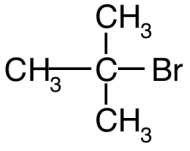
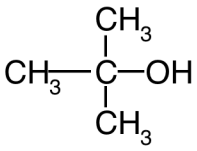
"Grade or Education" = 1

CHEM 2261/01
Summer 11
Exam 1
Chapters 1-3

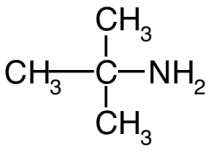
1. Determine whether the functional groups in the compounds having the structures shown below are primary, secondary, or tertiary. Choose the correct statement from the multiple choices.



A



B



C

__ A. Compound B is primary.

__ B. Compound C is tertiary.

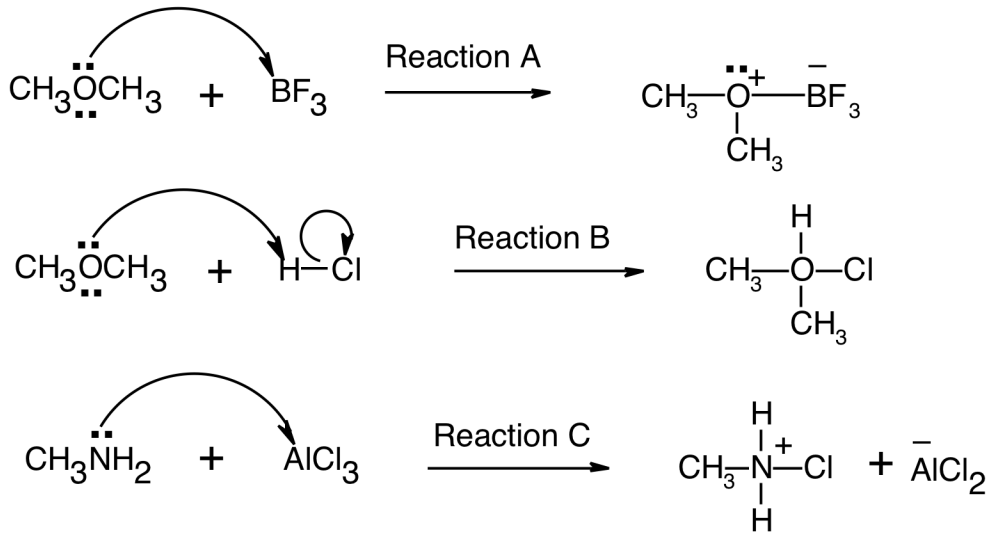
__ C. Compound A is primary.

__ D. Compound C is secondary.

__ E. Compound C is primary.

Rationale:
Chapter 2 Problem 23

2. Shown Below are three curved-arrow reactions. Which of these reactions is correct?



__ A. Only Reaction A is correct.

__ B. Only Reaction B is correct.

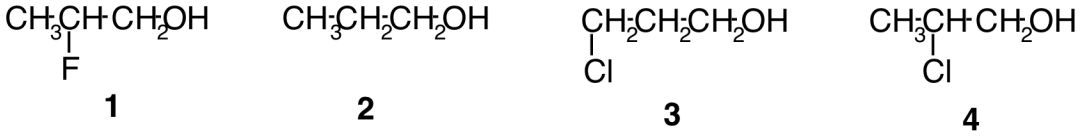
__ C. Only Reaction C is correct.

__ D. Only Reaction B and Reaction C are correct.

__ E. All three reactions are correct.

Rationale:
Chapter 1 Problem 85

3. Examine the numbered structures below. Which choice orders these structures in order of DECREASING acidity? (strongest acid listed first)



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

__ A. 1 > 4 > 3 > 2

__ B. 2 > 3 > 4 > 1

__ C. 1 > 3 > 4 > 2

__ D. 2 > 3 > 4 > 1

__ E. 2 > 4 > 3 > 1

Rationale:
Chapter 1 Problem 56

4. Draw the MOST STABLE chair conformers of cis-1-ethyl-2-methylcyclohexane (the cis isomer) and trans-1-ethyl-2-methylcyclohexane (the trans isomer). Choose the correct statement regarding these two isomeric compounds.

