

OSMANIA UNIVERSITY

FACULTY OF TECHNOLOGY

B.Pharmacy Course Structure & Syllabus

Rules & Regulations for B. Pharmacy Course
(Applicable for batch admitted during the Academic year 1994-95 to 2002-03)

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM I YEAR						
COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 1. 101	Organic Chemistry-I	2	—	30	70	3 hrs
PY 1. 102	Pharmaceutical.Chemistry (Inorganic)	2	—	30	70	3 hrs
PY 1. 103	Pharmaceutics-I	2	—	30	70	3 hrs
PY 1. 104	Mathematics-I / Biology	4/4	—	30	70	3 hrs
PY 1. 105	Computer Applications	1	—	15	35	1.5 hrs
PY 1. 106	Physical Pharmacy-I	2	—	30	70	3 hrs
PY 1. 107	Organic Chemistry-I	—	4	25	50	6 hrs
PY 1. 108	Pharmaceutical Chemistry-I (Inorganic)	—	4	25	50	6 hrs
PY 1. 109	Pharmaceutics-I	—	4	25	50	6 hrs
PY 1. 110	Biology	—	6	25	50	6 hrs
PY 1. 111	Computer Applications	—	2	15	35	3 hrs
PY 1. 112	Physical Pharmacy-I	—	4	25	50	6 hrs
		13	18 / 24	305	670	

PY 1. 104 Mathematics - I for Intermediate Biology Students

PY 1. 110 Biology for Intermediate Mathematics Students

Duration of course I year - 32 weeks - Instruction

' - 2 weeks - Preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM II YEAR I semester

COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 2. 101	Organic Chemistry-II	4	—	30	70	3 hrs
PY 2. 102	Mathematics-II	4	—	30	70	3 hrs
PY 2. 103	A.P.H.E	4	—	30	70	3 hrs
PY 2. 104	Microbiology	4	—	30	70	3 hrs
PY 2. 105	Organic Chemistry-II	—	8	25	50	6 hrs
PY 2. 106	A.P.H.E	—	6	25	50	6 hrs
PY 2. 107	Microbiology	—	6	25	50	6 hrs
		16	20	195	430	

Duration of course II year I semester 16 weeks instruction
2 weeks preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM II YEAR II semester

COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 2. 201	Pharmaceutical Analysis-I	4	—	30	70	3 hrs
PY 2. 202	Dispensing & Hospital Pharmacy	4	—	30	70	3 hrs
PY 2. 203	Pharmaceutical Engineering-I	4	—	30	70	3 hrs
PY 2. 204	Pharmacognasy-I	4	—	30	70	3 hrs
PY 2. 205	Pharmaceutical Analysis-I	—	6	25	50	6 hrs
PY 2. 206	Dispensing & Hospital Pharmacy	—	6	25	50	6 hrs
PY 2. 207	Pharmaceutical Engg. Drawing	—	4	25	50	6 hrs
PY 2. 208	Pharmacognosy-I	—	6	25	50	6 hrs
		16	22	220	480	

Duration of course II year II semester 16 weeks instruction
2 weeks preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM III YEAR I Semester						
COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 3. 101	Pharmacuetical Chemistry-II (natural products)	4	—	30	70	3 hrs
PY 3. 102	Pharmaceutics-II (Pharma. Tech)	4	—	30	70	3 hrs
PY 3. 103	Physical Pharmacy-II	4	—	30	70	3 hrs
PY 3. 104	Pharmacology-I	4	—	30	70	3 hrs
PY 3. 105	Pharmaceutical Chemistry-II (natural products)	4	8	25	50	6 hrs
PY 3. 106	Pharmaceutics-II	—	6	25	50	6 hrs
PY 3. 107	Pharmacology-I	—	6	25	50	6 hrs
		16	20	195	430	

Duration of course III year I semester 16 weeks instruction
2 weeks preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM III YEAR II Semester

COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 3. 201	Biochemistry	4	—	30	70	3 hrs
PY 3. 202	Business Management (Incl.Industrial Psychology)	4	—	30	70	3 hrs
PY 3. 203	Pharmaceutical Engg-II	4	—	30	70	3 hrs
PY 3. 204	Pharmacognosy-II	4	—	30	70	3 hrs
PY 3. 205	Forensic Pharmacy	4	—	30	70	3 hrs
PY 3. 206	Bio Chemistry	—	6	25	50	6 hrs
PY 3. 207	Pharmaceutical Engg.II (Incl.I & II Practicals	—	6	25	50	6 hrs
PY 3. 208	Pharmacognosy-II	—	6	25	50	6 hrs
		20	18	225	500	

Duration of course III year II semester 16 weeks instruction
2 weeks preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM IV YEAR I Semester

COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 4.101	Pharmaceutical Chemistry-III (Medicinal chemistry-I)	4	—	30	70	3 hrs
PY 4.102	Pharmaceutical Analysis-II	4	—	30	70	3 hrs
PY 4.103	Pharmaceutics-III Dosageformulation & Design	4	—	30	70	3 hrs
PY 4.104	Pharmacology-II	4	—	30	70	3 hrs
PY 4.105	Pharmaceutical Analysis-II	—	6	25	50	6 hrs

PY 4.106	Pharmaceutics-III (Dosage formulations & Design)	–	6	25	50	6 hrs
PY 4.107	Pharmacology-II	–	6	25	50	6 hrs
		16	18	195	430	

Duration of course IV year I semester 16 weeks instruction
2 weeks preparation for exam

SCHEME OF INSTRUCTION AND EXAMINATION FOR B.PHARM IV YEAR II Semester						
COURSE NO	SUBJECT	PERIODS/WEEK (50 Minutes)		SES- SIO- NAL MARKS	EXAMI- NATION- MARKS	DURATION OF EXAMI- NATION
		THEORY	PRAC- TICALS			
PY 4. 201	Pharmaceutical Chemistry-IV (Medicinal chemistry-II)	4	–	30	70	3 hrs
PY 4. 202	Bio-Pharmaceutics & Pharmacokinetics	6	–	30	70	3 hrs
PY 4. 203	Cosmeticology	2	–	25	50	2 hrs
PY 4. 204	Pharmaceutical Biotechnology & Biological Pharmacy	4	–	30	70	3 hrs
PY 4. 205	Pharmaceutical Chemistry-IV Medicinal Chemistry-II	–	6	25	50	6 hrs
PY 4. 206	Biopharmaceutics & Pharmacokinetics	–	4	25	50	6 hrs
PY 4. 207	Cosmeticology	–	4	25	50	6 hrs
PY 4. 208	Pharmaceutical Biotechnology & Biological Pharmacy	–	6	25	50	6 hrs
PY 4. 209	Library Assignments/ Seminars	–	4	A: Excellent, B: Very Good C: Good, D: Satisfactory F: Failed		
		16	24	215	460	

Duration of course IV year II semester 16 weeks instruction
2 weeks preparation for exam

ORGANIC CHEMISTRY – I

PY.1.101

Period / Week: 2

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

The subject of organic chemistry will be treated in its modern perspective keeping for the sake of convenience of the usual classification of organic compounds but laying emphasis on the following aspects.

UNIT – I Structure and properties: Energy of activation. Transition state; Free – radical substitution.

UNIT – II Stereo – chemistry optical and geometric isomerism, specification of R&S configuration, cycloalkanes; Nucleophilic aliphatic substitution, carbocations.

UNIT – III Elimination; Electrophilic and Free – radical addition; conjugation and Resonance; Nucleophilic addition and Nucleophilic acyl substitution.

UNIT – IV Chemistry of aliphatic compounds, including preparation and reactions of alkanes, alkenes, alcohol, ethers and alkynes.

