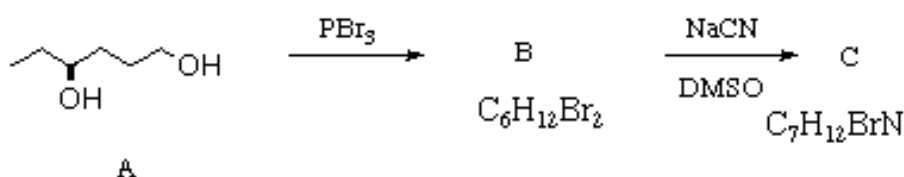


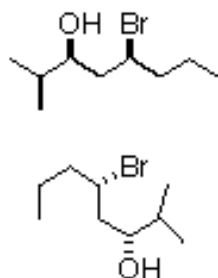
This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

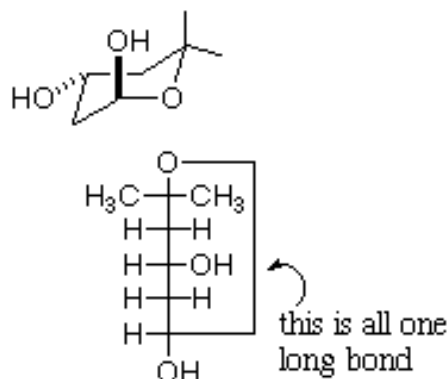


2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

a.

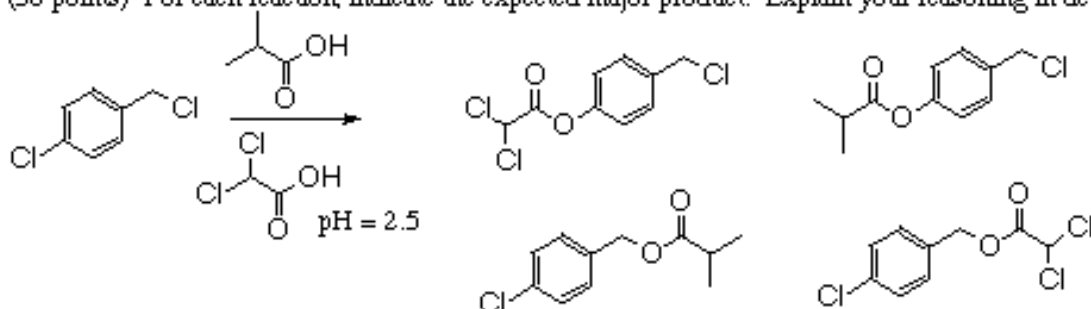


b.

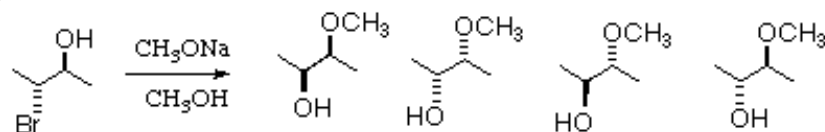


3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

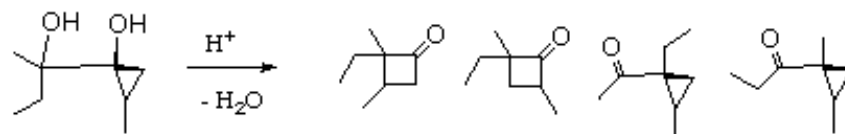
a.



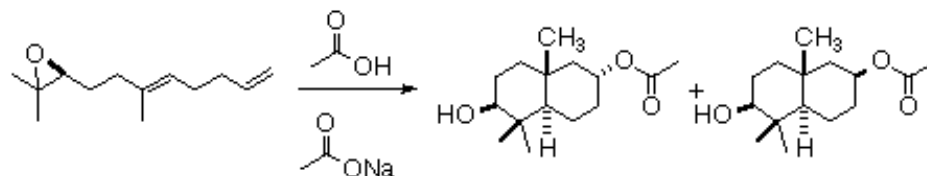
b.



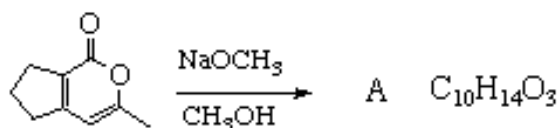
c.



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:



b) Deduce the structure of A, and draw an arrow-pushing mechanism for its formation.



A $\text{C}_{10}\text{H}_{14}\text{O}_3$

^{13}C NMR

204.9, s

166.0, s

151.8, s

130.1, s

51.0, q

44.9, t

39.0, t

33.2, t

29.9, q

21.3, t

^1H NMR

3.77, s, 2H

3.71, s, 3H

2.66, t, $J=7.5$ Hz, 2H

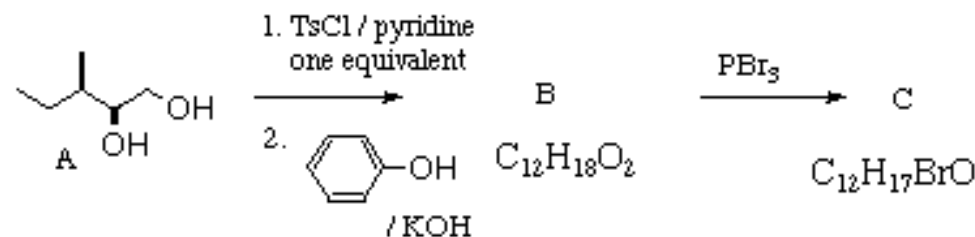
2.52, t, $J=7.8$ Hz, 2H

2.19, s, 3H

1.87, m, 2H

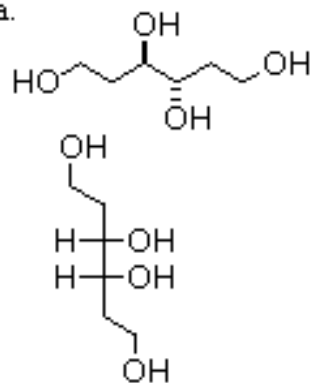
This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

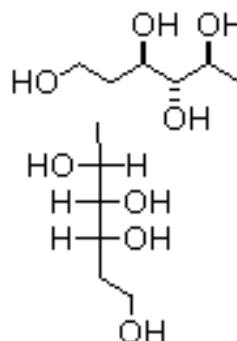


2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

a.

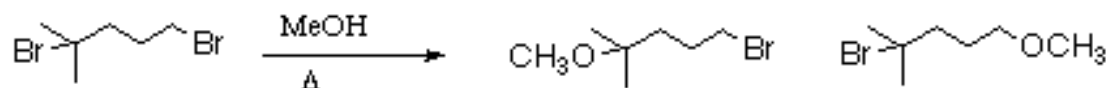


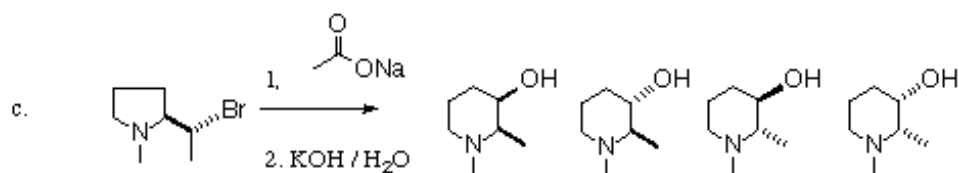
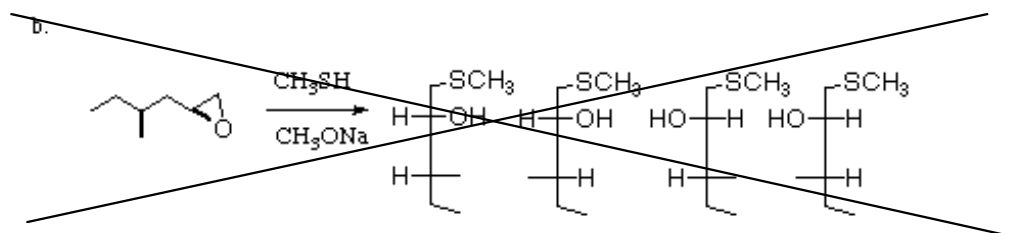
b.



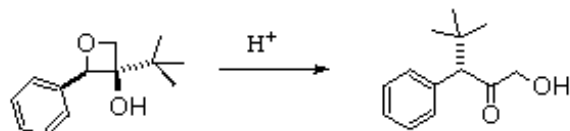
3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

a.

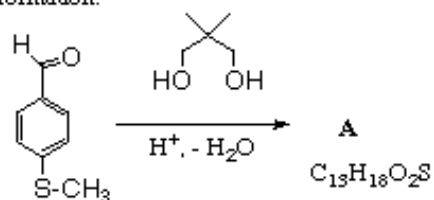




4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:



5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.



^{13}C NMR:

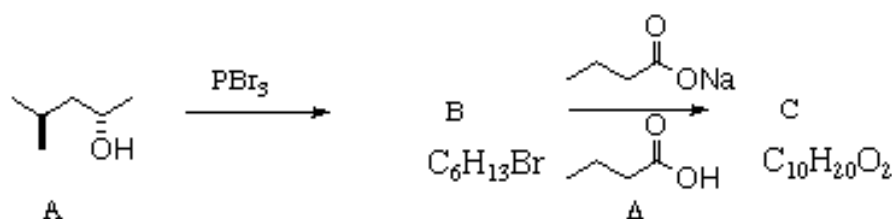
16.5, q
22.6, q
23.8, q
30.9, s
78.3, t (2)
102.1, d
127.1, d (2)
127.4, d (2)
136.2, s
140.0, s

^1H NMR:

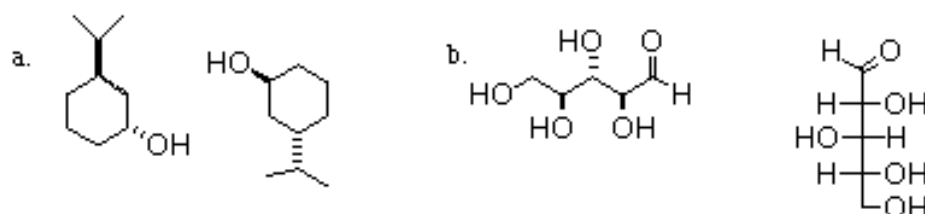
0.83, s, 3H
1.33, s, 3H
2.50, s, 3H
3.67, d, $J = 10.2$ Hz, 2H
3.79, d, $J = 10.2$ Hz, 2H
5.25, s, 1H
7.30, m, 4H

This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

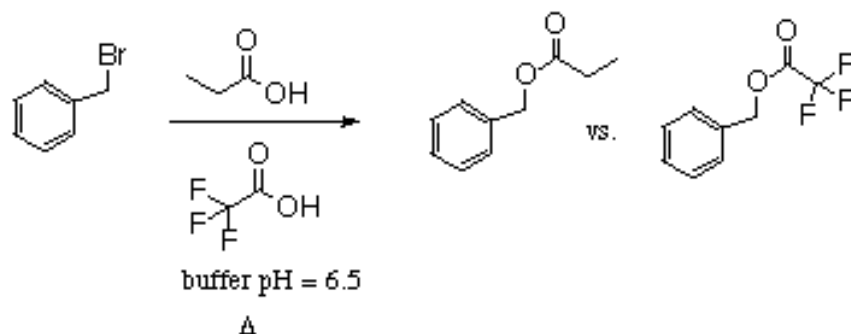


2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or the same.

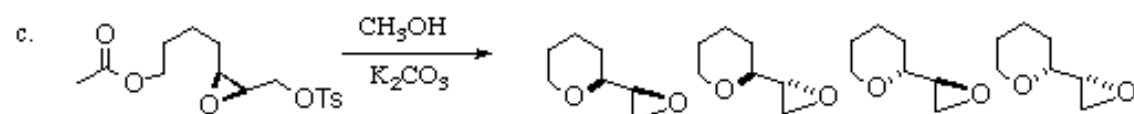
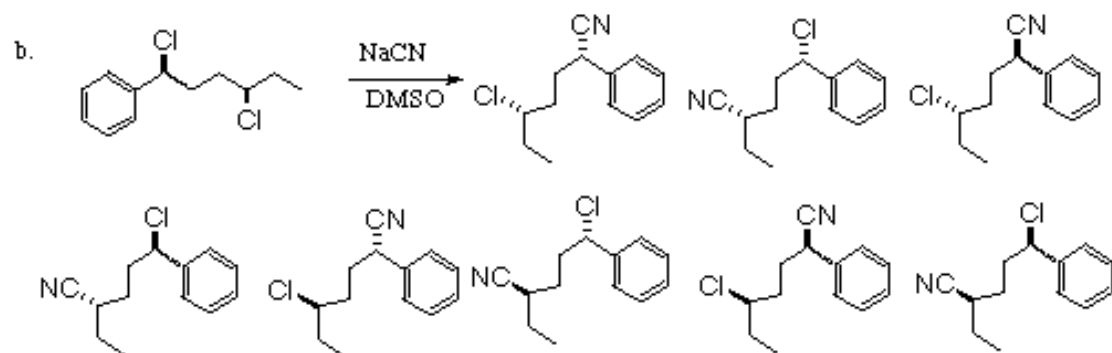


3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

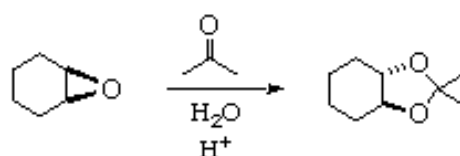
a.