__ A. The (most stable) trans isomer has the methyl group equatorial and the ethyl group axial.

__ B. The (most stable) cis isomer has the methyl group equatorial and the ethyl group axial.

__ C. The (most stable) trans isomer has the ethyl group equatorial and the methyl group axial.

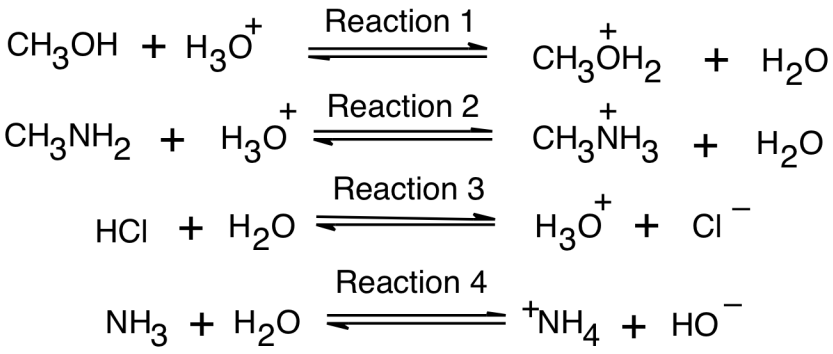
__ D. The trans isomer is more stable than the cis isomer.

__ E. The (most stable) cis isomer has the both the methyl group and the ethyl group equatorial.

Rationale:
Chapter 2 Problem 45

5. Use the pKa table below to figure out which of the reactions shown below the table favor PRODUCTS.

ACID	pK_a	ACID	pK_a
CH_3OH	15.5	$CH_3OH_2^+$	–2.5
H_2O	15.7	CH_3NH_2	40
H_3O^+	–1.7	$CH_3NH_3^+$	10.7
NH_4^+	9.4	HCl	–7



__ A. Only Reaction 1 and Reaction 4 favor products.

__ B. Only Reaction 2 and Reaction 4 favor products.

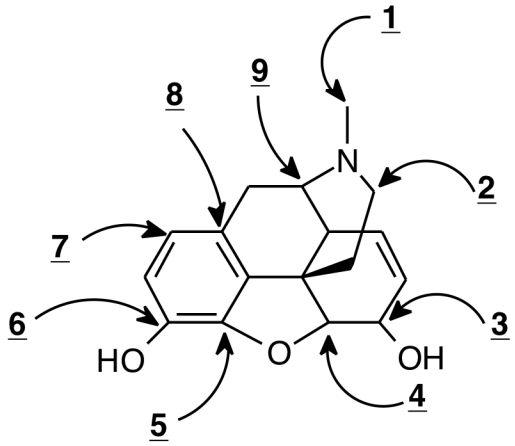
__ C. Reaction 1, Reaction 2, and Reaction 3 favor products.

__ D. Only Reaction 1 and Reaction 3 favor products.

__ E. Only Reaction 2 and Reaction 3 favor products.

Rationale:
Chapter 1 Problem 48

6. Figure out the number of hydrogens attached to each of the numbered carbon atoms in the following compound. Choose the CORRECT statement from the multiple choices.



