Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Inorganic 2

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Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

Solution **A** contains the compound $[Cu(H_2O)_6]Cl_2$

(a) State the type of bonding between the oxygen and hydrogen in this compound.

_____

(1)

(b) State why the chloride ions in this compound are **not** considered to be ligands.

_____

_____

_____

(1)

(c) An excess of ammonia was added to a sample of solution **A** to form solution **B**.

Write an ionic equation for the reaction that occurs when solution **A** is converted into solution **B** and state the colour of solution **B**.

Equation _____

_____

Colour _____

(2)

(d) Aqueous sodium carbonate was added to another sample of solution **A** to form a blue-green solid **C**.

Identify the blue-green solid **C**.

_____

(1)

(e) Reagent **D** was added to another sample of solution **A** to form a yellow-green solution.

Identify reagent **D** and write an ionic equation for the reaction that occurs when the yellow-green solution is formed from solution **A**.

Identity of reagent **D** _____

Equation _____

_____

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(2)

(f) Explain why colorimetry cannot be used to determine the concentration of solutions containing $[CuCl_2]^-$

In your answer refer to the electron configuration of the metal ion.

_____

_____

_____

_____

(2)

(Total 9 marks)

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Q2.

This question is about compounds containing ethanedioate ions.

(a) A white solid is a mixture of sodium ethanedioate ($Na_2C_2O_4$), ethanedioic acid dihydrate ($H_2C_2O_4.2H_2O$) and an inert solid. A volumetric flask contained 1.90 g of this solid mixture in 250 cm^3 of aqueous solution.

Two different titrations were carried out using this solution.

In the first titration 25.0 cm^3 of the solution were added to an excess of sulfuric acid in a conical flask. The flask and contents were heated to 60 °C and then titrated with a 0.0200 mol dm^{-3} solution of potassium manganate(VII). When 26.50 cm^3 of potassium manganate(VII) had been added the solution changed colour.

The equation for this reaction is

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$

In the second titration 25.0 cm^3 of the solution were titrated with a 0.100 mol dm^{-3} solution of sodium hydroxide using phenolphthalein as an indicator. The indicator changed colour after the addition of 10.45 cm^3 of sodium hydroxide solution.

The equation for this reaction is

$$H_2C_2O_4 + 2OH^- \rightarrow C_2O_4^{2-} + 2H_2O$$

Calculate the percentage by mass of sodium ethanedioate in the white solid.

Give your answer to the appropriate number of significant figures.

Show your working.

Percentage by mass of sodium ethanedioate _____ %

(8)

(b) Ethanedioate ions react with aqueous iron(III) ions in a ligand substitution reaction.

Write an equation for this reaction.

Suggest why the value of the enthalpy change for this reaction is close to zero.

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_____

_____

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_____

(2)

(c) Draw the displayed formula of the iron complex produced in the reaction in part (b)

Indicate the value of the O—Fe—O bond angle.

State the type of isomerism shown by the iron complex.

Bond angle _____

Type of isomerism _____

(3)

(d) Ethanedioate ions are poisonous because they react with iron ions in the body. Ethanedioate ions are present in foods such as broccoli and spinach.

Suggest one reason why people who eat these foods do not suffer from poisoning.

_____

_____

(1)

(Total 14 marks)

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