

REF. NO. Ex/FTBE/CHEM/T/112/2019(OLD)

BACHELOR OF ENGINEERING IN FOOD TECHNOLOGY AND BIOCHEMICAL  
ENGINEERING EXAMINATION

FIRST YEAR FIRST SEMRSTER-2019 (OLD)

INORGANIC AND ANALYTICAL CHEMISTRY

TIME- 3 HRS

FULL MARKS-100

Part-I (50 Marks)

Answer Question no. 1 and any four from the rest

1. (a) What is ionization energy? 5X2=10  
a. (b) Write the use of halogen tablet  
b. (c) Name the protein that contains Fe  
c. (d) Define electronegativity  
d. (e) Define ionic bond

2. Discuss the shapes of the following molecules using VSEPR model  
5X2= 10

H<sub>2</sub>O, CO<sub>2</sub>, SF<sub>6</sub>, PCl<sub>5</sub>, O<sub>2</sub>

3. Draw and explain Na<sup>+</sup>/K<sup>+</sup> pump. Define covalent bond. Give example. What is co-ordinate covalent bond? 5+2+1+2

4. Define dipole moment. Compare the dipole moment between NH<sub>3</sub> and NF<sub>3</sub>.  
What causes hydrogen bonding? What is the formula for potassium sulfide?  
2+4+2+2

5. What is lattice energy? Write Born-Lande equation. Draw Born-Haber cycle for NaCl formation from Na and Cl<sub>2</sub> . 3+3+4

6. What is molecular orbital theory? Draw the MO energy diagram for F<sub>2</sub><sup>+</sup> ion and determine the ion's bond order. 4+6

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B. E. FOOD TECHNOLOGY AND BIOCHEMICAL ENGINEERING FIRST YEAR  
FIRST SEMESTER- 2019 (OLD)

INORGANIC &

Time: 3 hrs

Full Marks: 100

ANALYTICAL CHEMISTRY

Use separate Answers script for each part

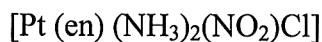
(50 marks for each part)

**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



(c) Give an example of Lewis acid and Lewis base

(d) What will be the number of unpaired electrons in  $\text{FeCl}_6^{3-}$  and  $\text{Fe}(\text{CN})_6^{3-}$ ?

(e) Draw all isomers of  $(\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  complexes

2x5 =10

2 (a) What important ideas we have from Werner Theory of Co-ordination compound. Calculate the crystal field stabilization energy for d7 ion such as  $\text{Co}^{2+}$  in octahedral field complex consider strong field and weak field

3+2

(b) What is the difference between paramagnetic and diamagnetic compounds? Calculate the magnetic moment value of  $[\text{Fe}(\text{CN})_6^{3-}]$

3+2

3. (a) What is Valence bond theory. Predict the geometry of  $[\text{Cr}(\text{H}_2\text{O})_6]\text{SO}_4$  using valence bond theory. 2+3

(b) What is spectrochemical series? According to this series justify the position of Chloride and Cyanide ligand 2+3

4(a) What is Primary Valency and Secondary Valency . Give an example of each

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

i)  $[\text{CoF}_6]^{3-}$

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

(c) Justify  $\text{MnCl}_4^{2-}$  is tetradral not square planar, why? 4+4+ 2

5 (a) State Arrhenius definition of acids and bases with examples. What is its merits and demerits.

(b) Justify  $\text{H}_2\text{SO}_4$  is stronger than  $\text{HNO}_3$

(c) According to HSAB theory explain with examples important characteristics of soft and hard acids and bases. 4+2+4

6.(a) Explain conjugate acid base theory with examples.

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

(c) What is Coordination isomerism? Give an example. 4+4+2