

$A \rightarrow AB$ $\neg A \rightarrow \neg AB$ $Y \rightarrow C$ $\neg A \rightarrow D$ $A \rightarrow \neg Y$ $(\neg D \rightarrow A)$

$AC \rightarrow Y$ $\neg A \rightarrow AC$ $CA \rightarrow C$ $\neg C$

$\neg (Y \rightarrow (\neg B \rightarrow B)) \rightarrow (\neg B \rightarrow B)$

$\bar{C} \quad \bar{D} \quad B \quad \bar{A} \quad C \quad D$
 $(C \quad B \quad \bar{A} \quad \bar{C} \quad D)$

	$\bar{A} \quad Y$	$AC \quad CA\bar{B}$		
$\bar{A} \quad B$	$A \quad \bar{C}$	$\bar{A} \quad B$	$A \quad \bar{A}\bar{B}$	$\bar{A}\bar{B}$
A	$C \quad D$	A	$C \quad D$	D

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SCHEME OF TEACHING AND EXAMINATION

S. No.	Course Name	L	T	C	P	Th	Pr	Total
1	PHARM-1011 Organic Chemistry-I	3	-	3	-	15	60	75
2	PHARM-1021 Pharmaceutical Technology-I (General and Dispensing Pharmacy)	3	-	3	-	15	60	75
3	PHARM-1031 Pharmacognosy-I	3	-	3	-	15	60	75
4	PHARM-1051 (M) Remedial Mathematics	3	-	3	-	15	60	75
5	PHARM-1051 (B) Remedial Biology	2	-	2	-	10	40	50
6	PHARM-1061 Computer Science and applications	2	-	2	-	10	40	50

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SCHEME OF TEACHING AND EXAMINATION

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SCHEME OF TEACHING AND EXAMINATION

p	s	no	n	C	-	15	60	75
PHARM-3011	Chemistry of Natural Products and including	3	-	3	-	15	60	75

B A C P T P A A C Y (B P A C D B A D Y

SCHEME OF TEACHING AND EXAMINATION

P	C	T	n	C	D	B	A	D
P Y								
PHARM-4011	Physical Chemistry	2	-	2	-	10	40	50
PHARM-4021	Pharmaceutical Technology-II	2	-	2	-	10	40	50
PHARM-4022	Principles of Pharmaceutical Operations	2	-	2	-	10	40	50
PHARM-4031	Pharmacognosy-III	3	-	3	-	15	60	75
PHARM-4041	Pharmacology-I	3	-	3	-	15	60	75
PHARM-4081	Environmental Studies	3	-	3	-	15	60	75
A C C A T								
PHARM-4111	Physical Chemistry Practical	-	3	-	2	10	40	50
PHARM-4121	Pharmaceutical Technology Practical-II	-	3	-	2	10	40	50
PHARM-4122	Pharmaceutical Operations Practical	-	3	-	2	10	40	50
PHARM-4131	Pharmacognosy Practical-III	-	3	-	2	10	40	50
PHARM-4141	Pharmacology Practical-I	-	3	-	2	10	40	50
o		T	T	T	T			

- Note: i) There will be minimum one Sessional Examination in each theory paper.
 ii) Internal assessment for practical will be based on day to day performance including Attendance, Viva and Laboratory record.

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SCHEME OF TEACHING AND EXAMINATION

p	1	2	3	4	5	6	7	8	9	10	11	12
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PHARM-5011 Medicinal

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Scheme of Teaching and Examination

P	Y	Th	Pr	Th	Pr	Th	Pr	Th	Pr
THEORY									
PHARM-6011	Pharmaceutical Analysis-II	3	-	3	-	15	60	75	
PHARM-6012	Medicinal Chemistry-III	3	-	3	-	15	60	75	
PHARM-6021	Cosmetology	3	-	3	-	15	60	75	
PHARM-6022	Pharmaceutical Jurisprudence	2	-	2	-	10	40	50	
PHARM-6031	Pharmacognosy-IV	3	-	3	-	15	60	75	
PHARM-6041	Pharmacology-III	3	-	3	-	15	60	75	
AC CA									
PHARM-6111	Pharmaceutical Analysis Practical-II	-	3	-	2	10	40	50	
PHARM-6112	Medicinal Chemistry Practical-III	-	3	-	2	10	40	50	
PHARM-6121	Cosmetology Practical	-	3	-	2	10	40	50	
PHARM-6131	Pharmacognosy Practical-IV	-	3+1(Tutorial)	-	3	15	60	75	
PHARM-6141	Pharmacology Practical-III	-	3	-	2	10	40	50	
Total									

- Note:
- i) There will be minimum one Sessional Examination in each theory paper.
 - ii) Internal assessment for practical will be based on day to day performance including Attendance, Viva and Laboratory record.
 - iii) There will be an industrial/pharmacy practice training of four weeks duration after the completion of sixth semester examination.

A **B** **C** **D**
Y **X** **Z** **W**

SEMESTER	THEORY	MARKS	PRACTICAL/ REPORT	MARKS	TOTAL
First Semester	5	500/450	4/5	400/450	900
Second Semester	5	500	4	400	900
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Stereoisomers, enantiomers, diastereoisomers, optical activity, chiral centre, racemic modification, meso-structures, configuration, reactions involving stereoisomers, stereoselective and stereospecific reactions.

Geometric isomers, conformational isomers, configurational isomers, conformational analysis of ethane and n-butane, conformations of cyclohexanes, axial and equatorial bonds, Newman projections, Fischer and Wedge formula.

Relative and absolute configuration, sequence rules, D & L, R & S and E & Z system of nomenclature.

(4 Lectures)

Al n n C o n

Alkanes : Nomenclature of straight and branched chain alkanes and alkyl groups, classification of carbon atoms of alkanes, isomerism in alkanes, sources, methods of preparation, physical properties and chemical reactions.