morphine

__ A. The carbon atom numbered 2 has 1 hydrogen attached to it.

__ B. The carbon atom numbered 9 has 3 hydrogens attached to it.

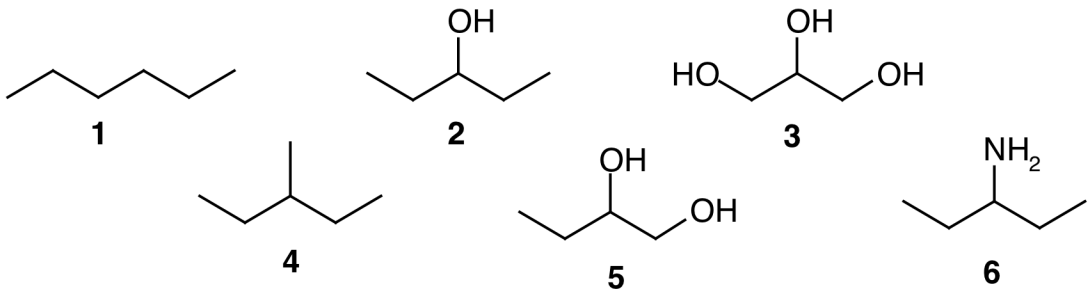
__ C. The carbon atom numbered 1 has 4 hydrogens attached to it.

__ D. The carbon atom numbered 4 has 1 hydrogen attached to it.

__ E. The carbon atom numbered 5 has 1 hydrogen attached to it.

Rationale:
Chapter 2 Problem 11

7. Examine the numbered structures below. Pick the choice which lists these structures in order of decreasing boiling points of the corresponding compounds. (Highest boiling point first)



__ A. 3 > 5 > 2 > 6 > 1 > 4

__ B. 1 > 2 > 3 > 4 > 5 > 6

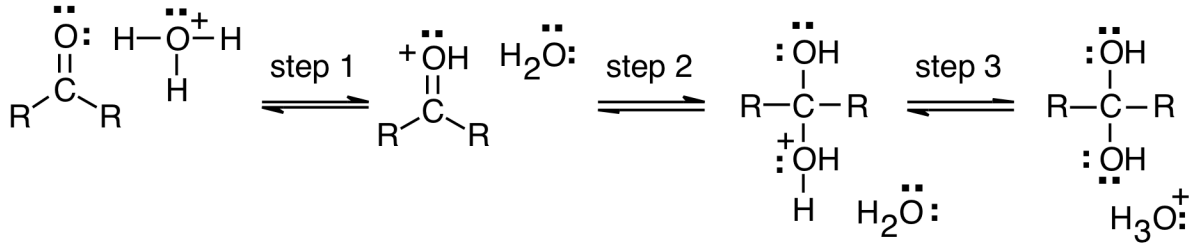
__ C. 6 > 3 > 5 > 2 > 4 > 1

__ D. 1 > 4 > 6 > 2 > 5 > 3

__ E. 4 > 1 > 6 > 2 > 5 > 3

Rationale:
Chapter 2 Problem 31

8. Using curved arrows show the mechanism of the following 3-step reaction sequence. Draw your curved arrows right on the test page and use your drawing to pick the correct statement from the multiple choices.



__ A. In the structures just to the left of the step 2 reaction arrows a curved arrow starts from a lone pair on the oxygen atom of H_2O and points to the bottom of the carbon atom of the other structure.

__ B. In the structures just to the left of the step 2 reaction arrows a curved arrow starts from a lone pair on the oxygen atom of H_2O and points to the hydrogen atom attached to the oxygen atom of the otganic (carbon-containing) structure.

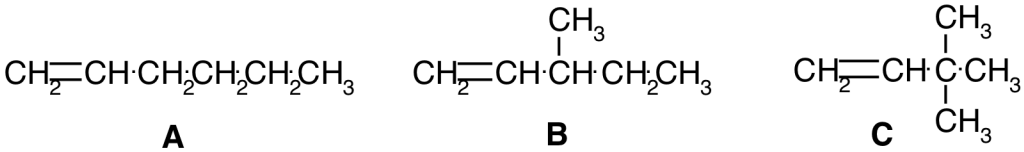
__ C. In the structures just to the left of the step 3 reaction arrows a curved arrow starts from a lone pair on the oxygen atom of H_2O and points to the uppermost hydrogen atom attached to the uppermost oxygen atom in the organic (carbon-containing) structure.

__ D. In the structures to the left of the step 1 reaction arrows a curved arrow starts from a hydrogen atom of H_3O^+ and points to the oxygen atom of the other structure.