UNIT – V Aldehydes, ketones, carboxylic acids and esters.

Text Books:

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Allyn and Bacon, Inc., Boston, V. Edition, 1990.

Reference Books:

1. I. L. Finar, Organic Chemistry, Vol. 1, The English Language Book Society, London, V Edition 1988.
2. B. S. Furniss, A. J. Hannaford, V. Rogers, P. H. G. Smith and A. H. Tatchell, Vogell's Text Book of Practical Organic Chemistry (Including qualitative organic analysis), the English Language book Society.

3. F. G. Mann and B. C. Saunders, Practical Organic Chemistry,
Longman's, Green & Co. Ltd., London.

PHARMACEUTICAL CHEMISTRY – I (INORGANIC)

PY.1.102

Period / Week: 2

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I A review of electronic structure of atom, periodic classification and group properties of elements. An outline of methods of preparation, uses, sources of impurities, tests for purity and identity including limit tests for iron, arsenic, lead, chloride, sulphate and heavy metals of the following classes of drugs included in the Indian Pharmacopoeia. (The discussion of assays should be excluded).

Acids and Bases, Buffers, Antioxidants, water,

Gastrointestinal agents, Acidifying agents, Antacids, protectives and Adsorbents, Saline Cathartics.

Major Intra and Extra – cellular electrolytes, major physiological ions, Electrolytes used for replacement therapy, Physiological acid – base balance Electrolytes used in acid – base therapy, Electrolytic combination therapy.

UNIT – II Essential and trace elements; Transition elements and their compounds of pharmaceutical importance. Iron and haemotonics, Mineral supplements.

Inorganic Pharmaceuticals used for systematic effects, drugs used primarily for cationic and anionic components.

UNIT – III Topical agents: Protectives, Antimicrobials and Astringents gases and vapours: Oxygen therapy, Anaesthetic gases Respiratory stimulants.

UNIT – IV Dental products, Anticaries agents and dentifrices. Complexing and chelating agents.

UNIT – V Miscellaneous inorganic pharmaceutical agents, e. g. Sclerosing agents, Expectorants and emetics, poisons and antidotes, sedatives, Antioxidants reported.
Inorganic analytical reagents and their application.

Text Books:

1. J. H. block, E. G. Roche, T. O. Soine and C. O. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febinger Philadelphia.

Reference Books:

1. C. A. Discher, Modern inorganic Pharmaceutical Chemistry John Wiley and Sons, New York.
2. T. O. Soine and C. O. Wilson, Roger's Inorganic Pharmaceutical Chemistry, Lea and Febinger, Philadelphia.
3. L. M. Atherden, Bentley and Driver's Text Book of Pharmaceutical Chemistry, 8th Edn., Oxford University Press, London.
4. Pharmacopoeia of India, govt. of India, ministry of Health. 1985.
5. A. H. Backett and J. B. Stenlake, Practical Pharmaceutical Chemistry, Part I, The Athlone Press University of London.

PHARMACEUTICS – I

(Preparative Pharmacy including History of Pharmacy)

PY.1.103

Period / Week: 2

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT I: Pharmacy profession : Pharmacy as a career, Pharmaceutical Education, Registration as a Pharmacist. Evolution of Pharmacy Profession – earlier period, Middle ages. Modern, European and American Pharmacy, Pharmacopoeia of India and other countries (B.P., U.S.P., International)

Metrology: Metric weights and Measures, Basic and derived S.I. weights and measures. Interconversions Weighing – Selection and care of weights and balances. Sensitivity reciprocal and minimum, weighable quantities. Density absolute, apparent and relative. Specific gravity – hydrometers, Westphal balance, specific volume.

UNIT – II Liquids: Solutions, Syrups, dry syrups, elixirs, spirits, aromatic waters, liquids for external use – lotions, liniments, ear drops, throat paints, gargles, eye drops, glycerins, collodions.

Definition, general formulation, manufacturing procedures, uses of official and other products in common use.

