Ref No-Ex/ FTBE/CHEM/T/112/2018(s)

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

Ref No-Ex/ FTBE/CHEM/T/112/2018(s)

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 –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

$[Pt\ (en)\ (NH_3)_2(NO_2)Cl]$

$[Co(ONO)(NH_3)_5]SO_4$

(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 NH_3 and HNO_3 2x5 =10

2. (a)What is the difference between paramagnetic and diamagnetic compounds? Calculate the magnetic moment value of $[Fe(CN)_6^{3-}]$ 2+2=4

(b) Predict the geometry and magnetic property of $[Cr(H_2O)_6]SO_4$ using valence bond theory. 2+2=4

(c) Draw all isomers of $(Pt(NH_3)_2Cl_2]$ 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

i) $[CoF_6]^{3-}$

ii) $[Fe(CN)_6]^{3-}$

(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? 4

5(a) What will be the number of unpaired electrons in $FeCl_6^{3-}$ and $Fe(CN)_6^{3-}$? 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? 4

6. (a) Justify $[Ni(NH_3)_6]^{2+}$ is octahedral and $[Ni(CN_4)]^{2-}$ 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