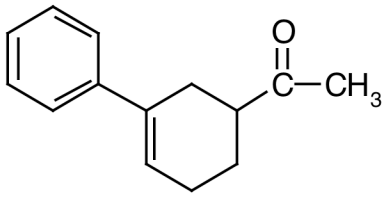
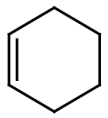
"Grade or Education" = 1

CHEM 2261/01
Summer 08
Final Exam
Chapters 1-11, 14

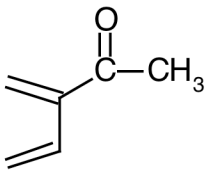
1. What two compounds could be used to produce the compound whose structure is shown below from a Diels-Alder reaction?



Pick the structures of the two compounds which can be used in this Diels-Alder reaction from the numbered choices below.



1



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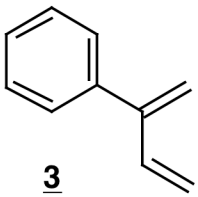

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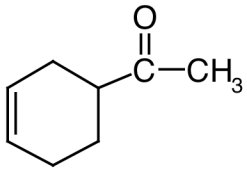

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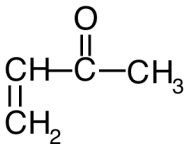


5

__ A. Compounds 3 and 4 can be used in this reaction.

__ B. Compounds 1 and 2 can be used in this reaction.

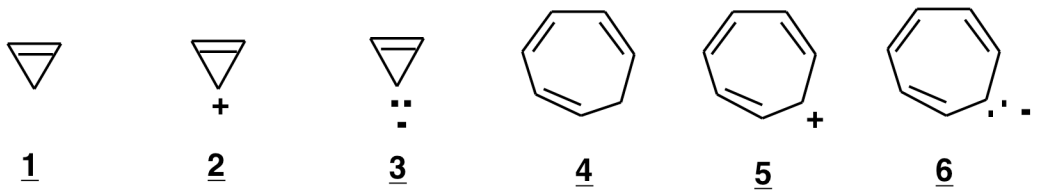
__ C. Compounds 5 and 2 can be used in this reaction.

__ D. Compounds 3 and 5 can be used in this reaction.

__ E. Compounds 4 and 2 can be used in this reaction.

Rationale:
Chapter 7 Problem 64a

2. Which of the numbered structures below is/are aromatic?



__ A. 3 and 6 only

__ B. All of the structures shown are aromatic.

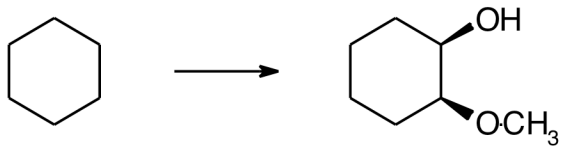
__ C. 1 and 4 only

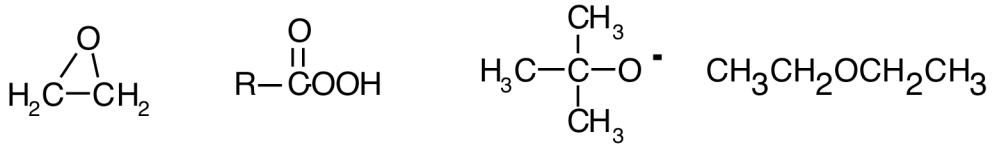
__ D. 2 and 5 only

__ E. 1, 2, 4, and 5 only

Rationale:
Chapter 15 Problem 3(a,b)

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.





EO **RCO_3H** ***tert*-BuO^-** **Et_2O**

__ A. First: $Br_2/h\nu$; Next: tert -BuO $^-$; Next: RCO_3H; Next: CH_3O^-; Next: PBr_3; Finally: HO^-

__ B. First: $Br_2/h\nu$; Next: tert -BuO $^-$; Next: RCO_3H; Finally: CH_3OH/H^+

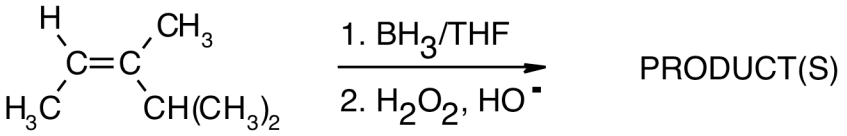
__ C. First: $Br_2/h\nu$; Next: tert -BuO $^-$; Next: Br_2/CH_2Cl_2; Finally: HO^-

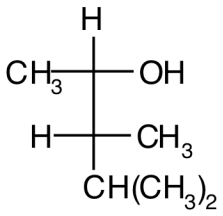
__ D. First: $Br_2/h\nu$; Next: Mg/Et_2O; Next: EO; Finally: H^+/H_2O

__ E. First: $Br_2/h\nu$; Next: tert -BuO $^-$; Next: RCO_3H; Next: CH_3O^-; Finally: H^+

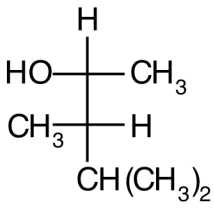
Rationale:
similar to Chapter 12 Problem 35d

4. Find the structure(s) of the product(s) of the reaction shown below. Pick the choice which references ALL of the CORRECT reaction products.





