1. What is the formal charge on oxygen in the following structure?

\[ \text{H}_2\text{C} = \text{O} - \text{CH}_3 \]

a. +2  
b. +1  
c. 0  
d. -1  
e. -2

2. Select the correct molecular formula for Methadone, a synthetic opioid drug prescribed to alleviate severe pain and to assist in the treatment of drug addiction.

Methadone

a. \( \text{C}_{22}\text{H}_{27}\text{NO} \)  
b. \( \text{C}_{21}\text{H}_{28}\text{NO} \)  
c. \( \text{C}_{21}\text{H}_{27}\text{NO} \)  
d. \( \text{C}_{21}\text{H}_{27}\text{NO}_2 \)  
e. \( \text{C}_{21}\text{H}_{25}\text{NO} \)

3. In which of the following structures does the oxygen have a formal charge of +1?

I \[ \text{H} - \text{O} - \text{H} \]
II \[ \text{H} - \text{O}: \]
III \[ \text{H} - \text{C} = \text{O} - \text{H} \]
IV \[ \text{H} - \text{C} - \text{H} \]

a. I only  
b. II only  
c. I and III  
d. I and IV  
e. I, III, and IV
4. Draw the structure of ethane (CH₃CH₃). For this problem and all others requiring you to draw a structure, use the program Marvin Sketch to draw the structure and give the SMILES code as your answer.

5. Draw the structure of acetone, CH₃COCH₃.

6. How many atoms are sp² hybridized in the following structure?

   ![Structure](image)

   a. 0  
   b. 1  
   c. 2  
   d. 3  
   e. 4

7. Draw the structure of any compound that contains the molecular formula C₄H₆ and that has zero sp² hybridized atoms.

8. Which of the following contains an sp² hybridized carbon?

   a. CH₄  
   b. CH₃⁻  
   c. CH₃CH₃  
   d. CH₃⁺  
   e. HCCH
9. Which of the following structures represent compounds that are constitutional isomers of each other?

a. I and II  

b. I and III  

c. II and III  

d. I, II and III  

e. All of them

10. Select the statement that is not true about Amoxicillin, an important antibiotic for the treatment of diseases such as pneumonia.

a. The atom marked (a) and the directly attached groups have a bent geometry.  

b. The hybrid orbitals $C_{sp2}$-$C_{sp2}$ are used to form the indicated bond (b).  

c. The solid wedge used for bond (b) is meant to indicate that the C=O group is above the plane of the paper.  

d. The amino group, marked (c), has a trigonal pyramidal structure.  

e. The hybrid orbitals $C_{sp3}$-$C_{sp3}$ are used to form the indicated bond (d).