Mechanism of free radical halogenation of alkanes, orientation, reactivity and selectivity, chlorofluorocarbons and ozone layer.

Cycloalkanes: Nomenclature, methods of preparation, chemical reactions, Bayer's strain theory, ring strain, isomerism in cyclopentane and cyclohexane, reactions of carbenes, cyclic ethers, crown ethers, epoxides.

Quantitative elemental analysis and structure elucidation, empirical formula and molecular formula.

(8 Lectures)

Al r

Nomenclature and classes of alkyl halides, methods of preparation, chemical reactions, mechanisms of nucleophilic substitution reactions, SN₁ and SN₂ reactions, carbonium ions, carbenium ions and carbocations, structure, relative stability, ease of formation, rearrangements and other characteristics of carbocations.

(4 Lectures)

Al o o n o o o n

Nomenclature, methods of preparation, physical properties and chemical reactions.

Role of Solvent: Secondary bonding, solubility of non-ionic and ionic solutes, protic and aprotic solvents, ion pairs, role of solvent in substitution reactions, phase-transfer catalysis.

(4 Lectures)

Al n D n n Al n

Pharmacognosy

Pharmacognosy

1. Introduction, development, present status and future scope of pharmacognosy.
2. Introduction to following groups of plant constitute

(2 Lectures)

A

Revision simultaneous equations, partial fractions and resolution of linear and quadratic (non repeated) equations. (5 Lectures)

ono

Revision on angle measurement and T-Ratios, addition, subtraction and transformation formulae. T ratios of multiple, sub-multiple and allied angles; applications of Logarithms. (8 Lectures)

An n o

Cartesian co-ordinates, distance between two points, area of triangle, locus of a point, straight line, slope and intercept form, double intercept form, general equation of first degree. (8 Lectures)

C

Differential: Limits and functions, differential coefficient, differentiation of standard functions, including function of a function (chain rule), differentiation of implicit functions, logarithmic differentiation, parametric differentiation, element of successive differentiation, Application in Pharmaceutical Sciences & related field.

Integral:: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, partial functions and substitution, formal evaluation of definite integral including definite integral as area under curve, Application in Pharmaceutical Sciences & related field. (20 Lectures)

Books

1. Grewal BS, Higher Engineering Mathematics. Khanna Publishers, New Delhi. Latest Edition.
2. A Textbook of Mathematics for XI-XII students, NCERT Publication, New Delhi. Latest Edition.
3. Schaum. Differential Equations. McGraw-Hill, Singapore. Latest Edition.

A B A Y (B)

Books

A B A Y (B)

1. General structure of the plant body - structure and function of the stem, root and leaf and the modification,

2. Structure of the flower with reference to their families, Ranunculaceae, Cruciferae, Leguminosae, Malvaceae, Compositae, Labiatae, Liliaceae and Graminae, description of flower, floral diagram and floral formulae, Reproduction processes - pollination and fertilization, fruits, seeds structure, germination and dispersal.
(8 Lectures)
3. Knowledge of physiological process – Transpiration, photosynthesis, respiration and growth, growth regulators, morphogenesis, heredity and variation,

4. Extractives including liquid and dry extracts, tinctures, infusions, etc. by the techniques of simple, modified and multiple maceration; simple, intermittent and reserved percolation

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8. Acidity of α -hydrogens, acid catalyzed and base promoted halogenation of ketones, Aldol condensation, reactions related to Aldol condensation, Wittig reaction, Claisen condensation, malonic ester and acetoacetic synthesis.

Acidity of α -hydrogens, acid catalyzed and base promoted halogenation of ketones, Aldol condensation, reactions related to Aldol condensation, Wittig reaction, Claisen condensation, malonic ester and acetoacetic synthesis.

(3 Lectures)

9. Amines: Nomenclature, physical properties, salts of amines, stereochemistry of nitrogen, preparation methods including reduction of nitrocompounds, ammonolysis

Amines: Nomenclature, physical properties, salts of amines, stereochemistry of nitrogen, preparation methods including reduction of nitrocompounds, ammonolysis

C o n t e n t s

M o n o s a c c h a r i d e s : Introduction, definition and classification, stereoisomers of (+)-glucose, oxidation, osazone formation, lengthening of C-C chain of aldoses (Kiliani-Fischer synthesis), shortening of aldoses (Ruff degradation), conversion of an aldose into its epimer, configuration of (+)-glucose, configuration of aldoses, D and L system of configuration, tartaric acid, families of aldoses and their absolute configuration, cyclic structure of D-(+)-glucose and formation of glucosides, configuration at C-1, methylation reactions,

o p o n o n

Precipitation reactions, solubility product, effects of common ion, acids, temperature and solvent upon the solubility of a precipitate, conditional solubility product, fractional precipitation, argentometric titrations,

2.3 Adsorption at solid surface/interface: Electrical properties of interfaces, interfacial properties of particles in suspensions.

(9 Lectures)

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Scope and concepts, Newtonian systems and viscosity, Non-Newtonian systems & flow expressions, thixotropy, determination of viscosity and other rheological parameters, applications in pharmaceutical product development.

(7 Lectures)

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Introduction, importance in pharmacy, particle size and size distribution, particle shape, particle volume, methods of determining particle size, statistical diameters from number and weight distributions, Coulter-counter method for determining particle volume, specific surface, particle number, particle volume, derived properties of powders, porosity, density, angle of repose. Flow properties of powders and factors affecting these.

Significant digits and rounding of numbers, collection of primary and secondary data through experiments on surveys, sampling and complete enumeration survey, merits and limitations of various random and non-random sampling methods, data organization including frequency distributions and tabulation, diagrammatic representation of data, simple, multiple, sub-divided and floating bar diagrams, pie diagrams, 2-D and 3-D pictographic representation, graphs of frequency and cumulative frequency distributions.

