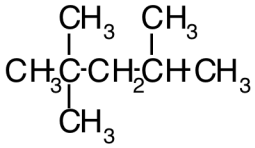
"Grade or Education" = 1

CHEM 2261/01
Summer 10
Exam 4
Chapters 10, 11, 14

1. How many alkyl halides can be obtained from the monochlorination of the alkane shown below? Neglect stereoisomers.



__ A. 3

__ B. 5

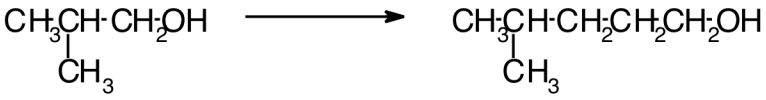
__ C. 2

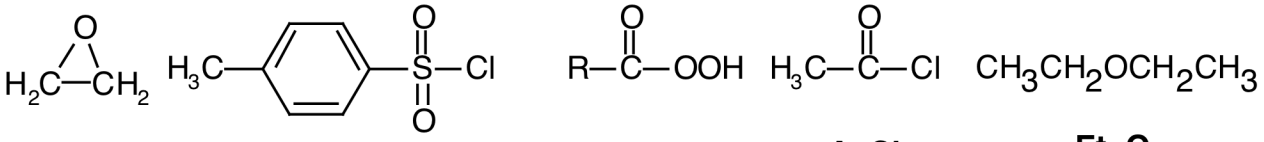
__ D. 1

__ E. 4

Rationale:
similar to Chapter 12 Problem 4i

2. 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.





EO **TsCl** **RCO_3H** **AcCl** **Et_2O**

__ A. First: **TsCl** /pyridine; Next: **EO** ; Finally: HO^-/H_2O

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

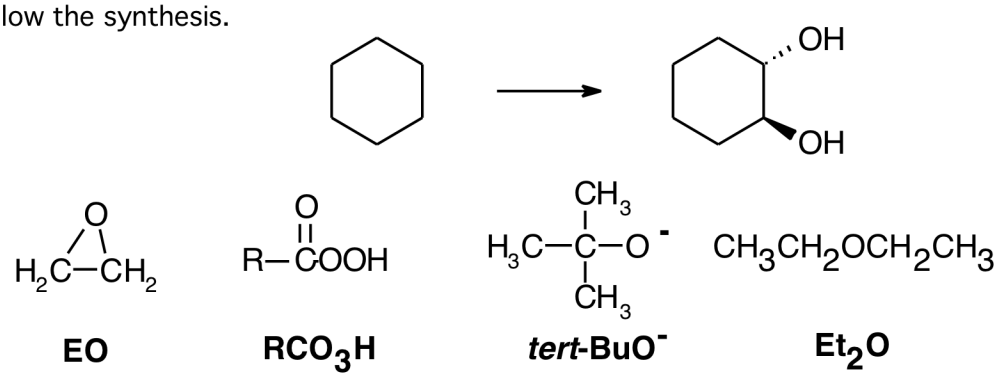
__ C. First: HBr/Δ; Next: Mg/**Et_2O** ; Finally: 1. **EO** , and 2. H^+

__ D. First: HBr; Next: Mg/**Et_2O** ; Next: **AcCl** ; Finally: H_2/Pd

__ E. First: **TsCl** /pyridine; Next: $HOCH_2CH_2MgBr$

Rationale:
Chapter 11 Problem 25b

3. 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: $Br_2/h\nu$; Next: **tert-BuO$^-$**; Next: Br_2/CH_2Cl_2; Next $NaNH_2$ (excess); Finally: H^+/H_2O