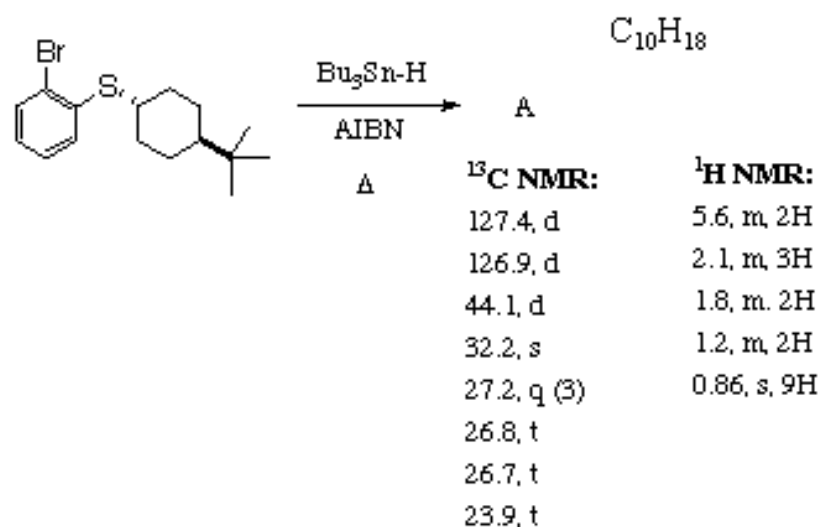
3. (cont) For each reaction, indicate the expected major product. Explain your reasoning in detail.



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

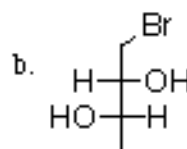
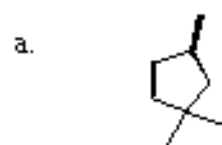


5. (20 points) Deduce the structure of the product and draw a detailed arrow-pushing mechanism for the transformation.

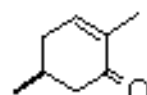
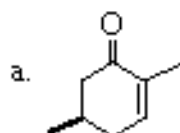


This is an open-book, open notes exam. Please show your work in detail.

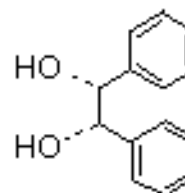
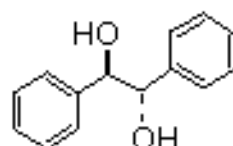
1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.



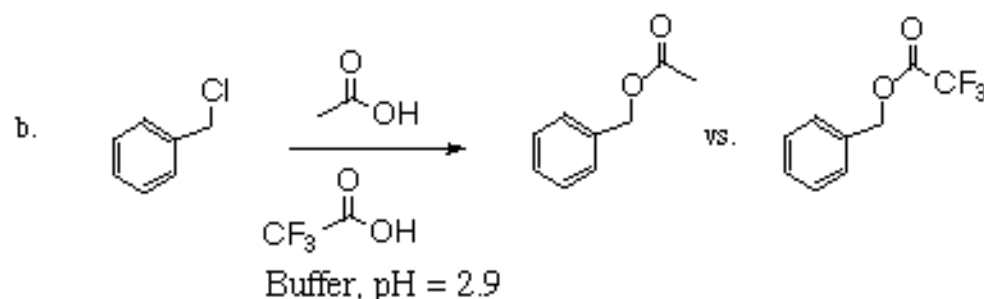
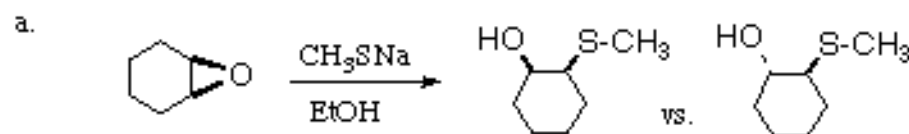
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.



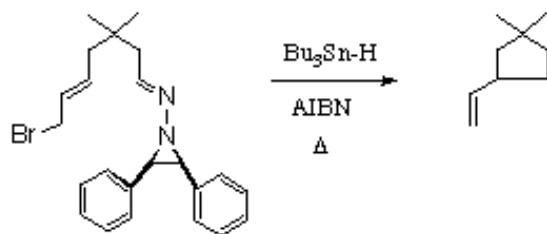
b.



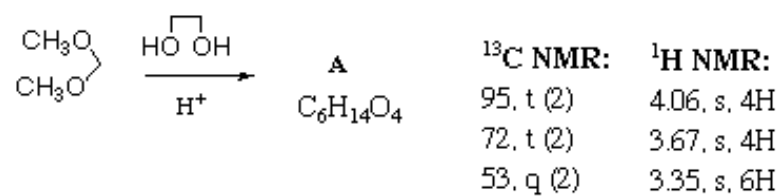
3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.



4. (30 points) Draw a detailed arrow-pushing mechanism for the following transformation.

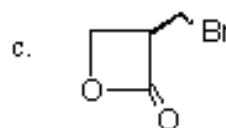
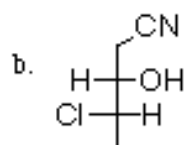
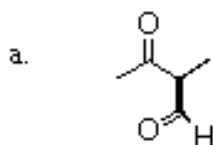


5. (30 points) Deduce the structure of **A**, and draw a detailed arrow-pushing mechanism for its formation.

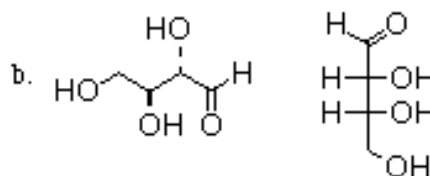
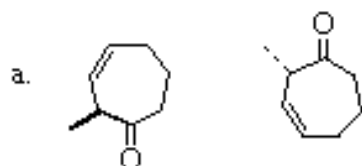


This is an open-book, open notes exam. Please show your work in detail.

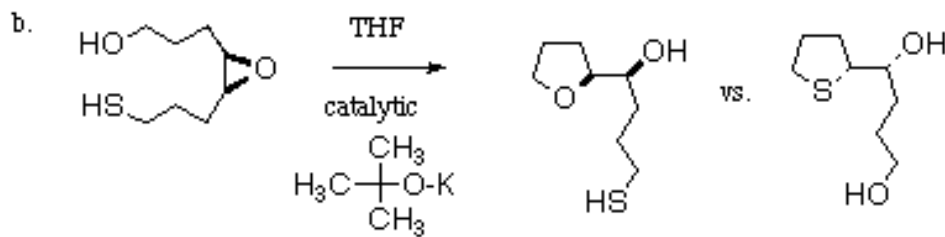
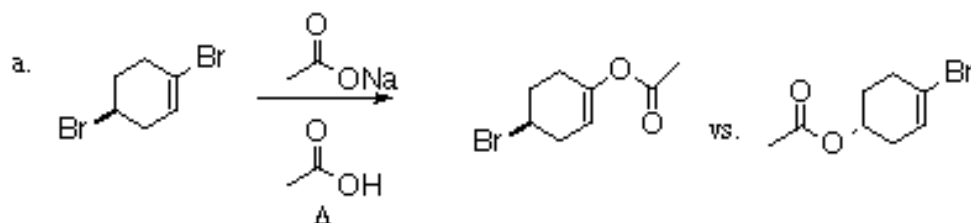
1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.



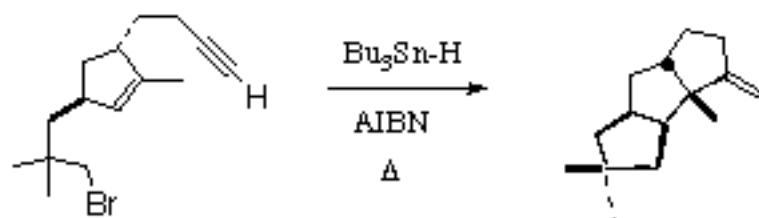
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.



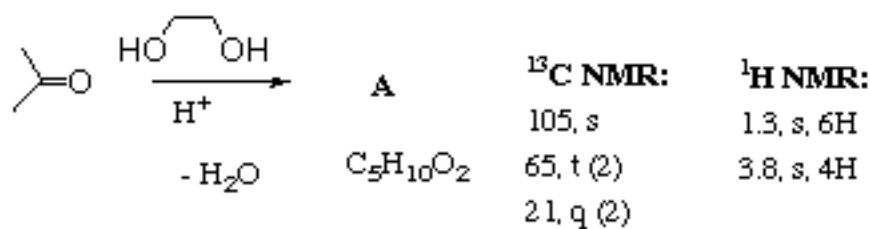
3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation.

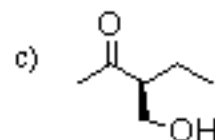
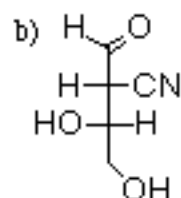
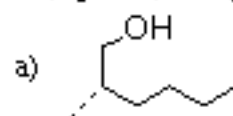


5. (40 points) Deduce the structure of **A**, and draw a detailed arrow-pushing mechanism for its formation.

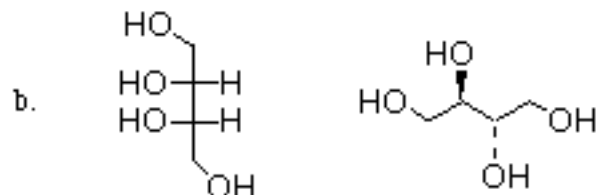


This is an open-book, open notes exam. Please show your work in detail.

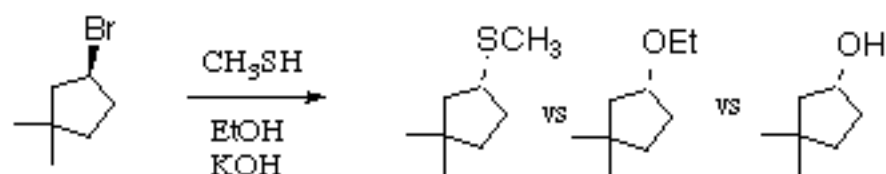
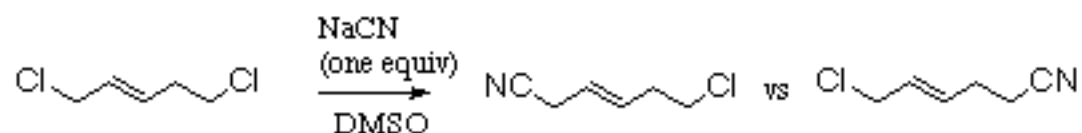
1. (8 points) Assign the absolute configuration (R vs. S) for each center.



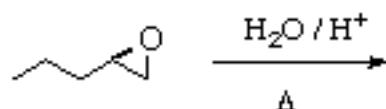
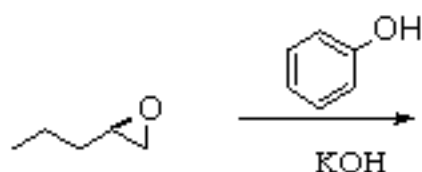
2. (12 points) For each pair, indicate whether they are diastereomers, enantiomers or the same.



