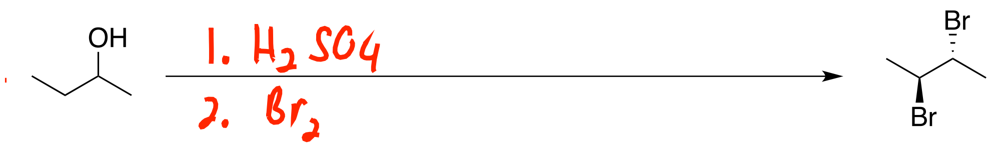
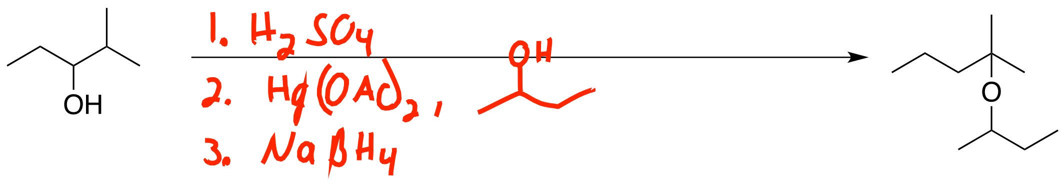
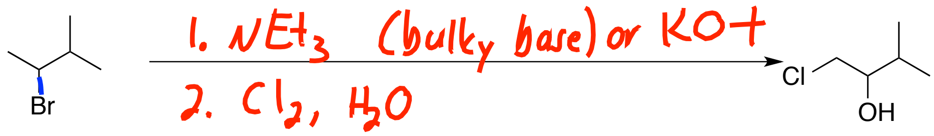
Answers

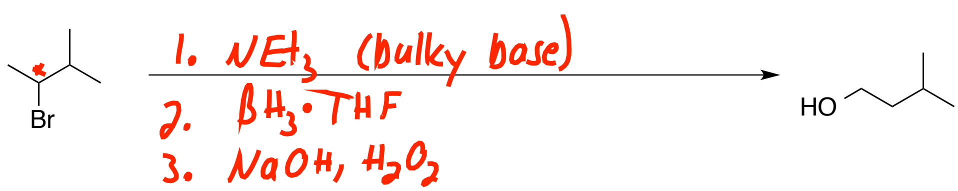
Organic Chemistry I
Test 3 Extra Synthesis Practice Problems
Page 1: Synthesis Design Practice.
Page 2+3: Predict the Product Practice (including some that involve stereochemistry).
Page 4: Cis/trans Stereospecific reactions: which recipe to use; which E or Z alkene to use.
Page 5: Recognizing cationic/anionic/radical reactions, and reasonable intermediates/first steps
Page 6: Elements of unsaturation/hydrogenation problems; ozonolysis puzzle problems.

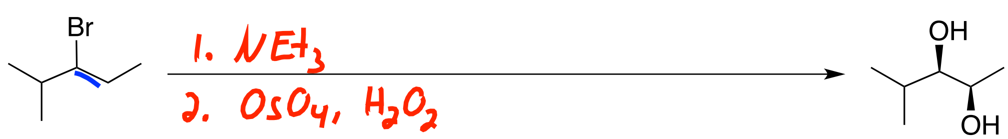
A. Provide reagents for the following transformations.

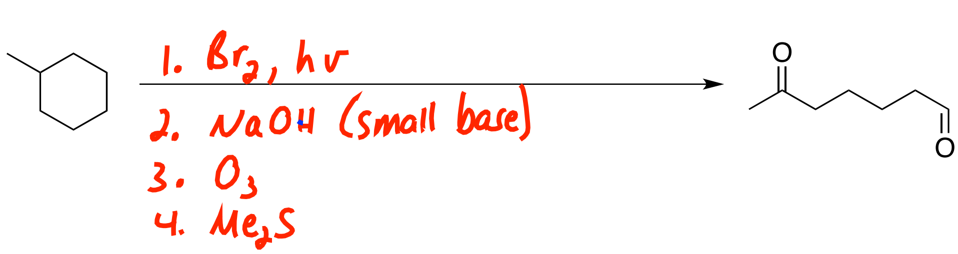
1. 