__ B. First: $Br_2/h\nu$; Next: **tert-BuO$^-$**; Next: **RCO_3H**; Finally: HO^-

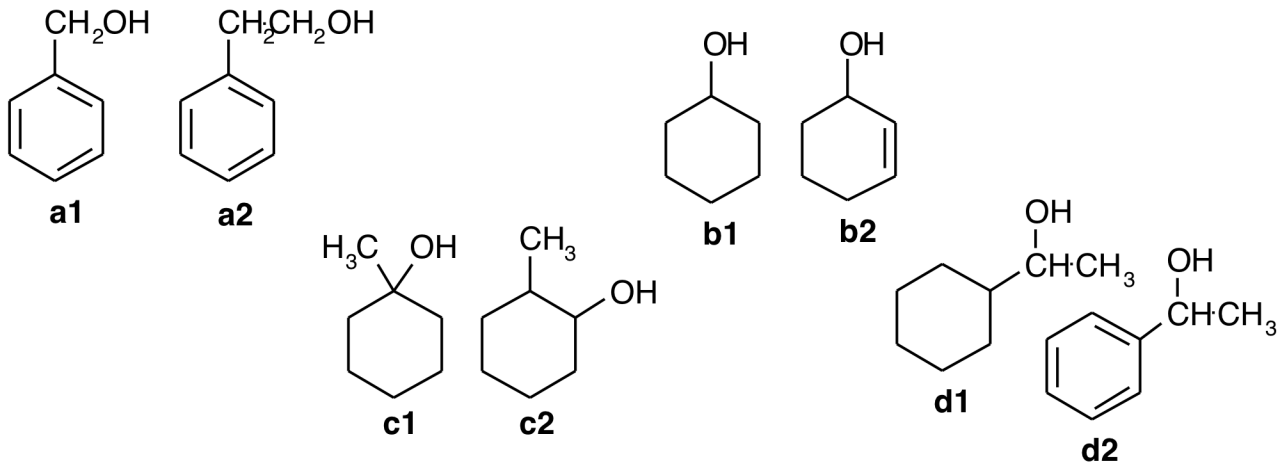
__ C. First: $Br_2/h\nu$; Next: Mg/**Et_2O**; Next: **EO**; Finally: H^+/H_2O

__ D. First: $Br_2/h\nu$; Next: HO^-; Next: H_2CrO_4; Next: **RCO_3H**; Finally: HO^-

__ E. First: $Br_2/h\nu$; Next: **tert-BuO$^-$**; Next: **EO**; Finally: HO^-

Rationale:
Chapter 12 Problem 19d

4. Figure out which alcohol in each of the pairs shown below will undergo dehydration more rapidly when heated with H_2SO_4. Pairs of alcohols share the same letter, ie, **a1** and **a2**. Choose the **CORRECT** statement from the multiple choices.



__ A. **a1** will undergo dehydration more rapidly than **a2** when heated with H_2SO_4.

__ B. **c2** will undergo dehydration more rapidly than **c1** when heated with H_2SO_4.

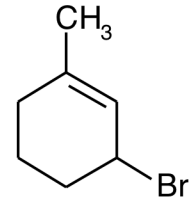
__ C. None of the other choices is correct..

__ D. **d2** will undergo dehydration more rapidly than **d1** when heated with H_2SO_4.

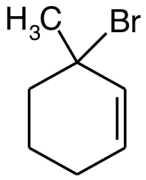
__ E. **b1** will undergo dehydration more rapidly than **b2** when heated with H_2SO_4.

Rationale:
similar to Chapter 10 Problem 34(a-d)

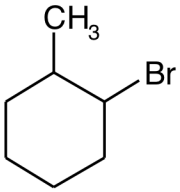
5. Find the major products of the reaction of 1-methylcyclohexene with the reagents specified in the multiple choices. Choose the response which **CORRECTLY** matches one or more structures below with a particular reaction. Ignore stereochemistry.



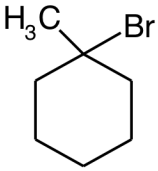
Product 1



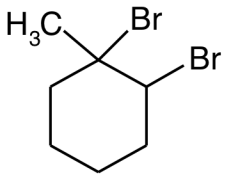
Product 2



Product 3



Product 4



Product 5

__ A. Products 1 and 2 are major products of the reaction of 1-methylcyclohexene with Br_2/CH_2Cl_2.

__ B. Product 4 is the major product of the reaction of 1-methylcyclohexene with NBS/Δ/peroxide.

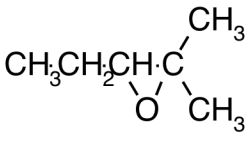
__ C. Products 3 and 4 are major products of the reaction of 1-methylcyclohexene with Br_2/CH_2Cl_2.

__ D. Product 3 is the major product of the reaction of 1-methylcyclohexene with HBr/peroxide.

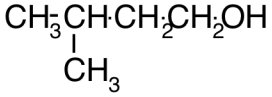
__ E. Product 3 is the major product of the reaction of 1-methylcyclohexene with HBr.

