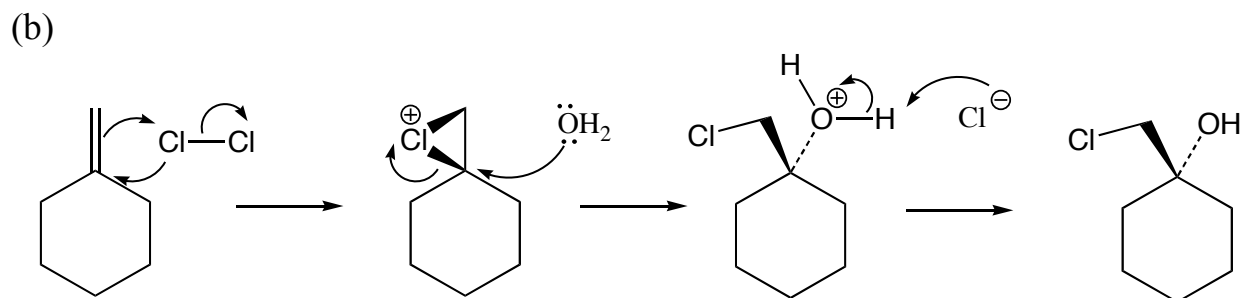
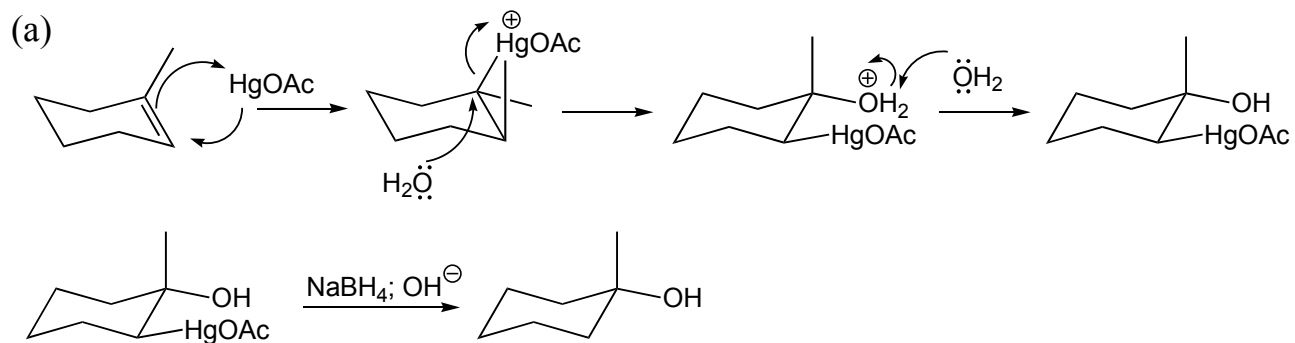


