

13.1 Transition Metals

Question Paper

Course	DPIB Chemistry
Section	13. The Periodic Table- Transition Metals (HL only)
Topic	13.1 Transition Metals
Difficulty	Medium

Time allowed: 10
Score: /5
Percentage: /100

Question 1

In which complexes does iron have an oxidation state of +3?

- I. $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- II. $[\text{Fe}(\text{H}_2\text{O})_5(\text{CN})]^{2+}$
- III. $[\text{Fe}(\text{CN})_6]^{3-}$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

[1 mark]

Question 2

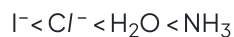
Which complex is likely to be colourless?

- A. $[\text{Zn}(\text{H}_2\text{O})_6]\text{Cl}_2$
- B. $[\text{NH}_4]_2[\text{Fe}(\text{H}_2\text{O})_6][\text{SO}_4]_2$
- C. $\text{K}_3[\text{Co}(\text{CN})_6]$
- D. $[\text{Ni}(\text{NH}_3)_6][\text{BF}_4]_2$

[1 mark]

Question 3

Part of the spectrochemical series is shown.



Which statement can be correctly deduced from the series?

- A. H_2O increases the p-d separation more than Cl^-
- B. H_2O increases the d-d separation more than Cl^-
- C. A complex with NH_3 is more likely to be blue than that with Cl^-
- D. Complexes with water are always blue

[1 mark]

Question 4

Ammonia is a stronger ligand than water. Which statement is correct when concentrated aqueous ammonia solution is added to dilute aqueous copper(II) sulfate solution?

- A. The d-orbitals in the copper ion split.
- B. There is a smaller splitting of the d-orbitals.
- C. Ammonia replaces water as a ligand.
- D. The colour of the solution fades.

[1 mark]

Question 5

Cobalt forms the complex $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$. Which statements are correct for this complex?

- I. The cobalt ion acts as a Lewis acid.
 - II. The cobalt ion has an oxidation state of +2.
 - III. There are 90° bond angles between the cobalt ion and the ligands.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

[1 mark]