Roll No. 22001.008023

Total Pages : 4

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July 2023

B.Tech. - II SEMESTER

Chemistry (BSC-102)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) For a particle in one-dimensional box, write the equation for calculating the energy values corresponding to $n = 2$. (1.5)

   (b) On the basis of CFT calculate spin only magnetic moment of $[Fe(NH_3)_6]^{3+}$. (1.5)

   (c) Write down the selection rules for electronic spectroscopy. (1.5)

   (d) What are intermolecular forces? How they impact on physical properties of matter? (1.5)

(e) How will you predict spontaneity in terms of entropy and free energy? (1.5)

(f) Explain electrochemical corrosion with suitable example. (1.5)

(g) Differentiate ionization energy and electron affinity. (1.5)

(h) Explain any *two* applications of HSAB principle. (1.5)

(i) Write short note on Optical activity. (1.5)

(j) Explain the mechanism of Nucleophilic bimolecular substitution reaction with an example. (1.5)

PART–B

2. (a) Prepare a molecular orbital energy-level diagram for NO, showing clearly how the atomic orbitals interact to form MOs, illustrating with explanation on difference in electronegativity between N & O and predict the bond order and the number of unpaired electrons. (8)

(b) What is meant by 'doping' in a semiconductor? Explain the role of doping on the band structure of solids. (7)

3. (a) Explain the process of fluorescence using Jablonski diagram. (5)

(b) Compare the principles of NMR and MRI. (5)

(c) Write short note on potential energy surface of $H + H_2$ model. (5)

4. (a) Derive Nernst Equation and write down its applications. (7)

(b) What is meant by hardness of water? How are they classified? Explain any *two* methods for softening of hard water. (8)

5. (a) What is effective nuclear charge? Calculate the Z_{eff} felt by valence electron of chromium atom ($z = 24$). (6)

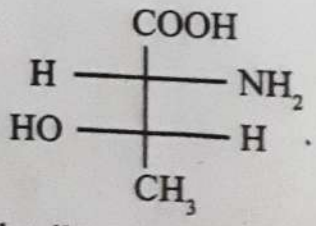
(b) Explain in detail on coordination number and geometries with examples for each. (5)

(c) Explain the periodic trend for electronegativity. (4)

6. (a) Give examples for

(i) Enantiomers (ii) Diastereomers (iii) Metamers (iv) Conformational isomers.

(b) What is/are the absolute configuration/s of the chiral carbon atom/s in



Explain in detail.

(c) Explain the structural isomerism in transition metal compounds with suitable examples. (5)

7. (a) Give example for elimination reaction and compare the El and E2 reactions mechanisms. (7)

(b) Explain in detail about synthesis of commonly used drug molecules Ibuprofen with reactions. (8)
