

Write the following information in the first page of Answer Script before starting answer

ODD SEMESTER EXAMINATION: 2020-21

Exam ID Number _____

Course _____ Semester _____

Paper Code _____ Paper Title _____

Type of Exam: _____ (Regular/Back/Improvement)

Important Instruction for students:

1. Student should write objective and descriptive answer on plain white paper.
2. Give page number in each page starting from 1st page.
3. After completion of examination, Scan all pages, convert into a single PDF, rename the file with Class Roll No. **(2019MBA15)** and upload to the Google classroom as attachment.
4. Exam timing from 10am – 1pm (for morning shift).
5. Question Paper will be uploaded before 10 mins from the schedule time.
6. Additional 20 mins time will be given for scanning and uploading the single PDF file.
7. Student will be marked as ABSENT if failed to upload the PDF answer script due to any reason.

**M.Sc. CHEMISTRY
THIRD SEMESTER
PHYSICAL CHEMISTRY-III
MSC-303**

Duration : 3 hrs.

Full Marks : 70

(PART-A : Objective)

Time : 20 min.

Marks : 20

Choose the correct answer from the following:

1X20=20

- If spin-spin coupling is more than that of spin-orbital coupling, then the molecule show:
 - Fluorescence
 - Phosphorescence
 - Chemiluminescence
 - Inter system crossing
- Among the following, in which region, maximum spontaneous emission occur?
 - Microwave region
 - Radio frequency region
 - Visible region
 - X-ray region
- Among 1S_0 , 3P_2 , 3P_0 and 1D_2 , which one is the ground energy state for an orbital which follow normal multiplicity?
 - 1S_0
 - 3P_2
 - 3P_0
 - 1D_2
- Which of the following multiplicity is observed in f^6 orbital?
 - Normal multiplicity
 - Inverted multiplicity
 - Both normal and inverted multiplicity
 - None of the above
- The ground state for Co^{+3} ion is:
 - 5F_4
 - 5F_0
 - 5D_4
 - 5D_0
- If separation between a donor and an acceptor (R) is half than that of critical energy transfer distance (R_0), the rate of transfer is proportional to:
 - $(1/2)^6$
 - $(2)^6$
 - $(1/2)^3$
 - $(2)^3$
- Which of the following is true for Photodynamic therapy?
 - It is a chemiluminescence process
 - It is a photosensitization process
 - It is a thermal process
 - None of the above
- Excited stable state of a dimer is known as:
 - Excimer
 - Exciplex
 - Photo-dimer
 - None of the above
- Which of them is correct?
 - True electrolyte is strong electrolyte
 - True electrolyte is weak electrolyte
 - Potential electrolyte is strong electrolyte
 - None of them

(PART-B : Descriptive)

Time : 2 hrs. 40 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. What is meant by quenching of fluorescence? Discuss about the Stern-Volmer equation. 5
b. Write a brief note on phase transfer catalysis. 5
2. Explain Einstein treatment for absorption of electromagnetic radiation. Discuss the favorable conditions for both spontaneous and stimulated emission. 6+4=10
3. a. Explain E- type delayed fluorescence. How can you prove that the ratio of quenching efficiency of E- type delayed fluorescence to that of phosphorescence is independent of efficiency of triplet formation? 6
b. What is meant by energy transfer efficiency? Determine the critical energy transfer distance from energy transfer efficiency. 4
4. a. What do you mean by normal multiplicity and inverted multiplicity? Determine the term symbols for Cr(II) and Co (III) complexes. Briefly illustrate about their ground states. 5
b. Write a short note on Bonta & Pintauro model of ion-solvent interactions. 5
5. a. Give pictorial description of Born model of ion-solvent interactions. 4
b. Derive Gibbs free energy free in case of Born model. 4
c. Differentiate between structural and non-structural models of ion-solvent interactions. 2
6. a. Write down the main assumptions of Debye-Huckel theory. 5
b. Show that the total charge on the surrounding ion cloud is equal and opposite to that on the central reference ion. 2
c. Derive Einstein Smoluchowski equation. 3
7. a. Write the fundamental electrocapillary equation for polarizable interfaces. 2
b. Using the above fundamental equation derive the expression of surface excess of a species i obtained from the plot of interfacial tension versus mean activity of the electrolyte taken under conditions of constant applied potential. 8
8. a. What is electrical double layer? How is it formed at the electrode/electrolyte interface? Define Helmholtz-Perrin model for electrical double layer. Apply this model to relate the surface tension change with potential of an electrolyte solution. 6
b. Explain what are polarizable and non-polarizable interfaces? 4

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