Rationale:
Chapter 11 Problem 18

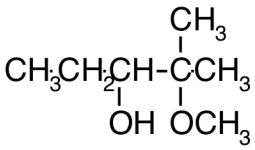
6. By looking at the numbered structures below figure out which of the multiple choices specifies the **CORRECT** product of a reaction.



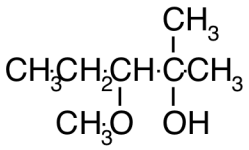
1



2



3



4

__ A. **1** + $CH_3O^-/CH_3OH \rightarrow$ **2**

__ B. **1** + $H^+/CH_3OH \rightarrow$ **2**

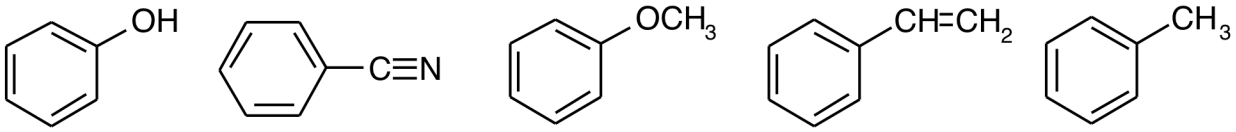
__ C. **1** + $H^+/CH_3OH \rightarrow$ **4**

__ D. **1** + $CH_3O^-/CH_3OH \rightarrow$ **4**

__ E. **1** + $CH_3O^-/CH_3OH \rightarrow$ **3**

Rationale:
Chapter 10 Problem 33(d,e)

7. 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 **g** is anisole.

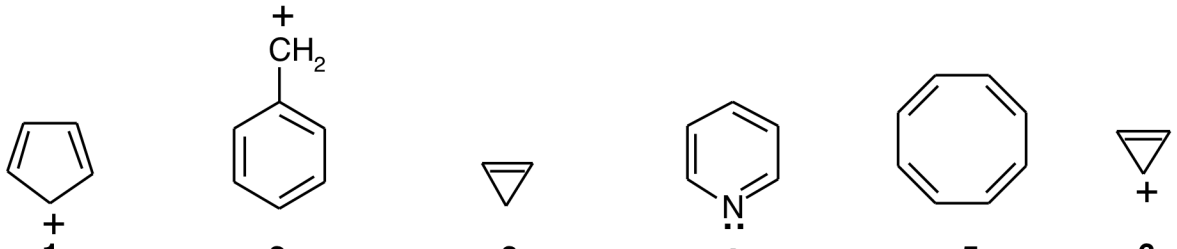
__ C. Compound **a** is phenol.

__ D. Compound **e** is styrene.

__ E. Compound **c** is phenylnitrile.

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

8. 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. **3** and **5** are antiaromatic.

__ B. **5** is antiaromatic.

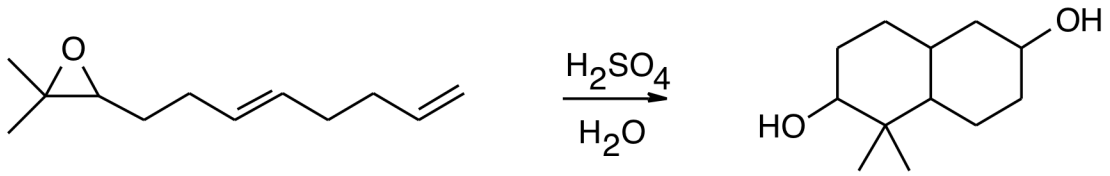
__ C. **1** , **3** , and **5** are aromatic.