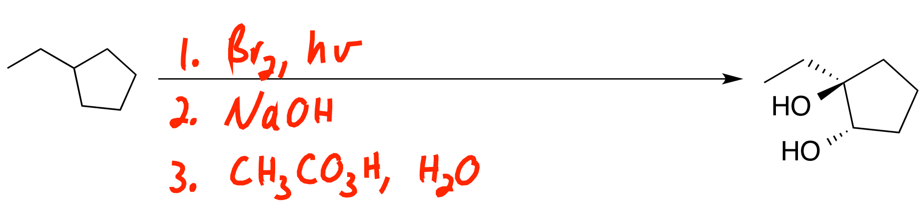
2. 

3. 

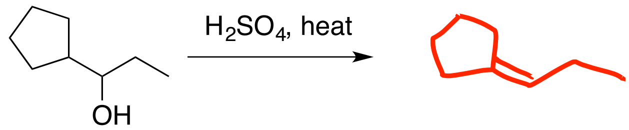
4. 

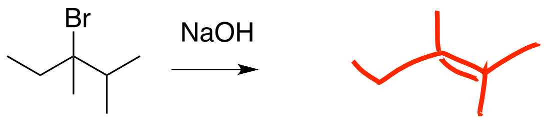
5. 

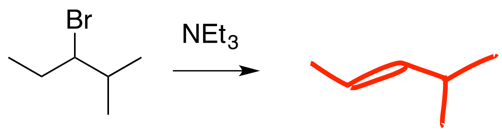
6. 

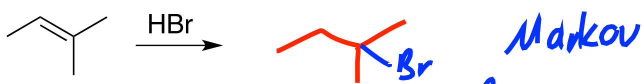
7. 

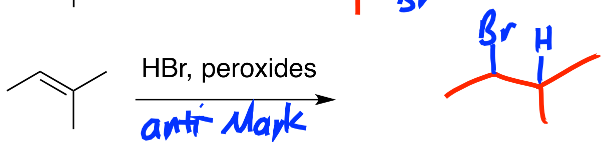
B. Draw the **major** product for each of the following reactions or reaction sequences. You needn't bother to show side products or minor products. For chiral molecules that are racemic , you needn't draw both enantiomers. BE CAREFUL TO SHOW THE CORRECT ORIENTATION, AND THE CORRECT STEREOCHEMISTRY IN CASES WHERE STEREOCHEM IS FACTOR. (3 points each).

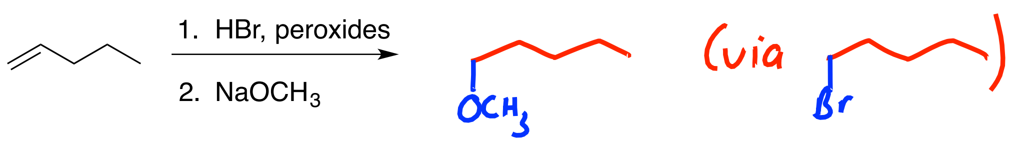
8. 

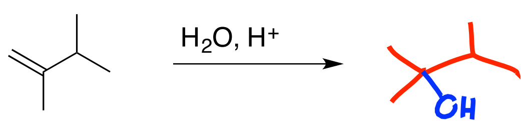
9. 

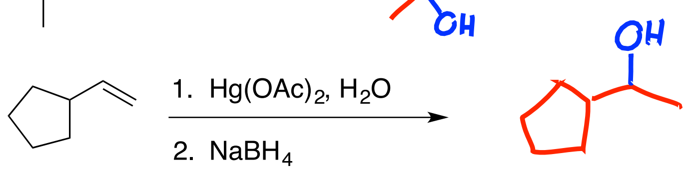
10. 

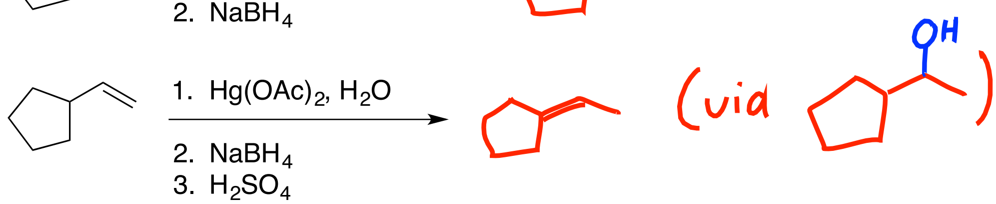
11. 

