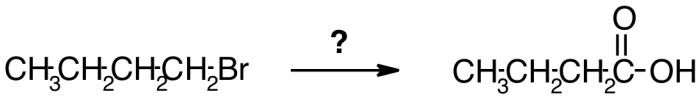
"Grade or Education" = 1

CHEM 2261/01
Summer 12
Exam 4
Chapters 10, 11, 12, 15

1. Which of the choices describes a **CORRECT** way to carry out the synthesis suggested in the figure below?



__ A. First react with OH^- and the oxidize with H_2CrO_4.

__ B. First eliminate HBr with t-BuO^-. Next generate terminal alcohol with BH_3/THF followed by $OH^-/H_2O_2/H_2O$. Finally oxidize with PCC (pyridinium chlorochromate).

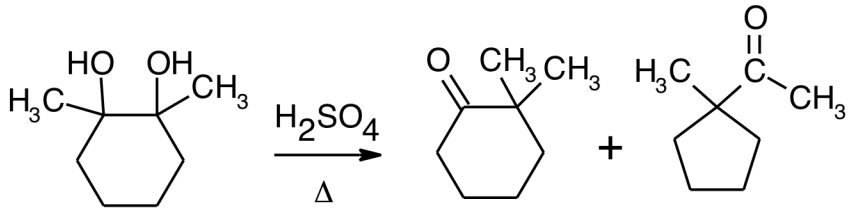
__ C. First eliminate HBr with t-BuO^-. Next generate alcohol with H_2SO4_2/H_2O. Finally oxidize with H_2CrO_4.

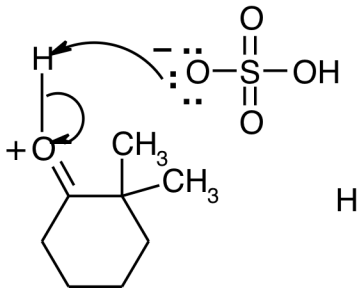
__ D. First react with OH^- and the oxidize with PCC (pyridinium chlorochromate).

__ E. First eliminate HBr with t-BuO^-. Next generate alcohol with H_2SO4_2/H_2O. Finally oxidize with PCC (pyridinium chlorochromate).

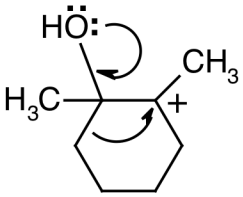
Rationale:
Chapter 10 Problem 45b

2. Work out the mechanism for the reaction shown in the figure below. Which of the numbered sets of electron movements shown below the reaction does **NOT** occur in this mechanism?





1



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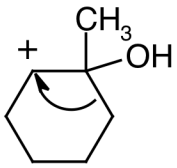

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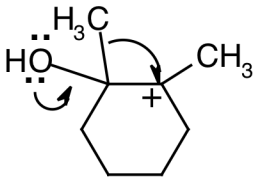

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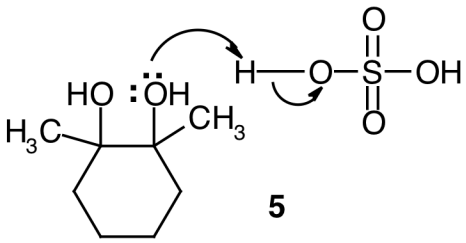

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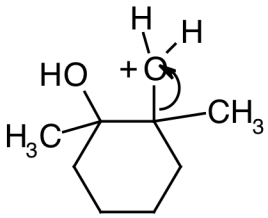

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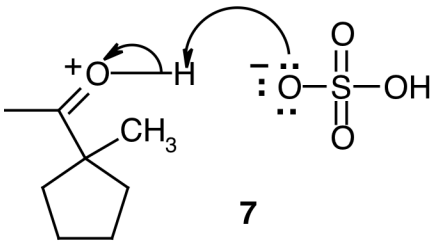


7

__ A. 4

__ B. 7

__ C. 1

__ D. 3

__ E. 2

Rationale:
Chapter 10 Problem 66a

3. Starting with (R)-1-deuterio-1-propanol how could you prepare (S)-1-deuterio-1-propanol?

__ A. First react with NaH followed by CH_3I to convert the alcohol to a methyl ether. Next react the methyl ether with NaOH to convert the methyl ether back to the alcohol with inversion of configuration.

