File Ref.No.169369/GA - IV - J2/2015/Admn

UNIVERSITY OF CALICUT

Abstract

General & Academic - BVoc programme in Pharmaceutical Chemistry-under Modified BVoc Regulations 2014- Revised Scheme and Syllabus -Implemented w.e.f 2018 admission onwards - Approved-Orders issued

G & A - IV - J

U.O.No. 10622/2018/Admn Dated, Calicut University.P.O, 11.09.2018

Read:-1. U.O No. 3707/2016/Admn dated 31.03.2016

2. U.O No. 7280/2016/Admn dated 13.06.2016

3. Item No. 1 & 3 in the Minutes of the Board of Studies in Pharmaceutical Chemistry held on 29.06.2018

4. Item No. I (17) in the minutes of the meeting of Faculty of Science held on 30.06.2018

5. Item No. II (H) in the minutes of the LXXVIII meeting of Academic Council held on 18.07.2018

ORDER

The Scheme and Syllabus of B.Voc Programme in Pharmaceutical Chemistry under B.Voc Regulations 2014, in the University, w.e.f 2015 admissions has been implemented vide paper read as (1) and an erratum has been issued to the same vide paper read as (2) by attaching the question banks in respect of 2nd to 6th semesters.

Board of Studies in Pharmaceutical Chemistry approved the revised syllabus of B.Voc Programme in Pharmaceutical Chemistry and resolved to implement the same in the University from 2018 admission onwards.

Faculty of Science vide paper read as (4) and Academic Council vide paper read as (5), approved the resolution of Board of Studies in Pharmaceutical Chemistry and orders of the Vice Chancellor has been received to implement the items in the minutes of Faculty of Science that have been approved by Academic Council.

Sanction has, therefore, been accorded for the implementation of the Revised Scheme and Syllabus of BVoc programme in Pharmaceutical Chemistry under BVoc Regulations 2014, in the University, w.e.f 2018 Admissions.

Orders are issued accordingly.

(The syllabus is available in the website: www.universityofcalicut.info)

Biju George K

Assistant Registrar

To

1.Principals of affiliated Colleges offering B.Voc Programme in Pharmaceutical Chemistry

2.Controller of Examinations

Copy to :

JCE I/JCE IV/SF/DF/FC

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

B. Voc. Degree Programme in

PHARMACEUTICAL CHEMISTRY

SCHEME AND SYLLABI

For General and Skill Papers

2018 ADMISSION ONWARDS

PREAMBLE

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs alongwith broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

The B. Voc. Programme is designed to bridge the potential skill gap identified. The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components. The general education component provides emphasis to Communication skill, Presentation skill, Health and Safety, Industrial Psychology, Environmental awareness, Entrepreneurship development and other relevant subjects in the field. General Education Components should not exceed 40% of the curriculum. Skill Development Component should match the skill gap identified at least 50% of Skill Development Component should be allotted to practical and can grow up to 60% based on the nature of the course. The practical component can be carried out in the college and/or the industry partner premises.

B.Voc. Pharmaceutical chemistry is a graduate programme which disciplines at the intersection of chemistry, especially synthetic organic chemistry and pharmacology and various other branch of biological specialities where it involves design, chemical synthetics and development for market of pharmaceutical agents(drugs).

Most pharmacy degrees combine academic research with more vocational training and professional pharmacy skills, such as learning about legal and ethical issues and they will learn all about prescriptions, drugs, medications and clinical practice, and practice responding to different scenarios.

An effective science education can be imparted at the undergraduate level only by revamping the curriculum according to the needs and developments of the modern society from time to time. To achieve this goal, the curriculum should be restructured by giving emphasis on various aspects such as the creativity of students, knowledge of current developments in the discipline, awareness of environmental impacts due to the development of science and technology, and the skills essential for handling equipments and instruments in laboratories and industries.

It is essential to ensure that laboratory chemicals are used at a minimal level without affecting the skill and understanding aimed through laboratory sessions. The change brought about in the present scheme makes use of micro scale techniques and double burette titrations. This has been done without any conceptual deviation from the principles of experiments. This method not only reduces the expenditure on chemicals but also creates an environmental awareness among the students and pollution free atmosphere in the campus. This scheme saves time and energy of students while performing the experiments.

The units of the syllabus are well defined. The number of contact hours required for each unit is also given. A list of reference books is provided at the end of each course.

Aims

This curriculum has been prepared with the objective of giving sound knowledge and understanding chemistry of pharmacy to undergraduate students. The goal of the syllabus is to equip students with the potential to contribute to academic and industrial environments. This curriculum will expose students to various fields of pharama and develop interest in related disciplines.

Broad Objective

The B. Voc courses are designed with the following objectives,

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To understand basic facts and concepts in Pharmaceutical chemistry as well as in chemistry.
- To develop the ability for applying the principles of chemistry in drug synthesis
- To develop skills in the proper handling of instruments and chemicals.
- To be exposed to the different processes used in industries and their applications.
- To make the students eco-friendly by creating a sense of environmental awareness in them.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

Semester

A term consisting of 90 working days including examination days distributed over a minimum of 18 weeks of 5 working days consisting of six hours. Total credits in a semester: 30(equivalent to 450 hours). For final semester internship, the total duration is 900 hours.

Eligibility and Index Calculation

Candidates who have passed pre degree or plus two course(HSE/VHSE/Similar) in any stream with not less than 45% marks in aggregate shall be eligible to apply for admission to the B.Voc Pharmaceutical Chemistry programme.

Index mark calculation:

Plus two marks(HSE,out of 1200.Other streams should be converted to this appropriately).Additional marks are as follows:

1. 50% of the marks scored (in percentage) for Chemistry at +2 level

2. 40% of the marks scored (in percentage) for Biology at +2 level

3. 30% of the marks scored (in percentage) for Physics/Maths/Computer Science at +2 level

4. +2 /VHSE/CBSE/Diploma/Certificate course level- studied Pharmaceutical Science related subjects – 30 marks.

5. NSS-10

6. NCC- as per the A,B,C certificate (5,10,15)

7. CSS-10

Levels of Awards

B. Voc is programme with multiple exits. Following table shows the various certificates and their duration.

Awards	Duration
Diploma	2semester
Advanced diploma	4 Semester
B Voc Degree	6 Semester

Assessment of Students

Assessment of students for each subject will be done by internal continuous assessment and Semester-End examinations. This dual mode assessment will be applicable to both theory and practical and internship courses except for and project.

Sl No	Courses	Internal	External
1	Theory	20	80
2.	Practical and internship/Project	20	80
3.	Major Internship	0	100

Pattern of Questions for Semester-End Examinations

The question papers of Semester-End examinations of theory subjects shall be able to perform achievement testing of the students in an effective manner. Duration of Semester-End examinations will be 3 hours. The pattern of questions for theory subjects shall be as follows:

For Theory

Section	Total No.of questions	No.of question to be answered	Marks for eachquestion	Total marks
A:Very short/Objective type	10	10	1	10
B:Shortanswer type	12	8	2	16
C: Short essay type	9	6	4	24
D: Essay type	4	2	15	30
TOTAL				80

For Practical:

Marks Distribution	Total marks
Theory/ Algorithm/Flow diagram	20

Implementation	30
Result/Output	10
Record	10
Viva	10
Total	80

Grading- Indirect Grading System

Indirect Grading System based on a 7 point scale is used to evaluate the performance of students.

Marks scored	Grade	Remarks
90 and Above	A+	Outstanding
80 to 89	A	Excellent
70 to 79	B	Very Good
60 to 69	C	Good
50 to 59	D	Satisfactory
40 to 49	E	Adequate
Below 40	F	Failure

Calicut University
29-06-2018

Dr. Joby Thomas K
Chairman,
BoS Pharmaceutical Chemistry

CONTENTS

COURSE STRUCTURE

Credit Distribution

Semester	Common Course		General Component	Skill Component	Total
	English	Additional Language			
I	4	4	4+2+2= 8	5+5+4=14	30
II	4	4	4+3=7	4+4+3+4=15	30
III	4	-	2+3=5	5+5+4+5+2=21	30
Iv	4	-	2+3=5	4+4+3+4+2+4=21	30
V	-	-	3+3+4=10	+5+5+5+5=20	30
VI	-	-	-	30	30
Total	**16**	**8**	**38**	**118**	**180**

Detailed curriculum

Semester	Course Code	Paper code	Course Title	Hrs/ Week	Total Hrs	Credit	Marks
I	1.1	GEC1EG01	Transactions Essential English Language Skills A01	4	60	4	100
	1.2	GEC1ML02 GEC1HD02	Common course -7 Malayalam- Bhashayum Sahithyavum-I MAL1 A01 (2) Prose and one act plays A07(3)	4	60	4	100
	1.3	GEC1MT01	Mathematics-I	4	60	4	100
	1.4	GEC1IC01	Theoretical and Inorganic Chemistry-I CHE1BO1	3	45	2	100
	1.5	GEC1IC02	Theoretical and Inorganic Chemistry – II CHE2B02	3	45	2	100
	1.6	SDC1BC01	Introduction to Biochemistry	4	60	5	100
	1.7	SDC1IC03(P)	Inorganic Chemistry-Practical –I CHE4B05(P)	4	60	4	100
	1.8	SDC1PH01 (P)	Pharmaceutics Practical I	4	60	5	100
II	2.1	GEC2EG04	Ways with Words A02	4	60	4	100
	2.2	GEC2ML05 GEC2HD05	Common course-9 Malayalam- Bhashayum Sahithyavum-II MAL2A02(2) Poetry and shortstories A09(3)	4	60	4	100
	2.3	GEC2MT02	Mathematics-II	4	60	4	100
	2.4	GEC2PC01	Physical Chemistry-I CHE3B03	3	45	3	100
	2.3	SDC2MB01	Microbiology	4	60	4	100
	2.5	SDC2HA01	Human Anatomy and Physiology	3	45	4	100
	2.6	SDC2PC02(P)	Physical Chemistry –Practical CHE6B14(P)	4	60	3	100
		SDC2INT01	Internship/Project	4	60	4	100

III	3.1	GEC3EG07	Writing for academic & professional success A03	4	60	4	100
	3.2	GEC3PHY01	Physics-I	2	30	2	100
	3.3	GEC3OC01	Organic Chemistry I CHE4B04	4	60	3	100
	3.4	SDC3PC01	Pharmaceutics	4	60	5	100
	3.5	SDC3PIC01	Advanced Pharmaceutical Operation and Inorganic Pharmaceutical Chemistry	4	60	5	100
	3.6	SDC3PHY02 (P)	Physics practical-I	2	30	2	100
	3.7	SDC3OC02(P)	Organic Chemistry Practical (P) CHE6B15 (P)	5	75	4	100
	3.8	SDC3PH02 (P)	Pharmaceutics Practical II	5	75	5	100
IV	4.1	GEC4EG10	Zeitgeist : Readings on society and culturesA04	4	60	4	100
	4.2	GEC4PHY03	Physics-II	2	60	2	100
	4.3	GEC4IC04	Inorganic Chemistry-III CHE5B06	3	45	3	100
	4.4	SDC4DP01	Drug design and Pharmacology	4	60	4	100
	4.5	SDC5DR01	Indian Drug Regulatory Guideline and Physical Pharmacy	4	60	4	100
	4.6	SDC4IC05 (P)	Inorganic Chemistry Practical CHE6B17(P)	4	60	3	100
	4.7	SDC4PH03(P)	Pharmaceutics Practical III	3	45	4	100
	4.8	SDC4PHY04(P)	Physics practical-II	2	30	2	100
	4.9	SDC4INT02	Internship/Project	4	60	4	100
V	5.1	GEC5OC02	Organic Chemistry II	3	45	3	100
	5.2	GEC5PH02	Physical Chemistry II	3	45	3	100
	5.3	GEC5PM01	Pharmaceutical Management	4	60	4	100
	5.4	SDC5MC01	Medicinal Chemistry	5	75	5	100
	5.5	SDC5EV01 SDC5EV02	Elective 1. Health education and community pharmacy 2. Introduction to Pharmacognosy	5	75	5	100
	5.6	SDC5MC02(p)	Medicinal Chemistry Practical (P)	5	75	5	100
	5.7	SDC5PH04(P)	Pharmaceutics Practical IV	5	75	5	100
VI	6.1	SDC6INT03	Major Internship		900	30	100

SEMESTER I

SEMESTER I

GEC1MT01
Mathematics – I
Total Hours 60; credits 4; Hours/week 4

Module I: Limits and continuty (4 hrs)
Limits and Continuity,Limit of sequencesof number,theorems for calculating limits of sequences.(Statement only proof and theorems omitted Section 1.2, &1.5 of the Text).

Module II: Derivatives (6 hrs)
Derivatives: The derivative of a function, a quick review of differentiation rules
(Section 2.1, 2.2, of the Text)

Module III: Applications of derivatives (10 hrs)
Applications of derivatives: Extreme values of a function. The mean value theorem, First derivative test, (Section 3.1, 3.2, 3.3, of the Text).

Module IV: Integration (4hrs)
Integration: Riemann sums and Definite integrals;
(Section 4.5, of the Text).Application of Integrals: Areas between curves, Finding Volumes by slicing. (Section 5.1ofthe Text.)

Module V: Hyperbolic functions, Application of Integrals and Improper Integrals, (10hrs)
Hyperbolic Functions- Definitions and Identities, Derivatives and Integrals,
Improper Integrals (Section: 6.10 & 7.6 of the Text)

Module VI : Polar Coordinates (15 hrs)
Polar coordinates, Graphing in Polar Coordinates, Polar equations for conic sections, Integration in Polar coordinates, Cylindrical and Spherical Coordinates.
(Sections 9.6, 9.7, 9.8, 9.9, 10.7 of the Text)

Module VII : Multivariable Functions and Partial Derivatives (11 hrs)
Partial Derivatives, differentiability, Chain rule (Sections, 12.3, 12.4, 12.5 of the Text)

Text Book
1.George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.
.
References
1. S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
2. Muray R Spiegel, Advanced Calculus, Schaum's Outline series.
3. S.S. Sastry, Engineering Mathematics, Volume I & II, 4th Edition PHI.
4. Murray R. Spiegel, Advanced Calculus, Schaum's Outline Series.

SEMESTER I

GECIIC01
Theoretical and Inorganic Chemistry – I CHE1B01
Total Hours 45; Credits 2; Hours/Week 3

Module I: Chemistry as a Discipline of Science (10 hrs)

What is Science? - Scientific statements - Scientific methods – Observation - Posing a question -Formulation of hypothesis – Experiment – Theory – Law - Revision of scientific theories and laws – Role of concepts and models in science - Scientific revolution.

Evolution of chemistry - Ancient speculations on the nature of matter - Early form of chemistry –Alchemy - Origin of modern chemistry - Branches of chemistry -Interdisciplinary areas involvingphysics and biology. Objectives of Chemical Research - Research design. Components of a research project: Introduction,review of literature, scope, materials and methods, results and discussion, conclusions andbibliography.

Module II: Some Basic Chemical Concepts (8 hrs)

Symbol of elements – Atomic number and mass number - Atomic mass – Isotopes, isobars and isotones -Molecular mass - Mole concept – Molar volume - Oxidation and reduction – Oxidation number andvalency – Variable valency - Equivalent mass.

Methods of expressing concentration: Weight percentage, molality, molarity, normality, mole fraction,ppm and millimoles.

Module III: Analytical Chemistry - I (9 hrs)

Laboratory Hygiene and Safety: Storage and handling of chemicals. Simple first aids: Electric shocks,fire, cut by glass and inhalation of poisonous gases - Accidents due to acids and alkalies - Burns due tophenol and bromine. Disposal of sodium and broken mercury thermometer - Use of calcium chloride and silica gel in desiccators. Awareness of Material Safety Data Sheet (MSDS) – R & S Phrases (elementaryidea only) – Safe laboratory practices – Lab safety signs.

Volumetric Analysis: Introduction - Primary and secondary standards – Standard solutions - Theory oftitrations involving acids and bases, $KMnO_4$, $K_2Cr_2O_7$, I_2 and liberated I_2 - Complexometric titrations.

Indicators: Theory of acid-base, redox, adsorption and complexometric indicators. Double burette method of titration: Principle and advantages.