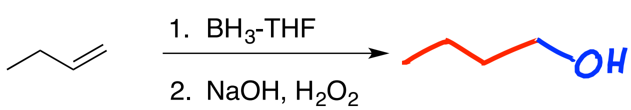
12. 

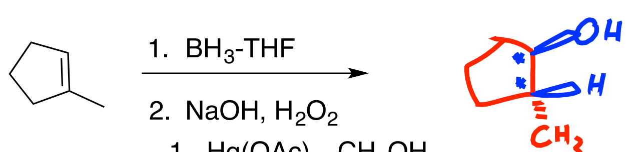
13. 

14. 

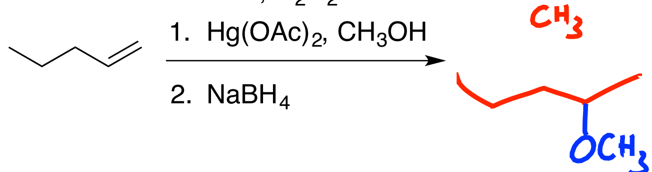
15. 

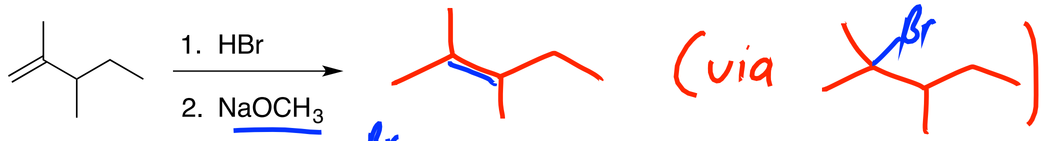
16. 

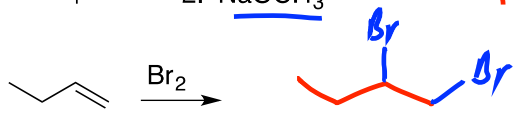
17. 

18. 

Note: explicit stereochemistry must be drawn. The enantiomer would have been equally acceptable.

19. 

20. 

21. 

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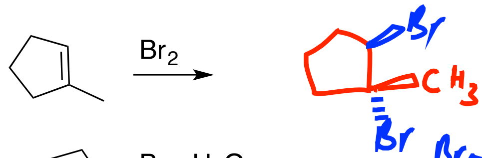
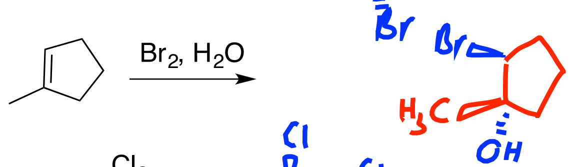
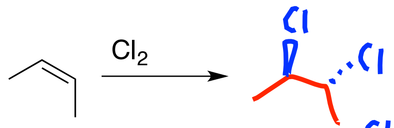
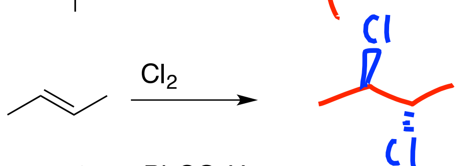
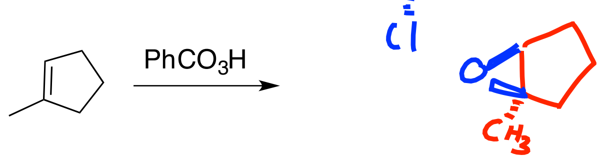
23. 

Note: explicit stereochemistry must be drawn. The enantiomer would have been equally acceptable. This principle will apply for any of the reactions producing two chiral centers. Problems 23-32

24. 

25. 

26. 

27. 

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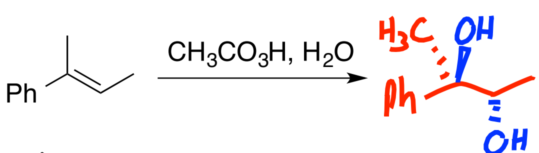
29. 