__ B. First react with NaH followed by CH_3I to convert the alcohol to a methyl ether. Next cleave the methyl ether with HI to make an iodide. Finally react the iodide with OH^- to turn the iodide back into an alcohol with inversion of configuration via an S_N2 reaction.

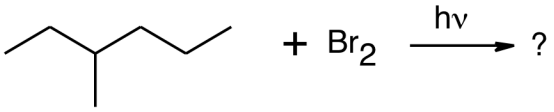
__ C. First react with H_2SO_4 to dehydrate the alcohol and generate an alkene. Next react with BH_3/THF followed by $H_2O_2/H_2O/OH^-$ to make a terminal alcohol.

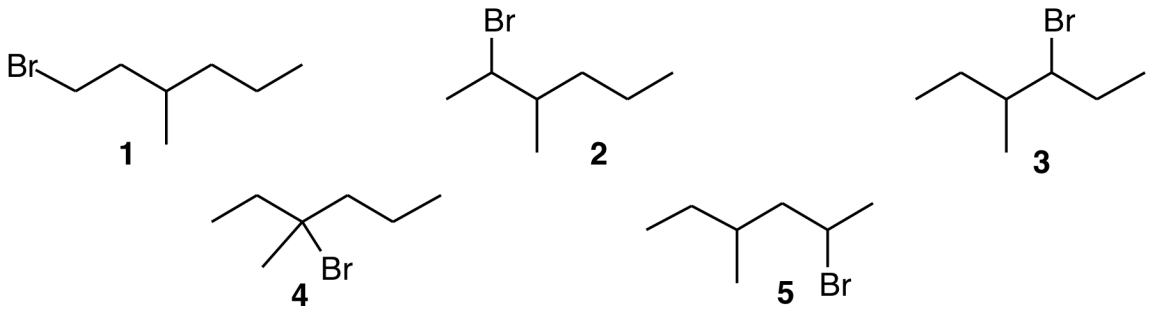
__ D. First react with a sulfonyl chloride (RSO_2Cl) in pryidine to make a sulfonate ester out of the alcohol, and then react with hydroxide (HO^-) to convert the ester back into an alcohol with inversion of configuration.

__ E. First oxidize the alcohol to an aldehyde with PCC (pyridinium chlorochromate). Next reduce the aldehyde back to the alcohol with inversion of configuration with H_2/Pd/C.

Rationale:
Chapter 10 Problem 36a

4. Find the major product of the reaction shown below. Ignore stereochemistry.





__ A. **3** is the major product of this reaction.

__ B. **1** is the major product of this reaction.

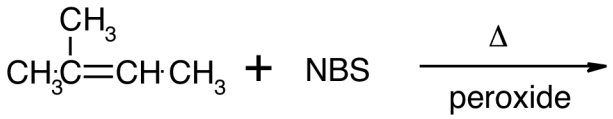
__ C. **5** is the major products of this reaction.

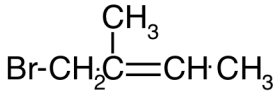
__ D. **4** is the major product of this reaction.

__ E. **2** is the major product of this reaction.

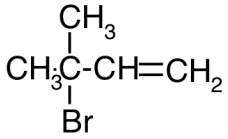
Rationale:
Chapter 12 Problem 22c

5. Find the correct **MAJOR** product(s) of the reaction below and choose the answer which suggests the **CORRECT** product(s).

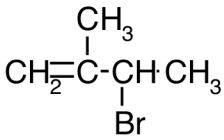




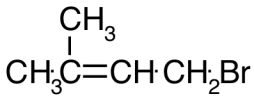
compound 1



compound 2



compound 3



compound 4

__ A. Only compound 3 is a product of this reaction.

__ B. Compounds 1, 2 and 3 are all products of this reaction.

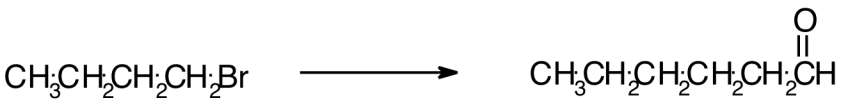
__ C. Compounds 2 and 4 are both products of this reaction.

