

29.1 Formulas, functional groups and naming

Name: _____ Class: _____ Date: _____

Total: 21 marks

KEY WORDS benzene 苯 • functional group 官能团 • aromatic 芳香 • benzene ring 苯环
• systematic nomenclature 系统命名法

Objective

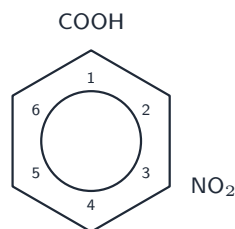
Build the skills to answer exam questions on **naming organic compounds** 有机化合物命名 — functional groups, the four kinds of formula, and **systematic nomenclature** 系统命名法 of aliphatic and **aromatic** 芳香 molecules.

You must be able to:

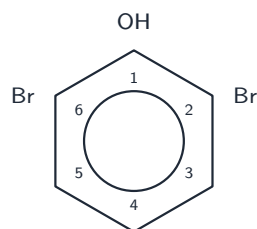
- identify the functional group that dictates a compound's properties
- interpret general, structural, displayed and skeletal formulas
- name aliphatic molecules (up to six carbons, incl. single rings)
- name simple aromatic molecules with one benzene ring (e.g. 3-nitrobenzoic acid)

1 Worked examples

■ Naming an aromatic compound

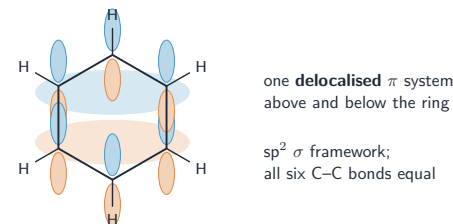


3-nitrobenzoic acid



2,4,6-tribromophenol

Number the ring from the principal group (carbon 1); the substituent positions give the name



The delocalised benzene ring

Name $\text{C}_6\text{H}_4(\text{NO}_2)(\text{COOH})$ with the groups on carbons 1 and 3.

- the —COOH is the principal group $\rightarrow$ parent is **benzoic acid**, its carbon is **C1**
- the —NO_2 is on **C3** $\rightarrow$ prefix **3-nitro**
- name: **3-nitrobenzoic acid**

Skeletal vs displayed. A skeletal formula shows each bond as a line, with carbons at the ends/bends and hydrogens on carbon left out; a displayed formula shows every atom and bond.

2 Practice

2.1 State what is meant by a **functional group**. [1]

2.2 Name the compound: a benzene ring with an —OH on C1 and —Br on C2, C4 and C6. [1]

3 Exam-style questions

3.1 The skeletal formula of a compound has 5 line-ends and bends in a chain with a terminal —COOH . Which feature does a skeletal formula leave out? [1]

A	B
C	D

- A the functional group
- B carbon atoms
- C hydrogen atoms bonded to carbon
- D the longest chain

3.2 Which is the correct systematic name for the molecule with an -NH_2 on C2 of a 4-carbon carboxylic acid? [1]

- | | |
|---|---|
| A | B |
| C | D |
- A 2-aminobutanoic acid
B butan-2-amine
C 2-aminobutanal
D aminobutanoic acid

3.3 Give the systematic name of: [3]

- (a) a benzene ring carrying one -CH_3 and one -NO_2 on adjacent carbons (methyl on C1)
(b) the cyclic alcohol cyclohexanol
(c) propanenitrile, $\text{CH}_3\text{CH}_2\text{CN}$

3.4 Draw the **skeletal** formula of 3-nitrobenzoic acid. [2]

3.5 A compound **W** has the skeletal structure of a five-carbon chain with a methyl branch on carbon 2, a $\text{C}=\text{C}$ between carbons 3 and 4, and an OH on carbon 1. Its molecular formula is $\text{C}_6\text{H}_{12}\text{O}$.

(a) Give the systematic name of **W**, and explain how the position numbers are chosen. [3]

(b) Give the empirical formula and the general formula of the homologous series to which **W**'s alcohol group belongs. [2]

(c) Draw the displayed formula of **W**. [3]

(d) Name **two** functional groups present in **W**, and for each state one reagent that would react with it. [4]