1



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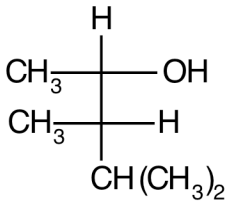
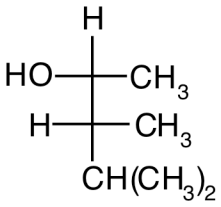


3



4

__ A. This reaction produces products 2 and 4.

__ B. This reaction produces products 1 and 3.

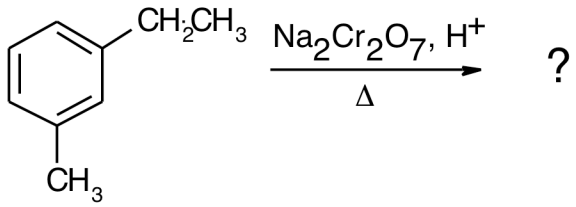
__ C. This reaction produces products 1 and 2.

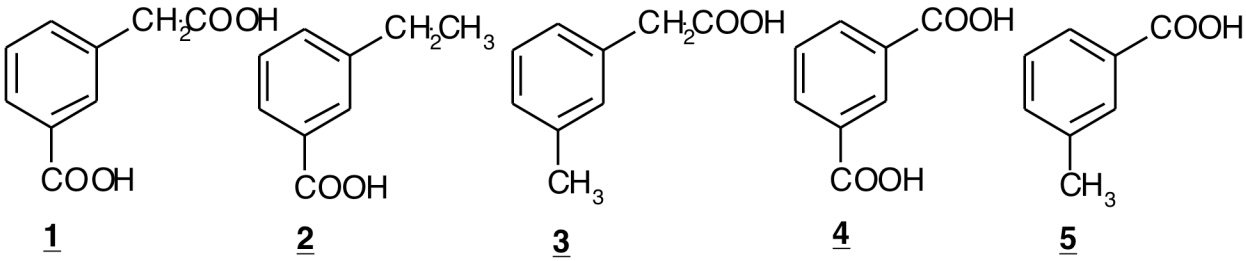
__ D. This reaction produces products 2 and 3.

__ E. This reaction produces products 3 and 4.

Rationale:
Chapter 5 Problem 93

5. Choose number of the CORRECT structure of the product of the following reaction:



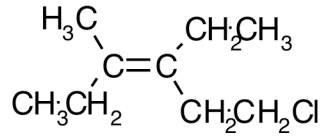


1 **2** **3** **4** **5**

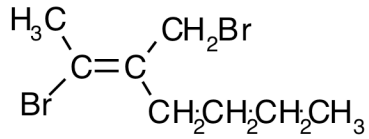
__ A. 5
__ B. 1
__ C. 4
__ D. 2
__ E. 3

Rationale:
moved to Chapter 16

6. Look at the four numbered structures below and pick the choice which designates one of these structures with its CORRECT E or Z configuration.



1



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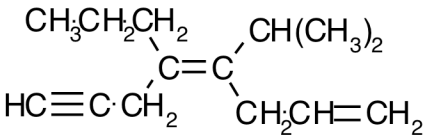

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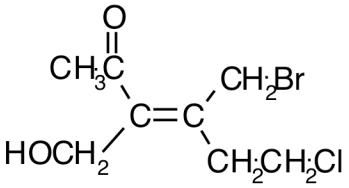


4

__ A. Structure 3 has the Z configuration.

__ B. Structure 4 has the Z configuration.

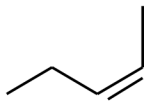
__ C. None of the choices gives the correct configuration for the corresponding numbered structure.

__ D. Structure 2 has the Z configuration.

__ E. Structure 1 has the E configuration.

Rationale:
Chapter 3 Problem 48

7. Using ethyne as the starting material, pick the choice which CORRECTLY describes how the compound with the structure shown below can be prepared.



