

34.4 Amino acids

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS amino acids 氨基酸 • isoelectric point 等电点 • electrophoresis 电泳
• peptide bond 肽键 • zwitterions 两性离子

Objective

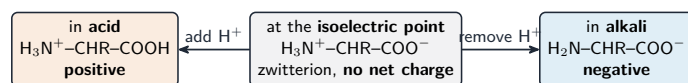
Build the skills to answer exam questions on **amino acids** 氨基酸 — **zwitterions** 两性离子, the **isoelectric point** 等电点, **peptide bonds** 肽键 and **electrophoresis** 电泳.

You must be able to:

- explain how an amino acid forms a zwitterion and how its charge changes with pH
- describe peptide-bond formation by condensation
- explain how electrophoresis separates amino acids

1 Worked examples

■ Charge with pH; peptide bonds

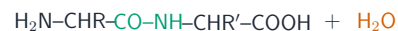


Charge depends on pH: positive in acid, the neutral zwitterion at the isoelectric point, negative in alkali

- in **acid** (low pH): $-\text{COO}^-$ gains H^+ → ion is **positive**.
- in **alkali** (high pH): $-\text{NH}_3^+$ loses H^+ → ion is **negative**.
- at the **isoelectric point**: mostly the neutral zwitterion, **no net charge**.



↓



the **peptide bond** (an amide link)

Two amino acids condense (losing water) to form a peptide (amide) bond

2 Practice

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

2.2 Name the type of bond formed when two amino acids join. [1]

3 Exam-style questions

3.1 At a pH **below** its isoelectric point, an amino acid carries an overall: [1]

A	B
C	D

- A positive charge
B negative charge
C zero charge
D double negative charge

3.2 In electrophoresis, an amino acid that is **negatively** charged moves towards the: [1]

A	B
C	D

- A negative electrode
B positive electrode
C neither electrode
D both electrodes

3.3 Explain, using equations or structures, how the charge on the amino acid glycine ($\text{H}_2\text{NCH}_2\text{COOH}$) changes between low pH and high pH. [3]

3.4 Two amino acids are mixed and held at a pH equal to the isoelectric point of one of them. Explain what happens to each in electrophoresis. [3]