Module IV: Atomic Structure (9 hrs)

Introduction based on historical development – John Dalton's atomic theory – Thomson's atom model and its limitations – Rutherford's atom model and its limitations – Failure of classical physics – Black body radiation - Planck's quantum hypothesis - Photoelectric effect - Generalization of quantum theory -Atomic spectra of hydrogen and hydrogen like atoms - Ritz-combination principle– Bohr theory of atom – Calculation of Bohr radius, velocity and energy of an electron - Explanation of atomicspectra – Rydberg equation - Limitations of Bohr theory - Sommerfeld modification - Louis de Broglie's matter waves – Wave-particle duality - Electron diffraction - Heisenberg's uncertainty principle.

Module V: Nuclear Chemistry (9 hrs)

Natural radioactivity – Modes of decay – Group displacement law – Theories of disintegration – Rate of decay – Decay constant – Half life period – Gieger-Nuttall rule – Radioactive equilibrium –Disintegration series – Transmutation reactions using protons, deutrons, α-particles and neutrons –Artificial radioactivity – Positron emission and K electron capture – Synthetic elements.

Nuclear stability – N/P ratio – Packing fraction – Mass defect – Binding energy – Nuclear forces –Exchange theory and nuclear fluid theory – Nuclear fission - Atom bomb – Nuclear fusion – Hydrogenbomb - Nuclear reactors - Nuclear reactors in India.

Isotopes: Detection – Aston's mass spectrograph – Separation of isotopes by gaseous diffusion methodand thermal diffusion method – Application of radioactive isotopes – 14C dating – Rock dating – Isotopesas tracers – Study of reaction mechanism (ester hydrolysis) – Radio diagnosis and radiotherapy.

Text Books

1. Jeffrey A. Lee, The Scientific Endeavor: A Primer on Scientific Principles and Practice, Pearson Education, 1999.
2. C.N.R. Rao, Understanding Chemistry, Universities Press India Ltd., Hyderabad, 1999.
3. Robert H. Hill and David Finster, Laboratory Safety for Chemistry Students, 1st Edition, Wiley, Hoboken, NJ, 2010.
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, East West Press, New Delhi, 2002.
5. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.
6. Satya Prakash, Advanced Inorganic Chemistry, Volume 1, 5th Edition, S. Chand and Sons, NewDelhi, 2012.
7. J. Mendham, R.C. Denney, J. D. Barnes and M. Thomas, Vogel's Text Book of Quantitative Chemical Analysis, 6th Edition, Pearson Education, Noida, 2013.
8. H.J. Arnikar, Essentials of Nuclear Chemistry, 4th Edition, New Age International (P) Ltd., NewDelhi, 1995 (Reprint 2005).

References

1. T.F Gieryn, Cultural Boundaries of Science, University of Chicago Press, Chicago, 1999.
2. H. Collins and T. Pinch, The Golem: What Everyone Should Know about Science, Cambridge University Press, Cambridge, 1993.
3. C.R. Kothari, Research Methodology: Methods and Techniques, 2nd Revised Edition, New AgeInternational Publishers, New Delhi, 2004.
4. Guidance in a Nutshell - Compilation of Safety Data Sheets, European Chemicals Agency, Finland, Version 1.0, December 2013.
5. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, Fundamentals of Analytical Chemistry, 8thEdition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
6. B.K, Sen, Quantum Chemistry – Including Spectroscopy, 3rd Edition, Kalyani publishers, NewDelhi, 2010.
7. D.A. McQuarrie, Quantum Chemistry, 2nd Edition, University Science Books, California, 2008.
8. R.K. Prasad, Quantum Chemistry, 4th Edition, New Age International (P) Ltd., NewDelhi, 2012.
9. J.B. Rajam and L.D. Broglie, Atomic Physics, 7th Edition, S. Chand and Co. Pvt. Ltd., NewDelhi, 1999.

SEMESTER I

GEC1IC02
Theoretical and Inorganic Chemistry – II CHE2B02
Total Hours 5; Credits 3; Hours/Week 2

Module I: Quantum Chemistry (18hrs)

Operator algebra – Linear and Hermitian operators - Laplacian and Hamiltonian operators - Eigenfunctions and Eigen values of an operator - Postulates of quantum mechanics - Well behavedfunctions.Time independent Schrödinger wave equation - Application to particle in a one dimensional box –Normalization of wave function - Particle in a three-dimensional box – Separation of variables -Degeneracy.Application of Schrödinger wave equation to hydrogen atom – Conversion of Cartesian coordinates topolar coordinates - The wave equation in spherical polar coordinates (derivation not required) -Separation of wave equation - Radial and angular functions (derivation not required) – Orbitals andconcept of Quantum numbers (n, l, m).

Radial functions - Radial distribution functions and their plots.Shapes of orbitals (s,p and d). Schrödinger equation for multi-electron atoms: Need for approximation methods.

Electron spin – Spin quantum number - Pauli's Exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle – Electronic configuration of atoms.

Module II: Periodic Properties (9 hrs)

Modern periodic law – Long form periodic table. Periodicity in properties: Atomic and ionic radii -Ionization enthalpy - Electron affinity (electron gain enthalpy) – Electronegativity. Electro negativity scales : Pauling and Mullikan scales. Effective nuclear charge – Slater rule and its applications –Polarising power. Diagonal relationship and anomalous behaviour of first element in a group (basic ideaonly).

Module III: Chemical Bonding – I (9 hrs)

Introduction – Type of bonds – Octet rule and its limitations.

Ionic Bond: Factors favouring the formation of ionic bonds - Lattice energy of ionic compounds - Born-Lande equation (derivation not expected) – Solvation enthalpy and solubility of ionic compounds –Born-Haber cycle and its applications – Properties of ionic compounds - Polarisation of ions – Fajan'srule and its applications.

Covalent Bond: Lewis theory. VSEPR theory: Postulates - Applications - Shapes of BeF_2, BCl_3, $SnCl_2$,CCl_4, NH_3, H_2O, PF_5, SF_4, ClF_3, XeF_2, SF_6, IF_5, XeF_4, IF_7 and XeF_6. Valence Bond Theory. Coordinatebond. Hybridization: Definition and characteristics - sp ($BeCl_2$, C_2H_2), sp^2 (BF_3, C_2H_4), sp3 (CH_4, NH_3,H_2O, NH_4^+, $H3O^+$ and $SO4^{2-}$), sp3d (PCl_5), sp3d2 (SF_6) and sp3d3 (IF_7) hybridizations. Limitations of VBT. Properties of covalent compounds. Polarity of covalent bond – Percentage of ionic character –Dipole moment and molecular structure.

Module IV: Chemical Bonding – II (9 hrs)

Covalent Bond: Molecular Orbital Theory – LCAO - Bonding and anti bonding molecular orbitals –Bond order and its significance. MO diagrams of homonuclear and heteronuclear diatomic molecules H_2, He_2, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, CO and NO – Comparison of bond

length, magnetic behaviour and bond energy of O_2, O_2^+, O_2^{2+}, O^{2-} and O_2^{2-}.Resonance structures of borate, carbonate and nitrate ions – Comparison of bond energy.Comparison of VB and MO theories.

Metallic Bond: Free electron theory, valence bond theory and band theory (qualitative treatment only) -Explanation of metallic properties based on these theories.

Intermolecular Forces: Introduction. Hydrogen bond: Intra and inter molecular hydrogen bonds - Effecton physical properties. Induction forces and dispersion forces: Van der Waals forces, ion-dipole, dipoledipole,ion-induced dipole, dipole-induced dipole and induced dipole-induced dipole interactions.

Text Books

1.A.K. Chandra, *Introductory Quantum Chemistry*, 4th Edition, Tata McGraw Hill Publishing Company, Noida, 1994.

2. R.K. Prasad, *Quantum Chemistry*, 4th Edition, New Age International(P) Ltd., New Delhi, 2012.

3. B.K, Sen, *Quantum Chemistry – Including Spectroscopy*, 3rd Edition, Kalyani publishers, NewDelhi, 2010.

4. B.R. Puri, L.R. Sharma and K.C. Kalia, *Principles of Inorganic Chemistry*, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.

5. Satya Prakash, *Advanced Inorganic Chemistry, Volume 1,* 5th Edition, S. Chand and Sons, NewDelhi, 2012.

6. Manas Chanda, *Atomic Structure and Chemical Bonding*, 4th Edition, Tata McGraw Hill Publishing Company, Noida, 2007.

7. R. Gopalan, *Inorganic Chemistry for Undergraduates*, Universities Press India Ltd., Hyderabad,2009.

References

1. D.A. McQuarrie, *Quantum Chemistry*, 2nd Edition, University Science Books, California, 2008.

2. M.C. Day and J. Selbin, *Theoretical Inorganic Chemistry*, East West Press, New Delhi, 2002.

3. P.W. Atkins and R.S. Friedman, *Molecular Quantum Mechanics*, 3rd Edition, Oxford . UniversityPress, New York, 1997

4. I.N. Levine, *Quantum Chemistry*, 6th Edition, Pearson Education Inc., New Delhi, 2009.

5. Jack Simons, *An Introduction to Theoretical Chemistry*, 2nd Edition, Cambridge University Press, Cambridge, 2005.

6. J.D. Lee, *Concise Inorganic Chemistry*, 5th Edition, John Wiley and Sons, New York, 2008.

SEMESTER I

Code: SDC1BC01
Introduction to Biochemistry
Total Hours 60 ; Credits 5 ; Hours/Week 4

Module I: Biological macromolecules: carbohydrates (10 hrs)

Introduction to carbohydrates, Nomenclature, definition and classification of carbohydrates. Monosaccharides, classification, structural aspect and biological significance. Disaccharides, Oligosaccharides, Polysaccharides. carbohydratemetabolism

Module II: Introduction to lipids (10 hrs)

Structure and function diversity of lipids, Definition and classification, Fatty acids, Triacyl glycerols, glycerophospholipids, Sphingolipids, steroids and other biologically important lipids (Terpenes, Steroids, cholesterol etc.)

Module III: Proteins and Nucleic acids (10 hrs)

Proteins, structure and function, General structure of Amino Acids, Classification of Amino acids, Peptide bond link amino acids in proteins, Composition of amino acid in protein and determining sequence of amino acid residue. Structure of protein, Types of protein structure, Primary structure, Secondary structure, Tertiary structure. Quaternary structure, Various other biologically important protein. Basic studies of nucleic acids.

Module IV: Enzymes and co-enzymes (15 hrs)

Structure and function of enzyme, Classification of enzyme, Enzyme kinetics and its mechanism of action Enzyme inhibition. Types of enzyme inhibition, Reversible enzyme inhibition, Irreversible enzyme inhibition, Regulation of enzyme activity, Enzymes and iso enzymes in clinical diagnosis. Coenzyme classification, Role of vitamin as coenzyme, Biological significance, Metal as coenzyme and its biological significance.

Module V: Role of vitamins, minerals and water (15hrs)

Brief chemistry and role of vitamins. Vitamins- water soluble,fat soluble and water soluble. Functions of vitamins. Deficiency of vitamins A DE KC B. .Water Role of minerals and water in life processes.

Text Books

1. Dr. U Satyanarayana, Biochemistry, 2nd edition, Books and allied (P)., 2004.
2. A. White Philip Handler, E.L. Smith, R.L. Hill Lehman, Principles of Biochemistry, 6th Edition, Tata McGraw Hill Publishing Company Ltd., 2004
3. D.L. Nelson, M.M. Cox, Lehninger Principles of Biochemistry, 4th edition, W.H, Freeman & Company, 2005

References

1. P.C. Champe, R.A. Harvey, Biochemistry, 2nd edition, Lippincott-Raven Publishers, 1994
2. R.K. Murray, D.K. Granner, P.A. Mayes. V.W. Rodwell, Harper's Illustrated Biochemistry, 26th edition, McGraw Hill Publhisher, 2003

SEMESTER I

SDCIIC03(P)
Inorganic Chemistry Practical – I CHE4B05(P)
Total Hours 60; Credits 4; Hours/Week 4

1. Use safety coat, goggles, shoes and gloves in the laboratory.
2. For weighing, either electronic balance or chemical balance may be used.
3. For titrations double burette titration method must be used.
4. A minimum number of 21 experiments should be done, covering III to VII modules, to appear for the examination.

Module I: Introduction to Volumetric Analysis
1. Weighing using chemical balance and electronic balance.
2. Preparation of standard solutions.

Module II: Technique of Quantitative Dilution
Any five experiments of the following types.
1. Preparation of 100 mL 0.2 M H2SO4 from commercial acid.
2. Preparation of 250 mL 0.025 M thiosulphate from 0.1 M thiosulphate.

Module III: Neutralization Titrations
1. Strong acid – strong base titration.
2. Strong acid – weak base titration.
3. Weak acid – strong base titration.
4. Estimation of NH3 by indirect method.
5. Titration of HCl + CH3COOH mixture *Vs* NaOH using two different indicators to determine thecomposition.
6. Estimation of borax: Standard sodium carbonate.

Module IV: Redox Titrations
a) Permanganometry
1. Estimation of oxalic acid.
2. Estimation of Fe2+/FeSO4.7H2O/Mohr's salt.
3. Estimation of hydrogen peroxide.
4. Estimation of calcium.

b) Dichrometry
1. Estimation of Fe2+/FeSO4.7H2O/Mohr's salt using internal indicator.
2. Estimation of Fe2+/FeSO4.7H2O/Mohr's salt using external indicator.
3. Estimation of ferric iron (after reduction with stannous chloride) using internal indicator.

c) Iodimetry and Iodometry
1. Estimation of iodine.
2. Estimation of copper.
3. Estimation of chromium.

Module V: Precipitation Titration (using adsorption indicator)
1. Estimation of chloride in neutral medium.

Module VI: Complexometric Titrations

1. Estimation of zinc.
2. Estimation of magnesium.
3. Estimation of calcium.
4. Determination of hardness of water.

Module VII: Some Estimations of Practical Importance

1. Determination of acetic acid content in vinegar by titration with NaOH.
2. Determination of alkali content in antacid tablets by titration with HCl.
3. Determination of copper content in brass by iodometric titration.
4. Determination of available chlorine in bleaching powder.
5. Determination of COD of water samples.
6. Estimation of citric acid in lemon or orange.
7. Determination of manganese content in pyrolusite.

References

1.J. Mendham, R.C. Denney, J. D. Barnes and M. Thomas, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th Edition, Pearson Education, Noida, 2013.

2.D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, *Fundamentals of Analytical Chemistry*, Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.

3. G.D. Christian, *Analytical Chemistry*, 7th Edition, John Wiley and Sons, New York, 2013.

4. A.L. Underwood, *Quantitative Analysis*, 6th Edition, Prentice Hall of India Pvt. Ltd, New Delhi 1999.

5. D.N. Bajpai, O.P. Pandey and S. Giri, *Practical Chemistry; For I, II & III B. Sc.* Students, S. Chand & Company Ltd, New Delhi, 2012.

SEMESTER I

SDC1PH01
Pharmaceutics Practical- I (P)
Total Hours 60 ; Credits 5 ; Hours/Week 4

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.
2. Separation of amino acids by TLC.
3. Qualitative analysis of inorganic as well as organic constituents of Urine.
4. Quantitative estimation of amino acids.
5. Estimation of glucose in urine
6. Estimation of calcium in Blood
7. Estimation of urea in urine
8. Titerable acidity of urine.
9. Estimation of cholesterol in Blood.
10. Estimation of Glucose in blood & urine.
11. Estimation of Urea in blood.
12. Estimation of ketone bodies in blood.

References

1. D.T. Pulmmer, An Introduction to Practical Biochemistry, McGraw Hill, 1987.
2. Practical Biochemistry by Harold Varley.
3. Text book of Biochemistry by Satyanarayana.

SEMESTER II

SEMESTER II

GEC2MT02
Mathematics – II
Total Hours 60: credit 4: Hours/week: 4

Module I : Matrices (15 hrs)
Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of an elementary Transformations, Row Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogeneous Equations, Characteristic equation of a matrix; Characteristic roots and characteristic vectors. (relevant sections of Text 2).

