

29.1 Formulas, functional groups and naming

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

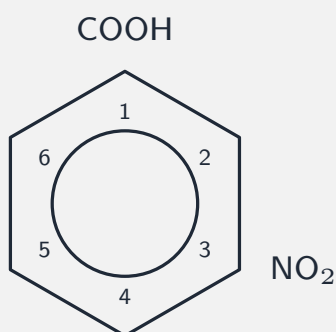
Build the skills to answer exam questions on **naming organic compounds** 有机化合物命名—functional groups, the four kinds of formula, and **systematic nomenclature** 系统命名法 of aliphatic and **aromatic** 芳香 molecules.

You must be able to:

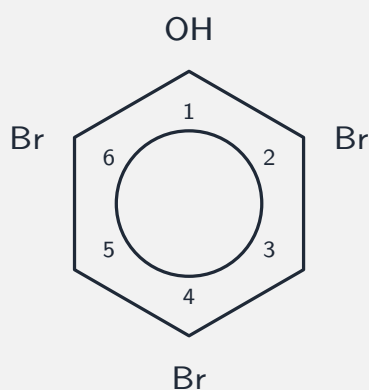
- identify the functional group that dictates a compound's properties
- interpret general, structural, displayed and skeletal formulas
- name aliphatic molecules (up to six carbons, incl. single rings)
- name simple aromatic molecules with one benzene ring (e.g. 3-nitrobenzoic acid)

1 Worked examples

■ Naming an aromatic compound

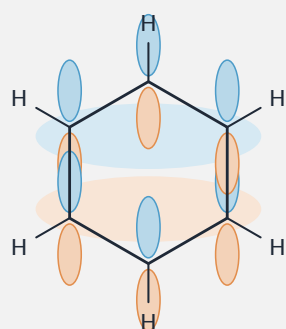


3-nitrobenzoic acid



2,4,6-tribromophenol

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



one **delocalised** π system
above and below the ring

sp^2 σ framework;
all six C–C bonds equal

The delocalised benzene ring

Name $C_6H_4(NO_2)(COOH)$ 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** 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** 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 $-\text{CH}_3$ and one $-\text{NO}_2$ 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]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **29.1 Naming organic compounds** past-paper sheet in the Library, or try these in **Practice mode**:

- 9701/44 N25 —Q8 (formulas, functional groups and naming)

Solutions

2.1 an atom or group of atoms that gives a molecule its characteristic chemical (and physical) properties.

2.2 2,4,6-tribromophenol.

3.1 C. A skeletal formula omits the hydrogen atoms bonded to carbon (and the carbons are shown only as line-ends/bends).

3.2 A. 2-aminobutanoic acid —the -COOH is C1, the -NH_2 is on C2.

3.3 (a) 2-methylnitrobenzene / 1-methyl-2-nitrobenzene

(b) cyclohexanol

(c) propanenitrile.

3.4 a benzene hexagon with -COOH drawn at C1 and -NO_2 at C3.