13.1 Transition Metals

Question Paper

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

Time allowed: 10

Score: /5

Percentage: /100

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Question 1

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

I. $[Fe(H_2O)_6]^{3+}$
II. $[Fe(H_2O)_5(CN)]^{2+}$
III. $[Fe(CN)_6]^{3-}$

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. $[Zn(H_2O)_6]Cl_2$

B. $[NH_4]_2[Fe(H_2O)_6][SO_4]_2$

C. $K_3[Co(CN)_6]$

D. $[Ni(NH_3)_6][BF_4]_2$

[1 mark]

Question 3

Part of the spectrochemical series is shown.

$$I^- < Cl^- < H_2O < NH_3$$

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]

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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 $[Co(NH_3)_5Cl]^{2+}$. 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]

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