__ D. **1** is nonaromatic.

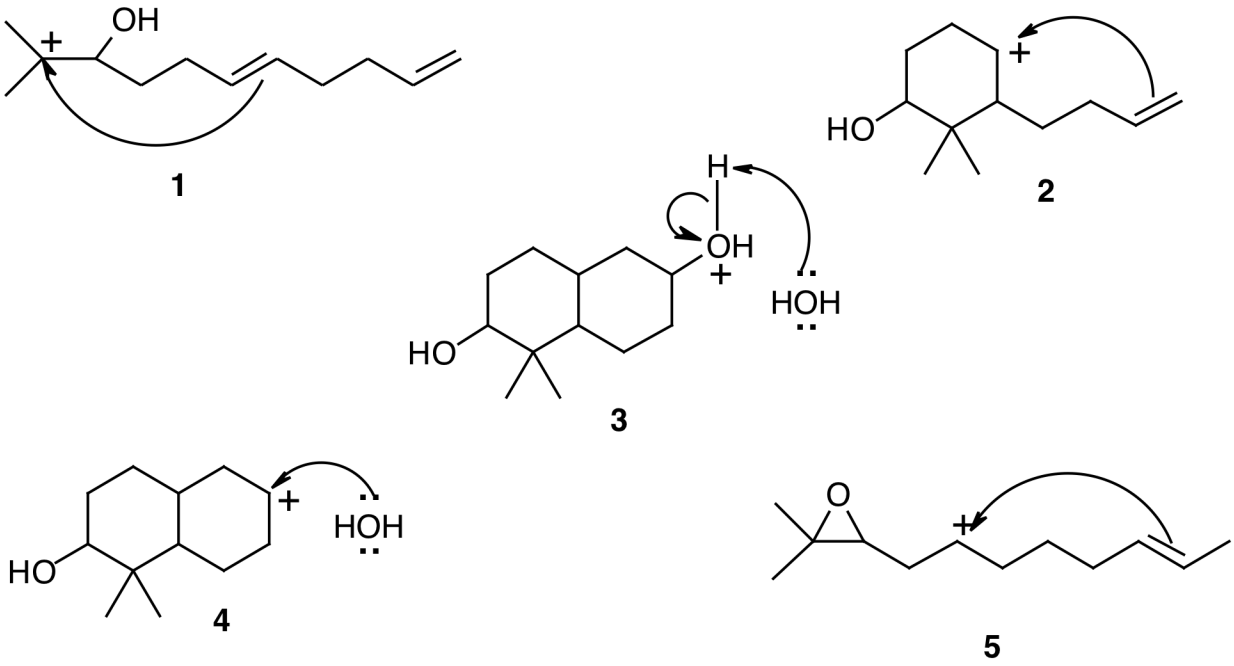
__ E. **2** , **4** , and **6** are aromatic.

Rationale:
similar to Chapter 15 Problem 36

9. Work out the curved-arrow mechanism for the rearrangement reaction shown below.



Which of the numbered curved-arrow mechanistic processes shown below is **NOT** part of your mechanism?



__ A. **4**

__ B. **1**

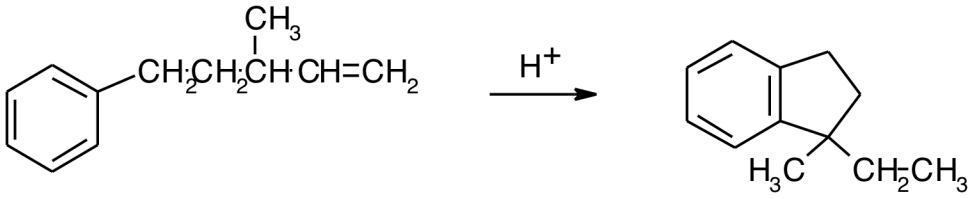
__ C. **5**

__ D. **2**

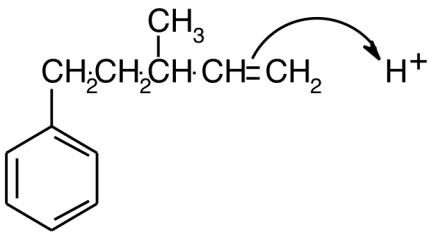
__ E. **3**

Rationale:
Chapter 10 Problem 59a

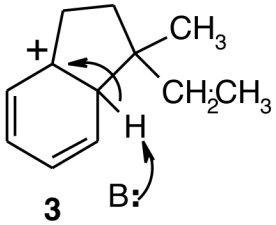
10. Work out the curved-arrow mechanism for the rearrangement reaction shown below.



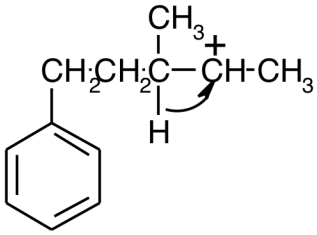
Which of the numbered curved-arrow mechanistic processes shown below is **NOT** part of your mechanism?



