WJEC (Eduqas) Chemistry A-level

SP OA2.2 - Identification of Aldehydes/Ketones by their Reaction with 2,4-Dinitrophenylhydrazine

Flashcards

What is the functional group of an aldehyde?

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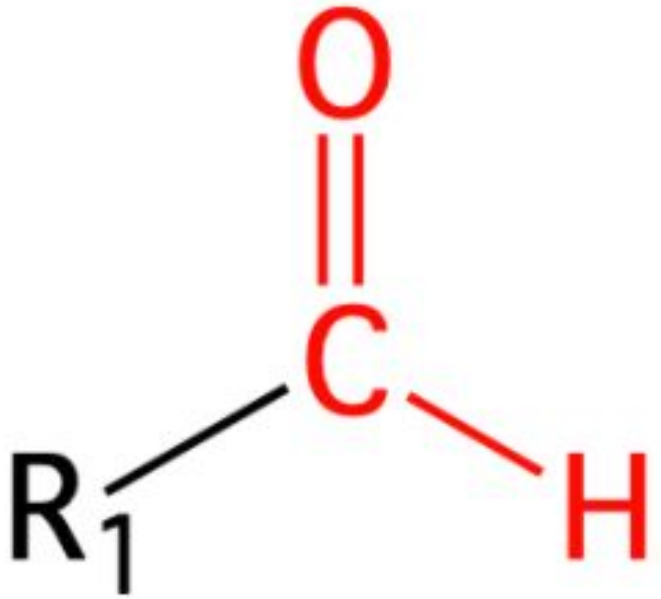

What is the functional group of a ketone?

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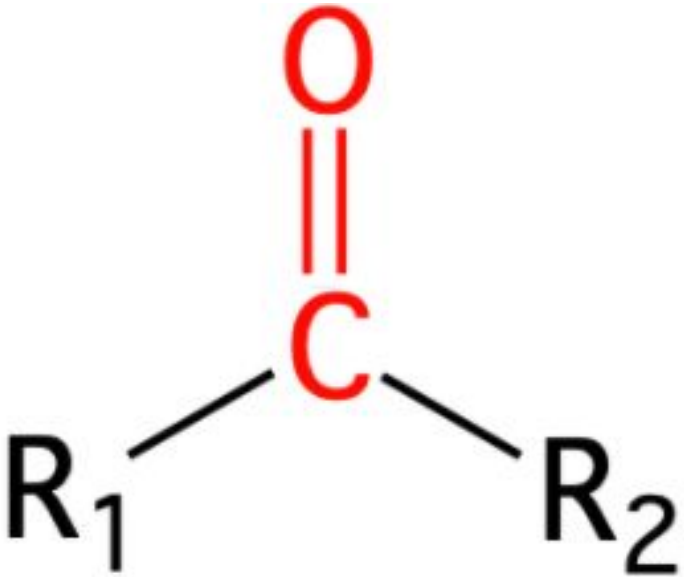

What reagent can be used to identify aldehydes and ketones?

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2,4-dinitrophenylhydrazine

(2,4-DNPH)

Give the structural formula for 2,4-dinitrophenylhydrazine (2,4-DNPH)

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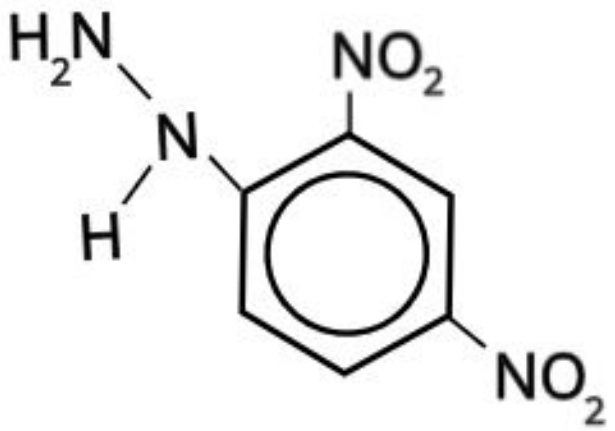

What type of reaction takes place when an aldehyde or ketone reacts with 2,4-DNPH?

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Addition-elimination reaction (condensation)

What is the positive test result when 2,4-DNPH reacts with an aldehyde or ketone?

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An orange/yellow precipitate is produced.

How can 2,4-DNPH be used to identify specific aldehydes and ketones?

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Add 2,4-DNP so that a precipitate forms. Purify the solid by recrystallisation. Compare the melting point of the pure crystals formed with the melting points of 2,4-dinitrophenylhydrazones of all the common aldehydes and ketones.

What apparatus is required to identify specific aldehydes and ketones?

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- Dropping pipettes
- Spatulas
- Boiling tubes
- Test-tube rack
- 100 cm^3 beaker
- 250 cm^3 beaker
- 10 cm^3 measuring cylinder
- 100 cm^3 conical flask
- Hot water bath
- Buchner funnel
- Filter paper
- Melting point apparatus
- Capillary tube

Outline the experimental procedure to identify specific aldehydes and ketones using 2,4-DNPH

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1. Add 1 cm depth of unknown aldehyde/ketone to a boiling tube.
2. Add 8 cm^3 of 2,4-DNPH solution to the boiling tube.
3. If a precipitate does not form, add dilute H_2SO_4 dropwise until a precipitate forms.
4. Filter the mixture under reduced pressure to isolate the solid derivative.
5. Purify the derivative by recrystallisation from the minimum amount of hot ethanol.
6. Filter the purified derivative under reduced pressure.
7. Dry a sample of the derivative with filter paper.
8. Use a capillary tube to obtain a melting point for this sample.
9. Repeat steps 1-8 with other unknown aldehydes/ketones.

What are the hazards associated with 2,4-DNPH, $CH_3CH_2COCH_3$, C_6H_5CHO, H_2SO_4 and CH_3CH_2OH?

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- 2,4-DNPH: flammable, toxic
- $CH_3CH_2COCH_3$: flammable, irritant
- C_6H_5CHO: harmful
- H_2SO_4: irritant
- CH_3CH_2OH: highly flammable

During recrystallisation, why is it necessary to add only a minimal amount of hot ethanol to the solid derivative?

During recrystallisation, why is it necessary to add only a minimal amount of hot ethanol to the solid derivative?

A minimal amount of hot ethanol is used to achieve a large yield of the required solid on recrystallisation. A larger yield is gained since using a minimum amount reduces the amount lost by retention in the ethanol.

Explain how the melting point of a sample relates to the purity of the compound

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Pure substances will have a sharp melting point whereas a substance with impurities will melt over a range of temperatures.

What are the advantages of filtering under reduced pressure?

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- Filtering under reduced pressure is much faster than standard filtration.
- Reduced pressure filtration is more efficient at removing residual liquid compared to standard filtration. This obtains a purer solid.