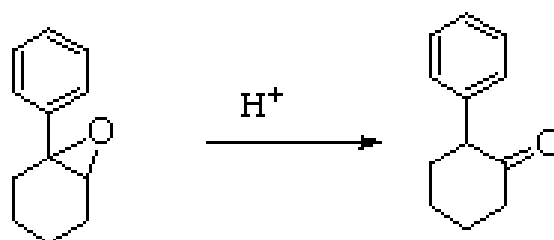
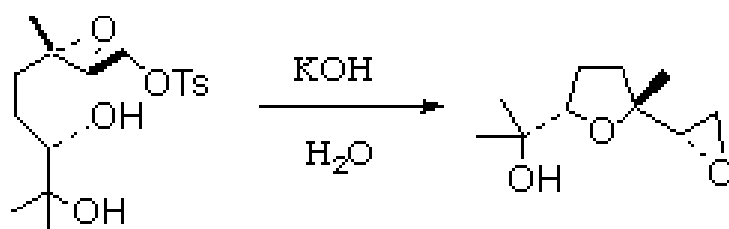
3. (20 points) For each, indicate the expected major product. Explain your reasoning.



4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

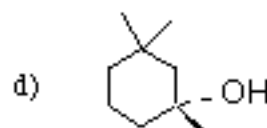
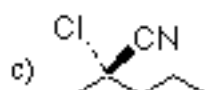
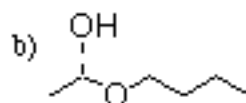
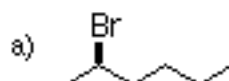


5. (20 points each) For each, draw a detailed arrow-pushing mechanism.

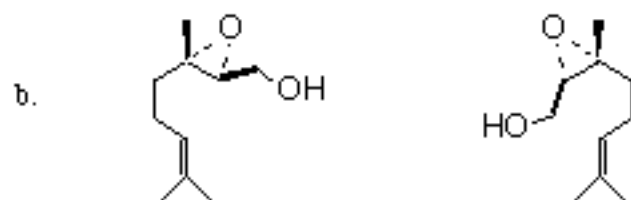
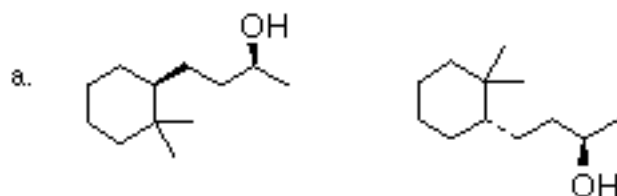


This is an open-book, open notes exam. Please show your work in detail.

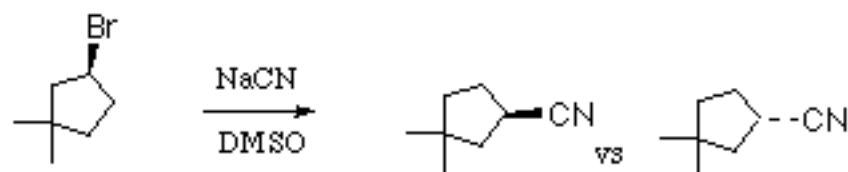
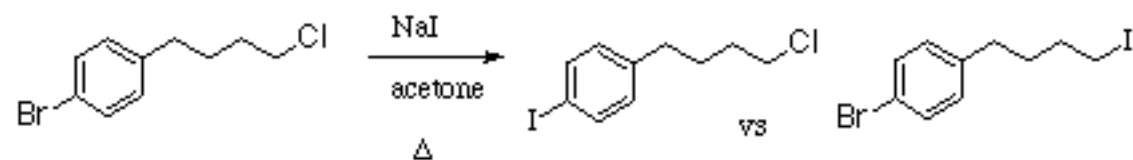
1. (12 points) Assign the absolute configuration (R vs. S) for each.



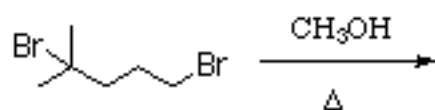
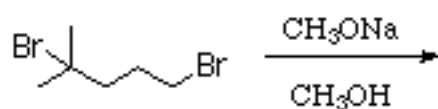
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same.



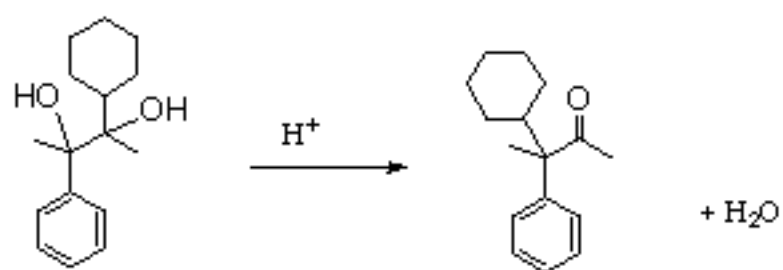
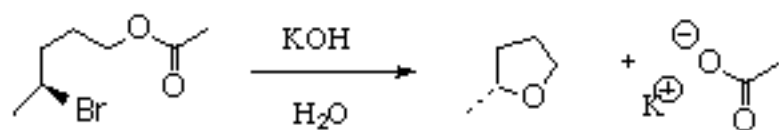
3. (20 points) For each, indicate the expected major product. Explain your reasoning.



4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.

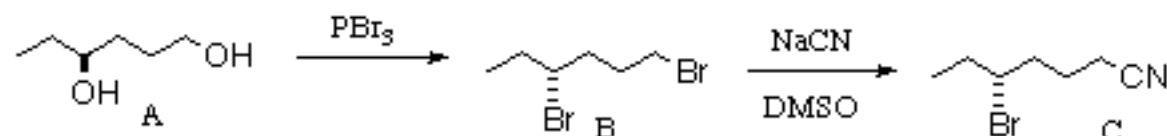


5. (20 points each) For each, draw a detailed arrow-pushing mechanism.



This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.



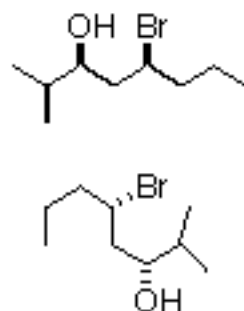
(4S)-1,4-hexanediol

(4R)-1,4-dibromohexane

(5R)-5-bromoheptanenitrile

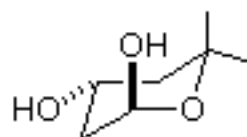
2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

a.

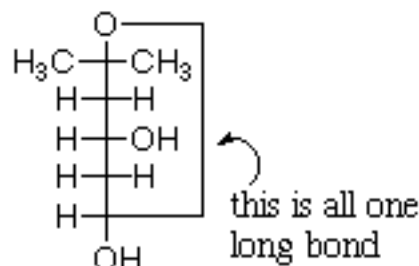


diastereomers

b.

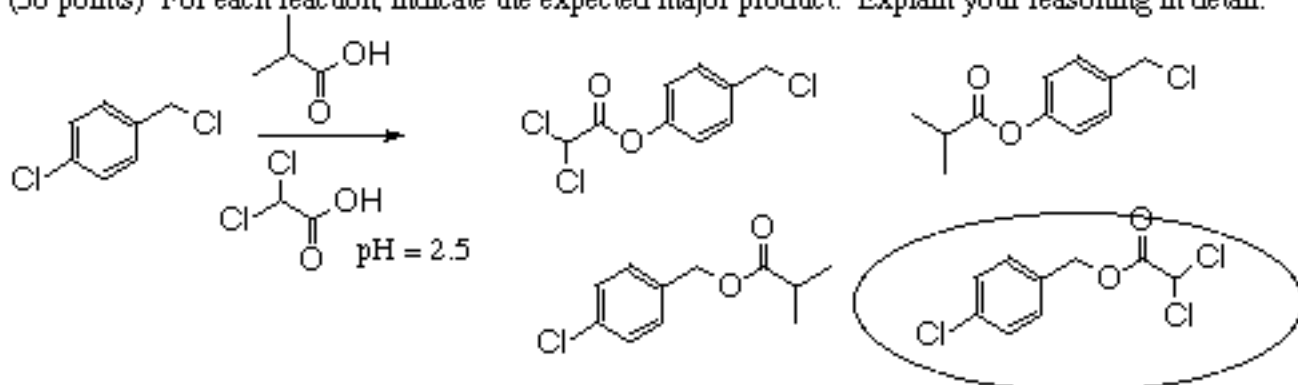


enantiomers

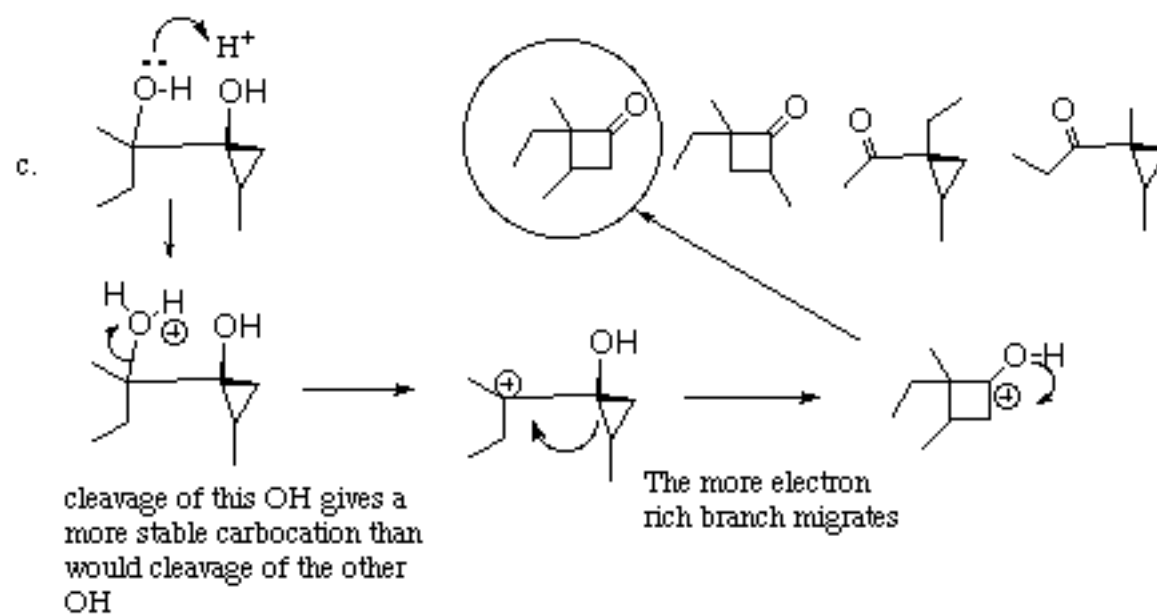
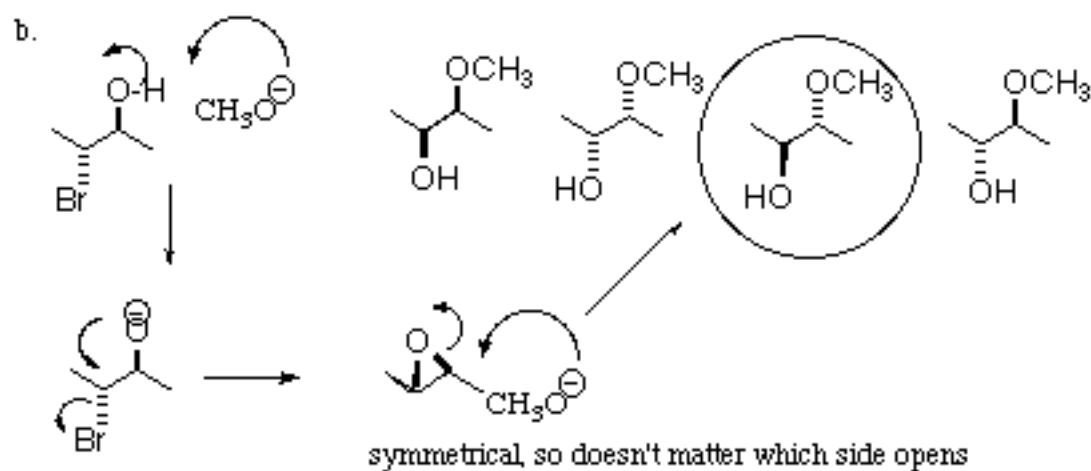


3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.