Module II : Vector Differential Calculus (20 hrs)
A quick Review of vector algebra, Inner product and vector product in R2 and R3.Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field;, Divergence of a vector field, Curl of a Vector Field.(relevant sections of Text 1).

Linear Differential Equations of second and higher order:
Differential operators ,Euler-Cauchy Equations,Wronskain.
Vector Integral Calculus: line integrals and independence of path.

Module III: **Laplace Transforms (5 hrs)**
Laplace Transforms: Laplace Transform, Inverse Transform
(relevant sections of Text 3 – excluding Proofs).

Module IV : Fourier Series ,Partial differential Equations(10 hrs)
Fourier Series : Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions. (Sections 10.1, 10.2, 10.4 of Text 3 – Excluding Proofs).

Module V : Ordinary Differential Equations (7 hrs)
Basic concepts and ideas, Geometrical meaning of y'. Seperable differential equations. (relevant sections of Text).

Module V I Numerical methods (3hrs)
Methods of first order differential equations. (relevant sections of Text).

Text Books
1. Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.
2. Frank Ayres JR : Matrices, Schaum's Outline Series, TMH Edition.
3.Erwin Kreyszig, Ross L. Finney, Calculus

References
1. S.S. Sastry, Engineering Mathematics, Volume II, 4th ed., PHI.
2. Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand.
3. Harry F. Davis & Arthur David Snider, Introduction to Vector Analysis, 6th ed., Universal BookStall, New Delhi.
4. Murray R. Spiegel, Vector Analysis, Schaum's Outline Series, Asian Student edition.

5.

SEMESTER II

GEC2PC01
Physical Chemistry– I CHE3B03
Total Hours 45; Credits 3; Hours/Week 3

Module I: Gaseous State (12 hrs)

Introduction - Postulates of kinetic theory of gases - Derivation of kinetic gas equation - Maxwell'sdistribution of molecular velocities - Root mean square, average and most probable velocities - Collisionnumber - Mean free path - Collision diameter - Deviation from ideal behavior - Compressibility factor –Van der Waals equation of state (derivation required) - Virial equation - Expression of Van der Waalsequation in virial form and calculation of Boyle temperature - PV isotherms of real gases - Continuity of states - Isotherm of Van der Waals equation - Critical phenomena - Critical constants and theirdetermination - Relationship between critical constants and Van der Waals constants.

Module II: Thermodynamics – I (18 hrs)

Definition of thermodynamic terms - System – Surroundings - Types of systems - Intensive andextensive properties - State and path functions - Zeroth law of thermodynamics - First law ofthermodynamics – Concept of heat, work, internal energy and enthalpy - Heat capacities at constantvolume and at constant pressure & their relationship - Expansion of an ideal gas - Work done in isothermal expansion and reversible isothermal expansion - Calculation of W, q, □E and □H forexpansion of an ideal gas under isothermal and adiabatic conditions - Joule-Thomson effect - Liquefaction of gases - Derivation of the expression for Joule Thomson coefficient – Inversion temperature.Second law of thermodynamics - Need for the law - Different statements of the law - Carnot's cycle and its efficiency - Carnot theorem - Concept of entropy - Entropy as a state function - Entropy as a function of V & T and P & T - Entropy as a criteria of spontaneity and equilibrium.

Work and free energy functions - Criteria for reversible and irreversible processes - Gibbs-Helmholtz equation - Partial molar free energy - Concept of chemical potential - Gibbs-Duhem equation - Clapeyronequation - Clapeyron-Clausius equation and its application.

Module III: Thermodynamics – II (10hrs)

Thermochemistry - Standard enthalpies of solution, combustion, neutralization, dissociation, formationand reaction – Hess's law – Variation of enthalpy of reaction with temperature – The Kirchhoff equation– Bond energies.

Third law of thermodynamics - Nernst heat theorem - Statement of third law.

Fundamental concepts of Statistical Thermodynamics - Permutations and combinations – Probability -Relation between entropy and probability - Stirling's approximation - Residual entropy and absoluteentropy.

Module IV: Liquid State (10 hrs)

Introduction - Uniqueness of water. Vapour pressure: Explanation and its determination. Surface tension:Explanation and its determination. Parachor: Explanation and its determination - Application to structureelucidation of compounds. Viscosity: Determination of molecular mass from viscosity measurements.Refraction: Refractive index – Molar refraction and optical exaltation – Application to structure elucidation.

Module V: Chemical Equilibria (10)

Law of chemical equilibrium - Equilibrium constant in terms ofconcentration, partial pressure and mole fractions - Relationship between Kc, Kp and Kx -Thermodynamic derivation of law of chemical equilibrium - Temperature dependence of equilibriumconstant - Van't Hoff's equation - Homogeneous and heterogenous equilibria - Le Chatelier's principleand its applications to chemical and physical equilibria.

Text Books

1. B.R. Puri, L.R. Sharma and M.S. Pathania, *Principles of Physical Chemistry*, 46th Edition, Vishal Publishing Company, New Delhi, 2013.
2. P.L. Soni, O.P. Dharmarha and U.N. Dash, *Textbook of Physical Chemistry*, 23rd Edition, Sultan Chand & Sons, New Delhi, 2011.
3. J. Rajaram and J.C. Kuriacose, *Chemical Thermodynamics*, Pearson Education, New Delhi,2013.
4. F. Daniels and R.A. Alberty, *Physical Chemistry*, 5th Edition, John Wiley and Sons, Canada,1980.
5. Gurdeep Raj, *Advanced Physical Chemistry*, 35th Edition, Goel Publishing House, Meerut, 2009.

References

1. Gordon M. Barrow, *Physical Chemistry*, 5th Edition, Tata McGraw Hill Education, New Delh,2006.
2. K.L. Kapoor, *Physical Chemistry*, Volumes II and III, Macmillan Publishers, Noida, 2004.
3. S. Glasstone and D.H. Lewis, *Elements of Physical Chemistry*, 2nd Edition, Macmillan &Company, UK, 1962.
4. W.J. Moore, *Physical Chemistry*, 5th Edition, Orient Longman, London, 1999.
5. R.P. Rastogi and R.R. Misra, *An Introduction to Chemical Thermodynamics*, 6th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2002.
6. T.L. Hill, *Introduction to Statistical Thermodynamics,* Addison-Wesley, New York, 1987.
7. P.W. Atkins, *Physical Chemistry*, 8th Edition, Oxford University Press, New Delhi, 2006.
8. G.W. Castellan, *Physical Chemistry*, 3rd Edition, Addison-Wesley Educational

SEMESTER II

SDC2MB01
Microbiology
Total Hours 60 ; Credits 4 ; Hours/Week 4

Module I: Introduction to Microbiology (20 hrs)

Classification of Microorganisms with detailed reference to Bacteria, Fungi, virus, and protozoa- Morphology, isolation and identification, growth and cultural characteristics, enumeration and reproduction. Nutritional requirements, growth and cultivation of bacteria and virus. Study of different important media required for the growth of aerobic and anaerobic bacteria & fungi. Differential media, enriched media and selective media, maintenance of lab cultures Staining of bacteria, theories of staining and types of staining techniques. General principles of microbial control- sterilization and disinfection.

Module II: Control of microbes by physical and chemical methods (10 hrs)

Disinfection, factors influencing disinfectants, dynamics of disinfection, disinfectants, antiseptics and their evaluation. Sterilization: different methods, validation of sterilization methods and equipments, sterility testing of pharmaceutical products. Clean area classification, Validation of aseptic room.

Module III: Immunity (30 hrs)

Preservative efficacy, Microbial assay of antibiotics and vitamin B12

Types of immunity. Antigens and antibodies: theories of antigen-antibody reactions, applications of antigen-antibody reactions. Interferons. Vaccines and sera - general study of the preparation of different types of vaccines, sera and toxoids. AIDS. Immunity defensive mechanism of body, microbial resistance, interferon.Vaccines, their preparation, standardization and storage. Sera, the ir preparation, standardization and storage.

Text Books

1. G.gunnz & S.J. Carter "cooper & gunn's tutorial Pharmacy", 6th ed., pitman medical publishing co. London 1972.
2. W.B. Hugo and A.D Russell "Pharmaceutical Microbiology", Blackwell scientific publication,oxford,1987.
3. "Microbiology"- Davis, Duldecco, Eisen.

References

1. Remington's Pharmaceutical sciences" Gennaro A.R ed.. 18th Ed, Mack, Publishing Co, Easton, pa, USA,1990.
2. L.M. Prescott, G.P. Jarly, D.A Klein," Microbiology" 2nd, Ed Wm. C. Brown publishers, Oxford, 1993.
3. S.P Vyas, V.K.dixit," pharmaceutical Biotechnology"1st ed. CBS Publishers & distributors, New Delhi,1998.
4. N.K Jain" Pharmaceutical Microbiology" Vallabh prakashan, Delhi.
5. K. Kieslich.ed 'Biotechnology" vol. Via, Verlag Chamie, Switzerland, 1984

SEMESTER II

SDC2HA01
Human Anatomy and Physiology
Total Hours 45; Credits 4; Hours/Week 3

Module I: Human body (15Hrs)

Introduction & Scope of Human Anatomy & Physiology Scope of anatomy and physiology and terminology used in these subjects.Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors).

Elementary tissues of the human body: Epithelial, connective muscular and nervous tissues, their sub-type and characteristics.Structural & functional organization of cell, its components and functions: Body fluids & its composition, transport mechanisms across the cell membrane, Cell cycle.

Module II: Systems (20Hrs)

Support & Movement-Osseous system: structure, composition and functions of skeleton, classification of joints, types of movements at joints, Disorders of joints.

Skeletal muscles: Their gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscle and their disorders. Nervous system-Central Nervous System: Functions of different parts of brain and spinal cord, Neurohumoral transmission in the Central Nervous System, reflex action, electroencephalogram, cranial nerves and their functions.Autonomic Nervous System: Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S

Module III: Maintenance of Human body – I (20Hrs)

Haemopoietic system: Composition and function of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation.Lymph and Lymphatic system: Composition, formation and circulation of lymph, disorders of lymphand lymphatic system. Basic physiology and functions of spleen.

Cardiovascular system: Basic outline of cardiovascular disorders like hypertension, hypo tension, arteriosclerosis angina, myocardial infarction, congestive heart failure and cardiac arrhythmia. Respiratory system: Anatomy of respiratory organs, functions of respiration, mechanism and regulation of respiration, respiratory volumes and capacity

Module IV: Maintenance of Human body-II (20Hrs)

Digestive system: Gross anatomy of the gastrointestinal tract functions of its different-parts Including those of liver, pancreas and gall bladder. Various gastro-intestinal secretions and their role in the absorption and digestion of food, disorders of digestive system.

Urinary system: Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance. Diseases of the urinary system.

Reproductive system: Male and Female reproductive system and their hormones. Physiology of menstruation, coitus and fertilization. Endocrine System: Basic anatomy and physiology of pituitary, thyroid, Parathyroid, Andrenals, pancreas, Testes and Ovary, their hormones and functions.

References

1. Anne M.R. Agur & Ming J. Lee: Grant's Atlas of Anatomy, Lippincott, Williams and Wilkins B.D. Chaurasia's Human Anatomy (3 Volumes) CBS Publishers & Distributors.
2. B. Young, J. W. Heath: Wheater's functional Histology-a Text and Colour Atlas, Churchill Livingstone.
3. Bullock B.L. & Henze R.L. Focus on Pathphysiology, Lippincott Chatterjee, C.C. Human Physiology (Medical Allied Agency, Calcutta)
4. Chummy S. Sinnatamby: Last's Anatomy – Regional and Applied, Churchill Libingstone.
5. Gandhi, T.P. et. al: Human Anatomy, Physiology & Health Education (B.S. Shah Prakashan, Ahmedabad).
6. Garg K et. al: A Text Book of Histology (CBS Publishers, New Delhi).
7. Ghai, C.L.: A Text book of practical physiology (Jaypee Brothers Medical Publisher (P)

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SEMESTER II

SDCPC02(P)
Physical Chemistry Practical CHE6B14(P)
Total Hours: 60; Credits: 3; Hours/Week:4

General Instructions

1. For weighing, either electronic balance or chemical balance may be used.
2. Use safety coat, goggles, shoes and gloves in the laboratory.
3. A minimum number of 13 experiments must be done, covering the nine modules, to appear for the Examination

.

Module I: Viscosity

1. Determination of viscosity of various liquids using Ostwald's viscometer.
2. Study of glycerine-water system and determination of percentage of glycerine using viscometer(plot composition against time of flow x density of the solution).

Module II: Colligative properties (Cooling curve method)

1. Determination of cryoscopic constant (Kf) of solid solvent using a solute of known molecularmass.
2. Determination of molecular mass of the solute using a solvent of known cryoscopic Constant (Kf).

Solid solvents: Naphthalene, biphenyl, camphor. Solutes: Naphthalene, biphenyl, 1,4dichlorobenzene, diphenylamine, acetanilide, benzophenone.

Module III: Transition Temperature

1. Determination of molal transition point depression constant (Kt) of salt hydrate using solute ofknown molecular mass.
2. Determination of molecular mass of the solute using a solvent of known molal transition point depression constant (Kt).

Salt hydrates: $Na2S2O_3.5H_2O$, $CH_3COONa.3H_2O$. Solutes: Urea, Glucose

Module IV: Phase Equilibria

1. Construction of phase diagram & determination of eutectic composition and eutectic temperature: Naphthalene-biphenyl system, Naphthelene-diphenyl amine system, Biphenyl–diphenylamine system.
2. Influence of KCl impurity on miscibility temperature of phenol–water system and determination of concentration of given KCl solution.

Module V: Refractometry

1. Determination of composition of glycerine-water mixture by refractive index method.
2. Determination of refractive indices of KCl solutions of different concentration and concentration of unknown KCl solution.

Module VI: Conductance

1. Conductometric titration of strong acid x strong base.
2. Conductometric titration of mixture of acids (strong and weak) x strong base.

Module VII: Potentiometry

1. Potentiometric titration of strong acid x strong base.
2. Potentiometric titration of weak acid x strong base.

Module VIII: pH metry

1. Preparation of alkaline buffer solutions.
2. pH metric titration of weak acid with strong base and calculation of dissociation constant.

Module IX: Kinetics (Demonstration experiments)

1. Determination of specific reaction rate of the hydrolysis of methyl acetate catalysed by hydrogenion at room temperature.
2. Determination of overall order of saponification of ethyl acetate.

References

1.A. Findlay, Findlay's Practical Physical Chemistry, 9th Edition, John Wiley and Sons, New York,1972.
2. J.B. Yadav, Advanced Practical Physical Chemistry, Goel Publications, Meerut, 2008.
3. D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw-Hill Book Company, New York, 1962.
4. W.G. Palmer, Experimental Physical Chemistry, Cambridge University Press, Cambridge, 2009.
5. R.C. Das and B. Behra, Experiments in Physical Chemistry, Tata McGraw Hill, NewDelhi,1983.
6. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, Fundamentals of Analytical Chemistry, 8thEdition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.

SEMESTER II

Code: SDC2INT01
Internship/ Project
Total Hours: 60; Credits: 4; Hours/Week:4

Internship should be carried out in the industry, not necessarily with
industry partner. The major idea for internship is to implement the things learned and to get a real life experience. The Evaluation process follows 80% external assessment and 20% internal assessment.

Every student will be assigned an internal guide, allotted from the parent department
concerned or an expert available in the college appointed by the principal or the head of the department. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project.

SEMESTER III

SEMESTER III

GEC3PHY01
Physics-I
Total Hours: 30; Credits: 2; Hours/Week: 2

Module; I Elasticity (4 Hrs)
Elastic modulii. (Elementary ideas)- Work done per unit volume- Poisson's ratio. relation between various elastic constants-Twisting couple on a cylinder- Torsion pendulum-

Module; II Surface Tension & viscosity (5 Hrs)
Surface tension (Elementary ideas)- Variation of surface tension with temperature, impurities, contamination- Effect of evaporation andcondensation.
Viscosity-Coefficient of viscosity-Derivation of poiseuille's equation, stokes equation-Determination of viscosity by poiseuille's method and stokes method-Brownian motion – Viscosity of gases

Module: III Thermo dynamics (4Hrs)
Thermodynamic processes –Indicator diagram (P-V diagram, P-T diagram, T-V diagram,T-S diagram)- Work done in Quasi static process-Work done in Isothermal, Adiabatic,Isochoric, Isobaric processes-First law of thermodynamics-Application to heat capacities-
Entropy-Change of entropy in a carnot's cycle, reversible cycle , irreversible cycle principle of increase of entropy- Entropy and available energy- entropy and disorder.