__ A. First steps: 1. $NaNH_2$, 2. CH_3Br; Next steps: 1. $NaNH_2$, 2. CH_3CH_2Br; Final step: Na/NH_3

__ B. First steps: 1. $NaNH_2$, 2. CH_3Br; Next steps: 1. $NaNH_2$, 2. CH_3CH_2Br; Final step: H_2 and Pd/C

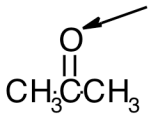
__ C. First steps: 1. $NaNH_2$, 2. CH_3Br; Next step: H_2/Lindlar catalyst; Final steps: 1. $NaNH_2$, 2. CH_3CH_2Br

__ D. First steps: 1. $NaNH_2$, 2. CH_3Br; Next step: Na/NH_3; Final steps: 1. $NaNH_2$, 2. CH_3CH_2Br

__ E. First steps: 1. $NaNH_2$, 2. CH_3Br; Next steps: 1. $NaNH_2$, 2. CH_3CH_2Br; Final step: H_2/Lindlar catalyst

Rationale:
Chapter 6 Problem 43e

8. What is the hybridization of the indicated atom in the molecule whose structure is shown below?



__ A. sp

__ B. sp^2

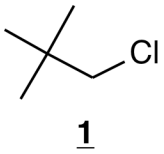
__ C. sp^3d

__ D. sp^3d^2

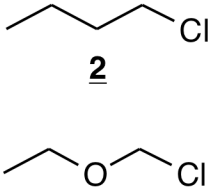
__ E. sp^3

Rationale:
Chapter 1 Problem 82b

9. Use the numbered structures shown below to choose the CORRECT statement from the multiple choices.

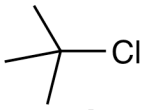


1



2

3



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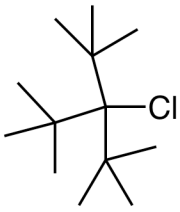


5

__ A. $(CH_3)_2CHS^-$ will react faster with 1 than CH_3S^- will.

__ B. 4 will react with H_2O faster than 5 will.

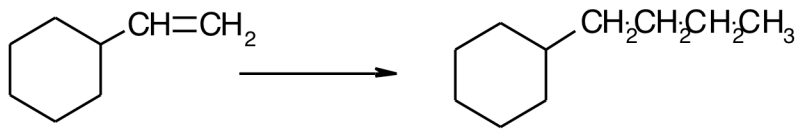
__ C. 3 will not react with HO^-.

__ D. 3 will react with HO^- faster than 2 will.

__ E. $(CH_3)_3CBr$ will react faster with CH_3CH_2OH than it will with H_2O.

Rationale:
Chapter 8 Problem 48

10. For the target compound whose structure is shown below choose the multistep synthesis which could be used to prepare it from the given starting material.



__ A. First: Br_2/CH_2Cl_2; Next: excess $^-NH_2$; Next: 1. $^-NH_2$, and 2. CH_3CH_2Br; Finally: $Na/NH_3(liq)$

__ B. First: HBr/peroxide; Next: Mg/Et_2O; Finally: ethylene oxide

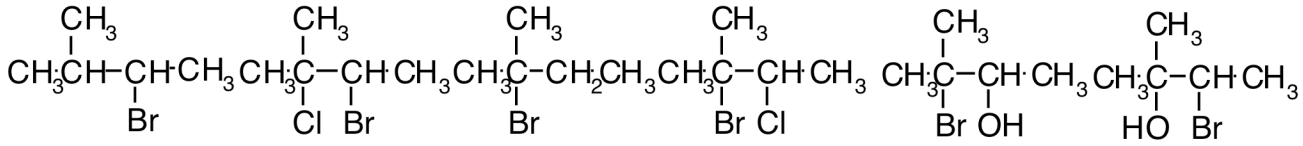
__ C. First: HBr/CH_2Cl_2; Next: Mg/Et_2O; Finally: ethylene oxide

__ D. First: Br_2/CH_2Cl_2; Next: excess $^-NH_2$; Next: 1. $^-NH_2$, and 2. CH_3CH_2Br; Finally: H_2 and Pt/C

__ E. First: Br_2/CH_2Cl_2; Next: excess $^-NH_2$; Next: 1. $^-NH_2$, and 2. CH_3CH_2Br; Finally: H_2 and Lindlar catalyst

Rationale:
Chapter 9 Problem 31d

11. FIgure out what will be the major product of the reaction of 2-methyl-2-butene with each of the reagents given in the multiple choices. Pick the choice which CORRECTLY matches the product structure with one of the structures shown below.



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

__ A. Br_2/CH_3OH will react to give 5 as the major product.

__ B. Br_2/CH_2Cl_2 will react to give 2 as the major product.

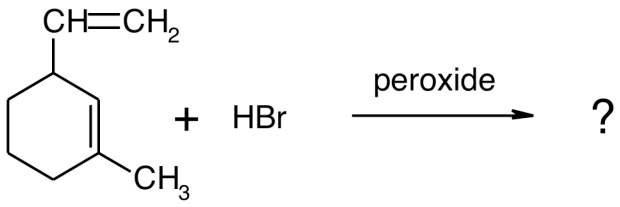
__ C. HBr will react to give 1 as the major product.