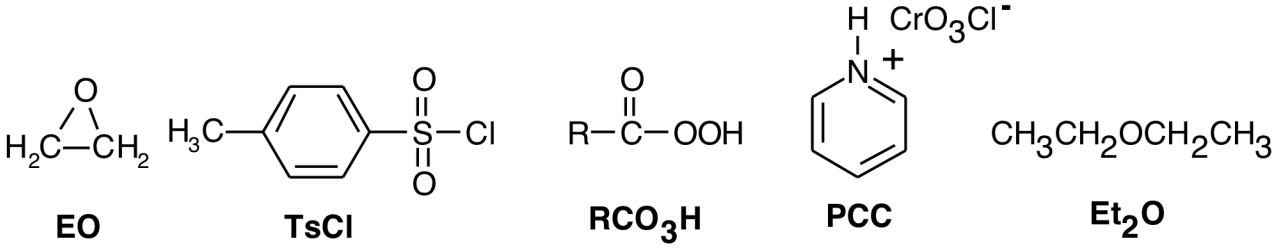
__ D. Only compound 4 is a product of this reaction.

__ E. Compounds 1 and 2 are both products of this reaction.

Rationale:
Chapter 12 Problem 22b

6. Pick the choice which **CORRECTLY** describes how the following synthesis could be carried out. Note the abbreviations used in the multiple choices for several reagents or solvents whose structures are shown below the synthesis.





__ A. First: $^{-}NH_2$; Next: Br_2/CH_2Cl_2; Next: $^{-}NH_2$(excess); Next: 1. $^{-}NH_2$, and 2. $HOCH_2CH_2Br$; Finally: H_2/Pd

__ B. First: HO^{-}/H_2O; Next: **TsCl**/pyridine; Next: CH_2=CHMgBr; Next: **RCO_3H**; Next: H^{+}/H_2O; Finally: **PCC**

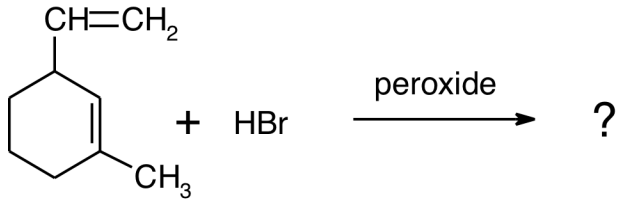
__ C. First: Mg/**Et_2O**; Next: 1. **EO**, and 2. H^{+}; Finally: **PCC**

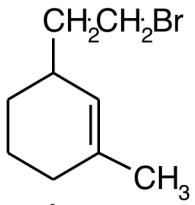
__ D. First: HO^{-}/H_2O; Next: **TsCl**/pyridine; Next: $HOCH_2CH_2MgBr$; Finally: **PCC**

__ E. First: HO^{-}/H_2O; Next: **TsCl**/pyridine; Next: CH_2=CHMgBr; Next: **RCO_3H**; Next: HO^{-}/H_2O; Finally: **PCC**;

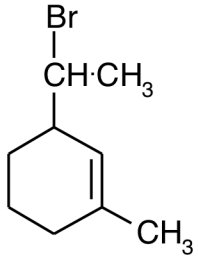
Rationale:
Chapter 11 Problem 29a

7. Choose structure of the **MAJOR** product of the reaction shown below.





1



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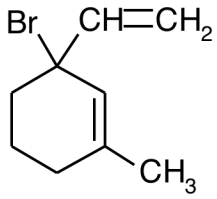

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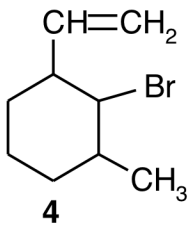

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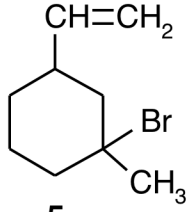
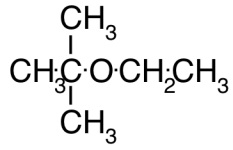


5

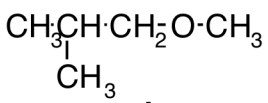
__ A. **2**
__ B. **4**
__ C. **5**
__ D. **3**
__ E. **1**

Rationale:
Chapter 12 Problem 32f

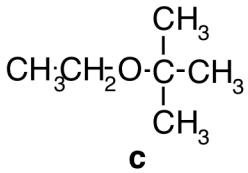
8. Which of the reactions specified in the multiple choices gives the **CORRECT** product? Use the labelled structures below for reference.



