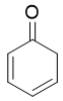
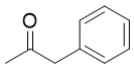
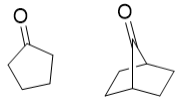
1. The pKa of 2,4-pentanedione is 9. Draw out the equilibrium and reason out the high acidity of this compound when compared with 2-pentanone.
2. For the compound shown below, draw out the tautomer. Is the keto form more stable?



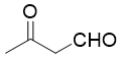
3. The following compound has 2 signals in the aliphatic region and signals in the aromatic region that correspond to the benzene ring. When D_2O was added to this, only aromatic signals remain. Explain



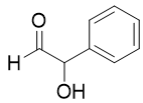
4. When the following compounds were dissolved in acetonitrile (solvent) and catalytic amount of H^+ was added, one of them produced an enol but not the other. Would you be able to identify this?



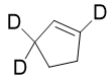
5. When the following compound is dissolved in toluene, analysis reveals the disappearance of this compound and the formation of two distinct compounds. Mass spectral analysis shows no change in mass compared to the original compound. What are these two new compounds?



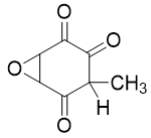
6. 2,4-Pentanedione exists in solution with its enol form with an equilibrium constant of 4. Calculate the % keto form in solution
7. A new compound whose structure shown below was being isolated. Mass spectrometry showed m/z was found as 136.05, which is the expected value. The compound shown below is expected to have a characteristic signal in the 1H NMR spectrum in the range 9-10 ppm for the aldehyde. However, NMR analysis was carried out and no such signal was observed. What was the compound that was instead being isolated?



8. The molecular formula of a compound $C_6H_8O_2$. You have been told that it contains a cyclohexane ring. The infrared spectrum shows a distinct signal at 1700 cm^{-1} and no other significant signals. Design an experiment that will help you identify the compound.
9. Propose a synthesis for the following compound:

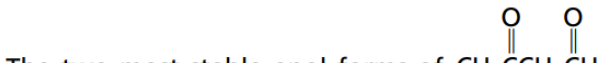


10. Terreic acid is a natural product that has the following structure. It is found to exist as an enol. Draw out possible enols and suggest which of these would be the dominant form



11. Write structural formulas corresponding to
    a. The enol form of 2,4-dimethyl-3-pentanone
    b. The enol form of acetophenone
    c. The two enol forms of 2-methylcyclohexanone

12. Is the product from the a-chlorination of (R)-sec-butyl phenyl ketone with chlorine in acetic acid chiral? Is it optically active?

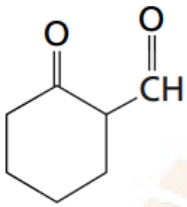
13. The two most stable enol forms of 

The two most stable enol forms of 1-phenyl-1,3-butanedione

14. Write the structure of the enolate ion derived from each of the following b-dicarbonyl compounds. Give the three most stable resonance forms of each enolate

(a) 2-Methyl-1,3-cyclopentanedione

(b) 1-Phenyl-1,3-butanedione

(c) 

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