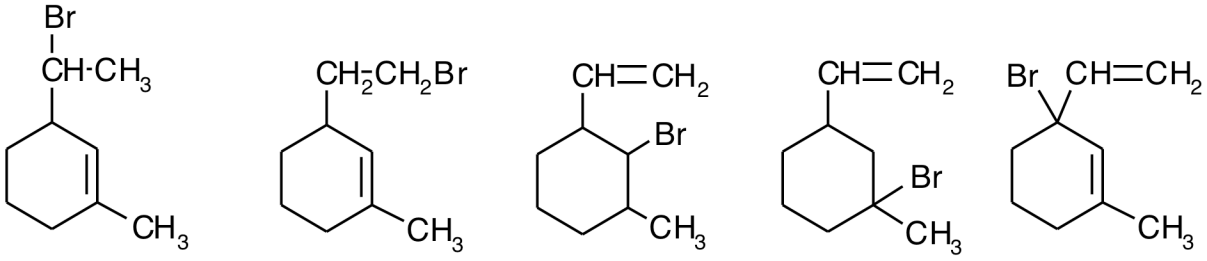
__ D. Br_2/H_2O will react to give 6 as the major product.

__ E. Br_2/NaCl will react to give 4 as the major product.

Rationale:
Chapter 4 Problem 40(a,g,j,k,l)

12. Choose structure of the major product of the reaction shown below.



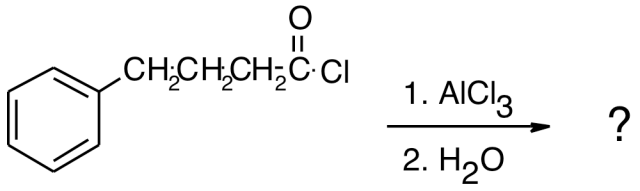


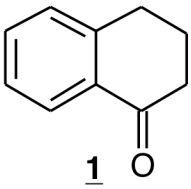
1 **2** **3** **4** **5**

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

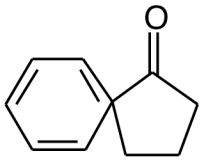
Rationale:
moved to Chapter 16

13. Choose the CORRECT structure of the product of the following reaction.





1



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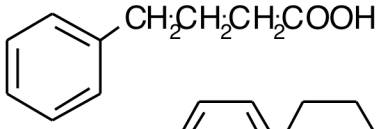

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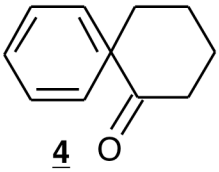

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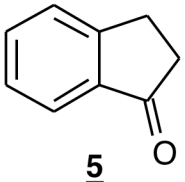

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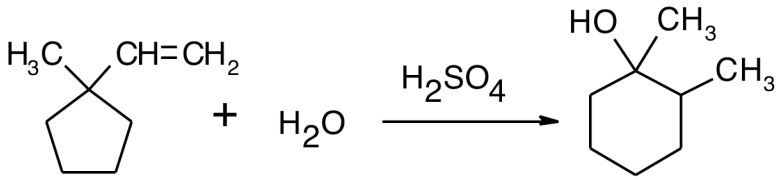
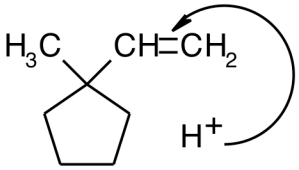
__ A. 4
__ B. 5
__ C. 2
__ D. 1
__ E. 3

Rationale:
moved to Chapter 16

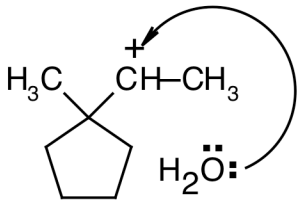
14. Work out the curved arrow mechanism for the reaction below, which involves a carbocation rearrangement.



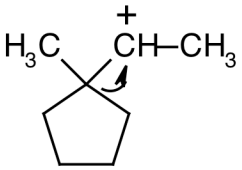
Choose the structure below with curved arrows which CORRECTLY depicts the electron movement involved in ONE of the steps of your mechanism.