(10 Lectures)

- Measures of central tendency, ideal characteristics, mean, median, mode, GM, HM and weighted arithmetic mean from discrete and continuous frequency distributions, quartiles, deciles and percentiles, measures of dispersion, range, quartile deviation, mean deviation, standard deviation, calculation of standard deviation from discrete and continuous frequency distributions, standard error of means, coefficient of variation.

(10 Lectures)

- Probability and events, Baye's theorem, probability theorems, elements of binomial and Poisson distribution, normal distribution, normal distribution curve and properties, calculation of areas under normal curve and standard normal variate (Z statistic), confidence limits, deviations from normality, kurtosis and skewness, elements of central limit theorem.

(8 Lectures)

- Linear correlation and regression analysis scatter plots, method of least squares, Pearsonian coefficients of correlation and determination, definitions of amount of explained variance, standard error of estimate and significance of regression (F).

(7 Lectures)

- Statistical inference, Type I and II errors, Students's t-test (paired and unpaired), F- test one way and two way ANOVA. Nonparametric tests, Sign test, Chi- square test, Wilcoxon signed rank test, Mann Whitney test, Spearman's rank correlation.

(6 Lectures)

Books

- Bolton S. Pharmaceutical Statistics, Practical and Clinical Applications. Marcel Dekker, New York. Latest Edition.
- Gupta SP. Statistical Methods. Sultan Chand & Co., New Delhi. Latest Edition.
- Daniel WW. Biostatistics: A Foundation for Analysis in Health Science. John Wiley, New York. Latest Edition.

Practical

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Steam distillation technique for

1.1. Separation of *o*- and *p*- nitrophenol

1.2. Separation of naphthalene from its suspension in water

Synthesis of organic compounds by

1.1. Acetylation (acetyl salicylic acid, acetanilide)

1.2. Benzoylation (benzamide, benzanilide, phenyl benzoate)

1.3. Nitration (

Part A

1. To study the particle size distribution of a given powder by optical microscopy.
2. To study the particle size distribution of a given powder by sieve analysis method.
3. To study the particle size distribution of a given powder by Andreasen pipette method.
4. To determine the relative viscosity of the given Newtonian fluids by Ostwald viscometer.
5. To study the working of a rotaviscometer.
6. To determine the critical micellar concentration by drop weight method.
7. To study the working of a DuNouy's tensiometer.
8. To determine the HLB of a given surfactant by saponification technique.
9. To determine the angle of repose of the given sizes of a powder and study the effect of moisture, talc and magnesium oxide on the angle of repose.
10. To study the effect of particle size and column head on the flow of a given powder through a glass tube.

Part A

1. Anatomy of Human Skeleton
2. Haematology {RBC & WBC counts, h-10.5513()3.09064.7448 Tf -423.84 -18672(o997)B3(y)30.9361()4.29986({)-32(e)-2.721-2.04496()213.7367(d)8.59.718(a)-2.7279f 0fe-423.84 -18672(o(i)9.96303(c))Tj /R8734(l)9.960.7448 Tf 9

- 2.2. Fats and Oils (Phospholipids, Glycolipids and Lipoproteins): Chemistry, hydrolysis, detergents, biosynthesis of fatty acids and steroids, acid valu

3.2. **C**

Gaseous sterilization by ethylene oxide and factors affecting its efficiency, applications.

(2 Lectures)

3.3. **B**

Different devices used (sintered glass, sintered porcelain, fibrous pads, membrane filter), testing of filters, bubble pressure technique and pore size determination. Advantages and disadvantages of bacterial filtration. Mechanism of bacterial filtration.

(3 Lectures)

3.4. **on**

3.4.1. Ultraviolet radiations - sources, penetrating power and applications.

3.4.2. Ionizing radiations - mode of action, sterilizing dose, applications, advantages and disadvantages.

(3 Lectures)

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Surgical Dressings: Definition, classification, primary and secondary dressings, and protectives.

Sutures and ligatures: Definition, absorbable, non absorbable and metallic sutures.

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3. Study of lipids and lipid containing drugs dealing with the general methods of extraction of fixed oils, biological source, chemical constituents, tests for identity, and uses of the following:
Arachis oil, Castor oil, Sesame oil, Cotton seed oil, Almond oil and Olive oil.
(5 Lectures)
4. Study of drugs containing resins and resin combinations: Colophony, Podophyllum, Cannabis, Myrrh, Asafoetida, Balsam of Tolu, Benzoin and Storax.
(9 Lectures)
5. Study of tannins and tannin containing drugs like Gambir, Catechu and Hamamelis.
(5 Lectures)
6. Sources, chemical tests for identity and salient microscopic features of the following fibres:
Cotton, Jute, Flax, Silk wool, Rayon, Nylon and Glass wool.
(8 Lectures)
7. Study of the biological sources, constituents and uses of the following selected drugs from animal sources:
Cantharides, Beeswax, Wool fat, Cod liver oil, Honey and Gelatin.
(5 Lectures)
8. Preparation of herbarium specimens of plant drugs.
(1 Lecture)

Books

1. Tylor VE, Brady LR, Robbers JE. Pharmacognosy. KM Varghese Company, Bombay. Latest Edition.
2. Evans WC, Trease and Evans Pharmacognosy. WB Saunders Ltd., London. Latest Edition.
3. Robinson T, The Organic Constituent of Higher Plants. Burge Publishing Co., Latest Edition.
4. Trease GE. A Textbook of Pharmacognosy. Bailliere Tindall, London. Latest Edition.

