Q1.

Which equation does **not** show the reduction of a transition metal?

A $TiCl_4 + 2\ Mg \rightarrow Ti + 2\ MgCl_2$ ○

B $2\ FeCl_3 + 2\ KI \rightarrow 2\ FeCl_2 + 2\ KCl + I_2$ ○

C $MnO_2 + 4\ HCl \rightarrow MnCl_2 + Cl_2 + 2\ H_2O$ ○

D $CoO + 4\ HCl \rightarrow [CoCl_4]^{2-} + H_2O + 2\ H^+$ ○

(Total 1 mark)

Q2.

Which will **not** act as a ligand in the formation of a complex ion?

A CH_4 ○

B CO ○

C H_2O ○

D NH_3 ○

(Total 1 mark)

Q3.

Which shows the correct oxidation state and co-ordination number of cobalt in $[Co(NH_3)_5Cl]Cl_2$?

	oxidation state	co-ordination number	
A	+2	5	○
B	+2	6	○
C	+3	5	○
D	+3	6	○

(Total 1 mark)

Q4.

Which statement is **not** correct?

A $CuCl_4^{2-}$ is square planar. ⬭

B NH_4^+ is tetrahedral. ⬭

C $[Co(H_2NCH_2CH_2NH_2)_3]^{2+}$ is octahedral. ⬭

D $[Fe(H_2O)_6]^{2+}$ is octahedral. ⬭

(Total 1 mark)

Q5.

Which compound decolourises acidified potassium manganate(VII) solution?

A $Al_2(SO_4)_3$ ⬭

B $CuSO_4$ ⬭

C $FeSO_4$ ⬭

D $Fe_2(SO_4)_3$ ⬭

(Total 1 mark)

Q6.

What is observed when concentrated hydrochloric acid is added to an aqueous solution of $CuSO_4$until no further change occurs?

A A colourless gas is evolved and a precipitate forms. ⬭

B A colourless gas is evolved and no precipitate forms. ⬭

C A precipitate forms that dissolves in an excess of concentrated hydrochloric acid. ⬭

D The solution changes colour and no precipitate forms. ⬭

(Total 1 mark)

Q7.

Which statement is correct about this reaction?

$$[Co(NH_3)6]^{2+} + 3H_2NCH_2CH_2NH_2 \rightarrow [Co(H_2NCH_2CH_2NH_2)_3]^{2+} + 6NH_3$$

A The co-ordination number of cobalt decreases. ⬭

B The enthalpy change is large and positive. ⬭

C The entropy change is large and positive. ⬭

D The shape of the complex changes from octahedral. ⬭

(Total 1 mark)

Q8.

Which complex exists as optical isomers?

A $[Ag(NH_3)_2]^+$ ⬭

B $[Co(C_2O_4)_3]^{4-}$ ⬭

C $[Cu(EDTA)]^{2-}$ ⬭

D $[Cu(NH_3)_4(H_2O)_2]^{2+}$ ⬭

(Total 1 mark)

Q9.

Which is **not** a correct statement?

A Transition metals form coloured ions and complexes ⬭

B Transition metals display variable oxidation states ⬭

C A ligand accepts a pair of electrons from a transition metal ⬭

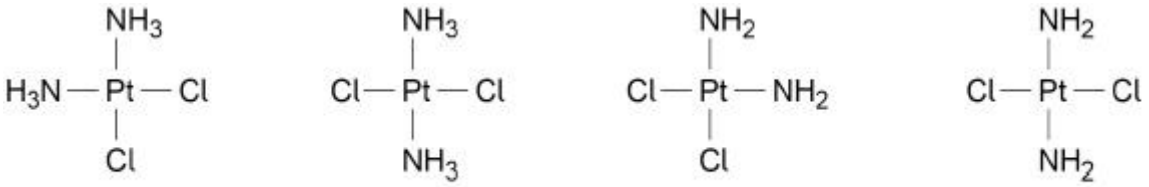
D A complex is a central metal atom or ion surrounded by ligands ⬭

(Total 1 mark)

Q10.

Cisplatin is an anti-cancer drug.

Which structure represents a stereoisomer of cisplatin?



A **B** **C** **D**

A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q11.

A solution absorbs light with wavelengths corresponding to red, yellow and green light.

Which ion is most likely to be in the solution?

A $Cr_2O_7^{2-}(aq)$ ⬭

B $Fe^{2+}(aq)$ ⬭

C $Fe^{3+}(aq)$ ⬭

D $Cu^{2+}(aq)$ ⬭

(Total 1 mark)

Q12.

What is the electron configuration of Cu^{2+}?

A $[Ar]3d^9 4s^2$ ⬭

B $[Ar]3d^{10} 4s^1$ ⬭

C $[Ar]3d^9$ ⬭

D $[Ar]3d^{10}$ ⬭

(Total 1 mark)

Q13.

Electrons in copper(II) ions can be excited by the absorption of light with a wavelength of 600 nm.

What is the increase in energy, in J, for each electron excited?

Speed of light, $c = 3.00 \times 10^8$ m s^{-1}
Planck's constant, $h = 6.63 \times 10^{-34}$ J s

A 3.98×10^{-40} ⬭

B 1.33×10^{-39} ⬭

C 3.32×10^{-28} ⬭

D 3.32×10^{-19} ⬭

(Total 1 mark)

Q14.

An oxide of vanadium catalyses the following reaction:

$$SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$$

What is the formula of the vanadium-containing intermediate formed in this reaction?

A V_2O ⬭

B VO ⬭

C V_2O_3 ⬭

D V_2O_4 ⬭

(Total 1 mark)