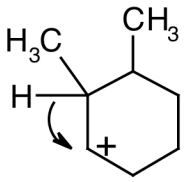
1



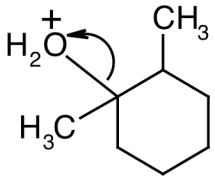
2



3



4



5

__ A. 1

__ B. 4

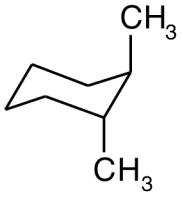
__ C. 2

__ D. 5

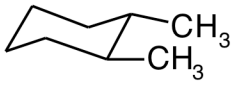
__ E. 3

Rationale:
Chapter 4 Problem 64

15. Which of the following structures represent cis isomers?



1



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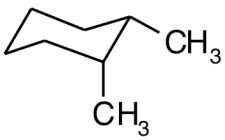
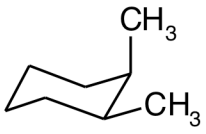


3



4

__ A. 2, 3 and 4

__ B. 2 only

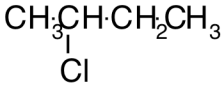
__ C. 3 and 4

__ D. 2 and 4

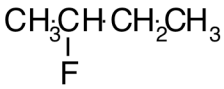
__ E. 2 and 3

Rationale:
Chapter 2 Problem 51

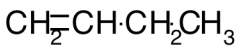
16. Figure out what the major elimination product(s) obtained from E2 reactions of hydroxide ion and the alkyl halides with structures 1 and 2 are. Choose the statement which is CORRECT from the multiple choices.



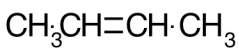
1



2



3



4

__ A. Both 1 and 2 react with hydroxide to give 4 as the major E2 product.

__ B. 1 and 2 react with hydroxide to give E2 products which are not shown in the structures above.

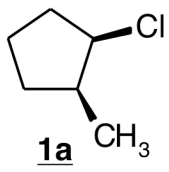
__ C. Both 1 and 2 react with hydroxide to give 3 as the major E2 product.

__ D. 1 reacts with hydroxide to give 4 as the major E2 product and 2 reacts with hydroxide to give 3 as the major E2 product.

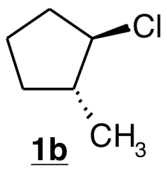
__ E. 1 reacts with hydroxide to give 3 as the major E2 product and 2 reacts with hydroxide to give 4 as the major E2 product.

Rationale:
Chapter 9 Problem 4(a,d)

17. Figure out whether each of the pairs of compounds whose structures are shown below are identical or are enantiomers, diastereomers, or constitutional isomers. Choose the CORRECT statement from the multiple choices.

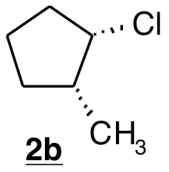


1a

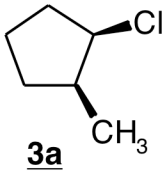


1b

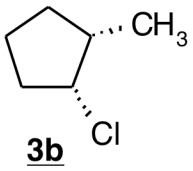
2a



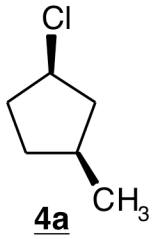
2b



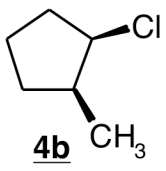
3a



3b



4a



4b

__ A. 3a and 3b are diastereomers.

__ B. 2a and 2b are enantiomers.

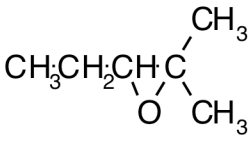
__ C. 4a and 4b are identical.

__ D. 2a and 2b are diastereomers.

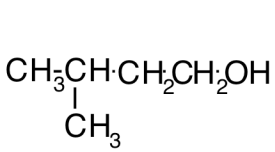
__ E. 1a and 1b are enantiomers.

Rationale:
Chapter 5 Problem 72

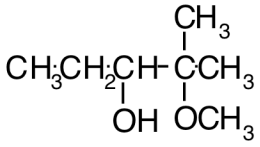
18. By looking at the numbered structures below figure out which of the multiple choices specifies the CORRECT product of a reaction.



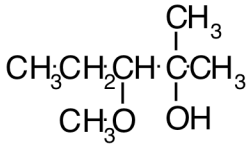
1



2



3



4

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

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

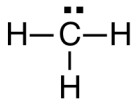
__ C. 1 + $CH_3O^-/CH_3OH \rightarrow$ 3

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

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

Rationale:
Chapter 10 Problem 33(d,e)

19. Give each atom in the structure below its appropriate formal charge. Choose the CORRECT statement from the multiple choices.



__ A. The formal charge on each H is +1

__ B. The formal charge on C is -4

__ C. The formal charge on each H is -1

__ D. The formal charge on C is -1

__ E. The formal charge on C is +4

Rationale:
Chapter 1 Problem 13b

20. Draw the most stable conformer of each of the disubstituted cyclohexanes named in the multiple choices and find the substance in which one of the substituents is in the AXIAL position in the MOST STABLE conformer.

