WORKED ANSWER KEY - Enolates and Keto-Enol Tautomerism

Instructor and self-check copy. Full explanations for six multiple-choice questions plus two constructed-response tasks.

Part A. Concept and product prediction

1. What is an alpha carbon of a ketone?

Correct: B. Any carbon directly adjacent to the carbonyl carbon

Reason: Alpha means the carbon immediately next to the carbonyl carbon.

2. Are keto and enol structures resonance contributors?

Correct: B. No; they are tautomers

Reason: Moving a proton and changing connectivity creates constitutional tautomers.

3. What type of reagent typically forms a ketone enolate almost quantitatively?

Correct: A. LDA in suitable conditions

Reason: A strong non-nucleophilic base such as LDA can effectively deprotonate an alpha hydrogen.

4. Which statement about an enolate is correct?

Correct: A. Negative charge is delocalized over alpha carbon and oxygen

Reason: Enolate resonance contributors show charge distribution across the C-C-O fragment.

5. What mechanism often creates a C-C bond between an enolate and methyl iodide?

Correct: A. SN2

Reason: Methyl electrophiles react by substitution through an SN2 pathway.

6. Benzaldehyde is typically non-enolizable because

Correct: B. It lacks an alpha hydrogen on an adjacent carbon

Reason: The aromatic carbon attached to CHO bears no hydrogen.

Part B. Show your reasoning

7. Draw the acetone enolate and two resonance contributors after removal of an alpha hydrogen. Identify where charge is delocalized.

Worked answer: Remove a methyl alpha H from acetone. Contributors are CH2=C(O-)-CH3 and -CH2-C(=O)-CH3. Both depict one delocalized enolate. Show base-to-H and C-H/C-O electron shifts.

8. Compare acetone and benzaldehyde for normal enolate formation. Explain which has an alpha hydrogen.

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Worked answer: Acetone has alpha H on both methyl groups and forms an enolate with suitable base. Benzaldehyde lacks an H on the adjacent aromatic ipso carbon, so it is not ordinarily enolizable.

Use the key to assess chemical reasoning, not just a matching final answer.