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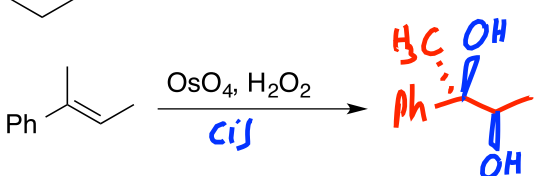
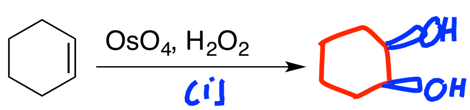
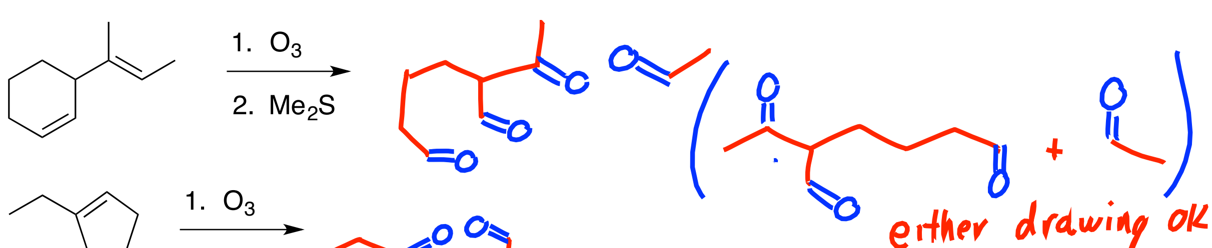
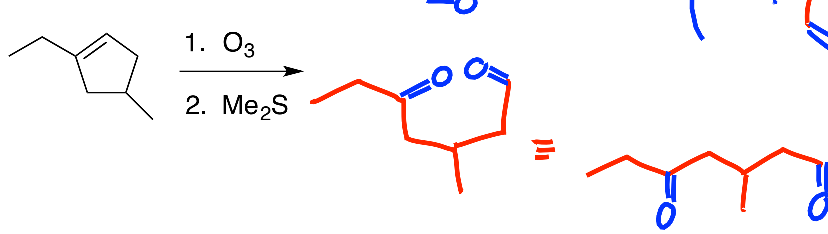
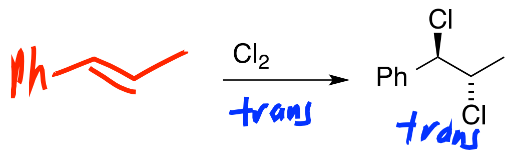
31. 

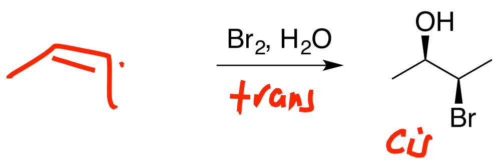
32. 

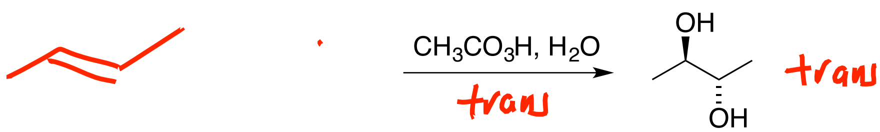
33. 

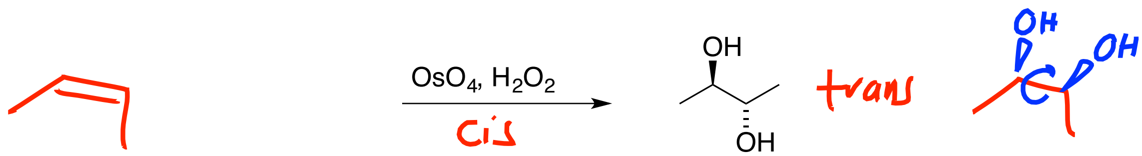
34. 

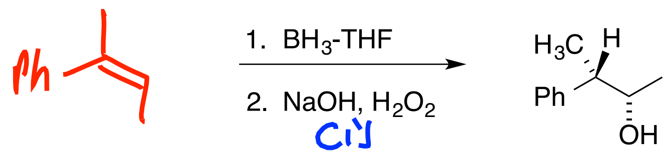
C. Draw the alkene that would product the products shown. Make sure to make your drawing clear whether the starting alkene was E or Z.