Module IV Conservation of Energy and Momentum (4 Hrs)
Conservation of energy of a particle –Energy function- Potential energy curve-
Conservative and Non conservative forces- Conservation of Linear momentum-Center of mass frame of reference.

Module V Oscillation and waves (4 Hrs)
Simple harmonic motion (Elementary idea)- equation –examples like oscillation of
simple pendulum, loaded spring-An harmonic oscillator-Damped harmonic oscillator.Wave motion-Equation for plane progressive wave-Energy density- Pressure variations ofplane waves-Fourier theorem.

Module VI Quantum mechanics (4Hrs)
Postulates of quantum mechanics-Wave function-Schrodinger equation (Time dependent & steady state form)-eigen values and eigen functions-electron microscope and scanning tunnelling microscope (Qualitative study)

Module VII Frames of reference: (3hrs)
Inertial frame of reference- Galilean transformation equations and Invariance.

ModuleVIII Relativity (2 hrs)
Breef idea on postulates of special theory-Lorentz transformation equations-length contraction-time dilation.

Text for Study:
Mechanics-J C Upadhaya
Modern Physics-Arthur Bieser
Heat and thermodynamics-Brijlal and Subramanium
Principles of Electronics-VK Mehta

Reference

- Mechanics – J C Upadhyaya
- Special theory of relativity- Resnick
- Modern physics –Arthur Beiser
- Waves, Mechanics & Oscillations- S B Puri
- Properties of matter- D S Mathur
- Heat and Thermo dynamics- D S Mathur (VEdn)
- Properties of matter-JC Upadhaya
- Heat and Thermodynamics - Zemansky
- 5.Physics- Resnick and Halliday
- Thermodynamics- Brijlal and Subramanium

SEMESTER III

GEC3OC01
Organic Chemistry– I CHE4B04
Total Hours: 60; Credits: 3; Hours/Week: 4

Module I: Introduction to Organic Chemistry (5 hrs)

Historical development – Uniqueness of carbon – Classification of organic compounds - Homologousseries - Functional groups (mention only) - Hybridization in organic compounds (mention only).Isomerism: Classification in to structural isomerism and stereo isomerism. Structural isomerism: Chainisomerism, position isomerism, functional isomerism, metamerism and ring-chain isomerism – Keto-enoltautomerism.

Module II: Stereochemistry (15 hrs)

Representation of Organic Molecules: Fischer, Flying wedge, Sawhorse and Newman projection formulae.

Stereoisomerism: Classification into conformational isomerism and configurational isomerism.*Conformational Isomerism:* Conformations - Dihedral angle - Torsional strain - Conformational analysisof ethane and *n*-butane including energy diagrams – Conformations of glycol. Baeyer's strain theory –Merits and demerits. Conformations of cyclohexane - Axial and equatorial bonds - Ring flipping –Conformations of mono substituted cyclohexane.*Optical Isomerism:* Definition – Specific rotation – Chirality and elements of symmetry – DLconfiguration - Enantiomers - Optical isomerism in glyceraldehyde, lactic acid and tartaric acid -Diastereomers – Meso compounds – Cahn-Ingold-Prelog rules - RS notations for acyclic optical isomerswith one and two asymmetric carbon atoms - Erythro and threo representations (elementary idea only) -

Racemic mixture - Resolution methods - Enantiomeric excess. Optical isomerism in compounds lackingasymmetric carbon atoms: Biphenyls and allenes. Asymmetric synthesis.

Geometrical Isomerism: cis-trans, syn-anti and EZ notations with examples - Methods of distinguishinggeometrical isomers using melting point, dipole moment, solubility, cyclisation and heat ofhydrogenation.

Module III: Reaction Mechanism: Basic Concepts (15 hrs)

Definition of reaction mechanism - Curved arrow formalism. Nature of bond fission: Homolysis andheterolysis. Types of reagents: Electrophiles and nucleophiles.

Resonance: Condition, rules and techniques of drawing resonance forms - Resonance energy -Calculation of resonance energy of benzene from heat of hydrogenation.

Electron Displacement Effects: Inductive effect: Definition – Characteristics - +I and -I groups.Applications: Comparison of acidity of (i) formic acid and acetic acid (ii) chlorobutanoic acids.Mesomeric effect: Definition – Characteristics - +M and -M groups.

Applications: Comparison ofbasicity of aniline, *p*-nitroaniline and *p*-anisidine. Hyperconjugation: Definition – Characteristics.

Examples: Propene, ethyl carbocation and ethyl free radical. Applications: Comparison of stabilities of(i) 1-butene and 2-butene (ii) toluene, ethyl benzene and *tert*-butyl benzene. Electromeric effect: Definition – Characteristics - +E effect (addition of H+ to ethene) and -E effect (addition of CN- toacetaldehyde). Comparison of inductive effect, mesomeric effect and hyperconjugation: Comparisonof electron density in benzene, toluene, phenol, chlorobenzene and nitrobenzene. Steric effect:Definition, reason and examples.*Reaction Intermediates:* Carbocations, carbanions, free radicals and carbenes (definition, hybridization,

structure, classification, formation, stability and important reactions) - Rearrangement of carbocations– Nitrenes (mention only).Types and Subtypes of Organic Reactions: Substitution, addition, elimination and rearrangement(definition and simple examples only).

Module IV: Aliphatic Hydrocarbons (15 hrs)

Alkanes: Nomenclature – Isomerism – Preparation from alkenes, alkynes and alkyl halides (reduction andWurtz reaction). Chemical properties: Halogenation (free radical substitution mechanism), aromatisationand isomerisation.*Cycloalkanes:* Nomenclature - Preparation by Freund reaction.*Alkenes:* Nomenclature – Isomerism. Preparation: Dehydrohalogenation of alkyl halides (Saytzeff's rule,mechanism not expected), dehalogenation of dihalides (stereochemistry expected) and dehydration ofalcohols (mechanism expected). Chemical properties: Electrophilic addition - Addition of hydrogen(explanation of stability and heat of hydrogenation based on hyperconjugation and resonance), addition of halogens (mechanism and stereochemistry expected), addition of hydrogen halides (Markownikov andAnti-Markownikov addition with mechanism) and addition of water (mechanism expected) - *Cis* and*trans* hydroxylation, permanganate cleavage and ozonolysis.*Alkadienes:* Classification into cumulated, conjugated and isolated dienes – Thiele's theory of partialvalency - 1,4-addition of 1,3-butadiene – Diels-Alder reaction.

Alkynes: Nomenclature of alkynes and alkenynes – Isomerism – Berthelot's reaction - Preparation from dihalides and acetylides. Chemical properties: Electrophilic addition – Addition of hydrogen usingLindlar's catalyst and Na/liquid ammonia - Addition of halogens and hydrogen halides – Oxymercuration- Ozonolysis - Reaction with chromic acid and KMnO4 - Acidity of 1-alkynes.Comparison of electrophilic addition rate of alkenes and alkynes. Chemistry of the test for unsaturation:Bromine water, bromine in CCl4 and Baeyer's reagent.

Module V: Aromatic Hydrocarbons (6 hrs)

Nomenclature and isomerism in substituted benzene, naphthalene and anthracene - Structure andstability of benzene (Kekule, Resonance and Molecular Orbital concepts). Electrophilic substitutionreactions in benzene with mechanisms: Halogenation, nitration, sulphonation, Friedel-Craft's alkylationand acylation - Orientation of aromatic substitution – Ring activating and deactivating groups withexamples - *ortho*, *para* and *meta* directing groups - Side chain oxidation.Haworth synthesis of naphthalene – Nitration and sulphonation of naphthalene. Polycyclic arenes ascarcinogens (simple examples only).

Module VI: Aromaticity (4 hrs)

Huckel's (4n+2) rule and its simple applications to benzenoid (benzene, naphthalene and anthracene) and non-benzenoid (furan, pyrrole, pyridine, indole, quinoline, cyclopropenyl cation, tropylium cation,cyclopentadienyl anion and annulenes) systems – Comparison of basicity of (i) pyrrole and pyridine (ii) indole and quinoline - Anti-aromatic compounds.

Text Books

1. L.G. Wade Jr., Organic Chemistry, 6th Edition, Pearson Education, New Delhi, 2013.
2. A. Bahl and B.S. Bahl, Advanced Organic Chemistry, 1st Multicolour Edition, S. Chand & Company, New Delhi, 2010.
3. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, A Textbook of Organic Chemistry, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.
4. C.N. Pillai, Organic Chemistry for Undergraduates, 1st Edition, University Press, Hyderabad, 2008.
5. S.C. Sharma and M.K. Jain, Modern Organic Chemistry, Vishal Publishing Company, New Delhi, 2014.
6. P.S. Kalsi, Organic Reactions, Stereochemistry and Mechanism, 4th Edition, New Age International Publishers, New Delhi, 2006.

References

1. J. Clayden, N. Greeves and S. Warren, Organic Chemistry, 2nd Edition, Oxford University Press,New York, 2012.
2.D. Nasipuri, Stereochemistry of Organic Compounds: Principles and Applications, 3rd Edition, New Age International Publishers, New Delhi, 2011.
3. E.L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1992.
4. V.K. Ahluvaliya, Organic Reaction Mechanisms, 3rd Edition, Narosa Publishing House, New Delhi, 2007.
5. M.S. Singh, Advanced Organic Chemistry: Reactions and Mechanisms, Pearson Education, New Delhi, 2014.
6. Peter Sykes, A Guide Book to Mechanism in Organic Chemistry, 6th Edition, Pearson Education,New Delhi, 2013.

SEMESTER III

Code: SDC3PC01
Pharmaceutics
Total Hours: 60; Credits: 5; Hours/Week:4

Module I :Posology (8 Hrs)

Meaning of pharmaceutical dose and dosage formulae Factor affecting pharmaceutical dose , dosage route of administration, calculation of doses for infants, adults and elderly patients,medical terms,pharmaceutical distribution system,Healthsystem,first aid measures, General view of pharmaceuticl industries in world wide view.

Module II: Pharmaceutical Calculations (5 Hrs)

System of weights and measures in Pharmacy - House hold measures and use of equivalents imperial system to metric system, Enlarging and reducing recipes, , Dilution and concentration of formulation – Calculation of Allegation method - Alligation medial and allegation alternate , percentage solutions, proof spirit, isotonic solutions and displacement value.

Module III :Prescription, Compounding of medication and Incompatibility (15Hrs)

Definition, parts, handling, sources of errors in prescriptions, knowledge of latin terms commonly used in prescription writing and their translation into English. Modern concepts of dispensing pharmacy. Powders, tablets, Capsules, Tablet triturates, Pills, Lozenges, Ointments, Creams, Pastes, Jellies, suppositories, Suspensions, Emulsions, mixtures, sprays, Inhalations, paints, labeling of dispensed products. physical, chemical and therapeutic incompatibilities and their corrections.

Module IV :Community Pharmacy (15 Hrs)

Introduction and management community pharmacy organization and structure of retail and wholesale drug store-types of drug stores and design- Legal requirements for establishment, maintenance of drug store. Dispensing of proprietary products, maintenance of records of retail and whole sale.

Inventory control in community pharmacy: definition, various methods of inventory control, ABC, VED, EOQ, lead time, safety, stock.

Module V :Health Education (7Hrs)

Pharmaceutical care: Definition and practical of pharmaceutical care. Emergency – treatment in stock, snake-bite, burns, poisoning, heart diseases, fractures, resuscitation methods. Elements of minor surgery and dressings. WHO definition, health promotion care of child, pregnant & breast feeding woman and geriatric patient, role of pharmacist in family planning, prevention of communicable diseases i.e tuberculosis, hepatitis, leprosy, AIDS, syphilis, gonorrhea.

Module VI : Public Health, Diseases & Awareness (10Hrs)

Classification of food requirement, balanced diet, nutritional deficiency disorders, their treatment and prevention, specification for drinking water. Demography cycle, family

planning, various contraceptive methods, First Aid: Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods.

Text Books

1. Hoover's dispensing of medication, Mack publishing.
2. Pharmaceutical practice, By Diana M Collett and Michale E. Aulton, Elbs publishers.
3. Dispensing for pharmaceutical students, by cooper and Gunn by S.J Carter, Cbs publishers.

Reference books:

1. Joseph Barnett Sprowls, prescription Pharmacy
2. S.J Carter, cooper and Gunn's dispensing for pharmaceutical students,
3. Carter, 11th edition CBS Publishers.
4. 3.N.K.jain and S.N. Sharma. The concise Pharmaceutical Dispensing. Vallabh Prakashan, Delhi.
5. N.K. Jain, Health education and Community pharmacy, CBS publishers.
6. Pharmaceutical Dosage forms and drug Delivery systems By Howard C, Ansel by
7. Lippincott Williams & Wilkins.
8. Remington: the science and practice of pharmacy, Mac publishers.
9. Drug and Cosmetics Act and Rules by Vijay Malik.
10. A practical guide to pharmaceutical care, Roverts John p ed9et.al), American pharmaceutical Association.
11. Current dispensing practices, Nanda Arun, Vallabh Prakashan.
12. Pharmacy Practice for technicians, Ballington Don A, New Age international publication.

SEMESTER III

Code: SDC3PIC01
Advanced Pharmaceutical Operations and Inorganic Pharmaceutical Chemistry
Total Hours: 60; Credits: 5; Hours/week: 4

Module I: Acids and Bases (18 Hrs)

Acids and bases-acid base theory, specification of acidity and basicity, inorganic acid (boric acid HCL, HNO_3, H_3PO_4), inorganic acids (H_2SO_4), inorganic bases (strong ammonia solution, calcium hydroxide, KOH, Na_2CO_3, NaOH,).
Buffers- theory and mechanism, pharmaceutical buffer selection, pharmaceutical buffer system, preparation of pharmaceutical buffer.
Antioxidant- theory, the selection of antioxidants, official antioxidants (hypophosphorous acid, sodium bisulphite, sodium thiosulphate, sodium nitrite, nitrogen).
Pharmaceutical accepted glass-chemistry of glass, types of test employed for glass.
Water: (water, purified water, water of injection, bacteriostatic water for injection, sterile water for injection).

Module II: Radio pharmaceuticals and contrast media (14 Hrs)
-radioactivity-alpha; beta and gamma radiations, biological effects of radiations, measurement of radioactivity, G.M. counter; radio isotopes—their uses, storage and precautions with special reference to the official preparations. Radio opaque contrast media—barium sulfate.

Module III:Major intra and extracellular electrolytes (10Hrs)

Electrolytes used for replacement therapy—sodium chloride and its preparations, potassium chloride and its preparations. Physiological acid-base balance and electrolytes used—sodium acetate, potassium acetate, sodium bicarbonate injection, sodium citrate, potassium citrate, sodium lactate injection, ammonium chloride and its injection. Combination of oral electrolyte powders and solutions

Module IV :Diagnostic Agents and Tests (18 Hrs)
Radiopaques - organo iodo compounds. Compounds used in function tests, dyes, radio isotopes, RIA, ELISA. Dyes used in pharmacy: fluorescein, mercurochrome, acridine dyes.Colouring agents: official colours, colour code.Liver and gastric function tests and kidney function tests.

References

1. T.E. Wallis, Text Book of Pharmacognosy, 5th Edn., J&A Churchil, 1967
2. W.C. Evans, Trease and Evans' Pharmacognosy, 15th Edn., Bailliere Tindall,2002.
3. C.K. Kokate, A.P. Purohit and S.B. Gokhlae, Pharmaconosy, Nirai Prakashan,2007.
4. S.S. Kadam, K.R. Mahadik, K.G. Bothra, Principles of Medicinal Chemistry Vol.1, 18th Edn., Nirali Prkashan, 2007.
5. A. Kar, Medicinal Chemistry, New Age International, 2007.
6. N.K. Jain, A Text Book of Forensic Pharmacy, 6th Edn., Vallabh Prakashan, 2003.
7. P. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, Tata McGraw Hill, 2001.
8. D.M. Vasudevan, S. Sreekumari, V. Kannan, Textbook of Biochemistry for Medical Students, 6th Edn., JP Medical, 2010.