Pharmacognosy: An Introduction to the Study of Drugs of Natural Origin

Dr. S. K. Chakravarti

Neuron and its neurotransmission, structure of brain

2. Furniss BS, Hannaford AJ, Smith PWG, Tatchell AR. Vogel's Textbook of Practical Organic Chemistry. Pearson Education Ltd, Singapore. Latest Edition.
3. Indian Pharmacopoeia. The Indian Pharmacopoeia Commission, Central Indian Pharmacopoeia Laboratory, Govt. of India. Ministry of Health and Family Welfare, Ghaziabad. Latest Edition.
4. British Pharmacopoeia. The Stationery Office on Beh

Books

1. Wallis TE. Textbook of Pharmacognosy. J. & A. Churchill Ltd., London. Latest Edition.
2. Evans WC, Trease and Evans Pharmacognosy. WB Saunders Ltd., London. Latest Edition.
3. Trease GE. A Textbook of Pharmacognosy. Bailliere Tindall, London. Latest Edition.
4. Tyler VE, Brady LR, Robbers JE. Pharmacognosy. KM Varghese Company, Bombay. Latest Edition.

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1.1. Gaseous State: The critical phenomenon (critical temperature, critical pressure, critical volume, P-V

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2.1. Energy and First Law of Thermodynamics: Preliminary

Sterility Tests: Introduction to the culture media used, testing procedures, controls, inactivation of antibacterial samples, a brief outline of tests on-powders, oils and ointments.

Pyrogen Tests: A brief outline of the Sham test and

B o r n

Study of drugs given below under section 1.1 and 1.2 for: biological source, chemical constituents and uses.
For drugs printed in bold and in parenthesis, also include study of cultivation, collection, substitutes, adulterants, diagnostic macroscopic and microscopic features and chemical tests for identity of drugs.

1. **Saponin Drugs**

1.1. Saponin Drugs: Dioscorea and (Sarsaparilla).

(2 Lectures)

1.2.

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Books

1. Tylor VE, Brady LR, Robbers JE. Pharmacognosy. KM Varghese Company, Bombay. Latest Edition.
2. Evans WC, Trease and Evans Pharmacognosy. WB Saunders Ltd., London. Latest Edition.
3. Robinson T, The Organic Constituent of Higher Plants. Burge Publishing Co., Latest Edition.
4. Trease GE. A Textbook of Pharmacognosy. Bailliere Tindall, London. Latest Edition.

<p>Pharmacology</p> <p>Definition, historical development, and scope of pharmacology.</p> <p>(1 Lecture)</p>	<p>Molecular Mechanisms of Drug Action</p> <p>Molecular mechanisms of drug action, receptors, receptor classification, theory of drug-receptor interactions, potentiation, antagonism phenomenon.</p> <p>(4 Lectures)</p>
<p>Drug Absorption and Distribution</p> <p>Drug absorption and its mechanism, factors affecting drug absorption, routes of drug administration, bioavailability, bioequivalence, distribution, plasma protein binding, half life of drug, biotransformation and cytochrome P450 monooxygenase system and excretion of drugs.</p> <p>(4 Lectures)</p>	<p>Autonomic Neurotransmission</p> <p>Autonomic neurotransmission, parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics, neuromuscular blocking agents.</p> <p>(11 Lectures)</p>
<p>Neurohumoral Transmission</p> <p>Neurohumoral transmission in CNS, general & local anesthetics, alcohol, hypnotics-sedatives, analgesics (narcotics and NSAIDs), centrally acting muscle relaxants, CNS stimulants and hallucinogens, drug addiction and drug abuse, Pathobiological aspects & drug therapy of epilepsy, Parkinson, schizophrenia, mania, anxiety, depression and Alzheimer disease.</p> <p>(25 Lectures)</p>	

Books

Public Awareness

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1. **Public Awareness**

- 1.1. Definition, scope and importance.
- 1.2. Need for public awareness.

(2 Lectures)

2. **Environmental Conservation**

2.1. Forest Resources

Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.

2.2. Water Resources

Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems, water quality management - management of water resources including rivers, lakes, ground water, fluorosis and arsenic problems.

2.3. Mineral Resources

Use and exploitation, environmental effects of extr

3.6. Food chains, food webs and ecological pyramids.

3.7. Introduction, types, characteristic features, structure and function of the following ecosystem:

3.7.1. Forest ecosystem.

3.7.2. Grassland ecosystem.

3.7.3. Desert ecosystem.

3.7.4. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).

(6 Lectures)

4. Biodiversity and Conservation

4.1. Introduction – Definition: genetic, species and ecosystem diversity.

4.2. Value of biodiversity – Consumptive use, productive use, social, ethical, aesthetic and option values.

4.3. Biodiversity at global, national and local levels.

4.4. India as a mega-diversity nation.

4.5. Hot spots of biodiversity.

4.6. Threats to Biodiversity: Habitat loss, poaching of wildlife, man wildlife conflicts.

4.7. Endangered and endemic species of India.

4.8. Conservation of biodiversity.

4.9. In-situ and Ex-situ conservation of biodiversity.

(6 Lectures)

5. Environmental Chemistry

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- 6.1. From unsustainable to sustainable development
- 6.2. Urban problems and related to energy.
- 6.3. Water conservation, rain water harvesting, watershed management.
- 6.4. Resettlement and rehabilitation of people; its problems and concerns, case studies.
- 6.5. Environmental ethics - Issues and possible solutions.
- 6.6.

3.2.

