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

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Name of the Student:_____
Max. Marks : 27 Marks **Time : 27 Minutes**

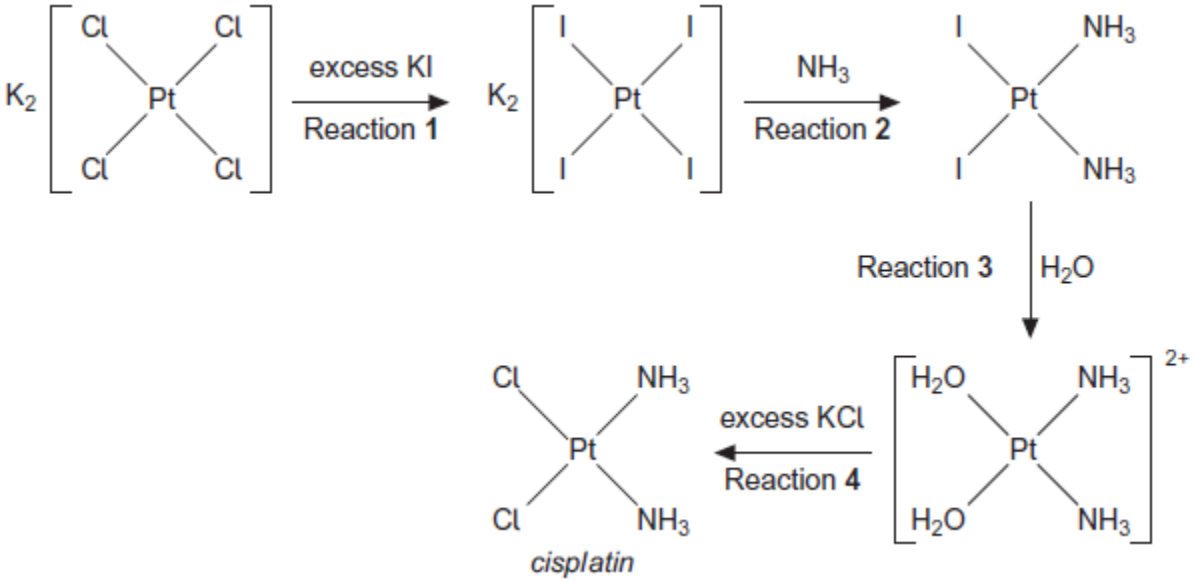
Q1.

Complexes containing transition elements have a wide variety of uses including acting as dyestuffs like *Prussian Blue*.

Cisplatin is a platinum-based chemotherapy drug used to treat various types of cancers. It was the first member of a class of anti-cancer drugs that react with DNA in tumour cells.

Cisplatin is prepared from K_2PtCl_4 according to the following scheme.

All the reactions shown are reversible.



(a) Name the type of reaction occurring in all four steps of the scheme.

_____

(1)

(b) Explain why an excess of potassium iodide is used in Reaction **1**.

_____

_____

_____

(2)

(c) (i) Write an equation for Reaction **1**.

_____

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_____

(1)

(ii) Calculate the percentage atom economy for the formation of K_2PtI_4 in Reaction **1**. Show your working.

_____

_____

_____

_____

(2)

(d) In Reaction **3**, silver nitrate solution is added to improve the yield of product.

(i) Write the **simplest ionic** equation for the reaction of iodide ions with silver nitrate.

_____

(1)

(ii) Suggest why addition of silver nitrate improves the yield of product from Reaction **3**.

_____

_____

(1)

(e) Suggest two reasons, other than poor practical technique, why the overall yield of *cisplatin* in this synthesis may be low.

Reason 1 _____

_____

Reason 2 _____

_____

(2)

(f) The *cisplatin* formed in Reaction **4** is impure. Outline how the impure solid is purified by recrystallisation.

_____

_____

_____

_____

_____

(3)

(g) Platinum compounds are highly toxic.

(i) State why *cisplatin* is used in cancer treatment despite its toxicity.

_____

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_____

(1)

(ii) Suggest a suitable precaution that should be taken by medical staff when using *cisplatin*.

_____

(1)

(Total 15 marks)

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Q2.

Reactions that involve oxidation and reduction are used in a number of important industrial processes.

(a) Iodine can be extracted from seaweed by the oxidation of iodide ions.
In this extraction, seaweed is heated with MnO_2 and concentrated sulfuric acid.

(i) Give the oxidation state of manganese in MnO_2

_____

(1)

(ii) Write a half-equation for the reaction of MnO_2 in acid to form Mn^{2+} ions and water as the only products.

_____

(1)

(iii) In terms of electrons, state what happens to the iodide ions when they are oxidised.

_____

_____

(1)

(b) Chlorine is used in water treatment. When chlorine is added to cold water it reacts to form the acids HCl and HClO
The following equilibrium is established.

$$Cl_2(aq) + H_2O(l) \rightleftharpoons H^+(aq) + Cl^-(aq) + HClO(aq)$$

(i) Give the oxidation state of chlorine in Cl_2 and in HClO

Cl_2 _____

HClO _____

(2)

(ii) Deduce what happens to this equilibrium as the HClO reacts with bacteria in the water supply. Explain your answer.

_____

_____

_____

_____

_____

(2)

(c) Concentrated sulfuric acid is reduced when it reacts with solid potassium bromide.
Concentrated sulfuric acid is **not** reduced when it reacts with solid potassium chloride.

(i) Write the two half-equations for the following redox reaction.

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$2H^+ + 2Br^- + H_2SO_4$ $Br_2 + SO_2 + 2H_2O$

Half-equation 1

_____

Half-equation 2

_____

(2)

(ii) Write an equation for the reaction of solid potassium chloride with concentrated sulfuric acid.

_____

(1)

(iii) Explain why chloride ions are weaker reducing agents than bromide ions.

_____

_____

_____

_____

(2)

(Total 12 marks)

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