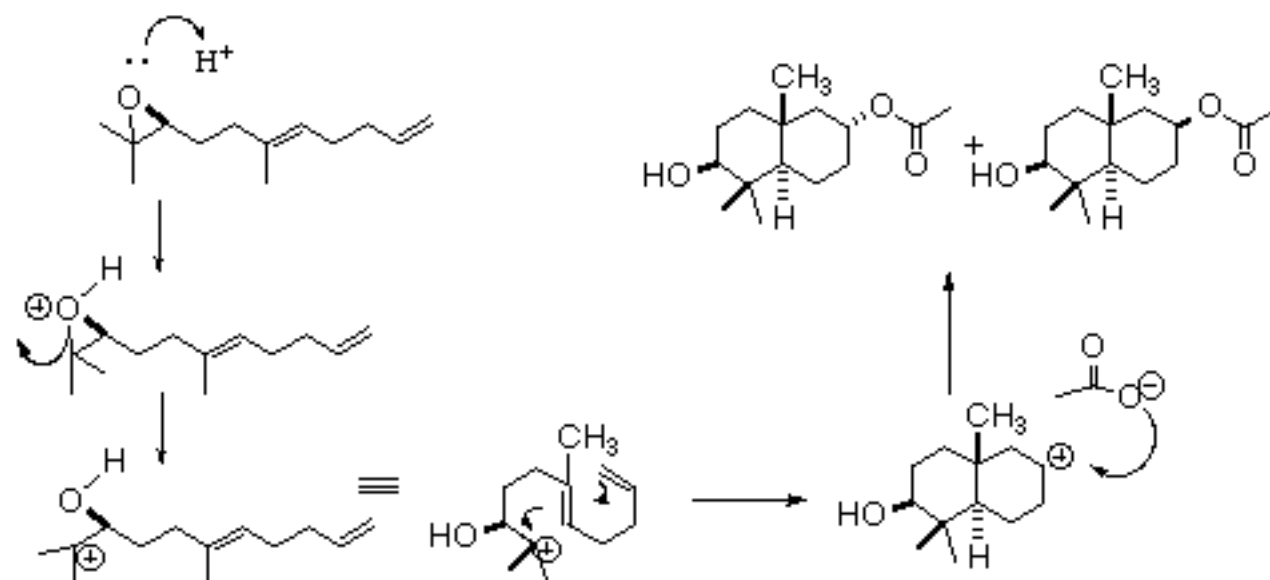
a.



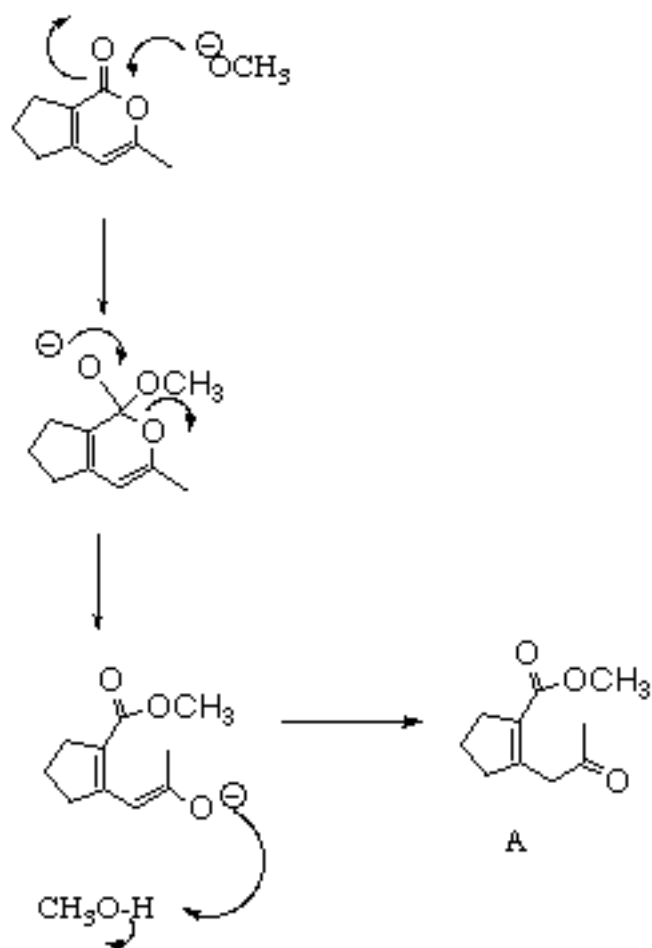
At this pH, only the dichloro acid is ionized, so that carboxylate is the nucleophile. That carboxylate effects S_N2 displacement of the chloride attached to the sp^3 -hybridized carbon.



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

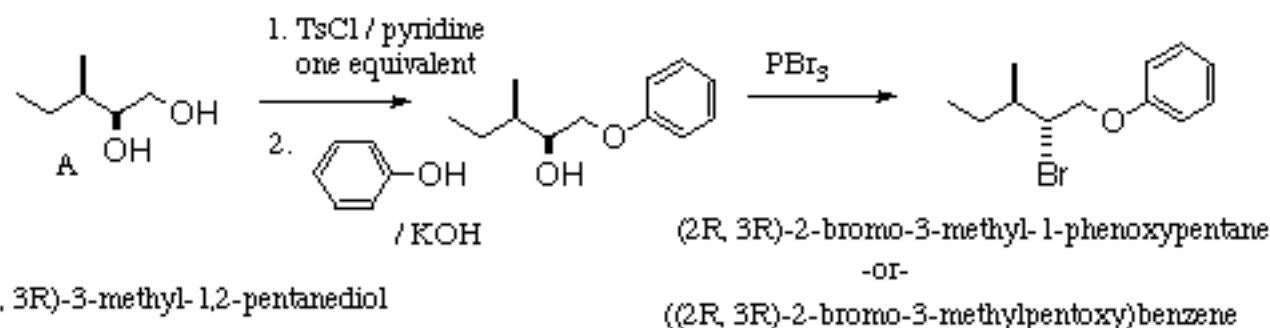


b) Deduce the structure of A, and draw an arrow-pushing mechanism for its formation.



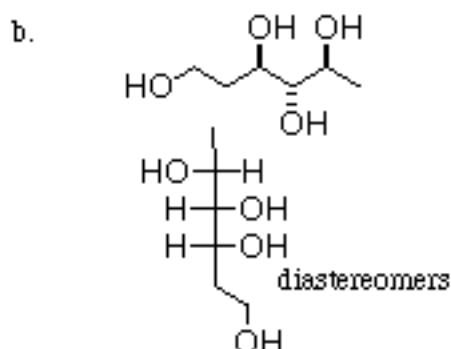
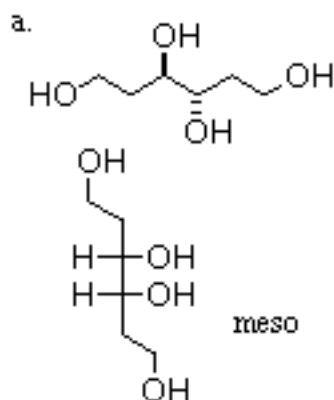
This is an open-book, open notes exam. Please show your work in detail.

1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.

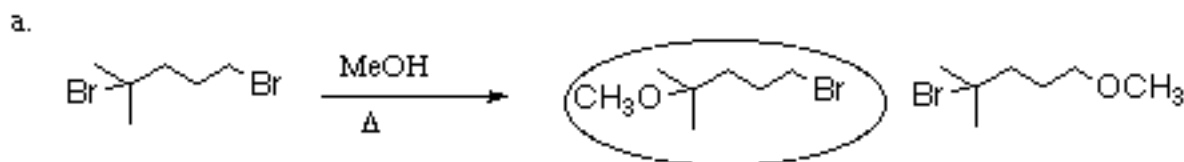


(2S, 3R)-3-methyl-1-phenoxy-2-pentanol

2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or meso.

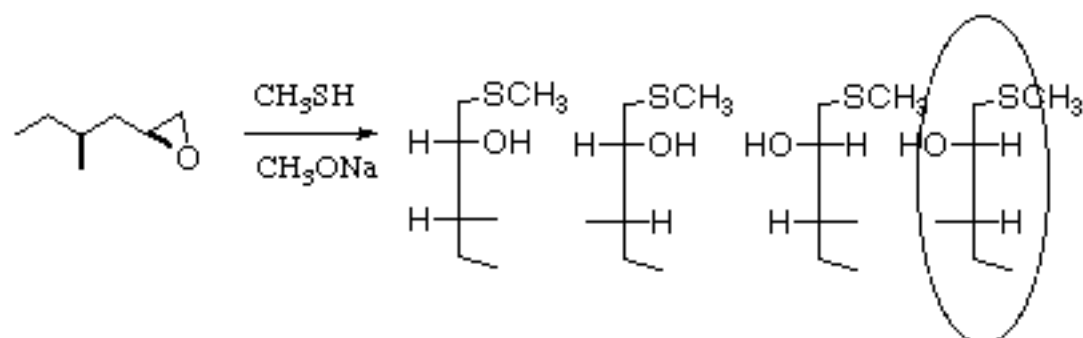


3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.



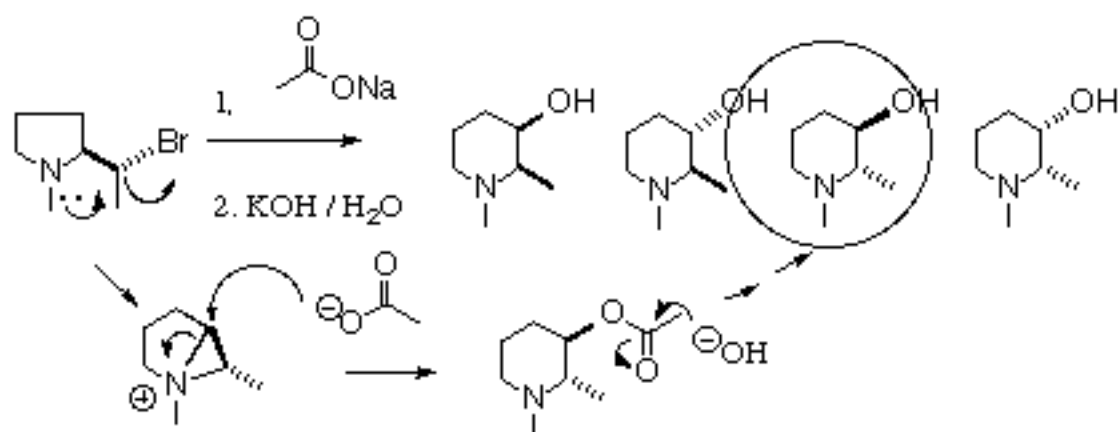
these are S_N1 conditions - the reaction proceeds by way of the cation, and it is much easier to form the cation from the tertiary halide than from the primary halide

b.



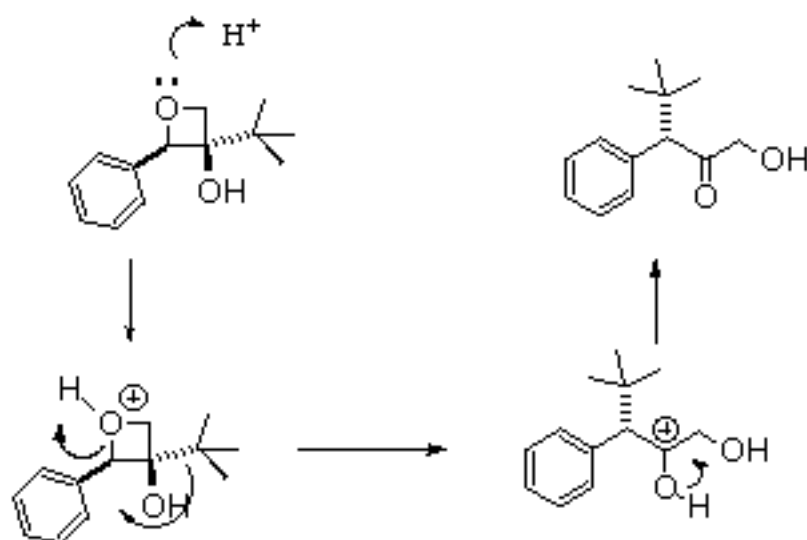
Neither center inverts

c.