4. Cofactors: Metals and Co-enzymes: Co enzymic forms of Thiamine, Riboflavin, Niacin, Pantothenic acid, Lipoic acid, Biotin, Folic acid, Vitamin B₁₂, Vitamin B₆.
(2 Lectures)
5. Carbohydrate metabolism
 - 5.1. Glycogen metabolism and its regulation, role of nucleotides in carbohydrate metabolism.
 - 5.2. Glycolysis and fermentation and their regulation, Utilization of galactose and fructose.
 - 5.3. Pentose phosphate Pathway.(3 Lectures)
6. The citric acid cycle
 - 6.1. Significance, reactions and energetics of the cycle.
 - 6.2. Amphibolic role of the cycle.
 - 6.3. Glyoxylic acid cycle.(2 Lectures)
7. Lipid metabolism
 - 7.1. Beta-oxidation of saturated and unsaturated fatty acids and its energetics. Alpha-oxidation.
 - 7.2. Biosynthesis of ketone bodies and their utilization.
 - 7.3. Biosynthesis of saturated and unsaturated fatty acids.
 - 7.4. Biosynthesis of Prostaglandins, Thromboxanes and Leukotrienes.
 - 7.5. Biosynthesis of Glycero and Sphingo phospholipids.(7 Lectures)
8. Electron Transport chain and oxidative phosphorylation
(3 Lectures)
9. Nitrogen and sulphur cycle
 - 9.1. Nitrogen fixation, ammonia assimilation, nitrification and nitrate assimilation.
 - 9.2. Sulphate activation, sulphate reduction.
 - 9.3. Incorporation of H₂S in organic compounds.
 - 9.4. Release of sulphur from organic compounds.(3 Lectures)
10. Metabolism of ammonia and nitrogen containing monomers
 - 10.1. Nitrogen balance.
 - 10.2. Biosynthesis of amino acids (Excluding aromatic amino acids).
 - 10.3. Catabolism of amino acids (Excluding Phe, Trp, H-12.32.72797(e)19259973(s)9.281403

- 10.7. Purine biosynthesis.
 - 10.8. Purine nucleotide interconversion.
 - 10.9. Pyrimidine biosynthesis.
 - 10.10. Formation of deoxyribonucleotides. (8 Lectures)
11. Replication of DNA (only prokaryotes) and its repair. (2 Lectures)
12. Biosynthesis of RNA and basic ideas of its processing. (2 Lectures)
13. Elementary idea of translation including genetic code and inhibitors of translation (targeting of prot

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Fundamental considerations: Application, coating materials, methodology coacervation- phase separation, air suspension, multiorifice-centrifugal process, pan coating, spray drying and spray congealing, interfacial polymerization, solvent evaporation and multiple emulsion technique.

(7 Lectures)

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General consideration, types of emulsion, test for identification of emulsion type, theory of emulsification, formulation of emulsion, mechanical equipments for emulsification, stability of emulsions, assessment of emulsion shelf-life.

(5 Lectures)

p n on

Practical considerations, pharmaceutical applications, formulation of suspensions - flocculated and deflocculated systems, suspending agents, evaluation of suspension stability.

(5 Lectures)

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Percutaneous absorption (structures, function and h

o n o n

Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation processes and its improvement with special reference to corticosteroids.

(4 Lectures)

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Techniques of immobilization of enzymes, factors affecting enzyme kinetics, bacterial enzymes such as hyaluronidase, penicillinase, streptokinase, streptodornase, amylases and proteases, Immobilization of bacteria and plant cells.

(5 Lectures)

B o o n o

Introduction, biotechnology drugs, antisense nucleotides, pharmacognostical applications, pharmacological applications, pharmaceutical manufacturing applications, organic synthesis applications, list of biotechnology medicines approved and in development stat.29986(T)-38

(4 Lectures)

PA

Experiments based on formulation and/or testing of

1. Suspensions
2. Emulsions
3. Semisolids
4. Suppositories
5. Capsules
6. Microencapsulation

PA

1. Find out the viable bacterial count of the bacterial culture by pour plate technique.
2. Find out the total bacterial count by turbidimetry and microscopy.
3. Screen the organism for amylolytic activity.
4. Carry out the microbiological assay of the provided antibiotic(s).
5. Find out the amylase activity of pancreatin.
6. Find out the proteolytic activity of pancreatin.
7. Find out the lipase activity of pancreatin.
8. Other relevant practical.

PA

1. Cardiac Pharmacology: Recording & interpretation of cardiac function in human volunteers such as ECG.
2. Respiratory Pharmacology: Recording & interpretation of pulmonary functions in human volunteers.
3. Gastrointestinal Pharmacology:
 - a. To study the ulcer healing properties of drugs in pylorus ligated rats.
 - b. To study the effect of antidiarrhoeal drugs on gast

4. To record the Concentration Response Curve (CRC) of selected drugs using rat colon/rat fundus isolated preparations.
5. To study the clinical manual as per the syllabus.

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Books

1. A.H. Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, Vol. I & II, The Athlone Press of the University of London (Latest Edition).
2. J. Bassett, R.C. Denney, G.H. Jeffery & J. Medhan, Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis. The English Language Book Society and Longman (Latest Edition).
3. H. H. Willard, L.L. Merritt; Jr., and J.A. Dean, Instrumental Methods of Analysis, VanNostr and Reinhold, New York (Latest Edition).
4. L. G. Chatten, Pharmaceutical Chemistry, Vols. I and II, Marcel Dekker, New York (Latest Edition).

Assignment**Drug**

Introduction: General pathways of drug metabolism; Phase I (Functionalization) and Phase II (Conjugation) reactions.

(2 Lectures)

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Basic concepts, active site directed irreversible e

- 2.3. Antimycobacterial agents: Introduction to mycobacterium, development of antimycobacterium agents and their use in therapeutics (dapson, Sulfoxone Sodium and Solapsone; Isonicotinic acid hydrazide, para Aminosalicyclic acid, Pyrazinamide and Ethionamide).
(2 Lectures)
- 2.4. Antimalarials; quinoline and analogues, 8-amino quinolines, 9-amino acridines, 4-aminoquinolines, diaminopyrimidine, and biguanides (Primaquin, Mepacrine, Chloroquin and Pyrimethamine).
(4 Lectures)
- 2.5.

5. H. Singh and V.K. Kapoor Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Delhi (Latest Edition).

Diagnostic Sensitivity Testing

Diagnostic Sensitivity Testing

Techniques for both covered and uncovered patch tests, interpretation of patch test, patch testing with nail lacquers, lipsticks, lanolin and hair dyes. Photosensitivity testing of cosmetics.

Predictive Sensitivity Testing: Testing of humans for irritancy, predictive testing for allergic contact sensitization and photosensitization capacity.