__ A. cis-1-ethyl-3-isopropylcyclohexane

__ B. trans-1-ethyl-2-isopropylcyclohexane

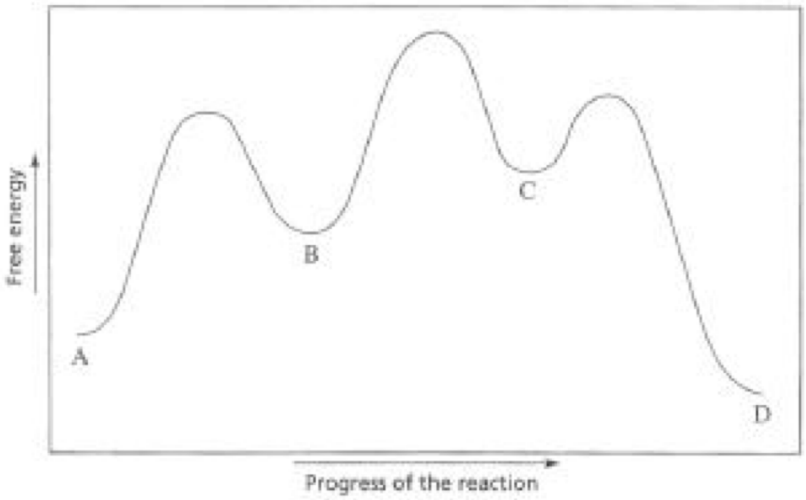
__ C. cis-1-ethyl-3-methylcyclohexane

__ D. cis-1-ethyl-4-isopropylcyclohexane

__ E. trans-1-ethyl-2-methylcyclohexane

Rationale:
Chapter 2 Problem 67

21. Given the reaction-coordinate diagram shown below for the reaction of A to give D, choose the statement which is CORRECT about this reaction.



__ A. The third step is the rate-determining step because products are not formed until it has been completed.

__ B. The second step is the rate-determining step because it has the transition state with the highest energy.

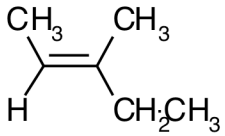
__ C. The first step (in the forward direction) has the lowest free energy of activation.

__ D. The first-formed intermediate is more apt to proceed on to products than it is to revert to reactants.

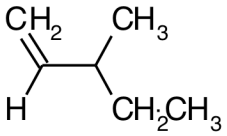
__ E. The first step is the rate-determining step because it is the step which is responsible for decomposing reactants.

Rationale:
Chapter 3 Problem 34

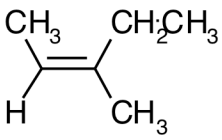
22. Find the elimination product(s) of (2S,3S)-2-chloro-3-methylpentane + high concentration of CH_3O^- among the numbered structures below. Choose the CORRECT product of this reaction.



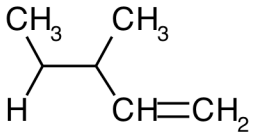
1



2



3



4

__ A. 3 is the product of this reaction.

__ B. 1 is the product of this reaction.

__ C. 2 is the product of this reaction.

__ D. 4 is the product of this reaction.

__ E. 1 and 3 are both products of this reaction.

Rationale:
Chapter 9 Problem 48a

23. Water and diethyl ether are immiscible liquids. In a vessel containing both water and ether charged compounds dissolve in water, and uncharged compounds dissolve in ether. Given that $C_6H_{11}COOH$ has a pKa of 4.8 and $C_6H_{11}NH_3^+$ ion has a pKa of 10.7, which of the following statements is TRUE ?

__ A. In order for the carboxylic acid to dissolve in the ether layer and the amine to dissolve in the water layer the pH of the water layer has to be below 4.8

__ B. In order for both both compounds to dissolve in the ether layer the pH of the water layer has to be between 4.8 and 10.7

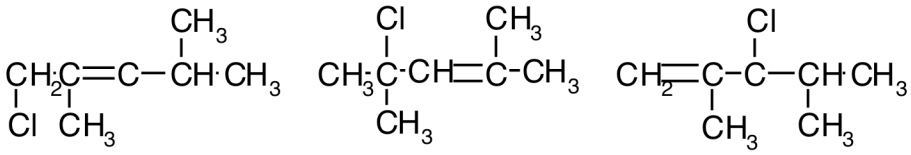
__ C. In order for both both compounds to dissolve in the water layer the pH of the water layer has to be above 10.7

__ D. In order for both both compounds to dissolve in the ether layer the pH of the water layer has to be below 4.8

__ E. In order for both both compounds to dissolve in the ether layer the pH of the water layer has to be above 10.7

Rationale:
Chapter 1 Problem 103

24. Find the kinetic and thermodynamic products of the reaction of one equivalent of HCl with 2,4-dimethyl-1,3-pentadiene among the numbered structures below. Choose the CORRECT statement from the multiple choices.