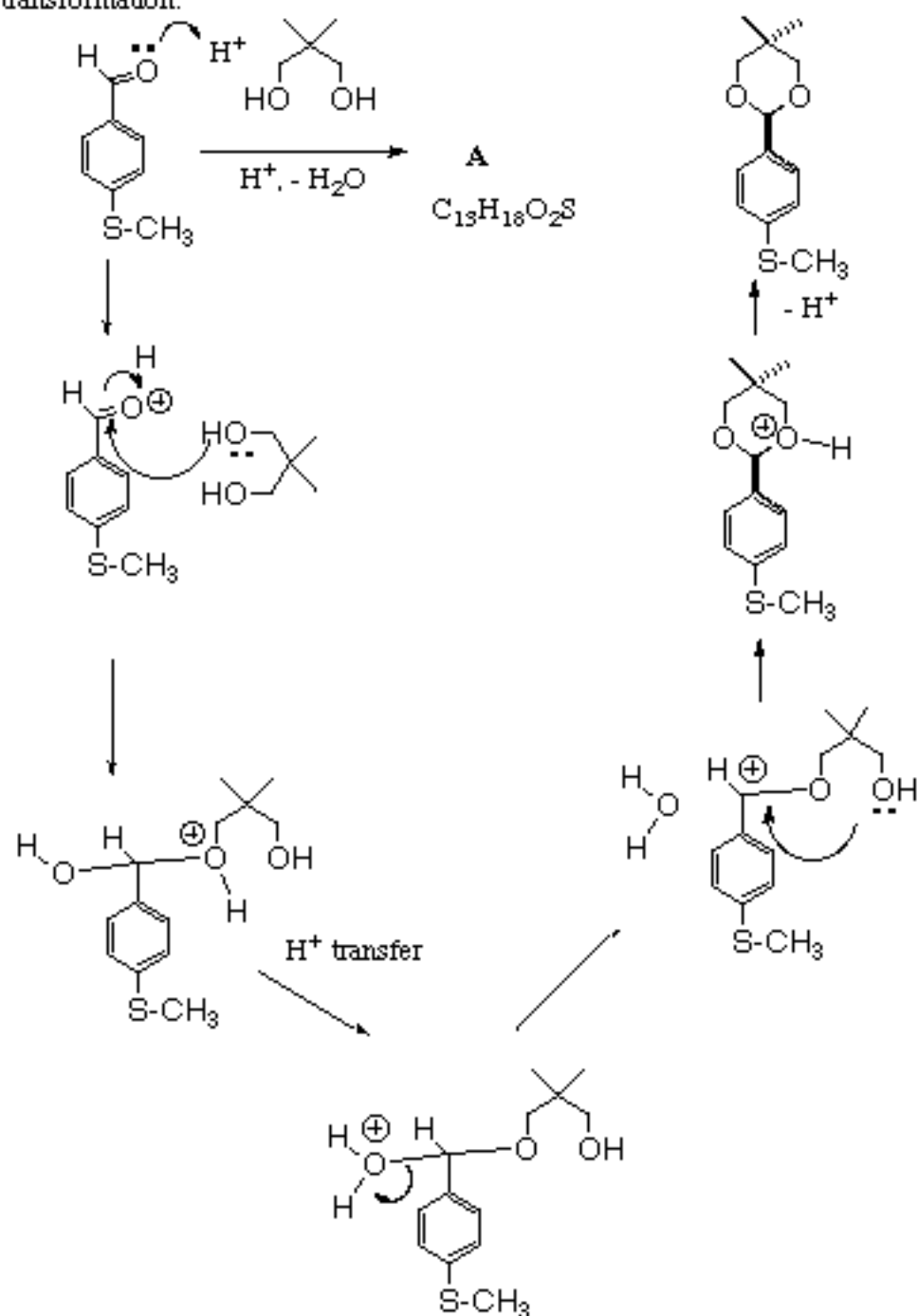


Both centers invert

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

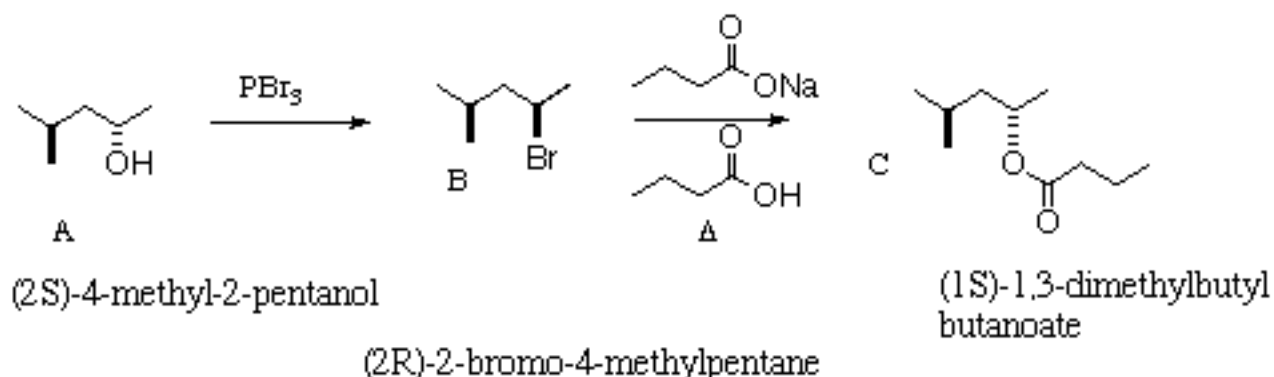


5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.

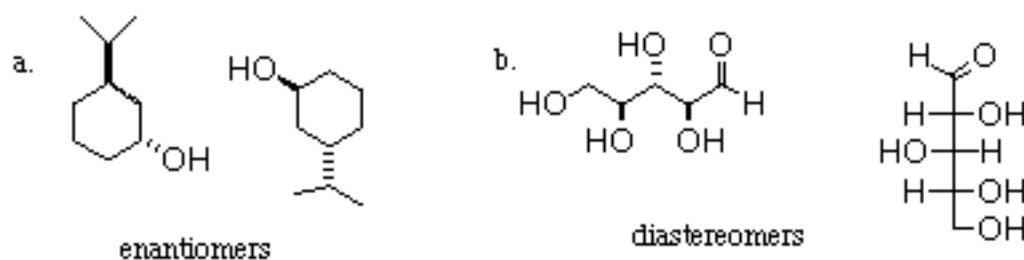


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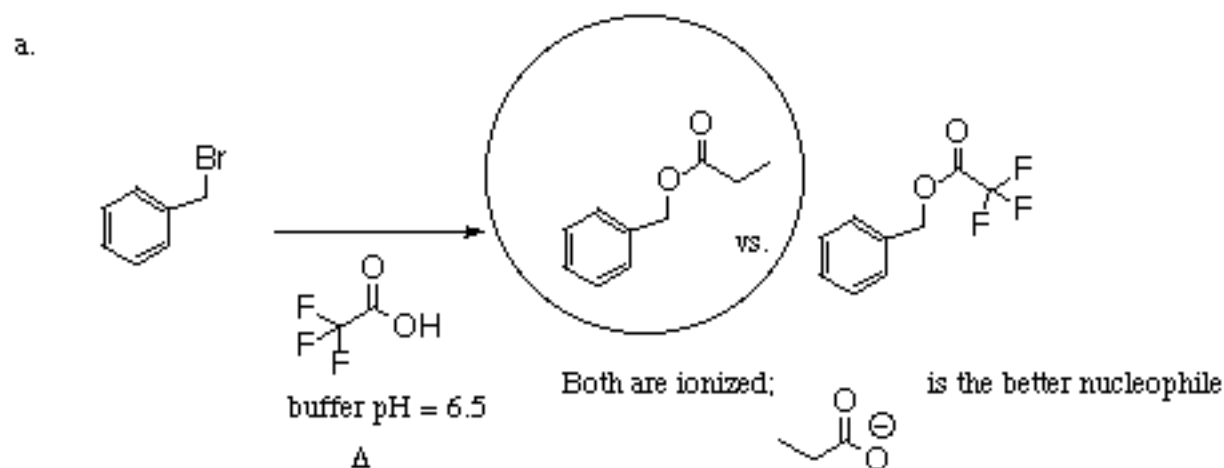
1. (20 points) Deduce the structures of B and C and give correct IUPAC names for A, B and C. You do not have to show mechanisms.



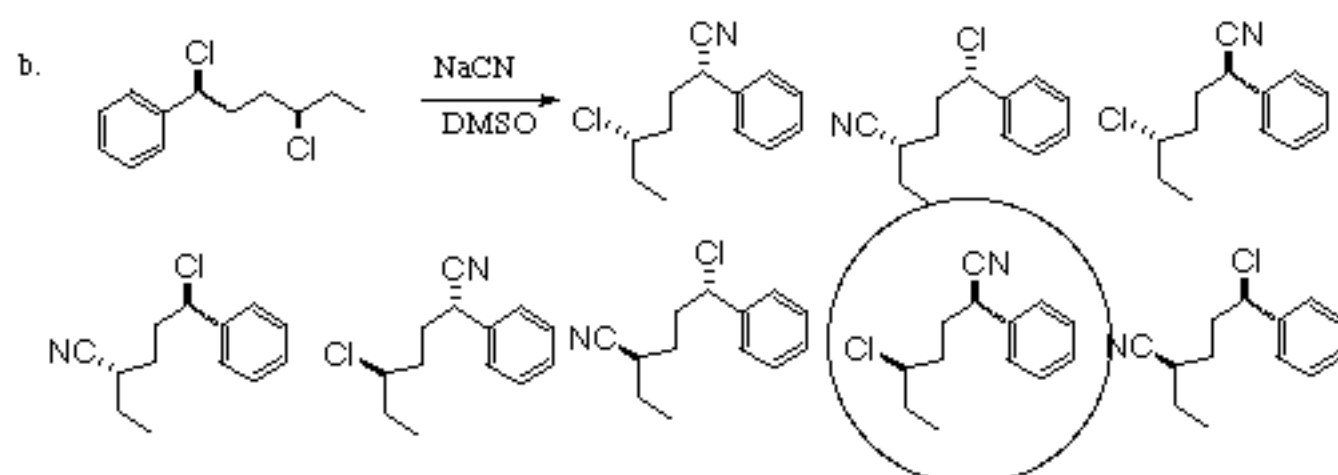
2. (10 points) For each pair, indicate if they are enantiomers, diastereomers or the same.



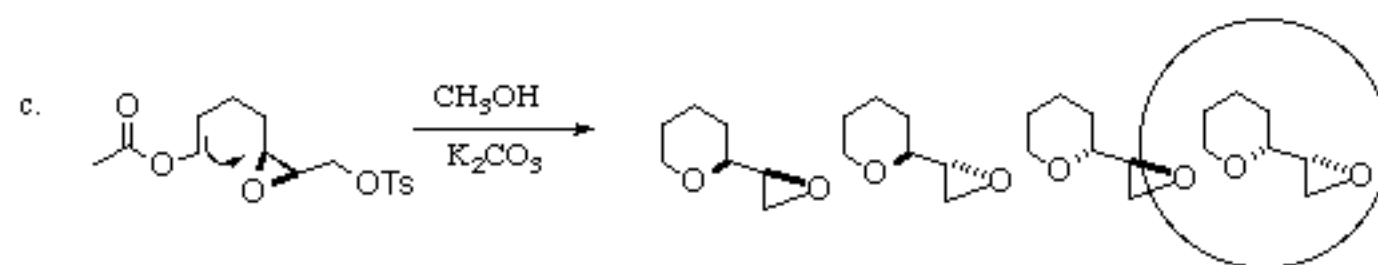
3. (30 points) For each reaction, indicate the expected major product. Explain your reasoning in detail.



3. (cont) For each reaction, indicate the expected major product. Explain your reasoning in detail.

