U.G. 4th Semester Examination - 2022

CHEMISTRY

[HONOURS]

Course Code : BCEMCCHC402

Course Title : Inorganic Chemistry-III

Full Marks : 30 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **ten** questions: 1×10=10

a) Arrange the following compounds in order of their decreasing acidity: XeF_6, XeF_4, XeF_2

b) Draw the structure of XeF_5 and write the hybridization of Xe in the said compound.

c) Among Bauxite and Haematite, which ore can be concentrated by Magnetie separation?

d) State the hybridization and oxidation state of Nickel in $Ni(CO)_4$.

e) Name the process by which Zirconium metal of very high purity can be obtained.

f) Give an example of a basic flux.

g) What is mosaic gold?

h) Draw the structure of fac $[Cr(H_2O)_3Cl_3]$

[Turn Over]

i) What happens when Microcosmic Salt is heated?

j) What is the difference between didentate ligand and bridging ligand?

k) How do you prepare Nitrolim? Cite one important use of Nitrolim.

l) What is 'Producer Gas'?

m) What do you mean by Silanes? Give one example.

n) What do you rnean by denticity of Ligand?

o) Give one example af an Inner metalic complex of 2nd order.

2. Answer any **five** questions: 2×5=10

a) Formation of $[XeF_2]^-$ from XeF_2 greatly increases the Xe – F bond length, but formation of $[XeF_2]^+$ from XeF_2 does not alter the Xe– F bond length significantly.— Explain.

b) Write the balanced equation of a Xenon compound which undergoes disproportionation reaction upon hydrolysis.

c) Extraction of Hg from HgO does not require any external reducing agent— Explain.

d) What happens when Sodium borohydride is treated with ammonium sulphate? Write the balanced equation.

e) Be_2C (Beryllium Carbide) on hydrolysis gives methane, whereas MgC_2(Magnesium Carbide)

gives Acetylene on hydrolysis- Explain.

f) Why Fluorine cannot act as a central atom in Interhalogen compounds?

g) NH_2–NH_2 can act as a monodentate ligand as well as a bridging ligand, but cannot act as a Chelating ligand – Justify your answer.

h) In $[CoBr(NH_3)_5]SO_4$, bromide ion is a ligand, while in $[Co(SO_4)(NH_3)_5]Br$, it is not a ligand - Explain.

3. Answer any **two** questions: 5×2=10

a) i) Why sulphide ores typically undergo self-reduction?

ii) Why a mixture of Cryolite and Fluorspar is used in the extraction of Aluminum from Bauxite?

iii) "Borazine acts as a lewis acid as well as a lewis base"—Justify the statement.

2+2+1=5

b) i) Consider the following reactions at $1000^{o}C$ and $2000^{o}C$.

$$2Mg + O_2 \rightarrow 2MgO; \quad \Delta G\left(\text{at } 1000^{o}C\right) = -941\,kJ/mole$$

$$\Delta G\left(\text{at } 2000^{o}C\right) = -314\,kJ/mole$$

$$2C + O_2 \rightarrow 2CO; \quad \Delta G\left(\text{at } 1000^{o}C\right) = -439\,kJ/mole$$

$$\Delta G\left(\text{at } 2000^{o}C\right) = -628\,kJ/mole$$

Calculate the free energy change of the reaction (given below) at $1000^{o}C$ and $2000^{o}C$ and prove that reduction of MgO with Carbon can occur at $2000^{o}C$ and not at $1000^{o}C$.

Reaction : $2MgO + 2C \rightarrow 2Mg + 2CO$

ii) What happens when ethanol is added to a basic solution of Carbon disulphide? Draw the structure of the product.

3+2=5

c) i) Consider an octahedral complex Ma_2b_2Cd, where a, b,c and d are monodentate ligands . What is the number of enantiomeric pairs for the complex?

ii) What is Tetraalkyl Lead? State its important use and also the drawbacks of its use.

iii) Pentaamminenitro cobalt(III) chloride is yellowish brown in colour, while pentaamminenitrito cobalt(III) chloride is red –Explain. 2+2+1=5

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