1 **2** **3**

__ A. 1 is the kinetic product and also the thermodynamic product.

__ B. 1 is the kinetic product and 3 is the thermodynamic product.

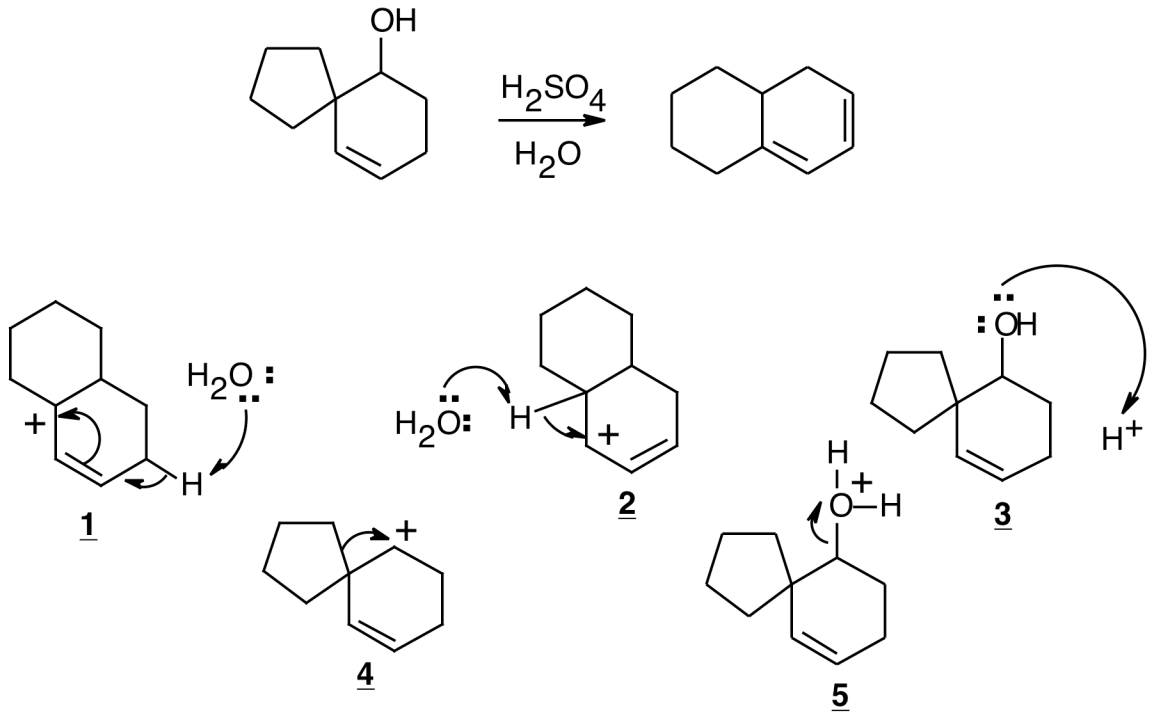
__ C. 2 is the kinetic product and also the thermodynamic product.

__ D. 3 is the kinetic product and 1 is the thermodynamic product.

__ E. 3 is the kinetic product and also the thermodynamic product.

Rationale:
Chapter 7 Problem 68

25. 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. 2

__ B. 4

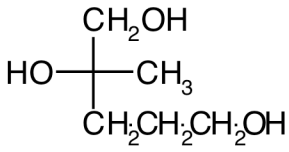
__ C. 1

__ D. 5

__ E. 3

Rationale:
Chapter 10 Problem 59b

26. Choose the CORRECT name of the substance whose molecular structure is shown in the Fischer projection below.



__ A. (S)-1,4,5-trihydroxy-4-methylpentane

__ B. (R)-2-methyl-1,2,5-pentanetriol

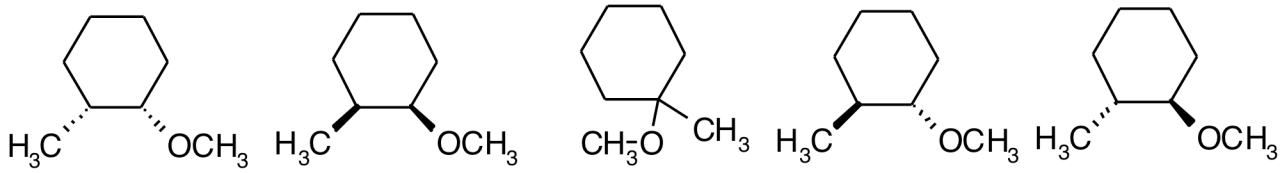
__ C. (R)-4-methyl-1,4,5-pentanetriol

__ D. (R)-1,4,5-trihydroxy-4-methylpentane

__ E. (S)-2-methyl-1,2,5-pentanetriol

Rationale:
Chapter 5 Problem 65g

27. Choose the CORRECT substitution product(s) of the reaction of trans-1-chloro-2-methylcyclohexane + CH_3OH from the numbered structures shown below.