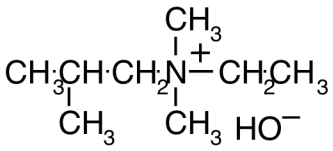
a



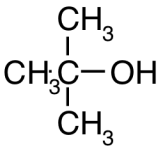
b



c



i



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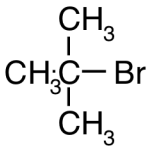

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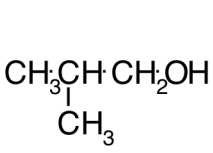

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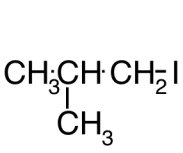

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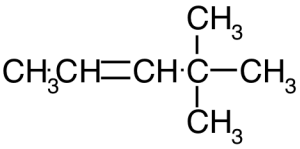

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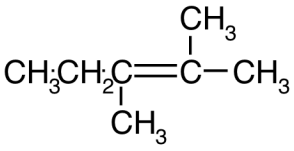
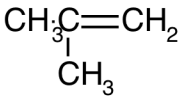
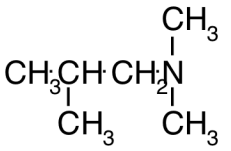


6



7



8

__ A. **c** + $H_2SO_4/\Delta \rightarrow$ **6**

__ B. **b** + $HI/\Delta \rightarrow$ **4** + CH_3OH

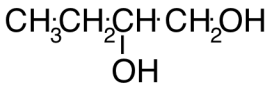
__ C. None of the reactions in the other choices gives the correct product.

__ D. **i**$/\Delta \rightarrow (CH_3)_2NCH_2CH_3$ + **7**

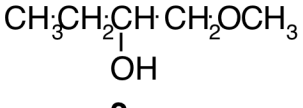
__ E. **a** + $HBr/\Delta \rightarrow$ **1** + CH_3CH_2Br

Rationale:
Chapter 10 Problem 38(a,b,c,i)

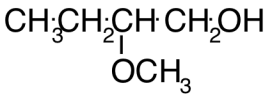
9. Which of the choices gives the **CORRECT** structure of the major product of the reaction of 2-ethyloxirane with the reagents specified? Use the numbered product structures below for reference.



1



2



3

__ A. 0.10 M NaOH gives product **3**.

__ B. CH_3OH/CH_3O^- gives product **2**.

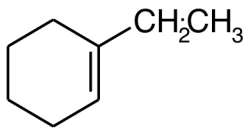
__ C. CH_3OH/HCl gives product **2**.

__ D. CH_3OH/HCl gives product **1**.

__ E. 0.10 M HCl gives $HOCH_2CH_2OH$.

Rationale:
Chapter 10 Problem 54

10. How could the following compound be prepared using cyclohexene as a starting material?



__ A. First react the cyclohexene with a peracid (RCO_3H). Next react with CH_3CH_2MgBr followed by aqueous HCl. Finally dehydrate with H_2SO_4.

__ B. First react the cyclohexene with BH_3/THF followed by $HO^-/H_2O_2/H_2O$. Next form a sulfonate ester with RSO_2Cl. Finally substitute the ethyl group for the sulfonate ester by reacting with CH_3CH_2MgBr.

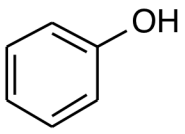
__ C. First react the cyclohexene with Br_2/CH_2Cl_2. Next react with $Mg/(CH_3CH_2)_2O$. Finally react with $CH_2=CH_2$ and $Pd(OAc)_2$.

__ D. React the cyclohexene with CH_3CH_2Br in the presence of a $Pd(OAc)_2$ catalyst to carry out thye synthesis in one step via a Heck reaction.

