Named Reactions Worksheet

Here is a worksheet consisting of 20 questions based on Named Reactions in Carbonyl Compounds. The key answers will be provided on the next page.

Worksheet: Named Reactions in Carbonyl Compounds

1. **Aldol Condensation**: Describe the mechanism of Aldol condensation and state the product formed when acetaldehyde undergoes this reaction.

2. **Cannizzaro Reaction**: Explain the Cannizzaro reaction and provide an example with formaldehyde.

3. **Perkin Reaction**: What is the Perkin reaction? Provide the reaction mechanism for the synthesis of cinnamic acid.

4. **Claisen-Schmidt Condensation**: Describe the Claisen-Schmidt reaction. What are the products when benzaldehyde reacts with acetone?

5. **Reimer-Tiemann Reaction**: Discuss the Reimer-Tiemann reaction and outline its application in the formylation of phenol.

6. **Baeyer-Villiger Oxidation**: What is Baeyer-Villiger oxidation? Explain the migration preference observed during this reaction.

7. **Clemmensen Reduction**: How does Clemmensen reduction reduce a carbonyl group? Write the reaction with acetophenone as the substrate.

8. **Wolff-Kishner Reduction**: Compare Wolff-Kishner reduction with Clemmensen reduction and illustrate the reaction of cyclohexanone with hydrazine.

9. **Friedel-Crafts Acylation**: Write the mechanism of Friedel-Crafts acylation for the synthesis of acetophenone.

10. **Tollens' Test**: Describe the Tollens' test and explain why aldehydes react with Tollens' reagent but ketones do not.

11. **Iodoform Test**: What is the significance of the iodoform test? Give an example of a carbonyl compound that gives a positive iodoform test.

12. **Gattermann-Koch Reaction**: Explain the Gattermann-Koch formylation reaction and its relevance in aromatic aldehyde synthesis.

13. **Rosenmund Reduction**: Describe the Rosenmund reduction process and state its industrial significance.

14. **Oppenauer Oxidation**: What is the Oppenauer oxidation? Provide the reaction mechanism for the oxidation of secondary alcohols to ketones.

15. **Pinnick Oxidation**: How does Pinnick oxidation differ from other aldehyde oxidations? Provide the reagents used and the outcome.

16. **Hydroboration-Oxidation**: Explain the hydroboration-oxidation of alkenes and describe how it results in an anti-Markovnikov addition of water.

17. **Robinson Annulation**: What is the Robinson annulation? Illustrate its application in the synthesis of cyclohexenone.

18. **Michael Addition**: Define the Michael addition reaction and provide an example of a 1,4-conjugate addition to an α,β-unsaturated carbonyl compound.

19. **Knorr Pyrrole Synthesis**: How is pyrrole synthesized in the Knorr reaction? Outline the mechanism and its key intermediates.

20. **Haloform Reaction**: What is the haloform reaction? Show the reaction mechanism for acetone reacting with iodine in basic conditions.

Key Answers:

1. Aldol condensation results in β-hydroxy aldehyde or ketone, followed by dehydration.
2. In Cannizzaro reaction, formaldehyde undergoes disproportionation to form methanol and formic acid.
3. Perkin reaction involves the synthesis of cinnamic acid from benzaldehyde and acetic anhydride.
4. Claisen-Schmidt condensation produces chalcones when benzaldehyde reacts with acetone.
5. Reimer-Tiemann reaction introduces a formyl group (-CHO) onto the ortho position of phenol.
6. Baeyer-Villiger oxidation converts ketones to esters, with migration of the more substituted alkyl group.
7. Clemmensen reduction converts ketones to alkanes using zinc amalgam in hydrochloric acid.
8. Wolff-Kishner reduction also converts carbonyl groups to alkanes, using hydrazine and a base.
9. Friedel-Crafts acylation generates acetophenone from benzene and acetyl chloride in the presence of $AlCl_3$.
10. Tollens' test is positive for aldehydes but not ketones due to the ease of oxidation of aldehydes.
11. The iodoform test is positive for methyl ketones like acetone, producing a yellow precipitate of iodoform.
12. Gattermann-Koch reaction is used for introducing a formyl group into aromatic rings.
13. Rosenmund reduction reduces acid chlorides to aldehydes using palladium and hydrogen.
14. Oppenauer oxidation selectively oxidizes secondary alcohols to ketones using aluminum alkoxides.
15. Pinnick oxidation uses sodium chlorite to oxidize aldehydes to carboxylic acids.
16. Hydroboration-oxidation results in anti-Markovnikov hydration of alkenes to alcohols.
17. Robinson annulation forms six-membered rings, including cyclohexenone derivatives.
18. Michael addition involves 1,4-addition of nucleophiles to α,β-unsaturated carbonyl compounds.

19. Knorr pyrrole synthesis involves the condensation of a 1,4-dicarbonyl compound with ammonia or primary amines.
20. The haloform reaction produces a carboxylate ion and haloform from methyl ketones.

This worksheet covers various important named reactions involving carbonyl compounds, allowing students to practice their understanding of reaction mechanisms and outcomes.