SEMESTER III

SDC3OC02(P)
Organic Chemistry Practical CHE6B15(P)
Total Hours: 75; Credits:4; Hours/Week: 5

General Instructions

1. Micro scale analysis must be adopted for organic qualitative analysis.
2. Use safety coat, goggles, shoes and gloves in the laboratory.
3. Reactions must be carried out in tiles, wherever possible.
4. A minimum number of 7 organic analysis and 7 organic preparations shall be done to appear for the examination.

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Module I: Reagent Preparation

Preparation of Borshe's reagent, Schiff's reagent, Tollen's Reagent, Fehling's solution, phenolphthalein,
methyl orange, N-Phenylanthranilic acid and neutral FeCl3.

Module II: Determination of Physical Constants

1. Determination of boiling point.
2. Determination of melting point (capillary method and using melting point apparatus).

Module III: Recrystallisation Techniques

Recrystallise any four organic compounds using ethyl acetate, ethanol and water. Note the crystalline shape.

Module IV: Solvent Extraction (Use ether and record the yield recovery).

1. Aniline from water.
2. Methyl benzoate from water.

Module V: Reactions of Organic Compounds

Study of the reactions of functional groups from the following list (also prepare the derivatives).

1. Phenols (phenol, α-naphthol, β-naphthol).
2. Nitro compounds (nitrobenzene, *o*-nitrotoluene).
3. Amines (aniline, N,N-dimethyl aniline).
4. Halogen compounds (chlorobenzene, benzyl chloride, *p*-dichlorobenzene).
5. Aldehydes and ketones (benzaldehyde, acetophenone).
6. Carboxylic acid (benzoic acid, cinnamic acid, phthalic acid, salicylic acid).
7. Carbohydrates (glucose, sucrose).
8. Amides (benzamide, urea).
9. Esters (ethyl benzoate, methyl salicylate).
10. Hydrocarbons (naphthalene, anthracene).

Module VI: Organic Preparations

1. Halogenation: *p*-bromoacetanilide from acetanilide, Tribromoaniline from aniline.
2. Nitration: *p*-nitroacetanilide from acetanilide
3. Oxidation: Benzoic acid from benzaldehyde, Benzoic acid from toluene.
4. Hydrolysis: Benzoic acid from ethyl benzoate, Benzoic acid from benzamide.

5. Diazo-coupling: Methyl orange from aniline, Phenylazo–β-naphthol from aniline.
6. Haloform reaction: Iodoform from acetone or ethyl methyl ketone.
7. Acylation: Acetylation of salicylic acid or aniline, Benzoylation of aniline or phenol.

Note: *Determine the yield. Calculate the theoretical yield and percentage conversion. Recrystallise the prepared compounds from appropriate solvents.*

Module VII: Chromatography

Paper chromatographic separation of mixture of two amino acids.

References

1. B.S. Furniss, A.J. Hannaford, P.W.G. Smith and A.R. Tatchell, *Vogel's Textbook of PracticalOrganic Chemistry*, 5th Edition, Pearson Education, Noida, 2014.
2. F.G. Mann and B.C. Saunders, *Practical Organic Chemistry*, 4th Edition, Pearson Education, Noida,2011.
3. Arthur I. Vogel, *Elementary Practical Organic Chemistry- Small Scale Preparations*, 2nd Edition,Pearson Education, Noida, 2013.
4. V.K. Ahluwalia and S. Dhingra, *Comprehensive Practical Organic Chemistry*, Universities Press,Hyderabad, 2004 (Reprint).

SEMESTER III

SDC3PH02 (P)
Pharmaceutics Practical -II
Total Hours: 75; Credits: 5; Hours/week: 5

Module I: Synthesis
Synthesis of some typical organic medicinal compounds, spectral illustration of the intermediates and products formed:
paracetamol, sulphanilamide, hippuran, benzocaine, clofibrate, mercurochrome, phenytoin, dapsone, diodoquin, antipyrine, aminacrine and phenobarbitone.

Module II:Dispensing

01. Emulsions
a. Castor oil emulsion
b. Shark liver oil emulsion
c. Liquid paraffin emulsion

02. Liniments
a. Turpentine liniment
b. Methyl salicylate liniment
c. Camphor liniment

03. Ointments
a. Compound benzoic acid ointment
b. Non-staining iodine ointment

04. Pastes
a. Unnas paste
b. Magnesium sulphate paste

05. Creams
a. Vanishing cream
b. Cetrimide cream

06. Paints
a. Mandel's paint
b. Tannic acid glycerine paint

07. Lotions
Calamine lotion

08. Dentrifices
a. Tooth paste
b. Tooth powder

09. Mixtures
Typical mixtures involving incompatibilities.

10. Tablets
a. Aspirin tablet
b. A P C tablets

References
1. T. E. Wallis, Practical Pharmacognosy, Churchill, 1948.
2. A.O. Bentley, J.E. Driver, Bentley and Driver's Textbook of Pharmaceutical Chemistry, 7th Edn., Oxford University Press, 1960.
3. K.A. Connors, A Textbook of Pharmaceutical Analysis, John Wiley & Sons,2007.
4. J.W. Cooper, C. Gunn, Cooper and Gunn's Dispensing for Pharmaceutical Students, Pitman Medical, 1967.
5. A. Kar, Advanced Practical Medicinal Chemistry, New Age International, 2007.

SEMESTER III

SDC3PHY03(P)
Physics Practical-I
Total Hours: 30; Credits: 2; Hours/week: 2

- **Characteristics of Diode and Zener diode**
- Liquid lens- Refractive index of liquid and glass
- **Torsion pendulum- Rigidity modulus**
- Spectrometer- Refractive index of the material of prism
- **Deflection Magnetometer- Moment of a magnet (Tan-A position)**
- **Potentiometer-Measurement of resistance**
- **Young's modulus – Uniform bending –using optic lever**
- Static torsion – Rigidity modulus
- **Spectrometer- Grating- Normal incidence**
- Melde's string- Frequency of fork (Transverse and Longitudinal mode)
- **Half wave rectifier and Full wave rectifier**
- **Field along the axis of a circular coil**

SEMESTER IV

SEMESTER IV

GEC4PHY03
Physics -II
Total Hours: 30; Credits: 2; Hours/Week: 2

Module I: Optics (7Hrs)
Laws of reflection and refraction- verification by Fermat's principle
Superposition of two sinusoidal waves (resultant amplitude and intensity)., constructive and destructive interference Interference by a plane film- colours of thin films**.** Fresnels and Fraunhoffer class of diffraction- plane diffractionGrating-resolving power and dispersive power. Experiment with grating Elementary idea- Brewster' law-

Module II: Electronics (5 Hrs)
Half wave, Full wave and bridge rectifier circuits- Efficiency & ripple factor- Filter circuits (capacitor filter and π filters) – Zener diode characteristics- Voltage stabilization.
Transistors- CB, CE, CC Configurations- characteristics- Current amplification factors relationconnecting α , β and γ .

Module III :Electrostatics (2 Hrs)
Coulomb's law between charges- Electric field- field lines- Electric potential-Gauss law

Module IV :Current electricity (3Hrs)
Drift velocity of charges- electric resistance- super conductivity (basic ideas)- Potentiometer – determination of resistance- carey fosters bridge-

Module V: Magnetism (3Hrs)
Earths magnetism- magnetic elements- Dia magnets-paramagnets and Ferro magnets magnetic moment-Deflection magnetometer-Tan A - Searle's vibration Magnetometer.

Module VI; Nuclear physics (3 Hrs)
Nucleus and its properties- nuclear force- stability of nucleus- binding energy- nuclear fission- fusion- reactors- Radio activity- α ,β and γ radiations- half life and mean life- C14 dating.

Module VII: Cosmic rays and Elementary particles (3 Hrs)
Elementary particles- Classification- Leptons- Hadrons- resonance particles- quarks- color and flavour-

Module VIII: Laser physics (2 Hrs)
Induced absorption- spontaneous emission and stimulated emission- population inversion- Principle of Laser- (qualitative study)

Module IX :Principle of Communication (2Hrs)

Transmission and reception of signals- modulation and demodulation- Types of modulation-AM, FM,PM.(Elementary only)

Text for study:

Optics-Brijlal&Subramanian
Principles of Electronics-VK Mehta

- Optics- Ajay Ghatak 2. Optics – Brijlal&Subrahmanian
- Laser fundamentals – Silfast
- Lasers – theory & applications- Thyagarajan & Ghatak
- Principles of Electronics – VK. Mehtha
- Introduction to Electro dynamics-David J Griffith
- Electricity and Magnetism – Arthur F kip
- Concepts of Modern physics – Arthur Beiser
- Nuclear physics – Irvin Kaplan
- Nuclear physics - D.C.Tayal

SEMESTER IV

GEC4IC04
Inorganic Chemistry – III CHE5B06
Total Hours: 45; Credits: 3; Hours/Week: 3

Module I: Analytical Chemistry - II (5 hrs)

Qualitative Analysis: Applications of solubility product and common ion effect in the precipitation ofcations – Interfering acid radicals and their elimination (oxalate, fluoride, borate, phosphate, chromate,arsenite and arsenate) - Introduction of micro scale experiments in inorganic and organic qualitativeanalysis & their advantages.

Gravimetric analysis - Co-precipitation and post precipitation - Accuracy and precision – Classification and minimization of errors - Sampling and its types (elementary idea only).

Module II: Representative Elements - I (7 hrs)

Hydrogen: Position in the periodic table – Isotopes of hydrogen (separation method not needed) –Difference between ortho and para hydrogen.

Alkali and Alkaline Earth Metals: Comparative study based on electronic configuration, oxidation state,size, density, melting point, boiling point, electrode potential, ionization energy, metallic character, flamecolour and hydration enthalpy - Reactivity with oxygen and water – Thermal stability and solubility of sulphates and carbonates – Basicity of hydroxides - Anomalous properties of lithium and beryllium -Diagonal relationship between lithium and magnesium & beryllium and aluminium - Preparation and uses of sodium carbonate and plaster of Paris - Structure of $BeCl_2$.

Boron Family: Electronic configuration, size, melting point, boiling point, density, standard electrode potential, ionization energy, electronegativity and oxidation state - Inert pair effect - Reactivity with water, hydrogen and halogen – Comparison of Lewis acidity of boron halides - Anomalous behavior of boron - Diagonal relationship between boron and silicon - Preparation, properties, structure and uses of diborane, boric acid, borazine and boron nitride – Structure of $AlCl_3$.

Carbon Family: Electronic configuration, catenation, size, melting point, boiling point, density, standard electrode potential, ionization energy, electronegativity and oxidation state - Inert pair effect – Reactivity with water, hydrogen and halogen - Allotropy – Structure and hybridization of diamond and graphite –Fullerenes (mention only) – Amorphous carbon. Anomalous properties of carbon.

Module III: Representative Elements - II (9 hrs)

Nitrogen Family: Electronic configuration, size, ionization energy, electronegativity, oxidation state, atomicity and allotropy - Hydrides (comparison of boiling point, reducing property, basic strength and bond angle) – Structure of oxides N and P - Oxy acids of N and P (structure and acidic strength only) –Anomalous properties of nitrogen - Preparation, properties and uses of ammonia and nitric acid.Oxygen Family: Electronic configuration, size, ionization energy, electronegativity, oxidation state and atomicity - Hydrides (comparison of boiling point and bond angle) – Structure of SO_2 and SO_3 - Oxy and peroxy

acids of sulphur (structure and acidic strength only) – Anomalous properties of oxygen - Preparation, properties, structure and uses of ozone, hydrogen peroxide and sulphuric acid – Role ofselenium in xerography.

Halogens: Electronic configuration, size, electron affinity, standard reduction potential, bond energy,electronegativity and oxidation state - Hydrides (acidic strength, reducing property and boiling point) –Oxy acids of chlorine (structure and acidic strength only) – Structure of ClO2 – Electropositive character of iodine - Anomalous properties of fluorine - Preparation and uses of hydrochloric acid -General preparation and properties of interhalogen compounds (study of individual members notrequired) – Structure and hybridization of ClF3, ICl3 and IF5 - Comparison of properties of halogens and pseudohalogens (cyanogen as example) – Structure of polyhalide ions.
Noble Gases: Discovery – Occurrence – Separation by charcoal adsorption method - Structure of oxides, fluorides and oxy fluorides of xenon - Reaction of xenon fluorides with water – Uses of noble
gases.

Module IV: Inorganic Polymers & Non-aqueous Solvents (9 hrs)
Inorganic Polymers: Structure and applications of silicones and silicates. Phosphazenes: Preparation, properties and structure of di and tri phosphonitrilic chlorides. SN compounds: Preparation, properties and structure of S2N2, S4N4 and (SN)x.
Non-aqueous Solvents: Classification - General properties - Self ionization and leveling effect –Reactions in liquid ammonia and liquid SO2.

Module V: Environmental Pollution (9 hrs)
Air pollution: Major air pollutants - Oxides of carbon, nitrogen and sulphur - Particulates – Londonsmog and photochemical smog. Effects of air pollution: Acid rain, green house effect and depletion of ozone. Control of air pollution - Alternate refrigerants. Bhopal Tragedy (a brief study).Water pollution: Water pollution due to sewage and domestic wastes – Industrial effluents –Agricultural discharge – Eutrophication. Quality of drinking water - Indian standard and WHO standard. Water quality parameters: DO, BOD and COD – Determination of BOD and COD. Toxic metals in water (Pb, Cd and Hg) - Minamata disaster (a brief study). Control of water pollution - Need for the protection of water bodies.
Thermal pollution, noise pollution and radioactive pollution (Sources, effects and consequences) -Hiroshima, Nagasaki and Chernobyl accidents (a brief study).
Local environmental movements: Silent Valley, Plachimada, Narmada.
Pollution Control Board: Duties and responsibilities.

Module VI: Solid Waste Management (6 hrs)
House hold, municipal and industrial solid waste - Non-degradable, degradable and biodegradablewaste – Hazardous waste - Pollution due to plastics. Solid waste management: Recycling, digestion,dumping, incineration, land treatment and composting. Impacts of medical waste and E-waste & their disposal. Energy production from waste.

Text Books

1. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, 3rd Edition, Longmans, Green, London, 1962.
2. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, 31st Edition, Milestone Publishers and Distributors, New Delhi, 2013.
3. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Oxford University Press, New Delhi 2008.
4. P.L. Soni and Mohan Katyal, Textbook of Inorganic Chemistry, 20th Edition, S. Chand and Sons,New Delhi, 2013.
5. R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press, Hyderabad, 2009.
6. S.S. Dara, A Textbook of Environmental Chemistry and Pollution Control, 8th Edition, S. Chand and Sons, New Delhi, 2008 (Reprint).
7. B.K. Sharma and H. Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 1996.

References

1. J. Mendham. R.C. Denney, J.D. Barnes and M. Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education, Noida, 2013.
2. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, Fundamentals of Analytical Chemistry, 8th Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
3. J.E. Huheey, E.A. Keitler and R.L. Keitler, Inorganic Chemistry – Principles of Structure and Reactivity, 4th Edition, Pearson Education, New Delhi, 2013.
4. B. Doughlas, D.H. McDaniel and J.J. Alexander, Concepts and Models in Inorganic Chemistry,3rd Edition, John Wiley and Sons, New York, 1994.
5. D.F. Shriver and P. Atkins, Inorganic Chemistry, 5th Edition, Oxford University Press, New York, 2010.
6. Gary L. Miessler, Paul J. Fischer and Donald A. Tarr, Inorganic Chemistry, 5th Edition, Prentice Hall, New Jersey, 2013.
7. Wahid U. Malik, G.D. Tuli and R.D. Madan, Selected Topics in Inorganic Chemistry, S. Chand and Co., New Delhi, 2010 (Reprint).
8. Gurudeep Raj, Advanced Inorganic Chemistry Vol-I, 33rd Edition, Krishna Prakashan Media (P) Ltd., Meerut, 2014.
9. Gurudeep Raj, Advanced Inorganic Chemistry Vol-II, 31st Edition, Krishna Prakashan Media (P) Ltd., Meerut, 2008.
10. A.G. Sharpe and H.J. Emeleus, Modern Aspects of Inorganic Chemistry, 4th Edition, UBs Publisher's Distributors Ltd., New Delhi, 2000.
11. A.K. De., Environmental Chemistry, 6th Edition, New Age International (P) Ltd., NewDelhi,2006.
12. A.K. Ahluwalia, Environmental Chemistry, Ane Books India, New Delhi, 2008.