(10 Lectures)

Bioethics

Ethnic skin and its cosmetic requirement. Cleansing products, skin toners, emollients, moisturizers, cold creams, vanishing creams, hand and body creams and lotions, hormone creams and lotions, barrier creams, anti wrinkle products, skin whitening products, anticellulite products, sunburn and sunscreen preparations, foundation makeup including face powders and rouges.

(12 Lectures)

Cosmetics

Nail Lacquers and removers: Raw materials, formulations and manufacture, evaluation of nail lacquers.

(3 Lectures)

Purpose, types and forms, formulation.

(2 Lectures)

Antiperspirants

Product forms, active ingredients, formulations.

(2 Lectures)

Shampoos

Product characteristics, raw materials, formulations and manufacture, quality assurance.

(5 Lectures)

Shampoos

Shampoos: Function, types and forms, raw material, evaluation.

Hair oils: Natural and synthetic oils.

Hair colourings/dyes: Bleaching agents, temporary, semipermanent, permanent, miscellaneous colouring agents.

Dye removers.

Depilatories: Chemical depilatories and epilatory compositions.

(8 Lectures)

Books

- 3.1 Remington: The Science and Practice of Pharmacy, Mack Publishing Co., U.S.A. (Latest Edition).
- 3.2 Poucher's perfumes, Cosmetics and Soaps, Vol. 3 (Cosmetics), 9th edition, 1992.
- 3.3 M.S. Balsam and E. Sagarin, Cosmetics: Science and Technology, Vol. 1-3, 2nd edition, 1974, Wiley Interscience, N. Y.

1. Volatile Oils:
- 1.1. Different methods of essential oil extraction (3 Lectures)
- 1.2. Biological source, chemical constituents and uses of the following drugs:
Mentha, Spearmint, Orange peel, Cinnamon, Nutmeg, Cardamom, Fennel, Dill, Clove, Eucalyptus, Pine, Lemongrass, Vetiver, Geranium, Rose, Sandalwood. (15 Lectures)
2. Introduction to different classes of plant growth regulators and their physiological role. (6 Lectures)
3. Plant derived insecticides. (7 Lectures)
4. Definitions of various Ayurvedic formulations:
Asavas & Aristas, Arka, Avaleha & Paka, Curna, Taila, Ghrita, Dravaka, Lepa, Vati & Gutika, Varti-Netarbindu & Anjana, Sattva, Parpati, Pisti, Bhasma. (2 Lectures)
5. Study of botanical sources including alternative controversial sources, chemical constituents and therapeutic uses of the following indigenous traditional drugs:
Amla, Bahera, Harad, Ashwagandha, Babchi, Brahmi, Vasaka, Tulsi, Shatavari, Shankpushpi, Kutaki, Kalmegh, Gokhru; Chirata, Ashoka, Jatamansi, and Gilo. (12 Lectures)

Books

1. V.E. Tyler, L.R. Brady & J. E. Robbers, Pharmacognosy (9th Edition) K. M. Varghese Company, Bombay, India, 1988.
2. W. C. Evans, Trease and Evans' Pharmacognosy (15th Ed.), W.B. Saunders Limited, 2002.
3. T. E. Wallis, Text Book of Pharmacognosy, J & A Churchill Ltd., London, 1967.
4. Ayurvedic Pharmacopoeia of India (different volumes)
5. Indian Pharmacopoeia, Govt. of India, Ministry of Health and Family Welfare, Delhi, (Latest Edition).

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1. **B o**

Basic principles of bioassays, radioimmunoassay, enzyme immunoassays, official bioassays of oxytocin, vasopressin, insulin and digitalis.

(4 Lectures)

2. **C o p**

Chemotherapy of Microbial Diseases: General principle of chemotherapy, Sulphonamides, quinolones, penicillins, cephalosporins, aminoglycosides, protein synthesis inhibitors (tetracyclines), antimalarial drug, drugs for amoebiasis, helminthiasis. Chemotherapy of tuberculosis, leprosy and chemotherapy of antiviral agent including drugs for HIV

3.

Pharmacognosy is the study of natural products of plant, animal and mineral origin. It deals with the identification, authentication, standardization and quality control of crude drugs. The study of pharmacognosy is essential for the pharmacist to ensure the safety and efficacy of the drugs.

1. Extraction of volatile oils studied in theory and their chromatographic studies.
2. Authentication and standardization of crude drugs covered in theory based on organoleptic and microscopic characters.
3. Gross identification of crude drugs.

Books

1. V.E. Tyler, L.R. Brady & J. E. Robbers, Pharmacognosy (9th Edition) K. M. Varghese Company, Bombay, India, 1988.
2. W. C. Evans, Trease and Evans' Pharmacognosy (15th Ed.), W.B. Saunders Limited, 2002.
3. T. E. Wallis, Text Book of Pharmacognosy, J & A Churchill Ltd., London, 1967.
4. Ayurvedic Pharmacopoeia of India (different volumes).
5. Indian Pharmacopoeia, Govt. of India, Ministry of Health and Family Welfare, Delhi, (Latest Edition).

Pharmacognosy is the study of natural products of plant, animal and mineral origin. It deals with the identification, authentication, standardization and quality control of crude drugs. The study of pharmacognosy is essential for the pharmacist to ensure the safety and efficacy of the drugs.