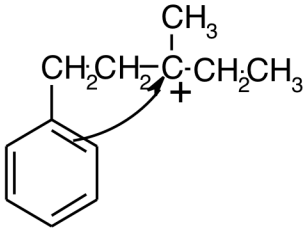
1



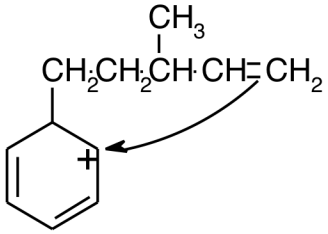
3



2



4



5

__ A. **2**

__ B. **1**

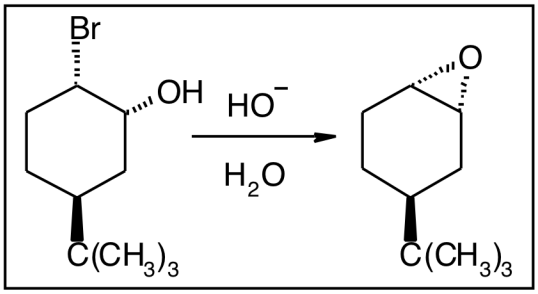
__ C. **4**

__ D. **3**

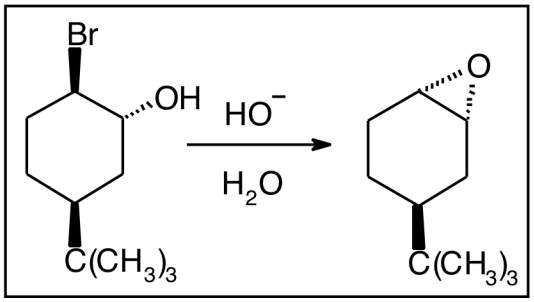
__ E. **5**

Rationale:
similar to Chapter 15 Problem 47a

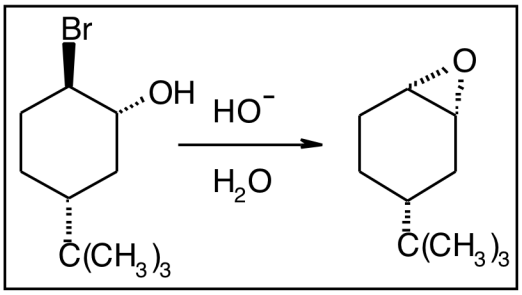
11. Which of the choices lists the reactions shown below in order of **DECREASING** speed (ie. fastest reaction > intermediate speed reaction > slowest reaction)?



Reaction A



Reaction B



Reaction C

__ A. **Reaction B > Reaction C > Reaction A**

__ B. **Reaction C > Reaction B > Reaction A**

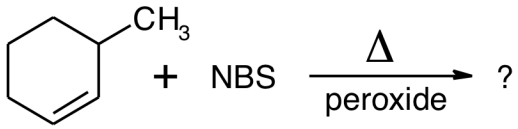
__ C. **Reaction A > Reaction B > Reaction C**

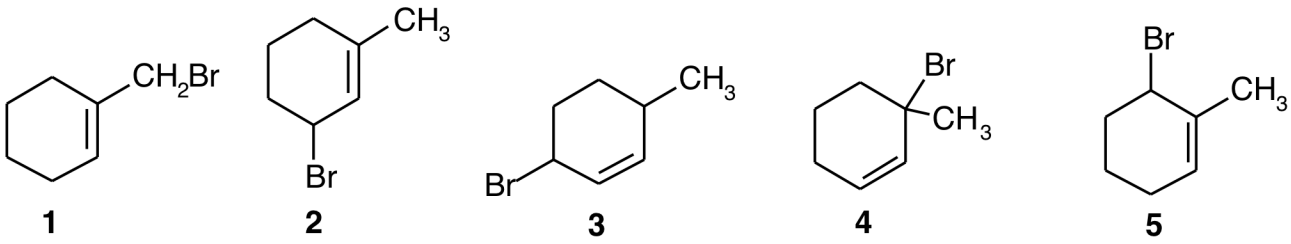
__ D. **Reaction A > Reaction C > Reaction B**

__ E. **Reaction B > Reaction A > Reaction C**

Rationale:
Chapter 10 Problem 60

12. Find the major product(s) of the reaction shown below. Ignore stereochemistry.





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

__ A. **2** and **4** are the major products of this reaction.

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

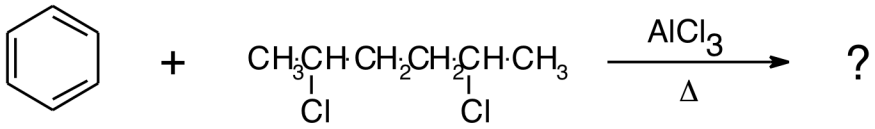
__ C. **3** and **4** are the major products of this reaction.

