

Exercise walk-through

5.4.1

Select amine preparation and distinguish nitrogen reactions

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 Write butan-1-amine in condensed form and its equation with HCl. [2]

2.2 Explain why phenylamine is a weaker base than a typical primary alkylamine. [2]

2.3 Identify the product when propanenitrile is reduced. State reagents and count the product carbons. [3]

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2.2 Phenylamine lone pair interacts with the ring, reducing availability for H^+ . Alkyl groups increase nitrogen electron density.

2.3 Identify the product when propanenitrile is reduced. State reagents and count the product carbons. [3]

2.3 Propan-1-amine, LiAlH_4 /dry ether then aqueous work-up, three carbons because nitrile carbon is retained.

Exercises 3.1·3.3

3.1 Plan preparation of phenylamine from nitrobenzene, including the work-up. Explain why the work-up is needed. [3]

3.2 Write the equation for ethanoyl chloride with excess ethylamine, including the salt by-product. [3]

3.3 State the two separate stages for making an azo product from phenylamine and phenol. Explain the cold condition and the colour. [4]

Exercises 3.1·3.3

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3.1 Sn and concentrated HCl under reflux; add alkali to convert the initially protonated phenylammonium species to free amine.

3.2 Write the equation for ethanoyl chloride with excess ethylamine, including the salt by-product. [3]

3.2 $\text{CH}_3\text{COCl} + 2\text{C}_2\text{H}_5\text{NH}_2 \rightarrow \text{CH}_3\text{CONHC}_2\text{H}_5 + \text{C}_2\text{H}_5\text{NH}_3^+\text{Cl}^-$. Correct amide, second amine/coefficient, salt/complete balance.

3.3 State the two separate stages for making an azo product from phenylamine and phenol. Explain the cold condition and the colour. [4]

3.3 Cold nitrous acid, from nitrite/acid, makes diazonium salt; alkaline phenol couples. Cold conditions reduce diazonium decomposition; extended delocalisation gives visible-light absorption.