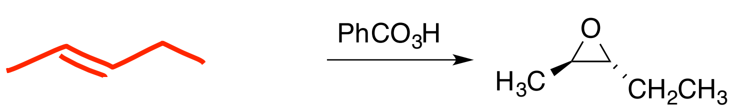
35. 

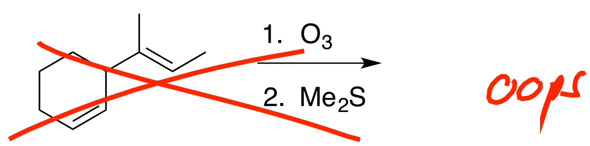
36. 

37. 

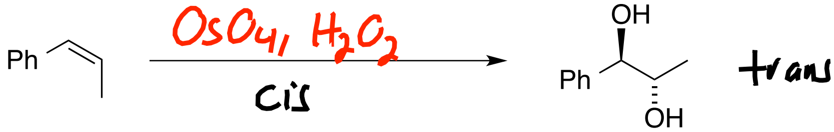
38. 

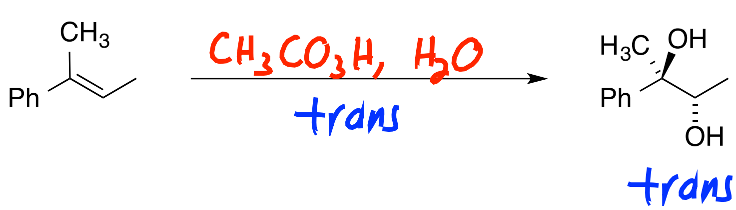
39. 

40. 

41. 

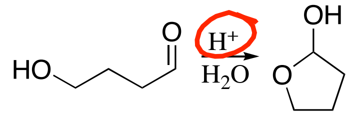
D. What reagent(s) would you use to conduct the following transformations?

42. 

43. 

E. Recognizing whether reaction mechanisms should be cationic, anionic, or radical; whether intermediates should be cationic, anionic, or radical; and recognizing what could be reasonably involved in the initial reaction step.

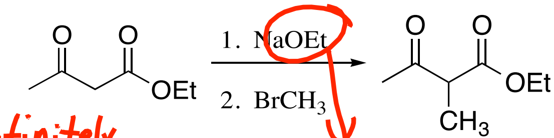
44. The transformation shown is common in many biological systems. Which of the following statements is definitely, absolutely **false**?



Cationic

a. The first step in the mechanism probably involves protonation of the carbonyl oxygen. T
b. The overall reaction involves an addition reaction T
c. The mechanism is probably radical in nature Definitely false

45. For the transformation shown, which of the following statements is definitely, absolutely **false**?

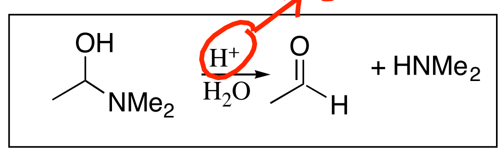


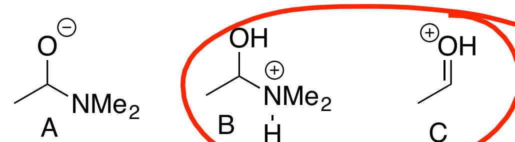
anionic

a. The first step in the mechanism probably involves protonation of a carbonyl oxygen. Definitely false
b. The overall reaction involves a substitution reaction T
c. The mechanism is probably anionic in nature T
d. The first step in the mechanism involves ethoxide anion grabbing a hydrogen. T

46. Shown is a reaction, and some possible intermediates along the mechanistic pathway. Given the reaction conditions shown, which of the following statements is true?

cationic





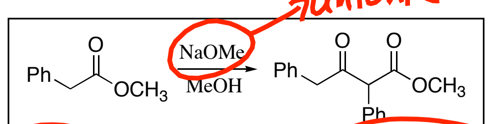
anionic

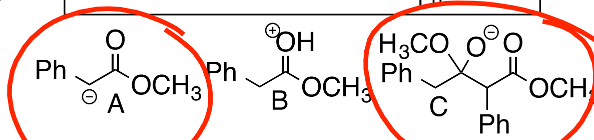
cationic

a. Structures **A** and **B** might be plausible intermediates; structure **C** definitely isn't
b. Structures **A** and **C** might be plausible intermediates; structure **B** definitely isn't
c. Structures **B** and **C** might be plausible intermediates; structure **A** definitely isn't
d. Structure **A** might be a plausible intermediates; structures **B** and **C** definitely aren't

