

1 Describe, with the aid of a labelled diagram, the bonding in methanal, HCHO . State the bond angles and explain how the $\text{C}=\text{O}$ bond is formed.

Carbonyl	Alcohol used
Propanal Structural formula =	Alcohol used to make propanal Structural formula =
Phenylethanone Structural formula =	Alcohol used to make phenylethanone Structural formula =

Chapter 2 Carbonyl compounds

- 3 a** In the oxidation of an alcohol, state the oxidising agent, the conditions and what would be observed as the reaction takes place.

Oxidising agent:

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Conditions:

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Observations:

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- b** Using [O] to represent the oxidising agent, write a balanced equation for the preparation of each of the following from an alcohol:

(i) propanal:

(ii) phenylethanone:

- 4** A ketone is prepared by refluxing the secondary alcohol with the oxidising agent. Sketch the reflux apparatus and briefly explain what you understand by the term reflux.

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- 5** An aldehyde *cannot* be prepared by refluxing the primary alcohol with the oxidising agent. The aldehyde is distilled from the mixture of the primary alcohol and oxidising agent. Explain why distillation is used, rather than reflux.

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Chapter 2 Carbonyl compounds

- 6 a** An aldehyde can be oxidised to form a carboxylic acid. In the oxidation of an alcohol, state the oxidising agent, the conditions and what would be observed as the reaction takes place.

Oxidising agent:

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Conditions:

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Observations:

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- b** Using [O] to represent the oxidising agent, write a balanced equation for the oxidation of propanal.

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- 7 a** Aldehydes and ketones can both be reduced to form alcohols. State the reducing agent and the conditions used:

Reducing agent:

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Conditions:

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- b** Using [H] to represent the reducing agent, write balanced equations for the reduction of each of the following carbonyl compounds:

(i) propanal:

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(ii) phenylethanone:

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- 8** Aldehydes and ketones undergo nucleophilic addition reactions. Explain what is meant by:

a a nucleophile

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b addition

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- c** Draw the structure of propanal and show clearly the dipole that makes the carbonyl group susceptible to nucleophilic addition.

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d With the aid of curly arrows, show the full mechanism (nucleophilic addition) for the reaction between propanal and NaBH_4 . Include any relevant dipoles and lone pairs of electrons.

9 a Describe a simple test for the detection of a carbonyl group.

Reagent:

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Observations:

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b Explain how the derivative could be used to identify a specific carbonyl compound.

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10 a Describe the use of the Tollens' test to detect an aldehyde.

Reagent:

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Conditions:

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Observations:

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Method:

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Chapter 2 Carbonyl compounds

b Tollens' test utilises a redox reaction.

(i) Write an equation for the reduction that takes place.

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(ii) Write an equation for the oxidation that takes place. Use [O] to represent Tollens' reagent.

propanal:

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phenylethanal:

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