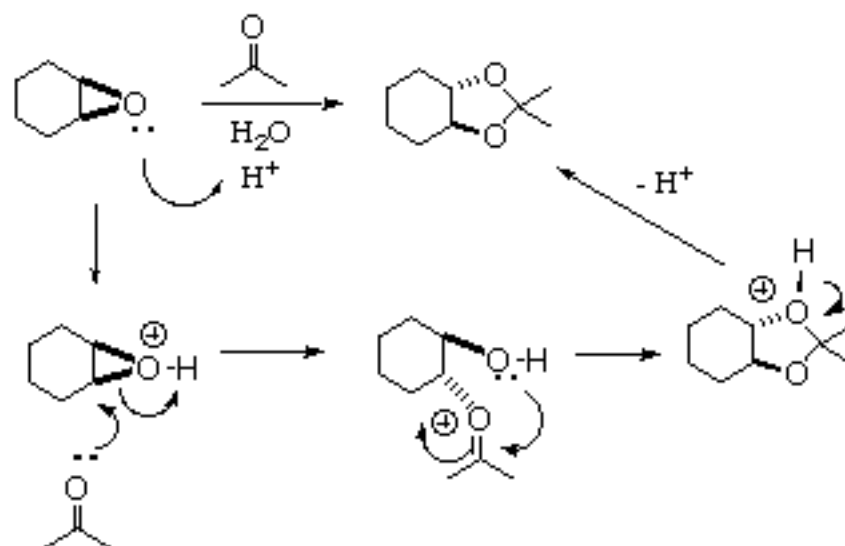


Benzylic center is the more reactive; only the reaction center inverts

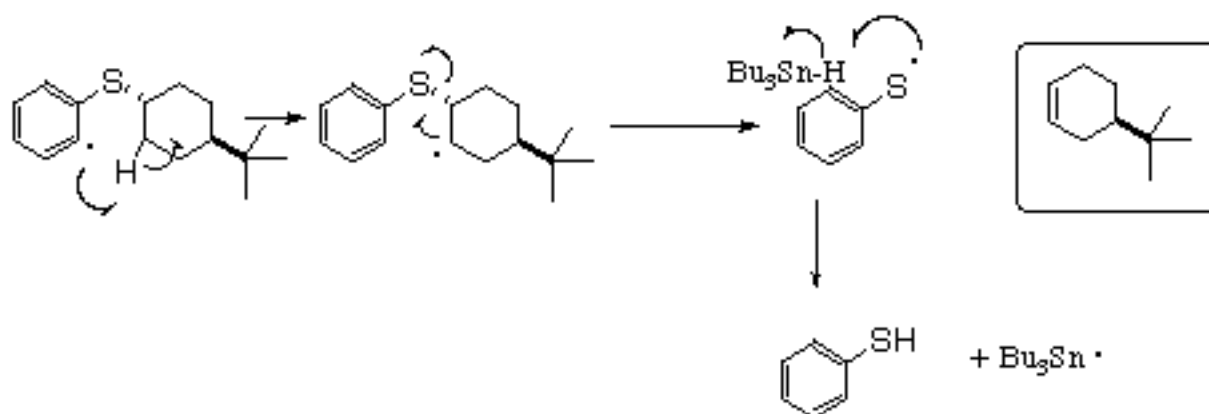
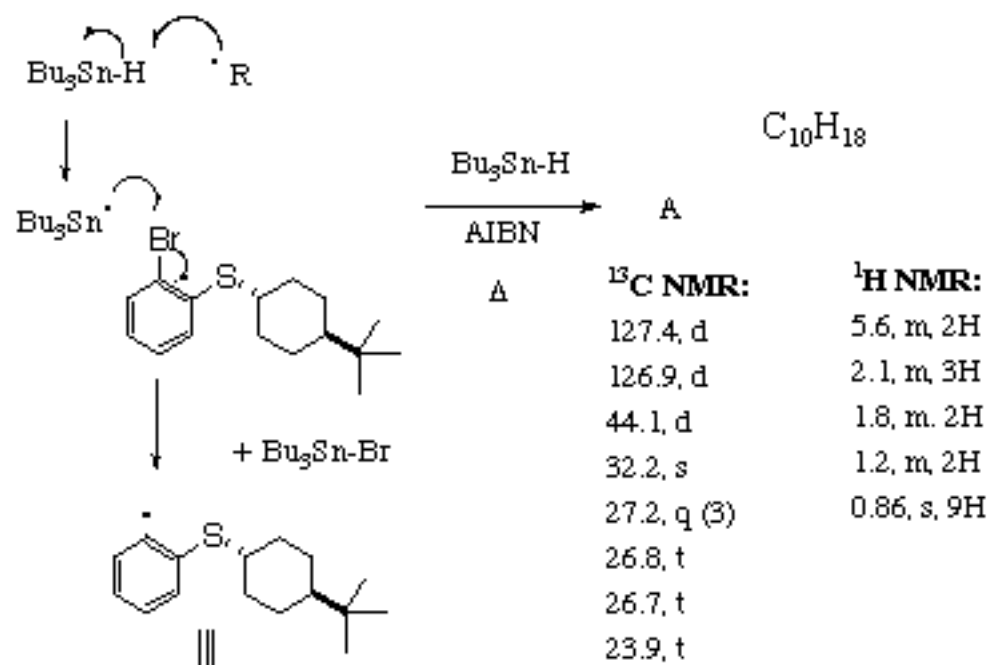


Only the reaction center marked with the arrow inverts

4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation:

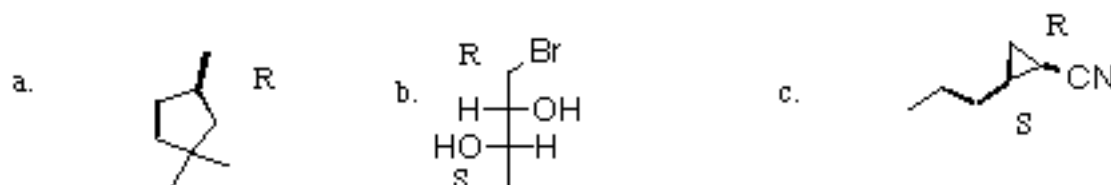


5. (20 points) Deduce the structure of the product, and draw a detailed arrow-pushing mechanism for the transformation.

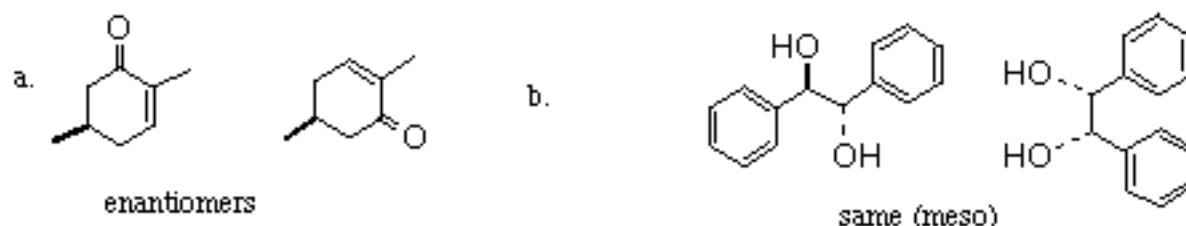


This is an open-book, open notes exam. Please show your work in detail.

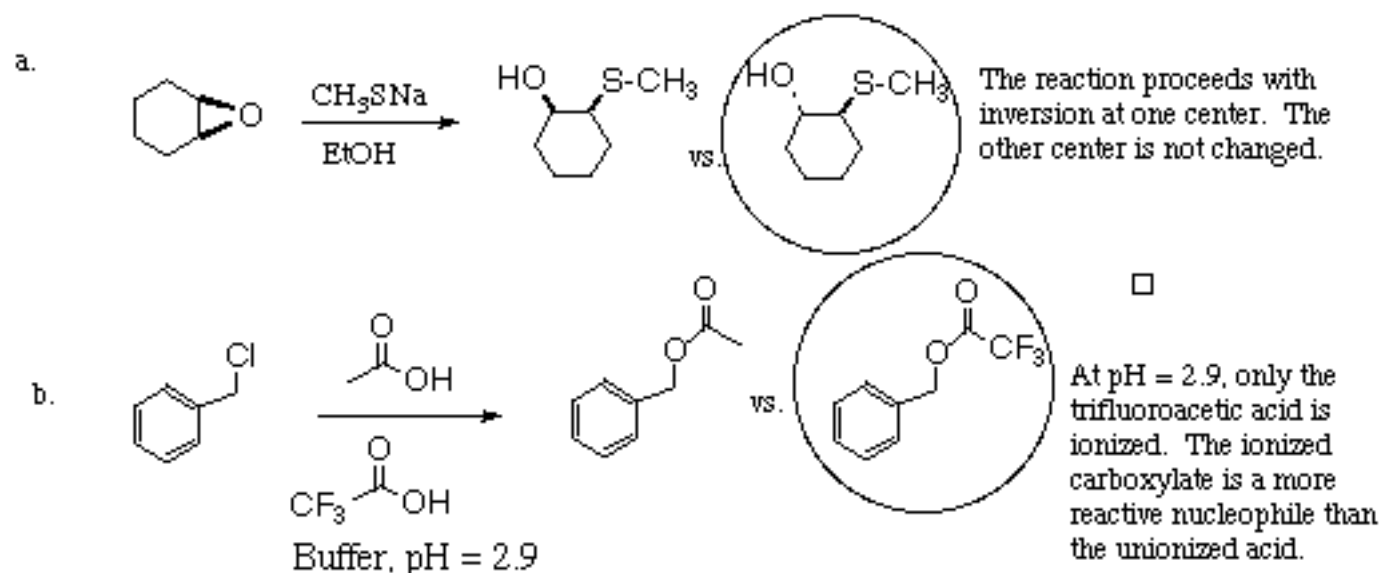
1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.



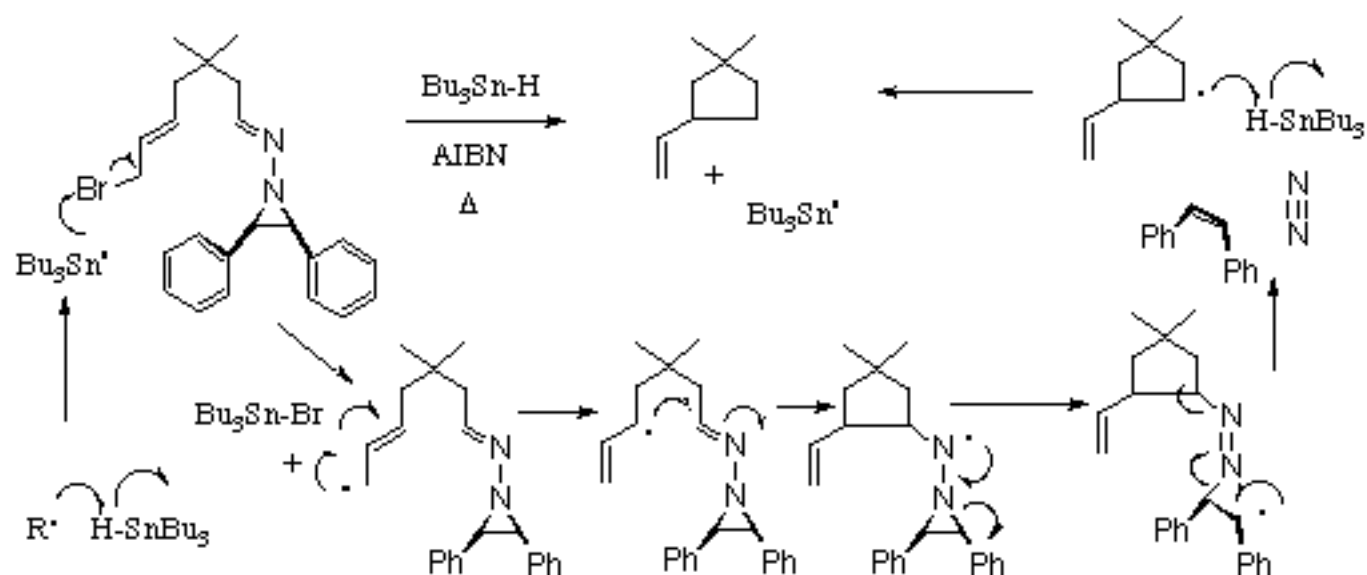
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.



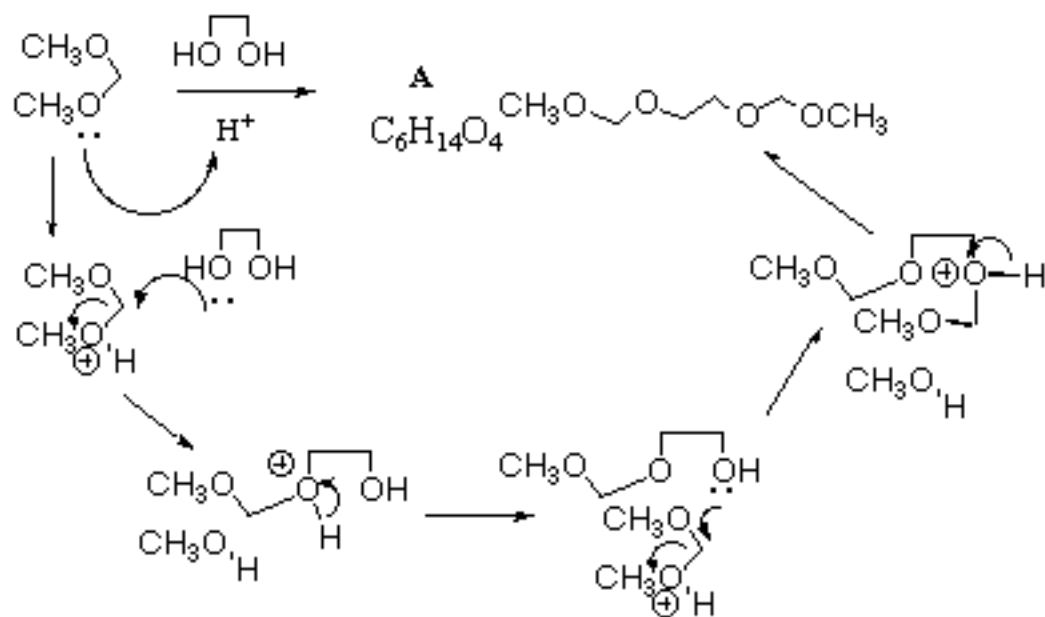
3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.