UNIT – III Semisolids: Ointments, creams, pastes, jellies. Definitions bases, general formulations, manufacturing procedures and uses of official and other products in common use.

Suppositories: Ideal requirements, different bases, manufacturing procedures and uses of official and other important products.

UNIT – IV Powders: Advantages and limitations as dosages forms manufacturing procedure and equipments, special care and problems in manufacturing

powders, Powders of I. P. and their uses, effervescent granules and salts and their specific uses.

Crude extracts: Principles and methods of preparation of dry, soft and liquid extracts and tinctures of I. P. from fresh and dry drugs and their uses.

UNIT – V Allergic extracts: Types of allergens, preparation of extracts, testing and Standardisation of extracts, general preparations.

Medical gases: Official medical gases and their uses containers and fittings, handling and storage.

Radio Pharmaceuticals: Therapeutic and diagnostic uses, facilities and work area, preparation of radio pharmaceuticals.

Text Books:

1. Bentley's text book of pharmaceuticals – Rawlins 9th Edn 1980.
2. Introduction to Pharmaceutical dosage forms by H. C Ansel – 5th Edn. 1990.

Reference Books:

1. i. General pharmacy M. L. Shroff (Relevant volumes
ii. Professional pharmacy by M. L. Shroff.
2. Copper & Gunn's dispensing for pharmaceutical students 12th edition.

MATHEMATICS – I

PY.1.104

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I ALGEBRA: - Laws of indices (without proof) surds, Definition and properties of surds, rationalization, square root and fourth roots.

UNIT – II LOGARITHMS: - Logarithm of a real number to an arbitrary base also Napierion base – Theorems on logarithms use of tables.

UNIT – III CALCULUS: - Functions limits, differential coefficient rules differentiation of a sum, product and quotient of functions, differentiation from first principles, differentiation of implicit geometrical, composite and inverse functions integration considered as converse of differentiation, simple integrations, standard forms like $\int x^n dx$, $\int \sin(ax) (dx)$, $\int \cos(ax) dx$ $\int \sec(ax) dx$. Methods of substitution, simple example.

UNIT – IV Trigonometry – Measurements of angles, trigonometrical ratios and simple relations conducting the complimentary and supplementary angles, Negative angles, sum and difference of two angles, sine and cosine formulae for multiple angles and half angles.

UNIT – V Identities – Relations between sides and angles of triangles, area of triangles, solution of triangles, general solution of trigonometric equations, ratio of circumscribed, inscribed circles of triangles, graphs.

Text Books: 1.A. Text book of mathematics by N. Krishna moorthy chand series volume – I.

1. Elements of calculus by D. C. Pavate & Bhagavat.

BIOLOGY

PART - A

PY.1.104

Sessional: 30

Examination: 70

Period / Week: 4

Duration of Exam: 3 hrs

Nature of Exam: Theory

- UNIT – I** Plant cell its structure, living and non-living inclusions, Different types of plant tissues and their functions. Morphology and histology of roots, stems, barks, woods, leaves, flowers, fruits and seeds. Modification of roots stems and leaves.
- UNIT – II** Plant taxonomy: Classification, study of the following families with special reference to medicinal and economically, important plants (a) Apocynaceae (b) Solanaceae (c) Umbelliferae (d) Cruciferae (e) Labiatae (f) Leguminosae (g) Rubiaceae (h) Papaveraceae (i) Rutaceae (j) Liliaceae.
- UNIT – III** Advanced plant physiology: Absorption, transpiration, respiration, photosynthesis, growth and role of plant hormones. Genetic code and Heredity: Polyploidy, Hybridization and mutation.
- UNIT – IV** Study of the different systems of frog. Study of animal tissues and cell division.
Histology of liver, kidney skeletal muscles, smooth muscles, lungs, heart, Pancreas, intestine and endocrine glands of rabbit.
- UNIT – V** Morphology and life history of human parasites: Plasmodium, entamoeba, tapeworm, ascaris, anchylostoma and trichonella. Life history of mosquito and house fly as agents for spreading diseases.

