

Exercise walk-through

5.2.1

Explain configurations, ligands and complex charge

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 ground-state configurations after [Ar] for Cr and Cu. [2]

2.2 Give the configurations of Fe^{2+} and Cu^{2+} after [Ar], explaining electron removal. [3]

2.3 Explain why zinc does not meet the transition-element definition but copper does. [2]

Exercises 2.1·2.3

2.1 Give the ground-state configurations after [Ar] for Cr and Cu. [2]

2.1 Cr: $3d^5 4s^1$; Cu: $3d^{10} 4s^1$.

2.2 Give the configurations of Fe^{2+} and Cu^{2+} after [Ar], explaining electron removal. [3]

2.2 Fe^{2+} $3d^6$; Cu^{2+} $3d^9$; 4s electrons are removed before 3d.

2.3 Explain why zinc does not meet the transition-element definition but copper does. [2]

2.3 Stable Zn^{2+} is d^{10} , with no incomplete d subshell; stable Cu^{2+} is d^9 , incomplete.

Exercises 3.1·3.3

3.1 Determine metal oxidation state and coordination number in $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ and

3.2 Explain why replacing water ligands with ammonia can change colour, and why a d^{10} ion often lacks d–d colour. [3]

3.3 Two complexes each have coordination number four. One is tetrahedral and one square planar. Explain why coordination number alone cannot distinguish them; identify the cis relationship in square-planar cisplatin. [2]

Exercises 3.1·3.3

3.1 Determine metal oxidation state and coordination number in $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+$ and

3.1 Chromium: +3, coordination number 6. Cobalt: +3, coordination number 6. Neutral water/en do not alter charge; two Cl^- contribute -2 in the first complex.

3.2 Explain why replacing water ligands with ammonia can change colour, and why a d^{10} ion often lacks d–d colour. [3]

3.2 Changing ligand changes d-orbital splitting, changing the wavelength absorbed. A full d subshell has no vacant d state for the required d–d promotion.

3.3 Two complexes each have coordination number four. One is tetrahedral and one square planar. Explain why coordination number alone cannot distinguish them; identify the cis relationship in square-planar cisplatin. [2]

3.3 The same four donor atoms can occupy different arrangements. In cisplatin the two Cl ligands are adjacent, not opposite.