4. (30 points) Draw a detailed arrow-pushing mechanism for the following transformation.

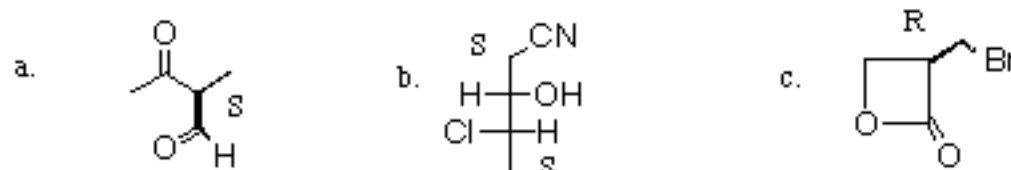


5. (30 points) Deduce the structure of **A**, and draw a detailed arrow-pushing mechanism for its formation.

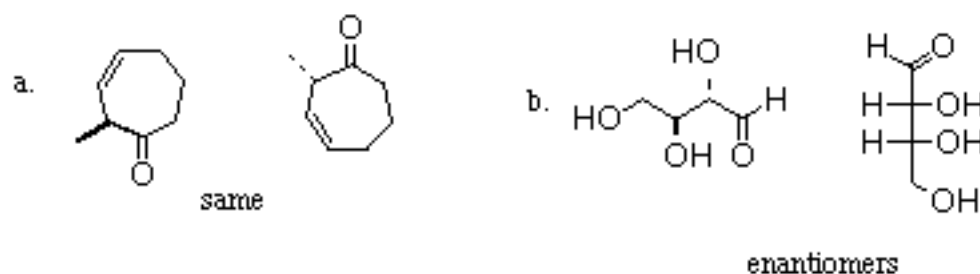


This is an open-book, open notes exam. Please show your work in detail.

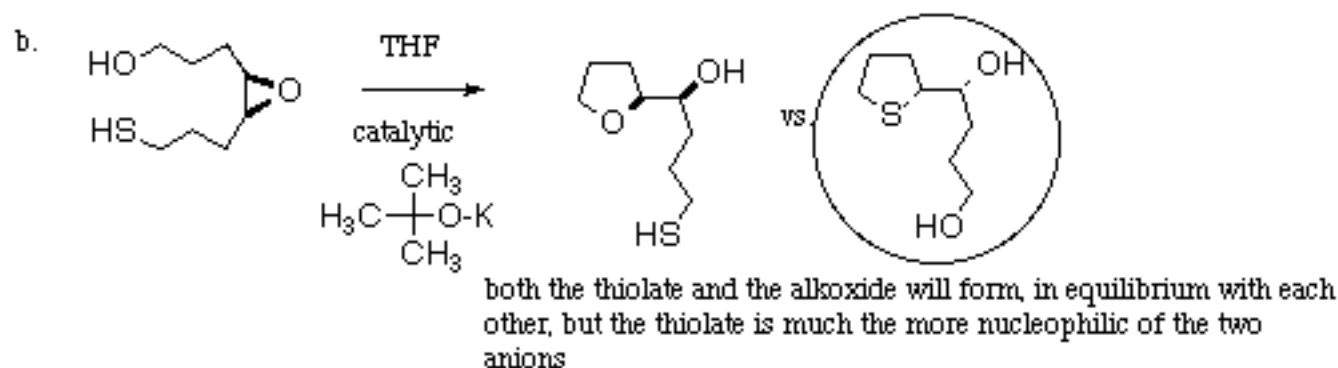
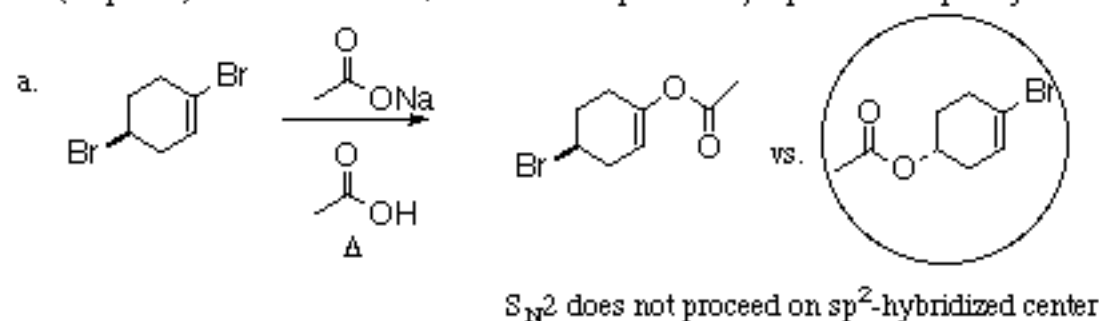
1. (12 points) Assign the absolute configuration (R vs. S) for each stereogenic center.



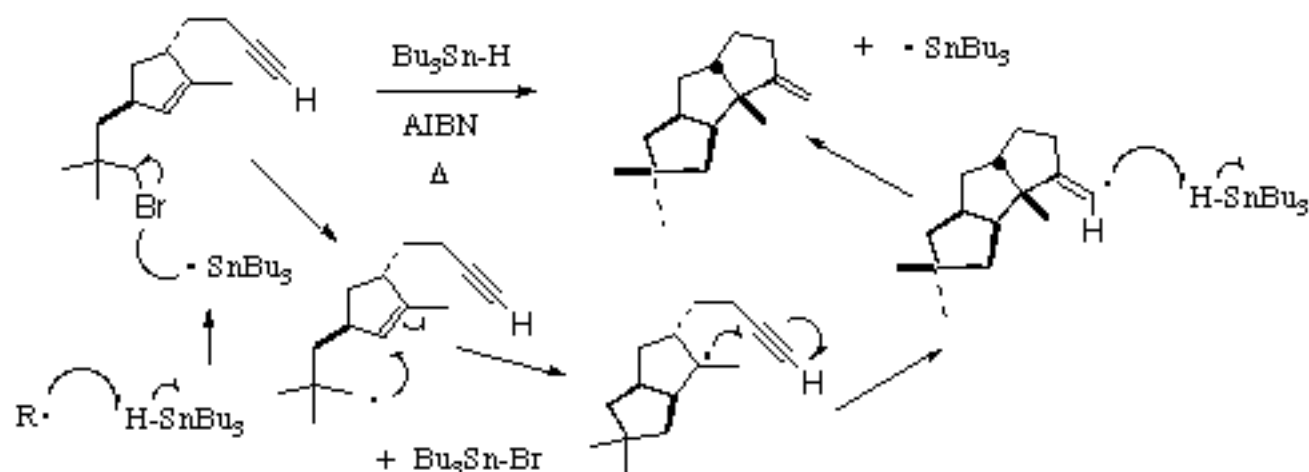
2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same. Identify any meso pairs.



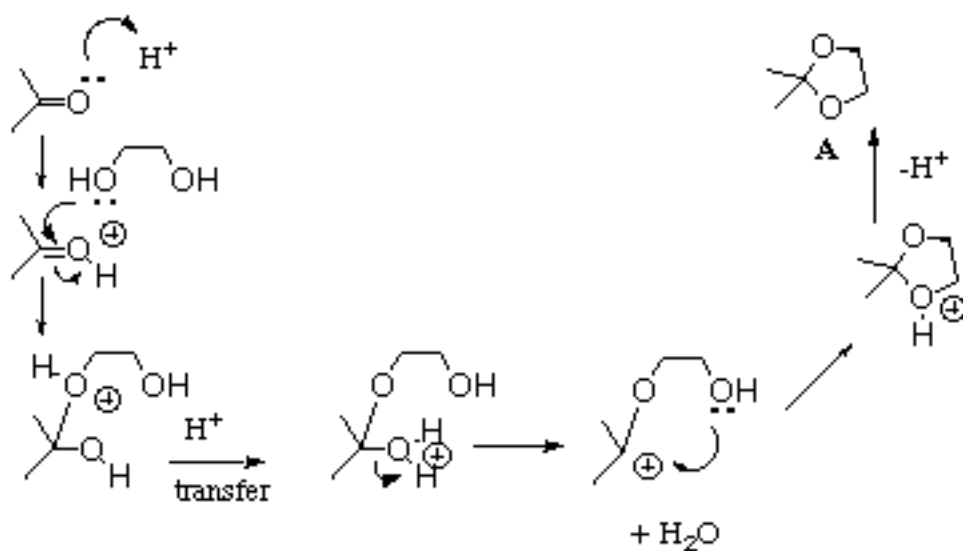
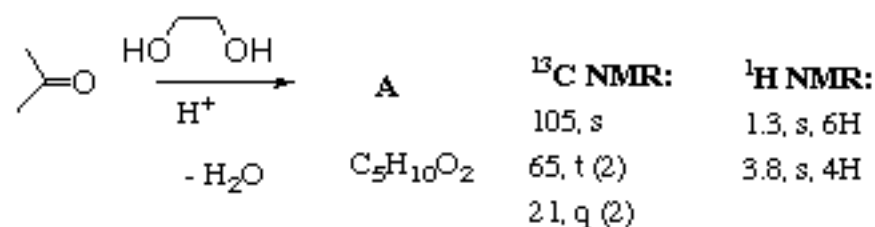
3. (20 points) For each reaction, indicate the expected major product. Explain your reasoning.



4. (20 points) Draw a detailed arrow-pushing mechanism for the following transformation.

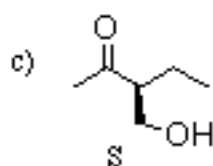
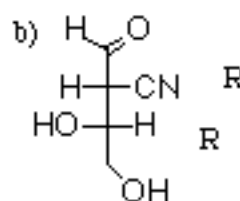
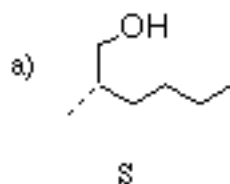


5. (40 points) Deduce the structure of **A**, and draw a detailed arrow-pushing mechanism for its formation.

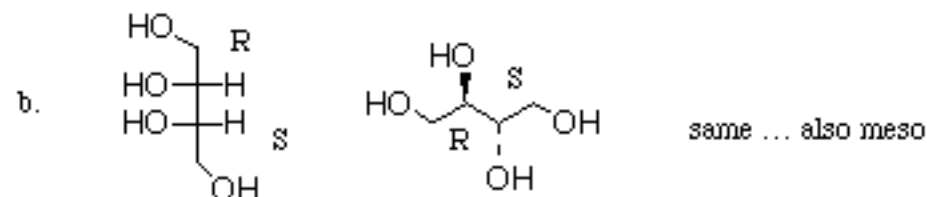
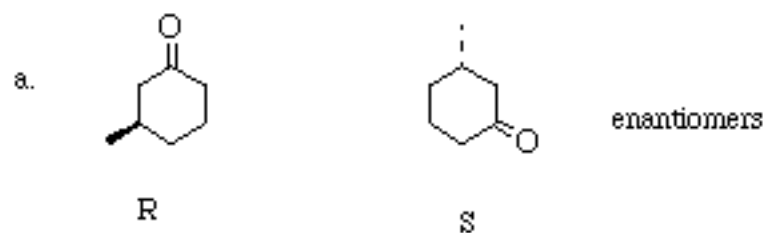


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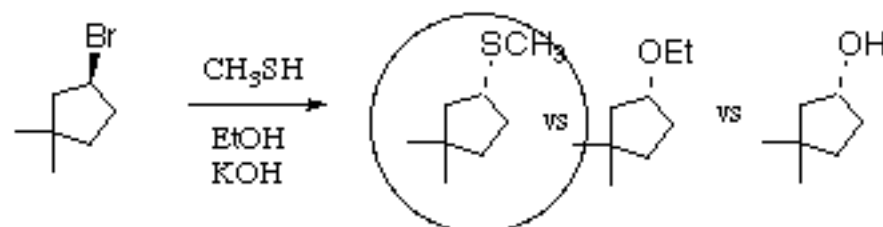
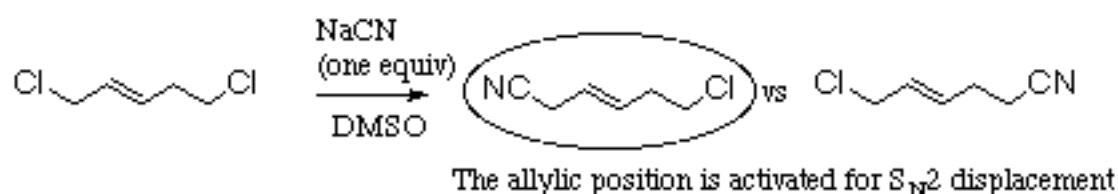
1. (8 points) Assign the absolute configuration (R vs. S) for each center.