47. Shown is a reaction, and some possible intermediates along the mechanistic pathway. Given the reaction conditions shown, which of the following statements is true?

anionic





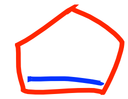
anionic

a. Structures **A** and **B** might be plausible intermediates; structure **C** definitely isn't
b. Structures **A** and **C** might be plausible intermediates; structure **B** definitely isn't
c. Structures **B** and **C** might be plausible intermediates; structure **A** definitely isn't
d. Structure **A** might be a plausible intermediates; structures **B** and **C** definitely aren't

F. Elements of Unsaturation/Hydrogenation Problems. For each problem there will be multiple satisfactory solutions.

48. Provide a possible structure for a compound with formula C_5H_8, given that it reacts with excess H_2/Pt to give C_5H_{10}.

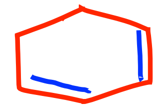
Answer must show one alkene and one ring. (Other structures also meet that requirement).
H2/Pt test proved 1 alkene.
EU=2 originally.
So the other EU must be ring.



etc

49. Provide a possible structure for a compound with formula C_6H_8, given that it reacts with excess H_2/Pt to give C_6H_{12}.

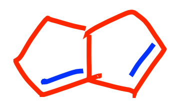
Answer must show two alkene and one ring. (Other structures also meet that requirement).
H2/Pt test proved 2 alkenes.
EU=3 originally.
So the other EU must be ring.



etc

50. Provide a possible structure for a compound with formula C_8H_{10}, given that it reacts with excess H_2/Pt to give C_8H_{14}.

Answer must show two alkenes and two rings. (Other structures also meet that requirement).
H2/Pt test proved 2 alkene.
EU=4 originally.
So the other two EU must be two rings.



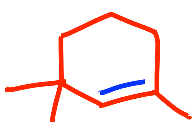
51. ~~Provide a possible structure for a compound with formula C_6H_8, given that it reacts with excess H_2/Pt to give C_6H_{12}.~~

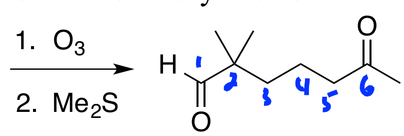
~~Answer must show two alkene and one ring. (Other structures also meet that requirement).
H2/Pt test proved 2 alkenes.
EU=3 originally.
So the other EU must be ring.~~

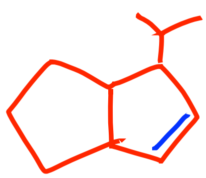
Oops, same as #49

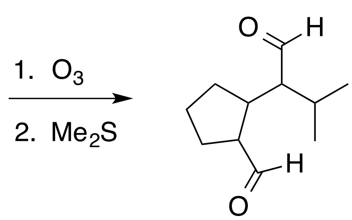
G. Ozonolysis: Draw starting chemicals that will undergo ozonolysis to produce the products shown. In some cases there may be more than one satisfactory answer.

52.



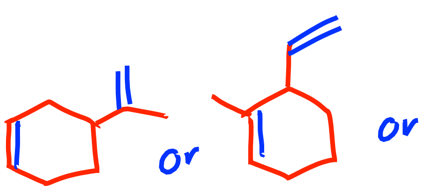


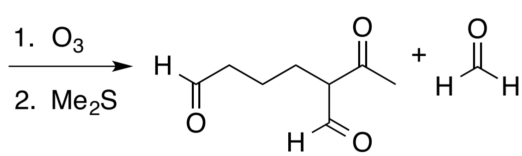




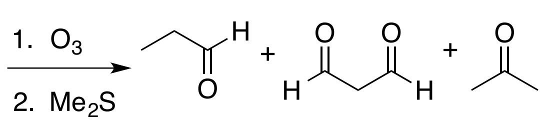
53.

Any of three answers





54.



55.