1. **Bo**
Study of various bioassay designs using various isolated preparations (frog rectus abdominis, rat colon, fundus,

SCHEME OF TEACHING AND EXAMINATION

Sl. No.	Name of the Course	Theory	Practical	Total	Internal Assessment	Sessional Examination	End Semester Examination	Total
Theory Courses								
PHARM-7011	Pharmaceutical Analysis-III	3	-	3	-	20	80	100
PHARM-7012	Medicinal Chemistry-IV	3	-	3	-	20	80	100
PHARM-7023	Pharmaceutical Technology-IV	3	-	3	-	20	80	100
PHARM-7024	Pharmaceutical Industrial Management	3	-	3	-	20	80	100
PHARM-7035	Pharmacognosy-V	3	-	3	-	20	80	100
PHARM-7046	Pharmacology-IV	3	-	3	-	20	80	100
Practical Courses								
PHARM-7111	Pharmaceutical Analysis Practical-III	-	6	-	6	20	80	100
PHARM-7122	Pharmaceutical Technology Practical-IV	-	6	-	6	20	80	100
PHARM-7133	Pharmacognosy Practical-V	-	3	-	6	20	80	100
PHARM-7144	Pharmacology Practical-IV	-	3	-	6	20	80	100
Total		18	18					1000

Note: i) There will be minimum one Sessional Examination in each theory paper.

ii) Internal assessment for practical will be based on day to day performance including Attendance, Viva and Laboratory record.

- Practical Courses**
1. **Physical Pharmacy** - Nature of electromagnetic radiations, the interaction between energy and matter, the absorption of energy by atoms and molecules, the emission of radiant energy by atoms and molecules; refraction and diffraction.

(2 Lectures)

2. n p o o

Electronic excitation, quantitative laws, deviations from Beer's law, graphical presentation of data, chromophores, photometric error, instrumentation (light sources, prism and grating monochromators, photoemissive and photomultiplier tubes), single and double beam instruments, Steps in spectrophotometric measurements (sample handling; amplifications and radiation of detectors, selection of wavelength and band width), concentration and optimum absorbance value, applications (direct and indirect methods, analysis of mixture).

(4 Lectures)

3. o An

Theory, quantitative description, experimental fact

9. **Origin of spectra, atomization and ionization, instrumentation (nebuliser, mirrors, burners, slits, monochromator, detector, background emission, interferences, qualitative and quantitative applications in pharmaceutical analysis).**
(2 Lectures)
10. **Theory of absorption of radiant energy by atoms, equipment, analytical applications.**
(2 Lectures)
11. **Plane of Polarization, types of molecules analysed, optical rotation, optical rotatory dispersion, circular dichroism, the effect of concentration, wavelength, solvent, temperature on optical rotation, the polarimeter.**
(3 Lectures)

Books

1. L.G. Chatten, Pharmaceutical Chemistry, Vol. 1 and 2, Marcel Dekker, NY (Latest Edition).
2. H. Beckett and J. B. Stenlake, Practical Pharmaceutical Chemistry, Vol. 1 and 2, Athlone Press of the University of London (Latest Edition).
3. H. Willard, L.L., Marriott; Jr., J. A. Dean, Instrumental Methods of Analysis, Van Nostrand Reinhold, N.Y. (Latest Edition).
4. V. M. Parikh, Absorption Spectroscopy of Organic Molecules, Addison-Wesley Publishing Co., London, 1974 (Latest Edition).
5. A. Skoog, E. 1. Holler and T. A. Nieman, Principles of Instrumental Analysis, Saunders Golden.
6. R.M. Silverstein, G.C. Baslien and T.C. Morrill, Spectrometric Identification of Organic Compounds, John Wiley and Sons, New York (Latest edition).

References

1. **Introduction, medicinal aspects of anaesthetic**

3.

2.5. Compression and Cohesion

Properties of tablets influenced by compression, measurement of transmission and distribution of forces in a compressed tablet, effect of pressure on relative volume, lubrication, adhesion and cohesion of particles, strength of granules, factors affecting strength of tablets.

(4 Lectures)

3. Pilot Plant Design

Factors to be considered during development, types of organizational structures responsible for pilot operations, educational backgrounds of pilot plant personnel, pilot plant design for tablets.

(4 Lectures)

4. Plant

Organization and personnel, general facilities, environmental factors, pharmaceutical manufacturing facilities.

(4 Lectures)

5. Sustained Release Drug Delivery

Sustained release drug therapy, advantages, drug properties relevant to sustained release, Introduction to sustained release oral dosage forms; parenteral dosage forms; implants; ocular inserts; transdermal systems. Introduction to delivery systems like nanoparticles, liposomes and niosomes.

(8 Lectures)

Books

1. Lieberman HA, Lachman L. Pharmaceutical Dosage Forms, Tablets, Vol. I, II, III. Marcel Dekker Inc., New York. Latest Edition.
2. Lachman L, Liebermann HA, Kanig JL. The Theory and

P A r t I I C u l a r C o u r s e o f M a n a g e m e n t

1. Introductory, Philosophy and nature of management. Importance of management. Limitations of the science of management. (3 Lectures)
2. Production, planning and control: Types of production, scheduling and control of production. (6 Lectures)
3. Inventory control: Objectives, inventory classification, ABC analysis, EOQ models, inventory control procedures. (5 Lectures)
4. Plant layout and line balancing: Concept and factors governing plant layout, process layout and product layout, methods of plant layout, storage space requirement, line balancing, and linear programming methods. (7 Lectures)
5. Work-study: Need for work study, objectives, method study procedure, flow process charts, design of work place, time study, performance appraisal. (6 Lectures)
6. Programming and Budgeting: Programming, zero based budgets, types and uses of budgets, preparation of budget, forecasting techniques. (7 Lectures)
7. Principles of quality management: Benchmarking and re-engineering principles. (4 Lectures)
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1. Clinical Pharmacology: Definition, concept and scope of clinical pharmacology. Role of pharmacist in health care system and pharmacovigilance. (4 Lectures)
2. Drug development process: Definition, scope and preclinical evaluation of drugs, safety evaluation, clinical trials and post marketing surveillance of new drugs. Contract Research Organization, its concept and scope. (8 Lectures)
3. Basic principles of drug therapy monitoring in paediatric and geriatric patients. Drug therapy in pregnancy and lactation. (7 Lectures)
4. Adverse drug reactions (their types and their incidence, importance and surveillance), drug interactions. (4 Lectures)
5. Essential medicine list and national drug policy. (2 Lectures)
6. Epidemiology of drug use and organization of drug information services/center. (4 Lectures)
7. Immunopharmacology: Definition, scope and application of Immunopharmacology, Immunomodulators and Immunosuppressants. (5 Lectures)
8. Autocoids and arachidonic acid metabolites (prostaglandins, thromboxanes, leucotrienes, lipoxins and platelet activating factor). Histamine and histamine receptor antagonists. (6 Lectures)
9. Necrosis and apoptosis, their mechanisms and their implications in disease. (2 Lectures)

