

BACHELOR OF ENGINEERING IN FOOD TECHNOLOGY AND BIOCHEMICAL
ENGINEERING EXAMINATION,

1st Year, 1st Semester

INORGANIC AND ANALYTICAL CHEMISTRY

Time: 3 hrs

Full Marks: 100

Use separate Answerscript for each part

(50 marks for each part)

PART I

Answer **Question no.1** and any four from the rest 2 X 5 = 10

1 (a) What is Na-K ATPase?

(b) Name an ion having multiple valences

(c) What is ionic bond?

(d) Write the name of one ionic compound and one covalent compound

(e) What is the geometry of a sp^3d^2 hybridized central atom?

2. Draw the structure of following compounds according to VSEPR theory:

CH_4 , XeF_4 , BrF_5 , NH_4^+ , SO_2 2 X 5=10

3. Define the following:-

lattice energy, dipole moment, covalent bond, nodal plane in MOT, radius ratio 2 X 5 =10

4. (a) What are the similarities and differences between atomic orbitals and molecular orbitals? Why ethyne molecule is linear? Why water molecule has bent structure but CO_2 is linear? 5+2+3

5. (a) What are the differences between Hemoglobin and Myoglobin?

(b) Write a short note on copper protein

(c) What is the use of halogen tablet? 3+5+2.

6. (a) Draw the MO diagram of O_2 and compare the bond length, magnetic properties of O_2 , O_2^+ and O_2^-

(b) What are intra and inter molecular hydrogen bonding? 6+4

[Turn over

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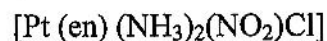
(50 marks for each part)

Part –II (50 Marks)

Answer **Question no.1** and any four from the rest

1(a) Write down the differences between double salt and complex salt.

(b) Give IUPAC nomenclature of the following



(c) Give an example of bidentate and hexadentate ligands.

(d) Give an example of Lewis acid and Lewis base with an example.

(e) Write down the conjugate bases of NH₃ and HNO₃

2x5 =10

2. (a) What is the difference between paramagnetic and diamagnetic compounds? Calculate the magnetic moment value of [Fe(CN)₆³⁻]

2+2=4

(b) Predict the geometry and magnetic property of [Cr(H₂O)₆]SO₄ using valence bond theory.

2+2=4

(c) Draw all isomers of (Pt(NH₃)₂Cl₂) complexes

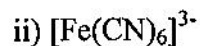
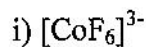
2

3(a) According to Werner theory explain with examples Primary Valency and Secondary Valency

4

(b) Calculate CFSE and magnetic moment of the following complexes

4



(c) What is bridging ligand? Give an example. 2

4 (a) Define hard and soft acids and bases with example 4

(b) Predict with reason which acid should be stronger in aq. solution HF and HI. 2

(c) Calculate the crystal field stabilization energy for d^7 ion (Ni^{2+}) in octahedral and tetrahedral complexes. Use units of Δ° in both cases and which is the most stable? 45(a) What will be the number of unpaired electrons in FeCl_6^{3-} and $\text{Fe}(\text{CN})_6^{3-}$? 2(b) Justify HCl behaves as an acid in H_2O but not in C_6H_6 2(c) H_2SO_4 is stronger than HNO_3 2(d) Draw the various shapes of d orbitals? Why it is split into two groups t_{2g} and e_g in an octahedral field? 46. (a) Justify $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is octahedral and $[\text{Ni}(\text{CN})_4]^{2-}$ is square planar. 4

(b) Explain conjugate acid base theory with examples. 4

(c) How many unpaired electrons are there in Cr^{3+} , Mn^{2+} , Co^{3+} , Fe^{2+} in a very weak octahedral field. 2