

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE

DEPARTMENT OF CHEMISTRY

M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)

I SEMESTER

W.E.F 2022-23 (R22 Regulations)

Title of the Paper: GENERAL CHEMISTRY

Course Code	22CH1T1	Course Delivery Method	Class Room / Blended Mode - Both
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction :2017- 18	Year of Offering: 2022 – 23	Year of Revision: 2022-23	Percentage of Revision: 40 %

S.No	COURSE OUTCOMES	PO'S
	After completion of the course, the student will be able to :	
1	Recollect the concepts of titrimetric analysis, statistical rules, visible spectro photometry and group theory in chemistry	2
2	Identify the role of titrimetric analysis, statistical rules, visible spectro photometry and group theory in chemistry.	1,7
3	Demonstrate knowledge of titrimetric analysis, statistical data analysis, visible spectro photometry and group theory in chosen job role.	1,4
4	Test the conceptual knowledge gained in titrimetric analysis, statistical rules / principles, visible spectrophotometry and group theory in chemistry.	1,6

Syllabus

Course Details:-

Unit	Learning Units	Lecture Hours
I	Treatment of analytical data : Classification of errors – Determinate and indeterminate errors –Minimisation of errors – Accuracy and precision – Distribution of random errors – Gaussian distribution – Measures of central tendency – Measures of precision – Standard deviation – Standard error of mean – student's t test – Confidence interval of mean – Testing for significance – Comparison of two means – F – test – Criteria of rejection of an observation – propagation of errors – Significant figures and computation rules – Control charts – Regression analysis – Linear least squares analysis.	12
II	Titrimetric Analysis: Classification of reactions in titrimetric analysis- Primary and secondary standards-Neutralisation titrations-Theory of Neutralization indicators-Mixed indicators- Neutralisation curves-Displacement titrations-Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method- Theory of adsorption indicators-Oxidation reduction titrations-Change of	12

	electrode potentials during titration of Fe(II) with Ce(IV)- Detection of end point in redox titrations-Complexometric titrations- Metal ion indicators-Applications of EDTA titrations-Titration of cyanide with silver ion.	
III	Visible spectro photometry – Theory of spectrophotometry and colorimetry, Beer-Lambert's law - Deviations from Beers law. Classification of methods of colour measurement or comparison (standard series method, Duplication method, Dilution method, photoelectric-photometer method, spectrophotometer method)- Instrumentation – Applications-determination of phosphates, chlorides, Iron, Manganese, chromium - Photometric titrations-Spectrophotometric determination of pK value of an indicator.	12
IV	Symmetry and Group theory in Chemistry I Symmetry elements [Rotational axis of symmetry (C_n), Plane of Symmetry(σ) and Classification of planes of symmetry i.e., Vertical plane(σ_v) Dihedral Plane(σ_d) and Horizontal Plane(σ_h), Improper rotational axis of symmetry(S_n), Inversion centre or Centre of symmetry(i) and Identity element(E)]. Identification of possible symmetry elements in the molecules H_2O , NH_3 , BF_3 , CH_4 , $[PtCl_4]^{-2}$, C_6H_6 , symmetry operation, Axioms of group theory-definition of group, sub group(Trivial and non-trivial sub groups), GMT tables- construction of GMT table Abelian (C_{2v}) and non abelian groups(C_{3v}), relation between order of a finite group and its sub group. Point symmetry group. Schoenflies symbols, Group generating elements, Classification of molecules- MLS, MHS, & MSS. Procedure to Find out Point group of a molecule (yes or no Method),	12
V	Symmetry and Group theory in Chemistry II Representation of groups by Matrices (representation for the C_n , C_{nv} , C_{nh} , D_n etc. groups to be worked out explicitly). Definition of Class and importance of similarity transformation in identifying symmetry class with C_{3v} as example, Character of a representation. Reducible and Irreducible representations - Mulliken notations for Irreducible representations The great orthogonality theorem (without proof) and its importance. Character tables and their use. Construction of Character table (C_{2v} and C_{3v} only). Application of group theory in IR and Raman spectroscopy taking H_2O , NH_3 , BF_3 examples. Mutual Exclusion principle with special reference to cis N_2F_2 and trans N_2F_2 .	12

Reference Books:

1. Vogel's text book of quantitative analysis. (3rd edition)Addition Wesley Longmann Inc.
2. Quantitative analysis R.A Day and A.L.Underwood. Prentice Hall Pvt.Ltd.
3. Fundamentals of Analytical Chemistry – Skoog and West
4. Instrumental Methods of analysis – B K Sharma.

Course Focus: Employability.

M.Sc. DEGREE EXAMINATION

FIRST SEMESTER

Paper-I :: General Chemistry - I

Time: 3 hours
70

Maximum Marks:

SECTION – A

Answer all the questions. Each question carries 4 marks.
(5x4M=20M)

1. (a) Discuss the role of control charts in large scale production. (CO-2, L
- 2)

(Or)

(b) Elaborate the measures of accuracy? (CO-2, L
- 2)
2. (a) Explain the terms primary & secondary standards in titrimetric analysis. (CO-2, L
- 2)

(Or)

(b) Enumerate the significance of mixed indicators. (CO-2,
L- 2)
3. (a) Give an account on classification of molecules in microwave spectroscopy. (CO-2, L
- 2)

(Or)

(b) Write a short note on degrees of freedom. (CO-2,
L - 2)
4. (a) What are hot bands? (CO-2, L
- 2)

(Or)

(b) Construct the group multiplication of C_{2v} point group (CO-2, L
- 2)
5. (a) List out the possible symmetry elements and write the point group of the molecule
HCHO. (CO-2, L –2)

(Or)

- (b) Define a class. Explain with an example. (CO-2, L - 2)

SECTION – B

(10x5=50M)

UNIT - I

6. (a) Write notes on determinate errors. (CO-2, L - 2)

(Or)

- (b)(i) What are the criteria for rejection of an observation? (CO-2, L - 2)

- (ii) Write notes on significant figures and computational rules. (CO-2, L - 2)

UNIT – II

7. (a) Explain the theory of neutralization indicators. (CO-2, L - 2)

(Or)

- (b) Describe the Volhard & Mohr method in precipitation titrations. (CO-2, L - 2)

UNIT – III

8. (a) Explain the spectrophotometric determination of Pk value of an indicator. (CO-2, L - 2)

(Or)

- (b) Discuss the procedure involved in the determination of phosphate ion and manganese.

(CO-2, L - 2)

UNIT - IV

9. (a) Elaborate in detail the symmetry elements & symmetry operations with suitable examples.

(CO-3, L - 3)

(Or)

(b) (i) Identify the possible symmetry elements in CH_4 & C_6H_6 molecules.
(CO-2, L-2)

(ii) Discuss the classification of molecules basing on possible symmetry elements into
MLS, MHS & MOS with examples. (CO-2,
L-2)

UNIT - V

10.a) Enumerate the role of group theory in IR & Raman spectroscopy. (CO-3, L- 3)

(Or)

b) Explain the construction of C_{2v} character table. . (CO-3, L-
3)