2. (12 points) For each pair, indicate whether they are diastereomers, enantiomers or the same.

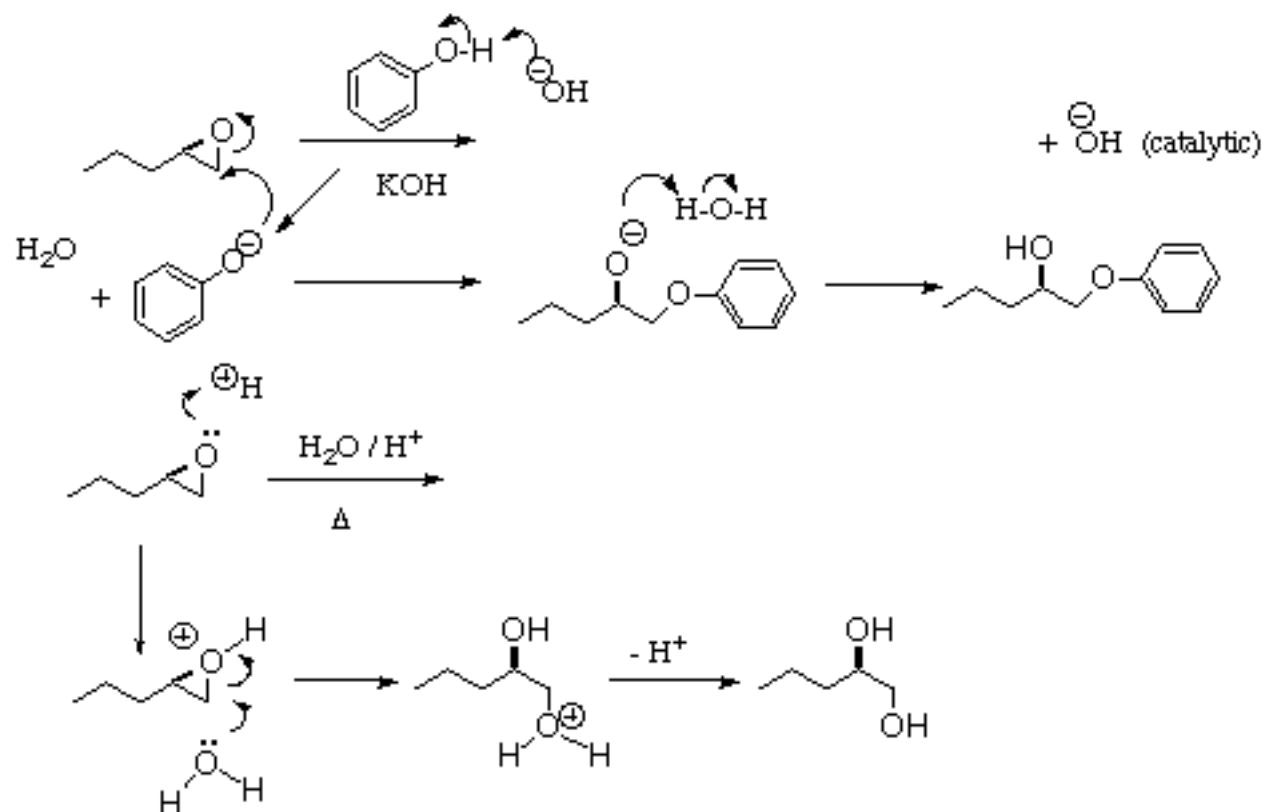


3. (20 points) For each, indicate the expected major product. Explain your reasoning.

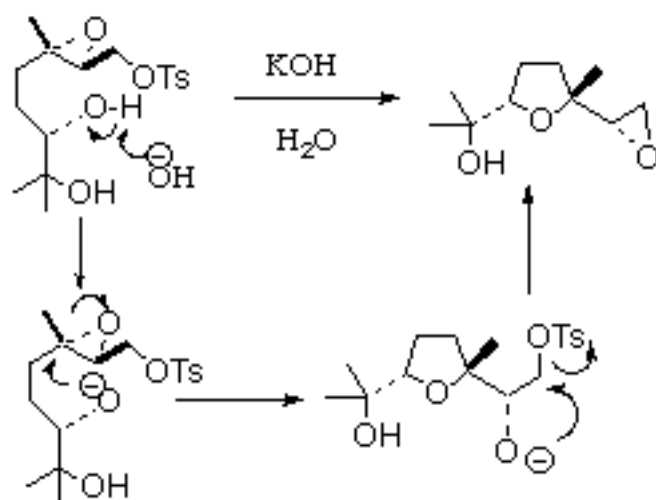


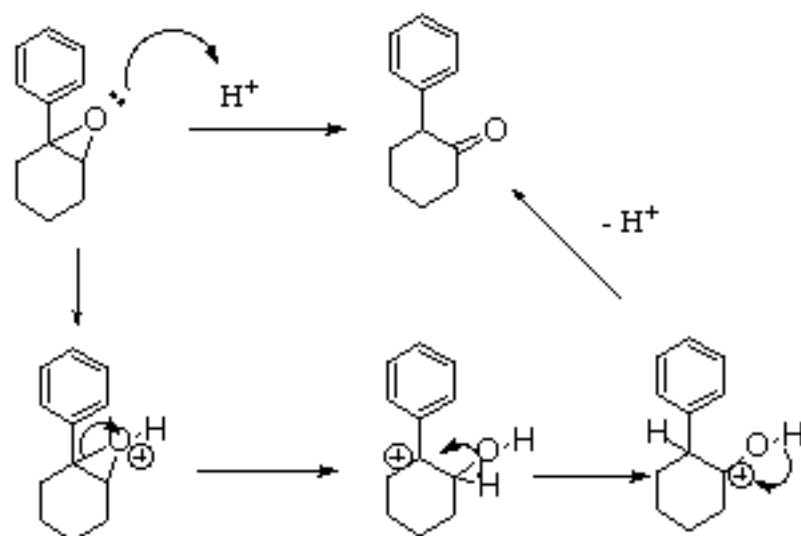
Of the three nucleophiles available, CH_3S^- , HO^- , and CH_3O^- , CH_3S^- is the most stable, so will be present in the highest concentration, and is also the most nucleophilic. The reaction will proceed with inversion of absolute configuration.

4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.



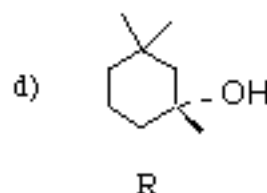
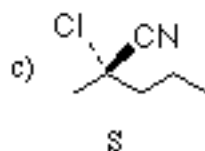
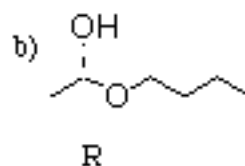
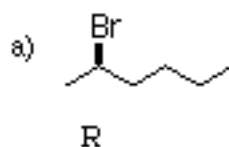
5. (20 points each) For each, draw a detailed arrow-pushing mechanism.



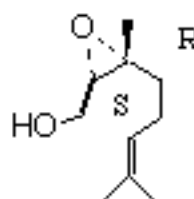
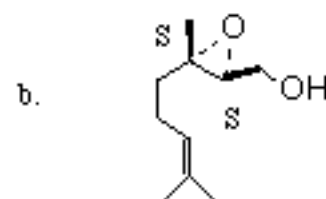
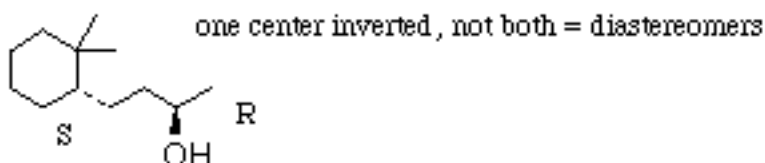
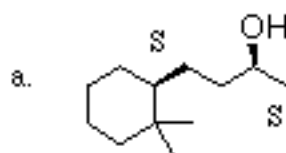


This is an open-book, open notes exam. Please show your work in detail.

1. (12 points) Assign the absolute configuration (R vs. S) for each.

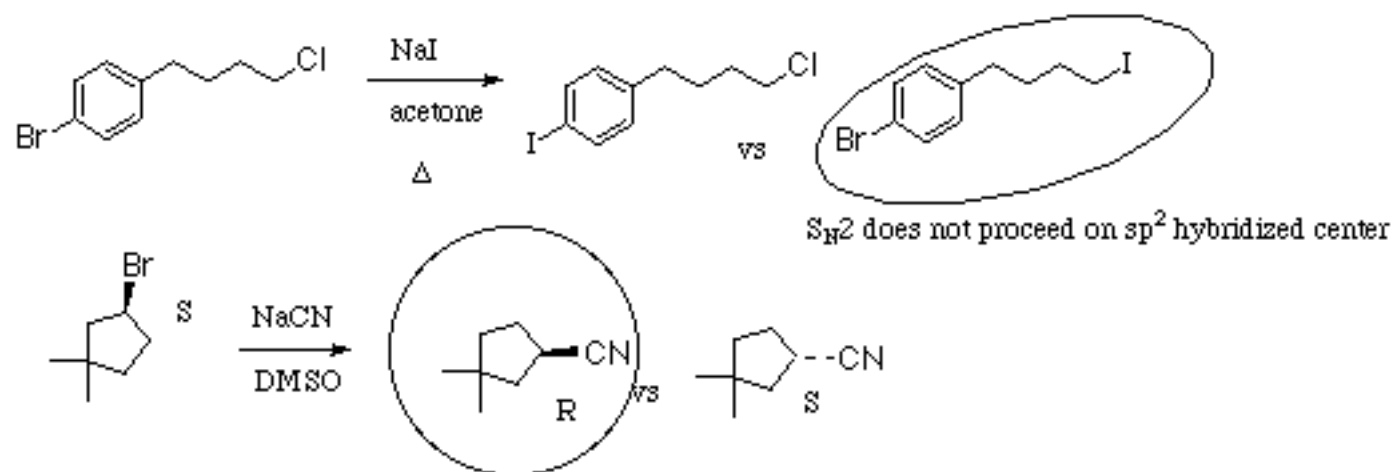


2. (8 points) For each pair, indicate if they are enantiomers, diastereomers, or the same.

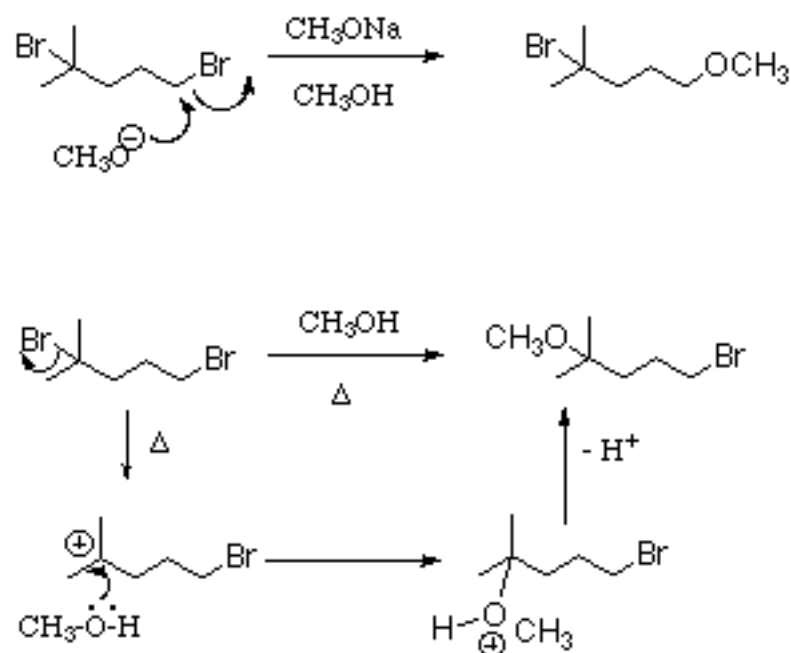


one center inverted, not both = diastereomers

3. (20 points) For each, indicate the expected major product. Explain your reasoning.



4. (20 points) Draw out a detailed arrow-pushing mechanism for each reaction, and draw the expected major product.



5. (20 points each) For each, draw a detailed arrow-pushing mechanism.