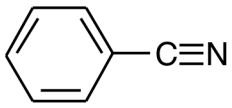
__ E. First react the cyclohexene with Br_2/H_2O. Next form a Grignard reagent with $Mg/(CH_3CH_2)_2O$. Next add the ethyl group by reacting the Grignard reagent with CH_3CH_2Br. Finally dehydrate with H_2SO_4 to regenerate the alkene.

Rationale:
Chapter 10 Problem 2a

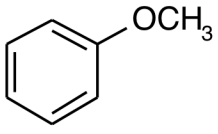
11. Figure out the names of the five compounds whose structures are shown below. Choose the one which is **CORRECTLY** named in the multiple choices.



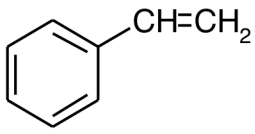
a



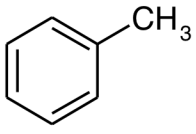
c



e



f



g

__ A. Compound **f** is toluene.

__ B. Compound **c** is phenylnitrile.

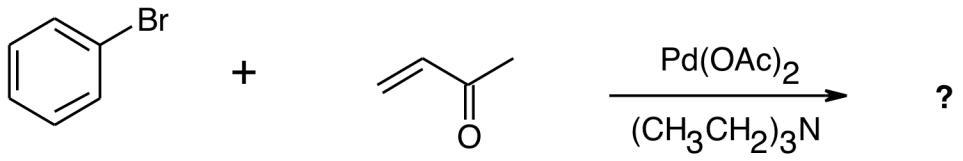
__ C. Compound **e** is styrene.

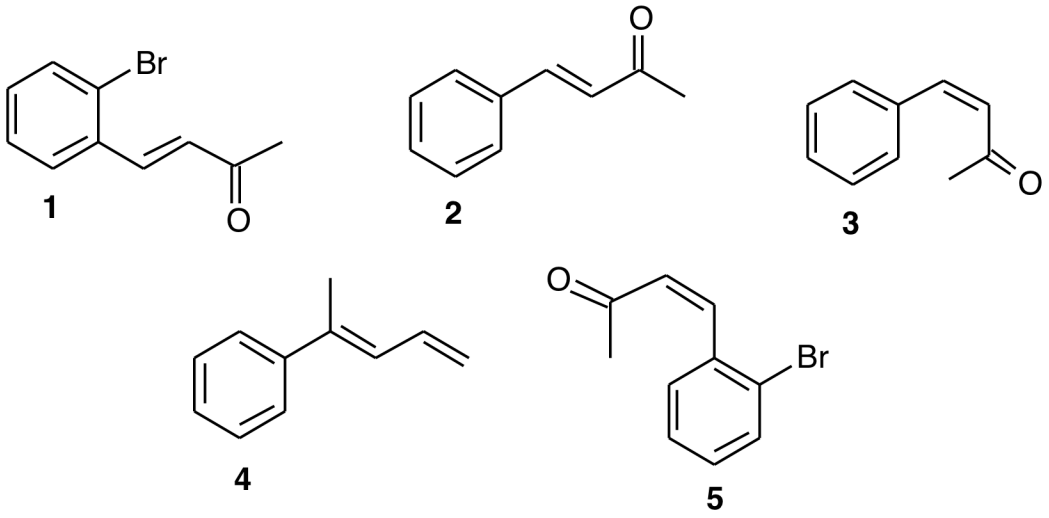
__ D. Compound **a** is phenol.