SEMESTER IV

SDC4DP01
Drug Design and Pharmacology
Total Hours: 60; Credits: 4; Hours/Week: 4

Module I : Principles of Drug Therapy and Drug Design (10 Hrs)

General Principles of Drug Therapy. Relationship between chemical structure, lipid solubility and biological activity of drugs. Stereochemistry and biologicalactivity.Drug action-receptor theories. Drug metabolism–different pathways. Drug design: various factors of drug design, rational drug design. Methods of lead discovery: optimisation of the lead, natural and synthetic sources of lead compounds. Bioisosterism. Prodrug and soft drug concept. Drug synthesis.

Combinatorial synthesis (basic concepts). Retrosynthetic analysis of benzocaine, saccharin, salbutamol and benzodiazepines. Basic concepts of CADD, molecular modeling, molecular docking. QSAR physicochemical parameters, introduction to 2D & 3D QSAR.

Module II :Pharmacology (8 Hrs)

General principles of pharmacology: biological response to drugs, passage of drugs across membranes. Pharmacokinetic principles: absorption, distribution, metabolism and excretion of drugs. Dose of drugs and routes of administration. Pharmacodynamic principles: dose response relationships, mechanism of drug action, unusual and adverse responses of drugs, structurally specific and nonspecific drugs. Ferguson's principle. Drug interactions-synergism, antagonism, drug addiction and drug dependence, drug tolerance, drug hypersensitivity.

Module III : Metallic compounds used in pharmaceutical chemistry (10 Hrs)

Calcium lactate, calcium gluconate, iron gluconate, iron fumerate, ferric ammonium citrate, ferrous sulphate, aluminium hydroxide gel, calamin, zincoxide, zinc stearate, magnesium stearate, talc, yellow mercuric oxide, trivalent and pentavalent antomonials, selenium sulfide, lithium salts, gold, platinum and bismuth compounds. Metal toxicity - cadmium, lead, copper and mercury.

Module IV : Drugs acting on CNS (20 Hrs)

General anaesthetics. Inhalation anaesthetics - ether, enflurane, halothane, nitrous oxide, cyclopropane. Intravenous anaesthetics - thiopentone sodium, ketamine.

Hypnotics, sedatives and anxiolytic agents. Anxiolytic agents-benzodiazepines, buspirone and meprobamate. Anticonvulsants: convulsions, types of epilepsy, barbiturates-hydantoins, oxazolidinediones, succinimides and benzodiazepines. Analeptics: xanthines, amphetamines, nikethamide and ethamivan. Centrally acting muscle relaxants: glyceryl ethers-mephenesin, alkane diolderivatives-meprobamate, benzodiazepines-librium, diazepam and baclofen.

Antiparkinson's agents: dopamine agonists, dopamine releasing agents and synthetic anticholinergics. Drugs for Alzheimer's disease: cholinergic agonists and acetylcholine esterase inhibitors.

Synthesis of the following drugs - Enflurane, Ketamine,Etomidate, Phenobarbital,Diazepam, Chlordiazepoxide, Meprobamate, Buspirone, Ethinamide, Nikethamide, Ethamivan, Trimethadione,Ethosuximide, Denzimol, Topiramate, Mephenesin, Levodopa, Besiperidine and Tacrine.

Module V: Analgesics (12 Hrs)

Narcotic analgesics - morphine and its analogues, phenyl(ethyl) piperidines, diphenyl heptanones and benzocaine derivatives. Antipyretics and NSAIDs: Basic idea of COX I &I I inhibitors, salicylatesaspirin,p-aminophenol derivatives-paracetamol, phenacetin, pyrazolidinedionesphenyl butazone, oxyphenbutazone, anthranilicacid derivatives-mefanamic acid, flufenamic acid,indoleacetic acid derivatives-indomethacin, arylacetic/propionic acid derivatives(ibuprofen, ketoprofen, flubiprofen and diclofenac), oxicams(piroxicam and tenoxicam). Drugs used for gout - allopurinol, selective COX II inhibitors Synthesis of the following drugs-levorphanol, pethidine, methadone, phenylbutazone, flufenamic acid, diclofenac, piroxicam, allopurinol and celicoxib.

References

1. G. Patrick, Medicinal Chemistry, BIOS. 2001.
2. T. Nogrady, D.F. Weaver, Medicinal Chemistry, Oxford University Press, 2005.
3. W.O. Foye, T.L. Lemke, D.A. Williams, Principles of Medicinal Chemistry, 4th Edn., Williams & Wilkins, 1995.
4. J.P. Remington, Remington's Pharmaceutical Sciences, Vol.13, , 19th Edn., Mack,
5. D. Sriram , P. Yogeswari, Medicinal Chemistry, Pearson Education India, 2010.
6. K. D. Tripathi, Essentials of Medical Pharmacology, 6th Edn., Jaypee, 2008
7. L.S. Goodman, A. Gillman, The Pharmacological Basis of Therapeutics, 10th Edn., McGraw Hill, 2001.
8. S.S. Kadam, Principles of Medicinal Chemistry, Vol.I & II, Pragati Books, 2008.
9. A. Kar, Medicinal Chemistry, New Age International, 2007.
10. C.O. Wilson, J.M. Beale, J.H. Block, Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th Edn., Lippincott Williams and Wilkins

SEMESTER IV

SDC4DR01
Indian Drug Regulatory Guidelines and Physical Pharmacy
Total Hours: 60; Credits: 4; Hours/Week:4

MODULE I : Good Laboratory Practice (5Hrs)
Good laboratory Practice, Standard operating procedure, Standard Testing procedure, Certificate of Analysis, Method of Analysis, good receipt note.

MODULE II :**Approval of new drugs (15 Hrs)**
Investigational New Drugs (IND) submission, format & content of IND, content of investigator Brochure, general consideration of new drug Approval (NDA), specific requirements, content & format of NDA, manufacturing control requirement of NDA.GMP, ISO 9000, TQM, ICH

MODULE III: Health and Hazards (7 Hrs)
Occupational Health and Hazards, Safety at workplace, Accident prevention techniques, Safety Management system, list of hazardous chemicals and handling of toxic and hazardous chemicals, acids, ether & etc.

MODULE IV: Forensic Pharmacy (18 Hrs)
Pharmaceutical Legislation in India. Legal aspects of trade in drugs.The Drugs and Cosmetic Act and rules Intellectual Property Rights (IPR), Patents, Trademarks, Copy rights, Patent Acts relevant sections (basic ideas only) A brief study of the various Prescription/Non-prescription Products, Medical /Surgical accessories, Diagnostic aids, appliances available in the market.

Physical pharmacy
MODULE V: Size reduction and separation (15 hrs)
Size reduction :- Objectives, and factors affecting size reduction, methods of size reduction– Study of Hammer mill, Ball mill, Fluid Enegy mill and Disintegrator.
Size separation–Size separation by sifting. Official Standard for powders. Sedimentation methods of size separation. Construction and working of cyclone separator.

Recommended Books for the syllabi are:

1. Gary D. Christian, Analytical chemistry, John Wiley & sons N.Y., 5th Ed., 1994.
2. Indian Pharmacopoeia 2007, Volume- I, II and III.
3. International conference on harmonisation of Technical requirements for registration of pharmaceuticals for human use. ICH Harmonised tripartite guideline. Guideline for Good laboratory Practical.

SEMESTER IV

SDC4PHY04 (P)
Physics Practical-II
Total Hours: 30; Credits:2 ; Hours/Week:2

1. Young's modulus- Pin and microscope (Non- Uniform bending)..
2. Potentiometer- Conversion of Galvanometer in to voltmeter –calibration by standard voltmeter
3. .Viscosity of liquid- Capillary flow- Variable pressure head method
4. Logic gates – Verification of truth table
5. Carey Fosters bridge- Resistivity of the material of wire
6. Surface Tension-Capillary rise method-Radius by microscope.
7. Young's modulus of a cantilever- Pin and microscope method
8. Potentiometer-Calibration of low range voltmeter
9. Moment of inertia of fly wheel
10. 4.. Tangent galvanometer – Reduction factor
11. Searle's vibration magneto meter – Comparison of moments
12.. Newton's rings- Wavelength of sodium light

SEMESTER IV

SDC4IC05(P)
Inorganic chemistry practcal-III CHE6B17(P)
Total Hours: 60; Credits: 3; Hours/Week: 4

General Instructions

1. Micro scale analysis must be adopted for inorganic qualitative analysis.
2. Mixtures containing more than one interfering anions must be avoided.
3. If interfering anions are not present, cations may be given from the same group.
4. Use safety coat, goggles, shoes and gloves in the laboratory.

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Module I: Inorganic Qualitative Analysis

1. Study of the reactions of following ions.
   Anions: Carbonate, sulphate, fluoride, chloride, bromide, iodide, acetate, borate, oxalate, phosphate and nitrate.
   Cations: Lead, bismuth, copper, cadmium, iron, aluminium, cobalt, nickel, manganese, zinc,barium, calcium, strontium, magnesium and ammonium.
2. Systematic analysis of mixtures containing two cations and two anions from the above list.
3. *Elimination of interfering anions:* Fluoride, borate, oxalate and phosphate.

Module II: Inorganic Preparations

1. Ferric alum
2. Potash alum
3. Mohr's salt
4. Nickel(II) dimethylglyoximate
5. Potassium trisoxalatoferrate(III)
6. Potassium trioxalatochromate(III)
7. Tris(thiourea)copper(I) sulphate
8. Tetraamminecopper(II) sulphate
9. Microcosmic salt
10. Sodium nitroprusside

References

1. G. Svehla, Vogel's Qualitative Inorganic Analysis, 7th Edition, Prentice Hall, New Delhi, 1996.
2. V.V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3rd Edition, The National Publishing Company, Chennai, 1974.
3. W.G. Palmer, Experimental Inorganic Chemistry, Cambridge University Press, 1970.

SEMESTER IV

SDC4PH03(P)
Pharmaceutics Practical III
Total Hours: 45; Credits: 4; Hours/Week:3

I Human anatomy and Physiology

- Study on Human Skelton system
- Demonstration of models
- Blood group identification
- Hb count determination of WBC RBC

II Microbiology

- Preparation of Various type of culture media :- Preparation of some typical nutrient media for collection and isolation of bacteria – preparation of pure cultures
- Nutrient agar, endo 's agar, chapman'sagar,tergitol – 7 agar, Mcconkey agar. Identification and staining of bacteria (simple staining, Gram staining, Acid fast staining, negative staining, and capsule staining)
- Examination of Bacteria for motility: - Hanging drop method
- Enumeration of bacteria in milk :- The reductase test
- Evaluation of disinfectants and antiseptics (phenol coefficient test, minimum inhibitory concentration)
- Antibiotic Sensitivity test – disc diffusion method.

SEMESTER IV

Code: SDC4INT02

Internship/Project
Total Hours: 60; Credits: 4; Hours/Week:4

Internship should be carried out in the industry, not necessarily with
industry partner. The major idea for internship is to implement the things learned and to get a real life experience. The Evaluation process follows 80% external assessment and 20% internal assessment.
Every student will be assigned an internal guide, allotted from the parent department
concerned or an expert available in the college appointed by the principal or the head of the department. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project.

SEMESTER V

SEMESTER V

GEC5OC02
Organic Chemistry – II
Total Hours: 45; Credits: 3; Hours/Week: 3

Module I: Halogen Compounds (9 hrs)

Nomenclature – Classification - Isomerism. Preparation of alkyl halides: From alcohols, Swarts reaction,Finkelsain reaction and allylic bromination of alkenes. Preparation of aryl halides: From benzene anddiazonium salts. Nucleophilic substitution reactions: SN1 & SN2 mechanisms - Characteristics and energyprofile diagrams - Comparison of rate of alkyl, aryl, allyl and vinyl halides. Elimination reactions: E1 &E2 mechanisms and their characteristics - Saytzeff's rule. Substitution *Vs* elimination. Nucleophilic aromatic substitution reaction with mechanism: Elimination–addition and addition–elimination mechanisms - Benzyne intermediate. Distinction between nuclear and side chain halogenated hydrocarbons. Uses of CHCl3, CHI3, CF3CHClBr and CF2Cl2 – Uses and health effects of CCl4.

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Module II: Hydroxy Compounds (8 hrs)

Alcohols: Nomenclature – Classification - Isomerism. reparation of ethanol from molasses – Preparation of rectified spirit and absolute alcohol - Power alcohol, proof spirit and denatured spirit (mention only). Chemical properties: Reactions involving cleavage of O-H bonds (acidity and esterification), oxidation (with PCC,- Chemistry of methanol poisoning – Harmful effects of ethanol in the human body. Test for alcohols: Luca's test and Victor Meyer's test.

Phenols:. Chemical properties: Acidity (substituent effects), bromination, nitration, sulphonation, Riemer-Tiemann reaction (mechanism not expected), Liebermann's nitroso reaction.Preparation and applications of phenolphthalein, fluorescein, eosin and alizarin – Reason for the colour change of phenolphthalein with pH. Uses of phenol.

Module III: Aldehydes and Ketones (6 hrs)

Nomenclature – Chemical properties: Nucleophilic addition (addition of water, HCN, bisulphite,alcohol and Grignard reagent - Comparison of nucleophilic addition rate of aliphatic and aromatic aldehydes and ketones), addition-elimination reactions (with hydroxyl amine, hydrazines, semicarbazide,ammonia and amines), reduction (Clemmenson, Wolff-Kishner, metal hydride and MPV reductions) and oxidation (with KMnO4, Tollen's reagent, Fehling's solution, Benedict's reagent, bromine water and Oppenauer oxidation) – Acidity of α-hydrogen - Aldol condensation (mechanism not expected)

Module IV: Carboxylic Acids (8hrs)

Carboxylic Acids: Nomenclature

Chemical properties: Acidity (effect of substituent on the acidity of aliphatic and aromatic carboxylic acids) - HVZ reaction - Decarboxylation - Kolbe electrolysis (mechanism expected) Action of heat on dicarboxylic acids – Blanc's rule. Preparation, reactions and uses of oxalic acid,cinnamic acid and citric acid - Role of lactic acid in exercise -

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Module V: Nitrogen Compounds (9 hrs)

Nitro Compounds:– Harmful effects of nitrobenzene in the human body. Explosives: Definition - TNT, nitro glycerine, RDX and ANFO (structural formula and chemistry behind the explosion).

Amines Chemical properties: Basicity (effect of substituents on the basicity of aliphatic and aromatic amines), carbylamine reaction, conversion of amine to alkene (Hofmann's elimination with mechanism and stereochemistry), acylation and reaction with nitrous acid. Electrophilic substitution reactions of aniline: Halogenation, nitration and sulphonation. Preparation and uses sulpha drugs – Structural formula of sulphapyridine, sulphadiazine, sulpha thiazole and sulpha guanidine. Separation of amines by Hinsberg's method. Diazonium Salts: Preparation and synthetic applications of benzene diazonium chloride. Preparation of methyl orange - Reason for its colour change with pH. Carbonic Acid Derivatives: Preparation and properties of urea and semicarbazide – Estimation of urea (hypobromite method and urease method) - Basicity of guanidine.

Module VIII: Heterocyclic & Active Methylene Compounds (5 hrs)

Heterocyclic Compounds: Classification – Nomenclature - Preparation and properties of furan, pyridine and indole. Active Methylene Compounds: Examples – Preparation of ethyl acetoacetate by Claisen condensation (mechanism not expected) - Tautomerism - Synthetic applications of ethylacetoacetate.

