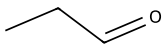
Aldehydes and ketones

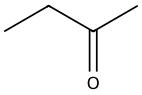
AQA 7405 · A level

Answer on your own paper. Show your working where needed.

1. Classify and name each structure

Classify A and B as an aldehyde or a ketone, then name each. Use the atoms bonded to the carbonyl carbon to justify each classification.

A 

B 

2. Identify an unlabelled sample

Two unlabelled samples contain butanal and butan-2-one. Name a reagent that distinguishes them, give a separate observation for each and explain the positive result.

3. Oxidise an aldehyde

Write the equation for complete oxidation of $CH_3CH_2CH_2CHO$ with acidified dichromate(VI), using [O]. Name the organic product and state the colour change.

4. Reduce two carbonyl compounds

Write condensed formulae for the products when ethanal and pentan-3-one are reduced separately with sodium borohydride. Classify each alcohol.

5. Mechanism of propanone reduction

Draw the first step when propanone reacts with aqueous sodium borohydride. Represent the nucleophile as H^- and show the carbonyl partial charges.

6. A product of butan-2-one

Butan-2-one forms a hydroxynitrile. Draw its structure, state its total number of carbons and explain which atom of CN^- forms the new bond.

7. When do two enantiomers form?

Compare the hydroxynitriles made from propanal and propanone. Which product has a chiral centre? Explain using the groups bonded to that carbon.

8. Diagnose a failed test

A student uses Fehling’s solution to distinguish propanal from propanone. Both cold samples stay blue. Explain why that result is inconclusive and describe a repeat that distinguishes them.

9. Extra challenge · Use a test and predict stereochemistry

An unknown C_4H_8O compound is butanal, butan-2-one or 2-methylpropanal. It gives no precipitate with warm Fehling’s solution. Identify it and explain your choice.

Draw the first step of its reaction with aqueous $NaBH_4$. Give the final structure and explain its stereochemical composition in an achiral environment.

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