1. What is the molecular formula of the following compound?
   a) C₉H₉NO
   b) C₉H₁₀NO
   c) C₁₀H₁₀NO
   d) C₁₀H₁₁NO
   e) C₁₀H₁₂NO

2. Which one of the following molecules has methyl groups in a **trans**- arrangement?

   ![Molecule Options]

3. What is the hybridisation of the designated atoms in the following compound?
   a) P = sp², Q = sp³, R = sp
   b) P = sp³, Q = sp², R = sp²
   c) P = sp₂, Q = sp, R = sp³
   d) P = sp³, Q = sp, R = sp²
   e) P = sp², Q = sp², R = sp²

4. What is the correct stick representation of (Z)-3-methyl-2-pentene?

   ![Stick Models]

5. What is the correct name for the following compound?
   a) (E)-3,5-dimethyl-3-hexene
   b) (Z)-3,5-dimethyl-3-hexene
   c) (Z)-2,4-dimethyl-3-hexene
   d) (E)-2-ethyl-4-methyl-2-pentene
   e) (Z)-2-ethyl-4-methyl-2-pentene
6. Which two of the following structures are configurational isomers?
   a) V and W
   b) X and Y
   c) X and Z
   d) Y and Z
   e) none of them

7. Which of the curly arrows are incorrectly drawn in the following reaction mechanism?
   a) X only
   b) Y only
   c) Z only
   d) all of them
   e) none of them

8. Which one of the following functional groups is incorrectly labelled?
   a) alkene
   b) amine
   c) aldehyde
   d) ketone
   e) carboxylic acid

9. Rank the following conformational isomers of 1,2-dichloroethane in order of increasing energy.
   a) V < X < Y < Z
   b) V < Y < Z < X
   c) Z < V < Y < X
   d) Z ≈ V < X ≈ Y
   e) V < Z < Y < X

10. Identify the nucleophile and electrophile in the first step of the following reaction and also predict which will be the major product formed.
    X
    H—Br
    Y          Z
    nucleophile          electrophile          major product
    a) H of HBr          X          Y and Z equal
    b) X                  Br of HBr      Z
    c) H of HBr          X          Y
    d) X                  H of HBr      Y
    e) Br of HBr         X          Z

Correct answers: 1D, 2E, 3D, 4A, 5C, 6B, 7E, 8C, 9E, 10D
1. What is the molecular formula of the following compound?
   a) C₉H₉N₂O
   b) C₉H₁₀N₂O
   c) C₁₀H₁₀N₂O
   d) C₁₀H₁₁N₂O
   e) C₁₀H₁₂N₂O

2. Which one of the following molecules has chlorine atoms in a cis- arrangement?

   A: \[ \text{Cl} \quad \text{Cl} \]
   B: \[ \text{Cl} \quad \text{Cl} \]
   C: \[ \text{Cl} \quad \text{Cl} \]
   D: \[ \text{Cl} \quad \text{Cl} \]
   E: \[ \text{Cl} \quad \text{Cl} \]

3. What is the hybridisation of the designated atoms in the following compound?
   a) P = sp², Q = sp³, R = sp²
   b) P = sp³, Q = sp², R = sp²
   c) P = sp³, Q = sp³, R = sp²
   d) P = sp³, Q = sp³, R = sp³
   e) P = sp², Q = sp², R = sp²

4. What is the correct stick representation of (E)-3-methyl-3-hexene?

   A: \[ \text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2 \]
   B: \[ \text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2 \]
   C: \[ \text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2 \]
   D: \[ \text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2 \]
   E: \[ \text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}=\text{CH}_2 \]

5. What is the correct name for the following compound?
   a) (E)-3,4,5-trimethyl-4-heptene
   b) (Z)-3,4,5-trimethyl-3-heptene
   c) (E)-3,4,5-trimethyl-3-heptene
   d) (E)-2-ethyl-3,4-dimethyl-2-hexene
   e) (Z)-2-ethyl-3,4-dimethyl-2-hexene
6. Which two of the following structures are configurational isomers?
   a) V and W
   b) X and Y
   c) X and Z
   d) Y and Z
   e) none of them

7. Which of the curly arrows are incorrectly drawn in the following reaction mechanism?
   a) X only
   b) Y only
   c) Y and Z
   d) X and Y
   e) X and Z

8. Which one of the following functional groups is incorrectly labelled?
   a) alkene
   b) amine
   c) ether
   d) ketone
   e) alcohol

9. Rank the following conformational isomers of 1,1,2,2-tetrachloroethane in order of increasing energy.
   a) V ≈ Z < Y < X
   b) Z < V < Y < X
   c) Z < V < Y ≈ X
   d) Z ≈ V < X ≈ Y
   e) V < Z < X < Y

10. Identify the nucleophile and electrophile in the first step of the following reaction and also predict which will be the major product formed.
    X
    \[ \text{H—I} \]
    Y
    Z
    nucleophile  electrophile  major product
    a) X  H of HI  Z
    b) H of HI  X  Y
    c) H of HI  I of HI  Y
    d) H of HI  X  Y and Z equal
    e) I of HI  X  Z
    Correct answers: 1E, 2D, 3C, 4E, 5B, 6B, 7E, 8B, 9B, 10A