__ E. In the structures just to the left of the step 3 reaction arrows a curved arrow starts from the bottom hydrogen atom in the organic (carbon-containing) structure and points to the oxygen atom of H_2O.

Rationale:
Chapter 3 Problem 57

9. Count the vinylic and allylic hydrogens in each of the three hydrocarbon structures shown below and pick the correct statement from the multiple choices.



__ A. Structure A has 2 vinylic hydrogens and 3 allylic hydrogens.

__ B. Structure A has 3 vinylic hydrogens and no allylic hydrogens.

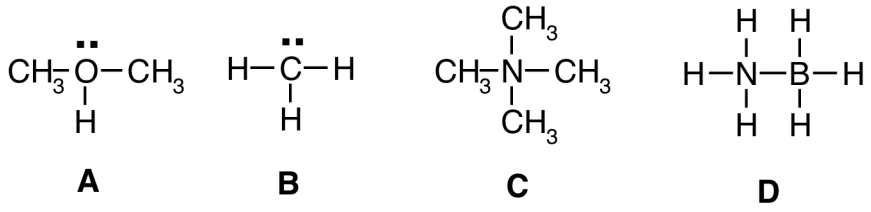
__ C. Structure B has 1 vinylic hydrogen and 3 allylic hydrogens.

__ D. Structure C has 3 vinylic hydrogens and 3 allylic hydrogens.

__ E. Structure B has 3 vinylic hydrogens and 1 allylic hydrogen.

Rationale:
Chapter 3 Problem 37

10. Look at the four incomplete Lewis structures below labelled A, B, C, and D. Figure out what the formal charges on all of the atoms of these structures are. Choose the correct statement from the multiple choices.



A **B** **C** **D**

__ A. The boron atom in structure D has a formal charge of +1.

__ B. The nitrogen atom in structure D has a formal charge of -1.

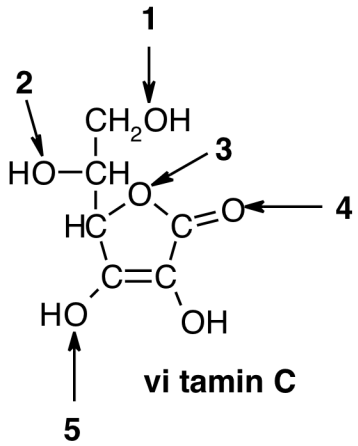
__ C. The carbon atom in structure B has a formal charge of +1.

__ D. The oxygen atom in structure A has a formal charge of -1.

__ E. The nitrogen atom in structure C has a formal charge of +1.

Rationale:
Chapter 1 Problem 13

11. Look at the structure of vitamin C shown below. Five of the oxygen atoms in this structure are labelled with numbered arrows. Figure out what the hybridization on each of these oxygen atoms is and choose the correct statement from the multiple choices.



__ A. The oxygen numbered 4 is sp^2 hybridized.

__ B. The oxygen numbered 2 is sp hybridized.

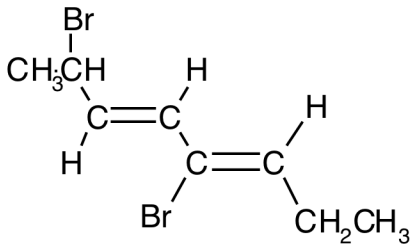
__ C. The oxygen numbered 1 is sp^2 hybridized.

__ D. The oxygen numbered 3 is sp hybridized.

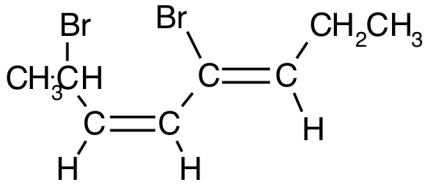
__ E. The oxygen numbered 5 is sp^2 hybridized.

Rationale:
Chapter 1 Problem 32b

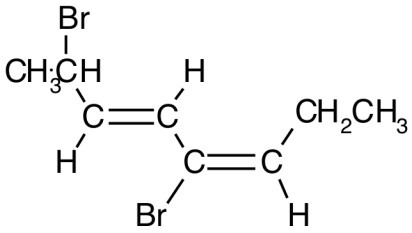
12. Which of the numbered structures shown below is (3E,5E)-2,5-dibromo-3,5-octadiene?