Text Books

1. L.G. Wade Jr., *Organic Chemistry*, 6th Edition, Pearson Education, New Delhi, 2013.
2. A. Bahl and B.S. Bahl, *Advanced Organic Chemistry*, 1st Multicolour Edition, S. Chand & Company, New Delhi, 2010.
3. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.
4. C.N. Pillai, *Organic Chemistry for Undergraduates*, 1st Edition, University Press, Hyderabad, 2008.
5. S.C. Sharma and M.K. Jain, *Modern Organic Chemistry*, Vishal Publishing Company, New Delhi, 2014.

References

1.J. Clayden, N. Greeves and S. Warren, *Organic Chemistry*, 2nd Edition, Oxford University Press, New York, 2012.
2. P.Y. Bruice, *Essential Organic Chemistry*, 1st Edition, Pearson Education, New Delhi, 2013.
3. V.K. Ahluwaliya, *Organic Reaction Mechanisms*, 4th Edition, Narosa Publishing House, New Delhi, 2013 (Reprint).
4. John McMurry, *Fundamentals of Organic Chemistry*, 5th Edition, Brooks/Cole, Pacific Grove, California, 2002.
5. I.L. Finar, *Organic Chemistry Vol. I*, 5th Edition, Pearson Education, New Delhi, 2013.
6. G.M. Louden, *Organic Chemistry*, 4th Edition, Oxford University Press, New York, 2008.
7. Jerry March, *Advanced Organic Chemistry*, 5th Edition, John Wiley and Sons, New York, 2004.
8. R.T. Morrison, R.N. Boyd, *Organic Chemistry*, 7th Edition, Pearson Education, New Delhi, 2013.
9. T.L. Gilchrist, *Heterocyclic Chemistry*, 3rd Edition, Pearson Education, New Delhi, 1997.

SEMESTER V

GEC5PH02
Physical chemistry - II
Total Hours: 45; Credits: 3; Hours/Week: 3

Module I: Kinetics & Catalysis (7 hrs)

Kinetics: Chemical kinetics and its scope - Rate of a reaction - Factors influencing the rate of a reaction - Rate law - Order and molecularity - Derivation of rate constants for first, second (with same and differentreactants), third (with same reactants only) and zero order reactions with examples (graphicalrepresentations needed) - Half life period (derivation for first and n_{th} order reactions) - Methods to determine the order of a reaction - Steady state approximation - Parallel reactions, opposing reactions, consecutive reactions and chain reactions with examples (elementary idea only) - Effect of temperature on reaction rates - Arrhenius equation - Determination and significance of Arrhenius parameters -Theories of reaction rates - Collision theory - Derivation of rate equation for bimolecular reactions using collision theory - Transition state theory - Expression for rate constant based on equilibrium constant and thermodynamic aspects (derivation not required) - Unimolecular reactions - Lindemann mechanism.*Catalysis:* Homogeneous and heterogenous catalysis - Theories of homogenous and heterogenouscatalysis - Enzyme catalysis - Michaelis-Menten equation (derivation not required).

Module II: Photochemistry (4 hrs)

Introduction - Difference between thermal and photochemical processes - Beer Lambert's law. Laws of photochemistry: Grothus-Draper law and Stark-Einstein's law of photochemical equivalence. Quantum yield and its explanation – Photosynthesis - Photochemical hydrogen-chlorine and hydrogen-bromine reactions. Photophysical processes: Jablonski diagram – Fluorescence – Phosphorescence. Non-radiative processes: Internal conversion and inter system crossing. Photosensitization – Chemiluminescence.Chemistry of vision.

Module III: Adsorption & Colloids(6 hrs)

Adsorption: Introduction - Difference between adsorption and absorption - Chemisorption and physisorption - Factors affecting adsorption. Adsorption isotherms: Freundlich and Langmuir isotherms(derivation required) - Multilayer adsorption - BET equation (derivation not needed) and its applicationsto surface area measurements. Applications of adsorption.

Colloids: Types and classification - Preparation and purification of colloids - Kinetic, optical and electrical properties of colloids - Protective colloids - Gold number - Hardy-Schulze rule. Emulsions and gels: Properties and applications – Surfactants. Electrical double layer - Zeta potential – Donnan membrane equilibrium - Dorn effect – Applications of colloids.

Module IV: Chromatography (9 hrs)

Introduction – Definition – Classification - Principles and applications of column chromatography, thin layer chromatography, paper chromatography, ion exchange chromatography, gel permeation chromatography, gas chromatography and high performance liquid chromatography - Rf values.

Module V: Spectroscopy (16 hrs)

Interaction of electromagnetic radiation with matter - Energy levels in molecules - Born-Oppenheimer approximation.

Rotational Spectroscopy: Introduction - Rigid rotor - Expression for energy - Selection rules – Intensities of spectral lines - Determination of bond lengths of diatomic molecules.

Vibrational Spectroscopy: Simple harmonic oscillator – Energy levels - Force constant - Selection rules– Anharmonicity - Fundamental frequencies – Overtones – Fingerprint region - Group frequency concept- Degree of freedom for polyatomic molecules - Modes of vibrations of CO_2 and H_2O.

Raman Spectroscopy: Basic principles – Qualitative treatment of rotational Raman effect – Vibrational Raman spectra - Stokes & anti-stokes lines and their intensity difference - Selection rules – Mutual exclusion principle.
Electronic Spectroscopy: Basic principles - Frank-Condon principle - Electronic transitions - Singlet and triplet states - Dissociation energy of diatomic molecules – Chromophore and auxochrome - Bathochromic and hypsochromic shifts.
Nuclear Magnetic Resonance (NMR) Spectroscopy: Proton NMR and ^{13}C NMR – Principle - Numberand position of signals - Chemical shift - Intensity of signals - Different scales – Spin-spin coupling.

Module VII: Molecular Symmetry and Group Theory (3 hrs)
Elements of symmetry of molecules – Identity, proper axis of rotation, reflection plane, inversion centreand improper axis of rotation – Schonflies notation

Text Books

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, 46th Edition, Vishal Publishing Company, New Delhi, 2013.
2. F. Daniels and R.A. Alberty, Physical Chemistry, 5th Edition, John Wiley & Sons, Canada, 1980.
3. Gurdeep Raj, Advanced Physical Chemistry, 35th Edition, Goel Publishing House, Meerut, 2009.
4. S. Glasstone and D.H. Lewis, Elements of Physical Chemistry, 2nd Edition, MacMillan & Company, UK, 1962.
5. J. Rajaram and J.C. Kuriacose, Kinetics and Mechanism of Chemical Transformation, 1st EditionMacmillan India Ltd., New Delhi, 1993.
6. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition, John Wiley & Sons, Inc., New York, 1989.
7. C.N. Banwell and E.M. McCash, Fundamentals of Molecular Spectroscopy, 4th Edition, McGraw–Hill Publishing Company Limited, New Delhi, 2002.
8. Gurudeep R. Chatwal and Sham K. Anand, Spectroscopy: Atomic and Molecular, 5th Edit Himalaya Publishing House, New Delhi, 2013.
9. K. Veera Reddy, Symmetry & Spectroscopy of Molecules, 2nd Edition, New Age International, New Delhi, 2009.

References

1. K. Laidler, Chemical Kinetics, 3rd Edition, Pearson Education, New Delhi, 2004.
2. K.K. Sharma and L.K. Sharma, A Textbook of Physical Chemistry, 5th Edition, Vikas Publishing
House, New Delhi, 2012.
3. K.L. Kapoor, Physical Chemistry Vol. 3&5, Macmillan Publishers, Noida, 2004.
4. G.K. Vemula Palli, Physical Chemistry, Prentice Hall of India, New Delhi, 1997.
5. P.W. Atkins, Physical Chemistry, 8th Edition, Oxford University Press, New Delhi, 2006.
6. G.M. Barrow, Physical Chemistry, 5th Edition, McGraw Hill, London, 1992.
7. W.J. Moore, Physical Chemistry, 5th Edition, Orient Longman, London, 1999.
8. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company, New Delhi, 1999.
9. D.A. Skoog, D.M. West, F.J. Holler and S.R. Crouch, Fundamentals of Analytical Chemistry, 8th
Edition, Brooks/Cole, Thomson Learning, Inc., USA, 2004.
10. B.K. Sharma, Instrumental Methods of Chemical Analysis, 24th Edition, Geol Publishing House,
Meerut, 2005..
11. P.R. Singh and S.K. Dixit, Molecular Spectroscopy: Principles and Chemical Applications, S.
Chand & Company, New Delhi 1980.

12. P.K. Bhattacharya, Group Theory and its Chemical Applications, Himalaya Publishing House,New Delhi, 1986.
13. F.A. Cotton, Chemical Applications of Group Theory, 3rd Edition, John Wiley & Sons, NewYork, 1990.

SEMESTER V

SDC5PM01
Pharmaceutical Management
Total Hours: 60; Credits: 4; Hours/Week:4

Module I Concept of Management (10 Hrs)

Administrative Management (Planning, Organizing Staffing Directing and Controlling). Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/ Morale) Principles of Management (Coordination, Communication, Motivation, Decision making, leadership, Innovation Creativity, Delegation of Authority / Responsibility. Record Keeping), Identification of key points to give maximum thrust for development and perfection**.**

Module II Drug regulatory affairs (5 Hrs)

Definitions, procedure of export & import of drug.

Module III Pharmaceutical marketing (10 Hrs)

Functions, buying, selling, transportation, storage financed feedback information, channels of distribution, wholesale, retail, department store, multiple shop and mail order business.

Module IV Salesmanship (5 Hrs)

Principle of sales promotion, advertising, ethics of sales, merchandising, literature, detailing, Recruitment, training, evaluation, compensation to the pharmacist**.**

Module V Market research (10 Hrs)

Measuring & Forecasting Market Demand - Major concept in demand measurement, Estimating current demand Geo-demo- graphic analysis. Estimating industry sales, Market share and future demand. Market segmentation & Market targeting.

Module VI Materials management (10 Hrs)

A brief exposure of basic principles of management major areas, scope, purchase, stores, inventory control and evaluation of materials management**.**

Module VII: Production management (10 Hrs)

A brief exposure of the different aspects of Production Management– Visible and Invisible inputs, Methodology of Activities Performance Evaluation Technique Process– Flow, Process Know-how, Maintenance Management.

Reference

1. Mohan S, Jai D.” Drug Store and Business Management “, 1st edition, 1995,S.V Kar & Co, Jalandhar
2. Singh S, Singh P.” Drug Store and Business Management”, 1st edition, 1995, S.Dinesh & Co.Circular Road Jalandhar.
3. Koontz & O‟Donnel Principles of Management Tata Mc Graw Hill, Delhi.
4. G. Vidya Sagar, Pharamceutical Industrial Management, 2nd edition, 2005, Pharma Book Syndicate

SEMESTER V

SDC5MC01
Medicinal Chemistry
Total Hours: 75; Credits: 5; Hours/Week:5

Module I: Drugs acting on ANS (10 Hrs)

Adrenergic stimulants: Phenyl ethanolamine derivatives-adrenaline, isoprenaline, salbutamol, ephedrine, and phenylephrine. Imidazole derivatives-naphazoline, xylometazoline and oxymetazoline. Adrenergic blockers: α and β adrenoreceptor antagonists-ergot akaloids, phenoxybenzamine, phentolamine, tolazoline, DCI, propranolol, atenolol,labetolol. Neurone blockers–Bretilium and Xylocholine. Cholinergic stimulants: nicotinic and muscarinic receptors, acetyl choline and analogues, pilocarpine, bethanechol and carbachol.Cholinergic blockers: tertiary and quaternary antimuscarinics, antispasmodic drugs-dicyclomine, glycopyrrolate, antiulcer drugs-pirenzepine, cycloplegic drugs-tropicamide, homatropine Anticholinesterases: Competitive inhibitors-physostigmine and neostigmine. Non competitive inhibitors: organophosphorus compounds, Nerve gases,Cholinesterase regenerators-2 PAM. Ganglion blocking agents: mecamylamine and trimethophan Curareform drugs: curare alkaloids, erythrina alkaloids and gallamine.Synthesis of the following drugs: salbutamol, naphazoline, tolazoline,propranolol, bretilium, carbachol, mecamylamine and gallamine.

Module II: Drugs acting on CVS (10 Hrs)

Cardiotonic drugs: cardiac glycosides-their chemistry and stereochemistry,Digoxin and digitoxin.

Antiarrhythmic drugs: quinidine, disopyramide, lidocaine, phenytoin and procainamide, β-blockers-propranolol. Calcium channel blockers-verapamil and Neurone blockers-bretilium.

Antihypertensive Drugs: peripheral antiadrenergics-prazosin and terazosin.Centrally acting drugs-reserpine, clonidine and methyl dopa. β-blockerspropranolol, atenolol and labetalol. Calcium channel blockers-nifedipine and amlodipine. ACE inhibitors-captopri. Angiotensin receptor blockers-losartan. Diuretics-thiazide diuretics.Antianginal drugs: vasodilators-nitrites and nitrates, β-blockers-propranolol. Calcium channel blockers-verapamil and nifedipine. Miscellaneous-dipyridamol and aspirin. Anticoagulants: heparin, coumarin derivatives and indane dione derivatives.Antilipidemic agents: atherosclerosis(mention only), Statins-lovastatin, simvastatin, fluvastatin, Fibrates-clofibrate, Miscellaneous-bile acid sequestrants and cholestyramine resin. Synthesis of the following drugs: procainamide, disopyramide, amlodipine, verapamil, captopril and fluvastatin.

Module III: Chemotherapy (15 Hrs)

Antibiotics: β-lactam antibiotics-penicillins and cephalosporins, natural,biosynthetic and semisynthetic penicillins, tetracyclines and chloramphenicol, a brief study of macrolide antibiotics, aminoglycoside antibiotics, polyene antibiotics, fluoroquinolones.

Sulphonamides: sulphanilamide, N-substituted sulphanilamide derivatives, mechanism of action, sulphones-dapsone, dihydrofolate reductase inhibitorstrimethoprim and cotrimoxazole.

Antitubercular agents: first line drugs-isoniazid, rifampicin, pyrazinamide, ethambutol, and streptomycin. Second line drugs-ethionamide, paraaminosalicylic acid and fluoroquinolones.

Antifungal agents: Antibiotics-amphotericinB, griseofulvin and nystatin. Azole derivatives-

ketoconozole,terconozole,fluconozole and clotrimazole. Pyrimidine derivatives- 5 Flucytosine.
Antiviral drugs: amantidine, interferon and ribavirin. Anti HIV agents zidovudine, and abacavir. Anti herpes simplex agents-brivudine, vidarabin and acyclovir. Anti-influeza agents-oseltamivir(tamiflu). Antiprotozoal agents: Amoebicides-metranidazole and tinidazole. Antimalarialschloroquine,primaquine, mefloquine, quinacrine and proguanil. Anthelmintics piperazines and benzimidazoles. Miscellaneous-eflornithine and pentamidine. Synthesis of the following drugs: ampicillin, cephalexin, chloramphenicol, sulphamethoxazole, dapsone, trimethoprim, ethambutol, griseofulvin, clotrimazole, acyclovir, metranidazole, primaquine, mebendazole.

Module IV: Antineoplastic Drugs (15 Hrs)
Neoplasm-cause therapeutic approaches. Alkylating agents-nitrogen mustards,nitrosourea, aziridines and aryl sulphonates. Antimetabolites-folic acid. Antagonists-purine and pyrimidine antagonists. Antibiotics-anthracyclines, actinomycinD, bleomycin. Plant products-vinca alkaloids, taxol derivatives. Hormones and their antagonists-tamoxifen. Miscellaneos-procarbazine, cisplatin. Synthesis of the following drugs: chlorambucil, carmustin, thiotepa, methotrexate,
5-fluoro uracil, procarbazine.

Module V :Psychopharmocological Agents (10 Hrs)
Tranquilisers: rauwolfia alkaloids, meprobamate, oxazepim, benzodiazepines, chlordiazepoxide, phenothiazene derivatives. Antidepressants: MAO inhibitors-Isocarboxazide, tranylcypromine and phenelzine. Tricyclic compounds-imipramine, trimipramine, amitriptynine,doxepine, amoxapine. Miscellaneous compounds-fluoxetine and trazodone.Antipsychotics: phenothiazine and thiothine derivatives, butyrophenones haloperidol,droperidon, rauwolfia alkaloids.Hallucinogens: triptaminederivatives-DMT, psilocybin, phenylalkylaminesmescaline, lysergic acid derivatives-LSD.Synthesis of the following drugs: chlordiazepoxide, meprobamate, imipramine chlorpromazine, tranylcypromine and haloperidol.