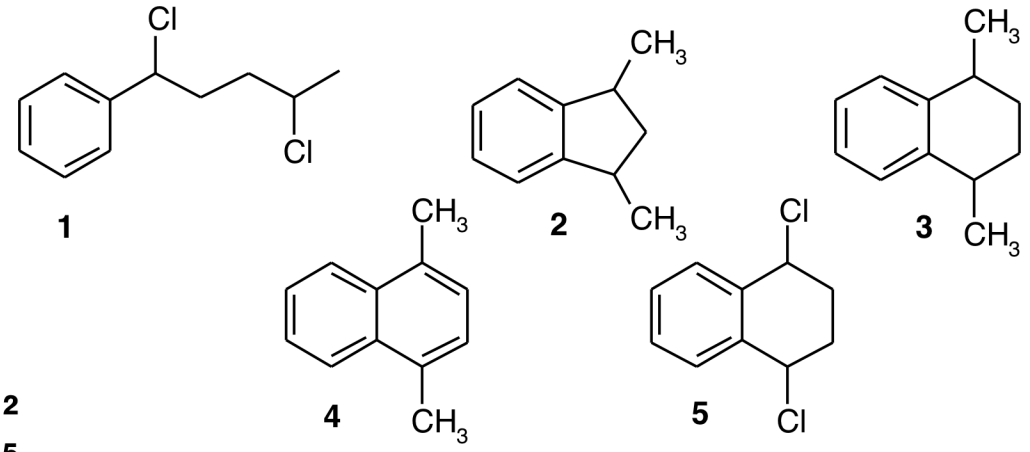
__ D. **1** , **2** , and **5** are the major products of this reaction.