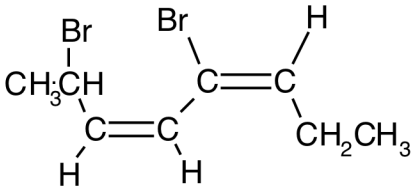
1



2



3



4

__ A. **3**

__ B. None of these structures is correct.

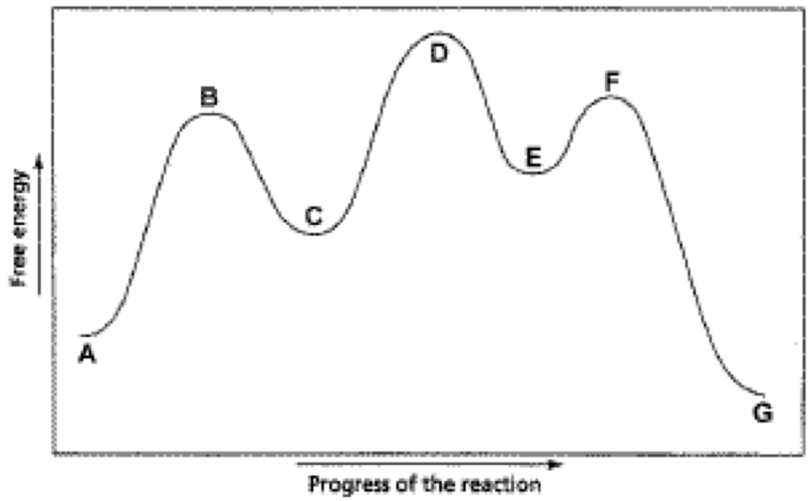
__ C. **2**

__ D. **1**

__ E. **4**

Rationale:
Chapter 3 Problem 54

13. Given the following reaction coordinate diagram for the reaction of A to give D choose the statement which is CORRECT about this reaction from the multiple choices. All answers refer to FORWARD reaction(s).



__ A. The overall reaction is endergonic.

__ B. C is the reactant of the rate-determining step.

__ C. C and E are transition states in the reaction.

__ D. The first step of the reaction is exergonic.

__ E. A is converted to C in the fastest step in the reaction.

Rationale:
Chapter 3 Problem 55(b,c,f,g,h)

14. Choose the statement which **CORRECTLY** gives the degree of unsaturation of a hydrocarbon with the molecular formula specified?

__ A. A hydrocarbon with the molecular formula $C_{40}H_{56}$ has a degree of unsaturation of 12.

__ B. A hydrocarbon with the molecular formula C_8H_{16} has a degree of unsaturation of 0.

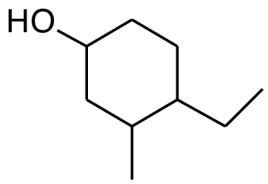
__ C. A hydrocarbon with the molecular formula $C_{12}H_{20}$ has a degree of unsaturation of 4.

__ D. A hydrocarbon with the molecular formula $C_{20}H_{34}$ has a degree of unsaturation of 14.

__ E. A hydrocarbon with the molecular formula $C_{10}H_{16}$ has a degree of unsaturation of 6.

Rationale:
Chapter 3 Problem 2

15. Choose the correct systematic name of the compound whose structure is shown below.



__ A. 3-methyl-4-ethylcyclohexanol

__ B. 1-ethyl-6-methyl-4-cyclohexanol

__ C. 1-methyl-2-ethyl-5-cyclohexanol

__ D. 4-ethyl-3-methylcyclohexanol

__ E. 1-ethyl-2-methyl-4-cyclohexanol

Rationale:
Chapter 2 Problem 75g

Answer Key

"Grade or Education" = 1

CHEM 2261/01
Summer 11
Exam 1
Chapters 1-3

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