

Exercise walk-through

5.4.2

Explain amino-acid charge and polymer formation

Pearson Edexcel · International A-Level · Chemistry

Choose a cell voltage

Your turn

Reduction potentials are $+0.80\text{ V}$ and $+0.34\text{ V}$. What is spontaneous E°_{cell} ?

- A. $+1.14\text{ V}$
- B. $+0.46\text{ V}$
- C. -0.46 V

Find oxidation state and coordination

Your turn

$[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ has which chromium state and coordination number?

- A. +1 and 4
- B. +3 and 6
- C. +3 and 2

Aspirin transfer calculation

Your turn

2.76 g salicylic acid, $M=138$, gives aspirin $M=180$ in 1:1 ratio. Dry mass is 2.52 g. What is yield?

- A. 50.0%
- B. 70.0%
- C. 91.3%

Exercises 2.1·2.3

2.1 Give the principal glycine form in acid, at zwitterion conditions and in alkali, with charges. [3]

2.2 Explain why glycine is achiral but alanine $\text{H}_2\text{NCH}(\text{CH}_3)\text{COOH}$ is chiral. [2]

2.3 Give the linkage formed when two amino acids condense and identify the small molecule lost. [2]

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2.1 $^+\text{H}_3\text{NCH}_2\text{COOH}$; $^+\text{H}_3\text{NCH}_2\text{COO}^-$; $\text{H}_2\text{NCH}_2\text{COO}^-$.

2.2 Explain why glycine is achiral but alanine $\text{H}_2\text{NCH}(\text{CH}_3)\text{COOH}$ is chiral. [2]

2.2 Glycine central carbon has two H atoms; alanine has four different groups at its central carbon.

2.3 Give the linkage formed when two amino acids condense and identify the small molecule lost. [2]

2.3 $-\text{C}(=\text{O})-\text{NH}-$ peptide/amide linkage; water.

Exercises 3.1·3.3

3.1 Give condensed formulae for both ordered dipeptides formed from one glycine and one alanine, ignoring zwitterion charges for this question. [4]

3.2 Identify the monomer of $[-\text{CH}_2-\text{CH}(\text{CONH}_2)-]$ and classify polymerisation. Explain why the side group does not change the classification. [3]

3.3 Explain how poly(ethenol) can be used for a water-soluble laundry bag, and how polyamide hydrogen bonding can strengthen fibres. [3]

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3.1 $\text{H}_2\text{NCH}_2\text{CONHCH}(\text{CH}_3)\text{COOH}$. $\text{H}_2\text{NCH}(\text{CH}_3)\text{CONHCH}_2\text{COOH}$.

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3.2 $\text{CH}_2=\text{CHCONH}_2$, propenamide; addition, because $\text{C}=\text{C}$ opens without eliminating a small molecule.

3.3 Explain how poly(ethenol) can be used for a water-soluble laundry bag, and how polyamide hydrogen bonding can strengthen fibres. [3]

3.3 Many OH groups hydrogen-bond to water, supporting dissolution. Polyamide N–H and C=O groups hydrogen-bond between chains, requiring energy to separate them/holding chains together.

Exercise 3.4

3.4 Describe a controlled optical-activity comparison of two pure alanine enantiomers and glycine. Explain why a zero result for an unknown amino-acid solution does not prove it contains a racemate. [5]

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3.4 Zero a polarimeter with solvent and use plane-polarised monochromatic light. Match concentration/path length and temperature/wavelength. Pure alanine enantiomers give equal opposite rotation; glycine is inactive. Zero can mean achiral glycine or cancellation in a racemate, so it is not unique evidence.