7. Draw a mechanism to explain the outcome of the following reaction. (6 points)



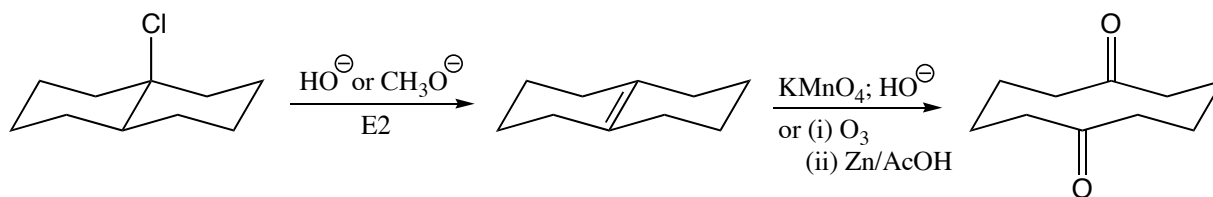
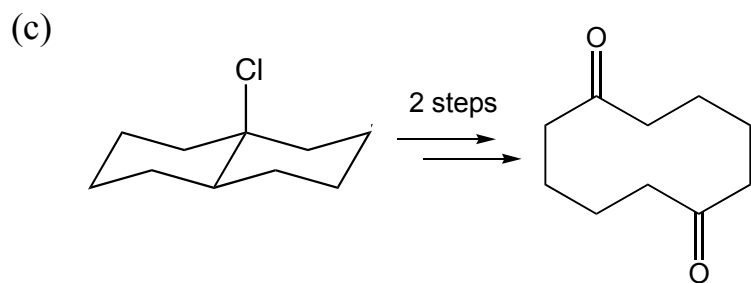
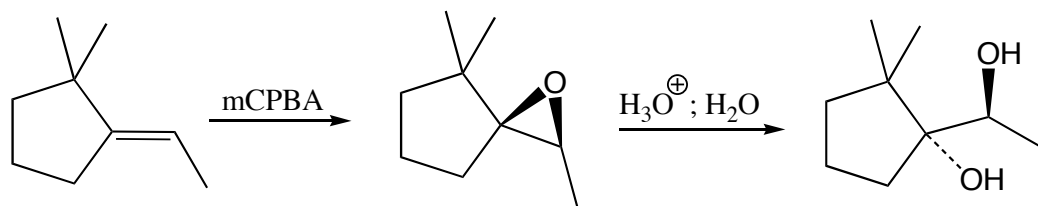
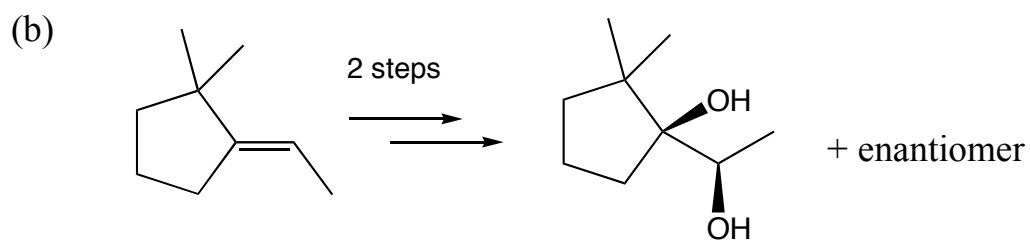
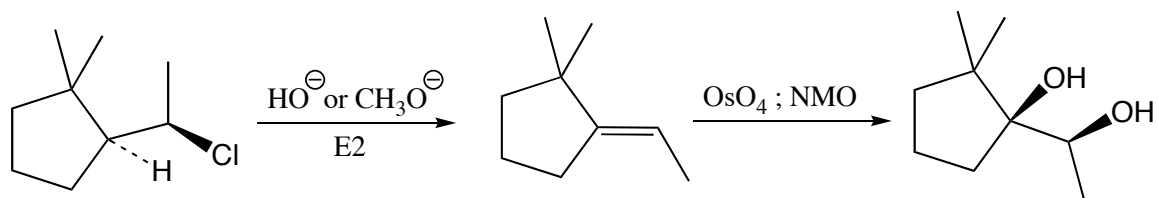
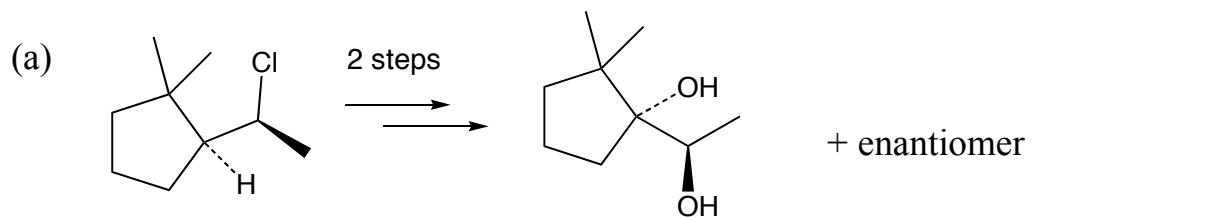
ANSWER KEY

8. Provide a full mechanism for any TWO of the following reactions. Include intermediates and use curved arrows to show electron flow. No transition states are required. Circle the answers to be graded. (12 points)



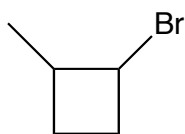
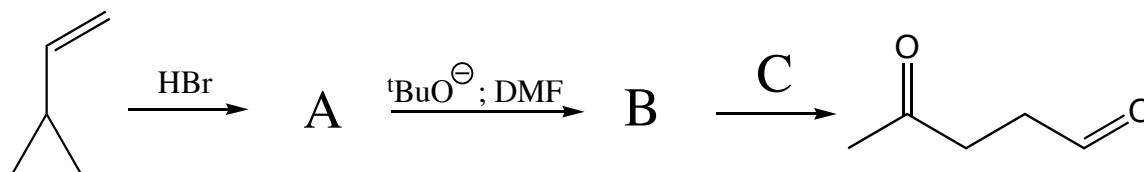
ANSWER KEY

9. Provide reaction conditions to accomplish the following multi-step transformations. (12 points)

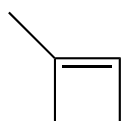


ANSWER KEY

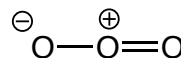
10. Identify molecules A, B, and C in the following synthesis. (9 points)



A



B



C

11. Show how you would synthesize the following molecule in 3 steps from cyclohexene and 4-chloro-1-butene. You may use any additional non-carbon containing reagents as necessary. (9 points)