Books

1. T.M. Speight, N. H. G. Holford, Aveery's Drug Treatment, 4th edition, Adis International.
2. R. Walker and C. Edwards, Clinical Pharmacy and Therapeutics, Churchill Livingstone, London, 1999.
3. D. G. Grahaems Smith and J. K. Aronson, Oxford Textbook of Clinical Pharmacology and Drug Therapy, Oxford University Press, 1984.
4. B. G. Katzung, Basic and Clinical Pharmacology, Lange Medical Publications, 8th Ed. (2000).
5. E. Braunwald, K. J. Isselbacher, J.B. Martin, A. S. Faue, J. D. Wilson Harrisons, D.L. Kasper, Principles of Internal Medicine, 13th edition, McGraw Hill International Book Co., 1994.
6. Drug, Facts and Comparisons, Facts and Comparisons, St. Louis, USA, 1995.
7. D.R. Laurence, Clinical Pharmacology, 5th edition, Churchill Livingstone, 1985.

Practicals in Analytical Chemistry

1. Determination of number and percentage of hydroxyl groups in the given sample of polyhydric alcohols or phenols.
2. Determination of percentage and number of amino groups in the samples.
3. Determination of percentage of the carboxylic acid by iodometric titration.
4. Determination of aldehyde and ketones by hydroxylamine hydrochloride; pyridine procedure.
- 5.

Pharmacology of Steroids

- 1.1. Introduction: Nomenclature, stereochemistry, simple reactions of cholesterol, stigmasterol, ergosterol, diosgenin, solasodine, bile acids; biosynthesis of testosterone, 17 (3-estradiol and aldosterone from cholesterol).
- 1.2. Estrogens: Synthesis of estradiol from cholesterol and diosgenin, ethinylestradiol from estrone; nonsteroidal estrogens; synthesis of diethylstilbesterol, SAR among estrogens; progestational agents; synthesis of progesterone from diosgenin and stigmasterol, ethisterone from dehydroepiandrosterone, oral contraceptives, SAR of progestins.
- 1.3. Androgens and Anabolic Agents: Synthesis of testosterone from diosgenin; methyltestosterone from dehydroepiandrosterone, methandienone from methyl testosterone, stanozolol from testosterone.
- 1.4. Adrenocorticoids : Glucocorticoids, mineralocorticoids, modifications in structure of hydrocortisone, SAR among glucocorticoids.

(15 Lectures)

The chemical naming and uses of compounds official in IP/BP in all the classes will be covered. The following topics shall be treated covering chemical naming, structure Activity Relationship, physicochemical and steric aspects, mode of action (wherever applicable) and uses. The emphasis would be mainly on B.P. and I. P. drugs. Synthesis of only those drugs given in parenthesis under each topic would be covered.

Pharmacology of Analgesics

- 2.1.1. Morphine and related drugs, synthetic modifications of morphine, codeine and thebaine.
- 2.1.2. Totally synthetic analgesics: Morphinans (N-Methylmorphinan and 3-hydroxy N-methylmorphinan); 6, 7-benzomorphans; 4-phenylpiperidines (pethidine, Methadone and Isomethadone); endogenous opioid peptides; opioid antagonists (Nalorphine).

(6 Lectures)

2.2. Cardiovascular Agents

- 2.2.1. Introduction; cardiac glycosides, structure-activity relationship; mechanism of action; toxic effects.
- 2.2.2. Antihypertensive agents; introduction; etiology; ganglion blocking agents; antiadrenergic agents, drugs acting directly on smooth muscles, drugs acting on CNS. (Propranolol).
- 2.2.3. Antianginals and vasodilators; introduction; mechanism of smooth muscle vasodilation, esters of nitrous and nitric acid, side-effects. (Nitroglycerine).
- 2.2.4. Antiarrhythmic and antifibrillatory drugs; classification of antiarrhythmic drugs, mechanism of action, side effects.
- 2.2.5. Antilipemic drugs.

(15 Lectures)

2.3. **An** ▼

3.1.1. Bio

3.1.1. Physicochemical factors affecting biopharmaceutical performance of drugs, with special emphasis on pH-partition hypothesis, absorption of ionic drugs in light of unstirred water layer, dissolution rate, d

1.3.2. Multiple Dose Regimens: Drug accumulation, relationship between initial and maintenance doses,

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Intravenous fluids - Packaging systems, administrative sets, administration procedures including volume control method, piggyback method, patient controlled analgesia, final-filter devices, intravenous admixtures - additives, parenteral incompatibility, total pare

- 3.2. Trade of medicinal plants and their products from India. (2 Lectures)
- 3.3. Worldwide trade of Ginseng, Cinchona alkaloids (quinine & quinidine), Liquorice, Senna, Isabgol, Dioscorea (diosgenin), tropane alkaloid containing plants. (7 Lectures)
- 4. Industrial production and utilization of following medicinal plants / phytoconstituents:
 - 4.1 Poppy, Cinchona, Catharanthus, Ipecac and Colchicine. (9 Lectures)
 - 4.2. Aloes, Senna, Rutin, Isabgol, Catechu and Tea catechins. (8 Lectures)
 - 4.3. Utilization of plants as a source of raw material for the synthesis of steroidal drugs. (2 Lectures)
- 5.

Book **o** **n**

1. L.G. Chatten, A Textbook of Pharmaceutical Chemistry, Vol. 2, Marcel Dekker, NY (Latest Edition).
- 2.