

[4]

5. a) Clearly distinguish between a “Proportional Counter” and a “Geiger Muller Counter”. What is the utility of each with particular reference to measurement of ionizing radiation? $2+\frac{1}{2}$
- b) Discuss the working principle of an inorganic scintillator. $2\frac{1}{2}$
- c) With the help of any one “Chemical Dosimeter”, explain how dose rate of an ionizing radiation is evaluated. $2\frac{1}{2}$
- d) With a suitable example of your choice, explain radiometric titration where the indicator used in the titration is radio-labelled. $2\frac{1}{2}$

Ex/SC/CHEM/PG/CORE/TH/XV-A/2023

M. Sc. (CHEMISTRY) EXAMINATION, 2023

(4th Semester)

PAPER: XV–A

[ANALYTICAL CHEMISTRY SPECIAL]

Time : Two Hours

Full Marks : 40

(20 marks for each unit)

Use a separate answer script for each unit.

Unit: A-4151

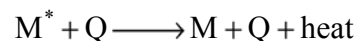
1. Answer *any five* questions : 5×2
- a) Account on the effect of pH on the emission characteristics of 7-hydroxy-4-methylcoumarin and fluorescein. Give mechanism of effect.
- b) Why are two monochromators used in the fluorescence spectrophotometer aligned perpendicular to each other?
- c) 4-N, N-Diethylaniline solution is added in different concentrations to anthracene solution and fluorescence spectra are collected. Do you expect any interesting spectral feature? Explain.
- d) How is life time (τ) related with intensity of emission? Is there any effect of M^{n+} (3d) on the value of τ of an organic fluorogenic ligand coordinated to the metal ion?

[Turn over

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- e) In a metal complex the metal dominated excited state (M_1) lies above S_1 type energy level. Draw the state diagram and comment on the emission spectral feature of the complex.
- f) Vit-A and naphthalene bear five conjugated double bonds. However, fluorescence intensity of naphthalene is approximately five times that of emission intensity of Vit-A. Explain.
- g) Why does phosphorescence emission appear at longer wavelength and life time is higher than fluorescence?

2. Answer any **one** question : 5



Using this scheme, derive Stern-Volmer relation and explain K_{SV} . Give plausible mechanism of quenching. What are the factors influencing the quenching process?

- b) "A molecule 'M' is irradiated and mixed with a second molecule 'X' to synthesise $[M^+X^-]$ while no such reaction is observed upon warming the mixture, in this case." Draw the state diagram of the process and explain.

[3]

3. Write notes on (any **two**) : $2 \times 2\frac{1}{2}$

- a) AIE and its application
- b) Application of fluorescence technique in the sensing of cations.
- c) Fluorescence application in disease diagnosis
- d) FRET and its advantages.

Unit: A-4152

4. a) Is sensitivity of a thermal balance affected due to vibration of the floor where it is installed? Justify your answer. What are the different deflection type balances used in a thermo-gravimetric instrument?

2+1

- b) What is automatic thermo-gravimetry? Describe it with the example of $CaCO_3$ and $SrCO_3$. If the corresponding mixtures of carbonates are treated with perchloric acid, can the mixture of products be estimated using automatic thermo-gravimetry? Justify.

1+2+1

- c) What do you mean by endotherm and exotherm in DTA? What is the fundamental difference between DTA and DSC? How can you measure ΔH of TNT using a simple DTA/DSC instrument?

1+1+1

[Turn over