ModuleV I Miscellaneous class of compounds (15 Hrs)
Diuretics: common diuretics and their mechanism of action-mercurial and nonmercurial diuretics, carbonic anhydrase inhibitors- acetazolamide and methazolamide, thiazide derivatives-hydrochlorothiazide, Loop diureticsfurosemide and ethacrynic acid, potassium sparing diuretics-amiloride, spironolactone. Antihistaminic drugs: histamine and its biological role, H1 antagonistsaminoalkylethers, diphenhydramine and doxylamine, ethylenediamine derivatives-pyrilamine, phenothiazines-promethazine, trimeprazine, piperazine derivatives-cyclizines, miscellaneous compounds-cetrizine and cyproheptadine. Hypoglycemic agents: type 1 and type 2 diabetes, insulin, suphonyl ureastolbutamide,acetohexamide and glibenclamide, biguanides-metformin, thiazolidinediones-rosiglitazone. Local anaesthetics: clinical application of local anaesthesia, coca and cocaine, hexylcaine, paraaminobenzoic acid derivative-benzocaine, procaine, tetracaine, chloroprocaine, anilides, lidocaine, etiodacaine and prilocaine. Antitussives: centrally acting antitussives-opium alkaloids and synthetic substitutes-codaine, noscapine, pholcodine, ethylmorphine, dextromethorphan, Non narcotic antitussives-diphenhydramine, expectorants-terpin hydrate, guaicol and bromhexine. Gastrointestinal drugs: purgatives-irritant, osmotic, bulk and lubricant purgatives,Antacids-systemic and non systemic antacids, H2 antagonists-cimetidine and ranitidine, proton pump inhibitors-omeprazole and pantaprazole, digestants, carminatives and antidiarrheals. Synthesis of the following drugs: acetazolamide, chlorthiazide furosemide, ethacrynic acid, amiloride, diphenhydramine, pyrilamine, promethazine,
omeprazole, tolbutamide, phenformin, benzocaine, procaine lidocaine, dextromethorphan.

References

01. G.L. Patrick, Medicinal Chemistry, BIOS, 2001.
02. T. Nogrady, D.F. Weaver, Medicinal Chemistry, Oxford University Press, 2005.
03. W.O. Foye, T.L. Lemke, D.A. Williams, Principles of Medicinal Chemistry, 4th Edn., Williams & Wilkins, 1995.
04. J.P. Remington, Remington's Pharmaceutical Sciences, Vol.13, 19th Edn., Mack,1990.
05. D. Sriram, P.Yogeswari, Medicinal Chemistry, Pearson Education India, 2010.
06. K.D. Tripathi, Essentials of medical Pharmacology, 6th Edn., Jaypee, 2008
07. L.S. Goodman, A. Gillman, The Pharmacological Basis of Therapeutics, 10th Edn., McGraw Hill, 2001.
08. S.S. Kadam, Principles of Medicinal Chemistry, Vol.I & II, Pragati Books, 2008.
09. A. Kar, Medicinal Chemistry, New Age International, 2007.
10. C.O. Wilson, J.M. Beale, J. Block, Textbook of Organic Medicinal and Pharmaceutical Chemistry, 12th Edn., Lippincott Williams.

SEMESTER V

SDC5EV01

Health Education and Community Pharmacy
Total Hours: 75; Credits:5 ; Hours/Week:5

Module I: Health (15Hrs)

Concept of health-Definition of physical health, mental health, social health, spiritual health determinates of heath, indicators of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Module II :Nutrition (15 Hrs)

Nutrition & health-Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins, & minerals-treatment & prevention. Demography & family planning – Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning method, chemical method, mechanical methods, hormonal contraceptives, population problem of India.

Module III :First-aids (25 Hrs)

First aid-Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures & resuscitation methods. Elements of minor surgery & dressings. Environment & health-Sources of water supply, water pollution, purification of water, health & air, noise, light-solid waste disposal & control medical entomology, arthropod borne disease & their control, rodents, animals & diseases. Fundamental principles of microbiology – Classification of microbes, isolation, techniques of organisms of common diseases. Communicable diseases-Causative agents, mode of transmission & prevention. a. Respiratory infections- Chicken pox, measles, influenca, diphtheria, whooping cough & tuberculosis. b. Intestinal infections: Poliomyelitis, Malaria, Filariasis.Arthropod borne infections-Plague, Malaris, Filariasis. d. Surface infections-Rabies, Thachoma, Tetanus, Laprosy. e. Sexually transmit ion diseases-Syphilis, Conorrhoea, AIDS. 8. Non-communicable diseases-Causative agents, prevention, care & control. Cancer, Diabetes, Blindness, Cardiovascular diseases.

Module IV: (20 Hrs)

Epidemiology-Its scope, methods, uses, dynamics of disease transmission. Immunity & immunizations Immunological products & their does schedule. Principles of disease control & prevention, hospital acquired infection, prevention & control. Disinfection, types of disinfection procedures.

SEMESTER V

Code: SDC5EV02

Fundamentals of Pharmacognosy
Total Hours: 75; Credits:5 ; Hours/Week:5

Module I : **Introduction to Pharmacognosy (10 Hrs)**
Definition, scope, history and development of Pharmacognosy, Introduction to secondary metabolites Definition & Classification.

Module II: Plant tissue & Morphology (10 Hrs)
Plan tissue of simple and complex and tissue system, morphology of root, stem, bark, wood, leaf, flower, fruit and seed, modification of root, stem and leaf, histology of root, stem and leaf.

Module III :Plant taxonomy (10 Hrs)
Study of the following families with special reference to medicinally important plants – Malvaccae, Apocynaceac, solanaceae, Leguminosae, Rubiaceae.

Module IV :**Study of drugs containing resins combinations: (10 Hrs)**
Introduction, classification, general properties, chemical tests of resins. Pharmacognostic Studies of the following resin containing drugs: Colophony, Podophyllum, Jalap, Cannabis, Capsicus, myrrh, Asafoetida, balsam of Tolu, balsam of Peru, Benzoin, turmeric and Ginger.

Module V: Study of tannins and tannin containing drugs: (5 Hrs)
Introduction, classification, general properties, chemical tests. Drugs: Black catechu, pale catechu and Myrobalans.

Module VI :**Study of Volatile oil containing drugs: (10 Hrs)**
Introduction, classification, general properties, chemical tests and general methods of obtaining volatile oils from plants. Pharmacognostic studies of the following drugs, containing volatile oils: Mentha, coriander, carway, dill, fennel, cinnamon, lemon peel, lemon grass, clove, nutmeg, eucalyptus, chenopodium, cardamom, valerian, sandalwood.

Module VII :Separation of active constituents from medicinal plants (20 Hrs)
Basic principle of extraction. The factors which may affect the extraction process. Different type of extracts and their preparations. The comparative studies of different methods employed for extraction of phytoconstituents. Phyto chemical screening of alkaloids, saponins,cardenolides, bufadienolides, flavonoids, tannins, anthraquinones, cyanogenetic glycosides and amino acids in different extracts.

Text Books:

1. Pharmacognosy: C.k. kokate, A.p. purohit, S.b. gokhale, Nirali prakashan, Pune, 39th edition, 2007.

2. Pharmacognosy and pharmacobiotechnology, Ashutosh Kar, New Age International Pvt. Ltd. Publishers, 2nd edition,2007.

3. A Text Book of Pharmacognosy: C.S Shah, J.S Quadry, B.S Shah Prakashan, Ahemedabad,8th edition, 1990.
4. Trease and Evan's Pharmacognosy: W.C Evans, W.B. Saunders Co, Singapore, 15th edition 2008.

Reference Books:

1. Pharmacognosy and phytochemistry, part I and II, Vinod D. Rangari, Carrier Publications, 1st edition, Reprint, 2007.
2. Pharmacognosy V.E. Tylar, L.R. Brady, J.E. Habbers, Lea and Febgir Philadelphia, 8th edition, 1981.

3. Cultivation and utilization of Aromatic Plants,handa S.S and Kaul ,M.K, regional Research Laboratory, Jammu, 1st edition,1997.

4. Mukherji P.K, Quality control of Herbal Drugs, Busines Horizon Pharma, Publishers,1st edition,2002.
5. Herbal drug technology,S.S. Agrawal and M.Paridhavi, Universities Press, 1st edition,2007.
6. Essentials of Pharmacognosy, S.H Ansari, Birla Publications Pvt. Ltd, 1st edition,2005-2006.

7. Microscopic profile of powdered drugs used in Indian systems of medicine, Malti G.Chauhan and Pillai APG, volume I, left drugs, 2005, Gujarat Ayurved University, Jamnagar.

SEMESTER V

Code: SDC5MC02 (P)

Medicinal Chemistry (P)
Total Hours: 75; Credits:5 ; Hours/Week:5

1. Synthesis of some typical organic medicinal compounds, spectral illustration of the intermediates and products formed:

- paracetamol,
- sulphanilamide,
- hippuran,
- benzocaine,
- clofibrate,
- mercurochrome,
- phenytoin,
- dapsone,
- diodoquin,
- antipyrine,
- aminacrine and
- phenobarbitone.

2.Preparation, assay including limit tests prescribed in the IP/BP of the following drugs: sodium salicylate, calcium lactate, yellow mercuric oxide, ferrous fumarate, ferric ammonium citrate, potassium antimony citrate, boric acid, light magnesium carbonate, and sodium citrate.

3 . Assay, test for identity and purity of the following synthetic drugs: aspirin, paracetamol, analgin, sulphadiazine (or any other sulphonamide), isoniazide, benzyl benzoate, piperazine, chloropromazine hydrochloride, diethyl carbamazine citrate, oxyphenbutazone, phenytoin sodium, ibuprofen, hexamine, tolbutamide and gamma benzene hexachloride.

4. Analysis of official drugs using common analytical techniques.

5. Assay of Antibiotics. Chemical Assay of Benzyl Pencillin

6. Assay of Vitamins: ascorbic acid, acetomenaphthone, niacinamide, pyridoxine and thiamine.

- To perform assay of Mefenemic acid as per IP’2007. 13
- To perform assay of Calcium gluconate injection as per IP 2007.
- To perform the assay of Isoniazide table as per IP’96
- To find out content of active ingredient of Metformine tablet as per IP’2007.13
- To perform the assay of active ingredient for Riboflavin as per IP’2007.13

SEMESTER V

Code: SDC5PH02 (P)

Pharmaceutics Practical-IV
Total Hours: 75; Credits:5 ; Hours/Week:5

1. **Macroscopic evaluation of crude drugs:-** Identification of crude drugs listed in theory (entire and broken condition) by Morphological characters- plant identification active principles, medicinal properties.
2. Microscopic examination of and identification of the powders of the following crude drugs:- clove, Ginger, Nux vomica, Cumin, cardamom Liquuorice Ashoka Cinamon Vasaka and Nutmeg

3. Qualitative analysis of crude plant extract :- Qualitative analysis of crude plant extract to detect the presence of phytochemicals - alkaloids, carbohydrates, glycosides,tannins ,flavanones and saponins.
4. Isolation phytochemicals from natural products- caffeine from tea,niccottin from tobacco,curcumin from turmeric,lycopene from tomato (not for Exam)
5. Analysis of fixed oils - Acid value ,saponification value,ester value etc.
6. Preparation of herbarium sheets.

SEMESTER VI

Code: SDC6INT03

Major Internship
Total Hours: 900; Credits:30

Objective

The major project should be carried out in the industry, not necessarily with industry partner. The major idea for internship is to implement the things learned and to get a real life experience. The Evaluation process follows 100% external assessment.

Short-term working experience in pharmaceutical companies will help students better understand the pharmaceutical industry, learn the process of drug discovery and development, and build a strong network with experts and fellows in the pharmaceutical field, which can positively contribute to future career development. In addition, it will help students to identify if they really enjoy working in industry and help them in choosing a future career after school.

B.VOC PHARMACEUTICAL CHEMISTRY

CURRICULAM SUMMARY

In comparison with B Sc Chemistry Programme

Semester	Code	Paper	Topic	B.SC. Chemistry No. of Hrs	B.Voc Pharmaceutical Chemistry No of Hrs
I	CHE1B01	Theoretical and Inorganic chemistry-I	Chemistry as discipline of life	6	6
			Some basic chemical concept	3	3
			Analytical chemistry	9	9
			Atomic structure	9	9
			Nuclear chemistry	9	9
	CHE1B02	Theoretical and Inorganic chemistry-II	Quantum chemistry	12	12
			Periodic properties	6	6
			Chemical bonding-I	9	9
			Chemical bonding-II	9	9
	CHE4B05(P)	Inorganic chemistry practical-I		36	60
II	CHE3B03	Physical Chemistry-I	Gaseous State	12	12
			Thermodynamics-I	18	18
			Thermodynamics-II	9	9
			Liquid state	6	6
			Chemical equilibria	9	9
	CHE6B14(P)	Physical chemistry practical		72	60
III		Organic chemistry I	Introduction to organic chemistry	3	3
			Stereochemistry	15	15
			Reaction mechanism basic concepts	12	12
			Aliphatic hydrocarbons	15	15
			Aromatic hydrocarbons	6	6
			Aromaticity	3	3
	CHE6B15 (P)	Organic chemistry practical		90	75
IV	CHE5B06	Inorganic chemistry – III	Analytical chemistry-II	6	6
			Representative elements-I	9	9
			Representative elements-II	12	12
			Inorganic Polymers	9	9

			& non-aqueous solvents		
			Environmental pollution	12	12
			Solid waste management	6	6
	CHE6B17(P)	Inorganic chemistry practical III		90	
V	SDC5OC02	Organic Chemistry - II	Halogen compounds	9	9
			Organomettalic compounds	3	----
			hydroxy compounds	12	8
			Ethers and epoxides	6	---
			Aldehydes and ketones	9	6
			Carboxylic acids and sulphonic acids	12	8
			Nitrogen compounds	15	9
			Hetrocyclic and active methylene compounds	6	5
		Physical Chemistry - II	Kinetics & catalysis	12	8
			Photochemistry	6	4
			Adsorption & Colloids	9	6
			Phase equilibria	9	----
			Chromatography	9	9
			Spectroscopy	18	16
			Molecular symmetry and group theory	18	3

MATHEMATICS

Semester	Papercode	Topic	B.SC.chemistry No. of Hrs	B.Voc Pharmaceutical Chemistry No. of Hrs
I	GECIMT01	Limits and continuity	20	2
		Derivatives	12	6
		Applications of derivatives	24	10
		Integration	16	4
		Hyperbolic functions	20	10
		Infinite series	28	2
		Polar coordinates	10	15

		Multivariable functions and partial derivatives	14	11
II	GEC2MT02	Ordinary differential equations	20	7
		Matrices	20	15
		Vector differential calculus	25	10
		Vector integral calculus	25	5
		Linear differential equations of second and higher order	20	5
		Laplace transforms	20	5
		Fourier series ,partial differential equation	30	10
		Numerical methods	20	3

PHYSICS

Semester	Code	Paper	Topic	B.SC. Chemistry No. of Hrs	B.Voc. Pharmaceutical Chemistry
III	SDC3PHY01	Properties of matter & thermodynamics	Elasticity	9	4
			Surface tension & viscosity	9	5
			thermodynamics	18	4
			Frames of reference	4	3
			Conservation of energy and momentum	10	4
			Relativity	8	2
			Oscillation and waves	8	4
			Quantum mechanics	6	4
	SDC3PHY02 (P)	Physics practical –I		**72**	**30**
IV	SDC4PHY03	Optics,laser,electronics & communication	Fermat's principe	2	1
			Interference	12	2
			Diffraction	8	2
			Polarisation	8	2
			Electronics	14	5

			Laser physics	6	2
			Principles of communication	6	2
			Electrostatistics	12	2
			Current electricity	8	3
			Magnetism	10	3
			Nuclear physics	14	3
			Cosmic rays &elementary particle	10	3
	SDC4PHY04 (P)	Physics practical		72	30