The worksheets are available in the tutorials and form an integral part of the learning outcomes and experience for this unit.

**Model 4: Isomerism**

The three pairs of isomers are constitutional, conformational and configurational (from left to right).

1. All of the molecules are constitutional isomers except those are conformational (see Q2) or configurational / stereoisomers (see Q3).
2. 
   ![Chemical structures](image)

3. 
   ![Chemical structures](image)

   **Extension:**

   Top row: (i) cyclic ether & chloride, (ii) cyclic ether (epoxide) & halide, (iii) alkene, chloride & alcohol and (iv) cyclic ether (epoxide) and halide.

   Second row: (i) ketone & chloride, (ii) cyclic ether & chloride, (iii) alkene, chloride & alcohol and (iv) acid chloride

   Third row: (i) alkene, chloride & alcohol, (ii) alkene, chloride & alcohol, (iii) enol & chloride, (iv) alkene, chloride & alcohol and (v) cyclic ether & chloride

4. From highest to lowest energy:

   ![Chemical structures](image)

5. No. At room temperature, the molecules have more than enough energy to rotate around a C-C bond. Conformers can only be isolated at (very) low temperature, in the solid phase.

**Model 5: Structure Elucidation**

1. Mass Spectrometry.

   The loss of an ethyl group would lead to a peak with an m/z value 29 less than the molecular ion peak.
\[ m/z \] Fragment

99  M+ peak: containing one $^{13}\text{C}$ (1% chance).

98  **Molecular ion** – C₄H₁₀O

83  C₅H₇O (loss of –CH₃ - 15 mass units)

55  C₄H₇ (loss of –CH₂CO - 43 mass units)

43  C₃H₇ (loss –of CH₃COC – 45 mass units)

39  C₃H₃

29  CHO or C₂H₅

3-methyl-pent-3-enone (see below) is an isomer of 4-methyl-pent-3-enone: the molecular ion peak will occur in the same place. The fragmentation pattern will be slightly different.

\[ \text{3-methyl-pent-3-enone} \]

3,4-dimethylpent-3-enone (see below) will show a molecular ion peak at 112 and will have a different (but similar) fragmentation pattern.

\[ \text{3,4-dimethylpent-3-enone} \]

2. Infrared Spectroscopy (IR)
3. **UV-Vis.**

Each carbon atom in benzene is sp$^2$ hybridized.

![Chemical structures](https://scilearn.sydney.edu.au/OrganicSpectroscopy/)

In conjugated compounds, there is an unhybridized p orbital on ≥4 adjacent atoms.

The usefulness of UV-Vis spectroscopy in organic chemistry is restricted to identifying conjugation.

Key to success: practice further by completing this week’s tutorial homework
Key to even greater success: practice even further by completing this week’s suggested exam questions.
For additional help on structure elucidation, see [https://scilearn.sydney.edu.au/OrganicSpectroscopy/](https://scilearn.sydney.edu.au/OrganicSpectroscopy/)