__ E. **1** , **3** , and **5** are the major products of this reaction.

Rationale:
Chapter 12 Problem 26c

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





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

__ A. **2**

__ B. **5**

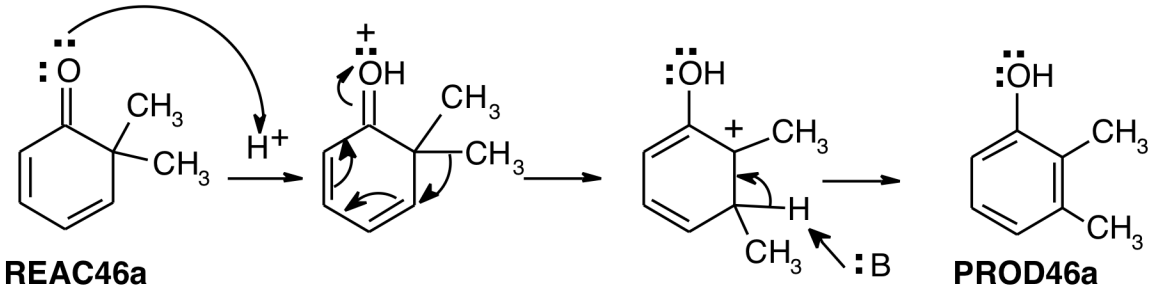
__ C. **4**

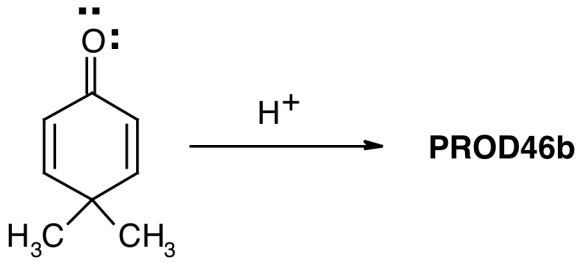
__ D. **1**

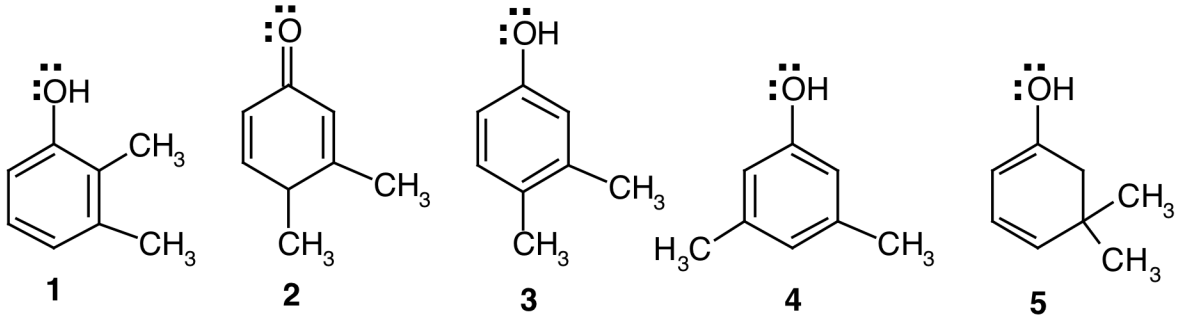
__ E. **3**

Rationale:
moved to Chapter 16

14. Examine the reaction mechanism shown below for the conversion of **REAC46a** into **PROD46a**. Based on this mechanism what is the **CORRECT** structure of **PROD46b**?







__ A. **4**

__ B. **1**

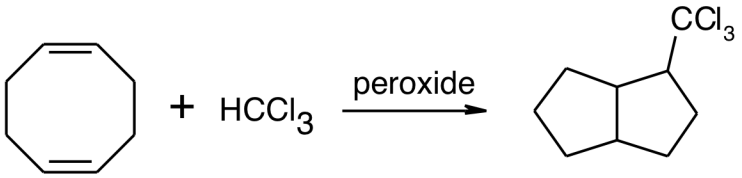
__ C. **2**

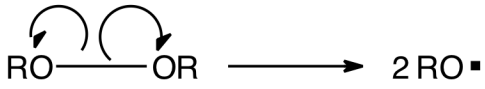
__ D. **3**

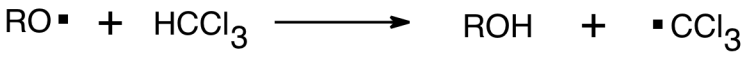
__ E. **5**

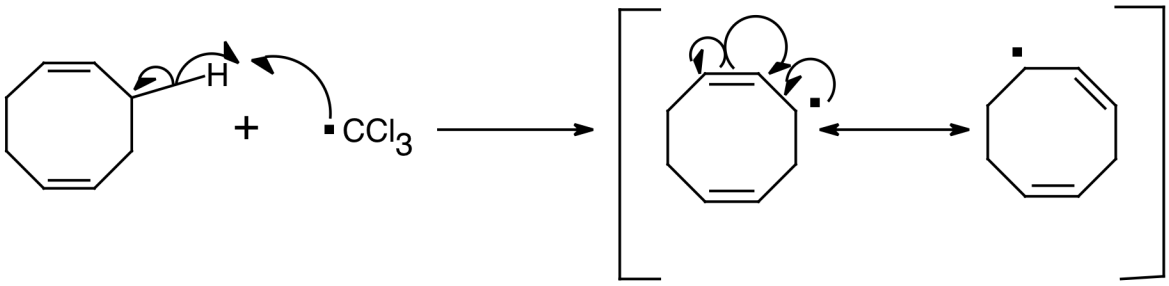
Rationale:
Chapter 15 Problem 51b

15. Part of the mechanism is shown for the reaction in the figure below. Which of the choices **BEST** describes what happens in the very next step of the mechanism (not shown)?









__ A. The 8-membered ring radical abstracts a hydrogen atom from an ROH molecule.

__ B. The lone electron (radical) in the position represented by the rightmost resonance structure attacks the more remote double bond on the exact opposite side of the 8-membered ring forming a structure with two connected 5-membered rings.

__ C. The radical on the 8-membered ring attacks a peroxide molecule attaching an OR group to the ring.

__ D. A 1,2 shift of a hydrogen atom occurs, moving the free radical electron one position further counterclockwise along the 8-membered ring.

__ E. The 8-membered ring radical abstracts a hydrogen atom from an $HCCl_3$ molecule.

Rationale:
Chapter 12 Problem 41

Answer Key

"Grade or Education" = 1

CHEM 2261/01
Summer 10
Exam 4
Chapters 10, 11, 14

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