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

__ A. 1 and 2 are the products of this reaction.

__ B. 3 is the product of this reaction.

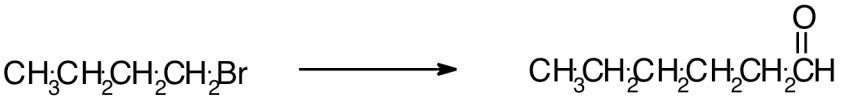
__ C. 4 and 5 are the products of this reaction.

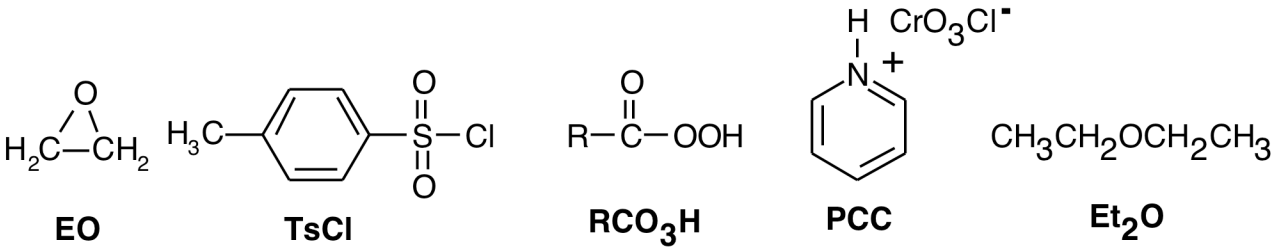
__ D. 1, 2, 3, 4 and 5 are the products of this reaction.

__ E. 1, 2, 4 and 5 are the products of this reaction.

Rationale:
Chapter 8 Problem 45d

28. 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: HO^-/H_2O; Next: TsCl /pyridine; Next: CH_2=CHMgBr; Next: RCO_3H; Next: HO^-/H_2O; Finally: PCC ;

__ B. 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

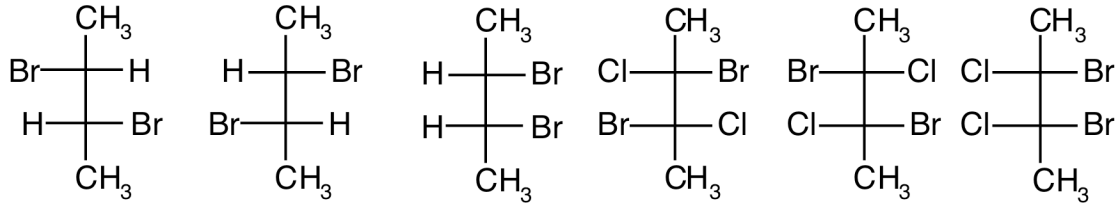
__ C. First: Mg/Et_2O; Next: 1. EO, and 2. H^+; Finally: PCC

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

__ E. First: HO^-/H_2O; Next: TsCl /pyridine; Next: $HOCH_2CH_2MgBr$; Finally: PCC

Rationale:
Chapter 11 Problem 29a

29. Examine the Fischer projections below. Which of the multiple choices gives the number(s) associated with the Fischer projection(s) of the CORRECT stereoisomer(s) obtained from the reaction of 2-butyne with the reagents specified?



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

__ A. Reaction with, 1. Cl_2/CH_2Cl_2, followed by 2. Br_2/CH_2Cl_2 gives the products with structures 4 and 5 only.

__ B. Reaction with, 1. $Na/NH_3(liq)$, followed by 2. Br_2/CH_2Cl_2 gives the products with structures 4 and 5 only.

__ C. Reaction with, 1. H_2/Lindlar catalyst, followed by 2. Br_2/CH_2Cl_2 gives the products with structures 1 and 2 only.

__ D. Reaction with, 1. $Na/NH_3(liq)$, followed by 2. Br_2/CH_2Cl_2 gives the products with structures 1 and 2 only.

__ E. Reaction with, 1. $Na/NH_3(liq)$, followed by 2. Br_2/CH_2Cl_2 gives the product with structure 6 only.

Rationale:
Chapter 6 Problem 44

30. Determine the degree of unsaturation for a hydrocarbon with the molecular formula $C_{40}H_{56}$.

__ A. This hydrocarbon has 13 units of unsaturation.

__ B. This hydrocarbon has 24 units of unsaturation.

__ C. This hydrocarbon has 26 units of unsaturation.

__ D. This hydrocarbon has 16 units of unsaturation.

__ E. This hydrocarbon has 18 units of unsaturation.

Rationale:
Chapter 3 Problem 2e

Answer Key

"Grade or Education" = 1

CHEM 2261/01
Summer 08
Final Exam
Chapters 1-11, 14

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

19. D

20. D

21. B

22. B

23. A

24. C

25. A

26. E

27. B

28. C

29. C

30. A