

4.5.5 Names, carbon counts and completed organic formulae

Name: _____ Class: _____ Date: _____

Total: 33 marks

KEY WORDS displayed formula • skeletal formula

Objective

Convert names into structural, displayed and skeletal formulae for carbonyls, acids, acyl chlorides and esters. Questions and completed answer drawings are original.

1 Key knowledge and worked examples

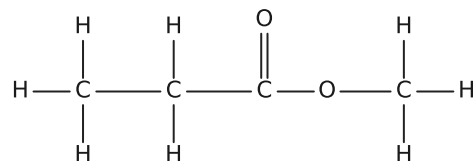
Count the carbonyl carbon as part of the named parent chain. An aldehyde ends in -CHO ; a ketone has carbon groups on both sides of C=O . A carboxylic acid ends in -COOH ; an acyl chloride in -COCl . An ester is R-CO-O-R' : its alkyl name comes from R' and its alkanoate name includes the carbonyl carbon on the acid side.

■ Worked name-to-structure route

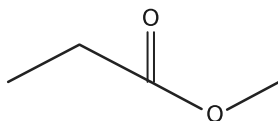
For methyl propanoate, the acid-side parent has three carbons including C=O ; the alcohol-side methyl adds one more. The condensed structural formula is $\text{CH}_3\text{CH}_2\text{COOCH}_3$, molecular formula $\text{C}_4\text{H}_8\text{O}_2$. Do not attach the methyl directly to carbonyl carbon: the ester oxygen must lie between it and the acid-side carbonyl.

Methyl propanoate

Displayed formula



Skeletal formula



A displayed formula shows every atom and bond. A skeletal formula uses unlabelled carbon ends/vertices with implied H to complete carbon valence; show O, Cl and any H bonded to oxygen explicitly. A double line to O is C=O , not another carbon atom. Check that each carbon has total bond order four and oxygen has its appropriate bonding.

2 Practice

2.1 Draw displayed and skeletal formulae for propanal. Give its condensed structural formula. [5]

2.2 Draw displayed and skeletal formulae for propanone. Give its condensed structural formula and explain the naming difference from propanal. [6]

2.3 Draw displayed and skeletal formulae for propanoic acid. Give its condensed structural formula. [5]

3 Exam-style questions

3.1 Draw displayed and skeletal formulae for propanoyl chloride. Give its condensed structural formula and state the organic product with water. [6]

3.2 An ester gives methanol and propanoic acid on acid hydrolysis. Name it, give its condensed structural formula, and draw its displayed and skeletal formulae. [6]

3.3 Give condensed structural formulae for ethyl ethanoate and methyl propanoate. Show that their molecular formulae are the same, explain their structural-isomer relationship and predict their different hydrolysis alcohols. [5]