__ E. Compound **g** is anisole.

Rationale:
Chapter 15 Problem 35(a,c,e,f,g)

12. Choose the **CORRECT** structure of the **MAJOR** product of the reaction shown below. shown below.





__ A. **2**

__ B. **1**

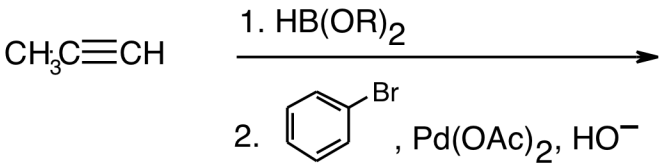
__ C. **3**

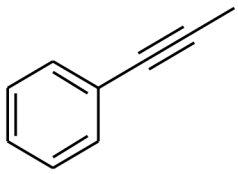
__ D. **4**

__ E. **5**

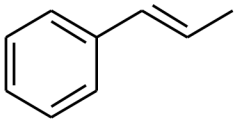
Rationale:
Chapter 11 Problem 28c

13. Choose the **CORRECT** structure of the **MAJOR** product of the reaction shown below.

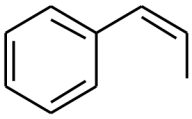




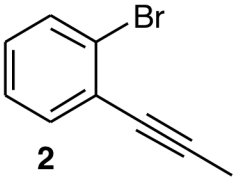
1



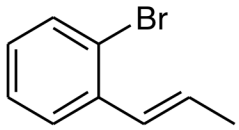
3



5



2



4

__ A. **4** is the major product of this reaction.

__ B. **1** is the major product of this reaction.

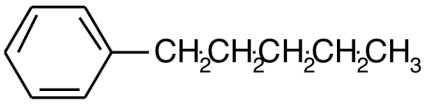
__ C. **2** is the major product of this reaction.

__ D. **5** is the major product of this reaction.

__ E. **3** is the major product of this reaction.

Rationale:
Chapter 11 Problem 22f

14. Pick the choice which describes how the compound with the structure shown below could be synthesized from benzene.



__ A. React benzene with $CH_3CH_2CH_2CH_2CH_2Cl$ and $AlCl_3$.

__ B. First react benzene with $CH_3CH_2CH_2CH_2C(=O)Cl$ and $AlCl_3$. Next react with NH_2NH_2/HO^-.

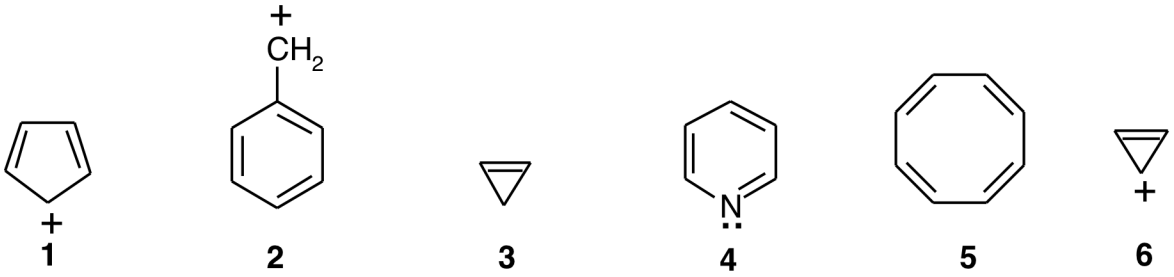
__ C. First react benzene with $Br_2/FeBr_3$. Next react with $(CH_3CH_2CH_2CH_2CH_2)_2CuBr$.

__ D. First react benzene with $Br_2/FeBr_3$. Next react with $CH_3CH_2CH_2CH_2CH_2Br$ and $Pd(OAc)_2/HO^-$.

__ E. React benzene with $CH_3CH_2CH_2CH_2CH_2B(OR)_2$ and $Pd(OAc)_2/HO^-$.

Rationale:
Chapter 15 Problem 28b

15. Classify each of the five numbered structures below as aromatic, nonaromatic, or antiaromatic. (Hint: If possible a ring will be nonplanar to avoid being antiaromatic.) Choose the **CORRECT** statement.



1 **2** **3** **4** **5** **6**

__ A. **1**, **3**, and **5** are aromatic.

__ B. **3** and **5** are antiaromatic.

__ C. **2**, **4**, and **6** are aromatic.

__ D. **1** is nonaromatic.

__ E. **5** is antiaromatic.

Rationale:
Chapter 15 Problem 36

Answer Key

"Grade or Education" = 1

CHEM 2261/01
Summer 12
Exam 4
Chapters 10, 11, 12, 15

1. A
2. D
3. D
4. D
5. C
6. C
7. B
8. C
9. B
10. A
11. D
12. A
13. E
14. B
15. C