Text Books:

1. A Text book of Botony By A. C Dutta.
2. A Text book of Biology – Vikram series.

COMPUTER APPLICATIONS

PY.1.105

Period / Week: 1

Sessional 15

Duration of Exam : 1.5 hrs

Examination: 35

Nature of Exam: Theory

UNIT – I COMPUTER CONCEPTS: Generation of computers. The BASIC structure of the computer. Types of memory chips. Characteristics of computers. Study of various input - output devices like magnetic tape, magnetic disc, MICR, OCR, CD ROMS, etc. types of printers. Principles of flow charting.

OPERATING SYSTEM: Importance of operating system. Basic commands of DOS, DIR, DATE, TIME, CD, MD, RD etc.,

UNIT – II PROGRAMMING IN BASIC: Introduction to Programming, Constants, Variables, and expressions. Usage of statements like LET, INPUT, READ/ DATA, PRINT, GOTO, IF/THEN, REM, For – NEXT, END etc.

UNIT – III WORD PROCESSING CONCEPTS: Introduction to word processing. Editing and Modifying a text, Block Operations, Margin Settings, Print, Enhancement commands, Spell checking, Shorthand and Mail Merging Concepts.

Text Books:

1. Computers and commonsense by Hunt & Shelly, PHI.
2. Programming in BASIC by E. Balagurusami.

Reference Books:

1. Mastering Word star BPB Publications.

PHYSICAL PHARMACY - I

PY.1.106

Period / Week: 2

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I States of matter and phase equilibria: Gaseous state, liquid state including Clapeyron equation; solids and crystalline state - x - Ray diffraction, melting point and heat of fusion, polymorphism, dilatometric analysis of compounds. Amorphous solids, Liquid crystalline state, Phase equilibria and the phase rule - systems containing the component, solid dispersions, phase equilibria in three component systems. Differential scanning calorimetry. (DSC) Differential thermal analysis. (DTA)

Thermodynamics: The first law of thermodynamics. Thermochemistry, the second law of thermodynamics, the third law of thermodynamics. Free energy functions and applications.

UNIT – II Physical properties of drug molecules: Dielectric constant and induced polarization, Refractive index and molar refraction, optical rotation, dispersion optical rotary dispersion and circular dichroism.

Solutions of nonelectrolytes : Properties and types solutions concentration expressions, solutions nonelectrolytes – ideal and real solutions. Colligative properties, Molecular weight determinations.

UNIT – III Solutions of electrolytes: Arrhenius theory of electrolyte dissociation, modern theory of strong electrolytes, Debye-Huckel Theory, coefficients for expressing colligative properties – α value, osmotic Coefficient, Osmolality.

Ionic equilibria : Modern Theory of acids, bases and salts – Bronstead – Lowry theory, Lewis electronic theory. Acid – base equilibria – Ionisation of weak acids, weak bases, water and ampholytes. Sorensen's pH scale. Acidity constants – effect of ionic strength upon acidity constants, effect of temperature on ionic equilibrium. Determination of acidity constants.

UNIT – IV Buffered and isotonic solutions: The buffer equation – common ion effect and the buffer equation for weak acid and its salt and a weak base and its salt. Factors influencing pH of buffer solutions. Drugs as buffers pH indicators buffer capacity and its calculations; van Slyke equation. Influence of concentration on buffer capacity and maximum buffer capacity. Buffers in pharmaceuticals and biologic systems – in vivo biologic buffer systems, pharmaceutical buffers, and preparation, influence of buffer capacity and pH on tissue irritation, stability vs optimum therapeutic response pH and solubility. Buffered isotonic solutions – measurement of tonicity, calculating tonicity and methods of adjusting tonicity and pH.

UNIT – V Electromotive force and oxidation – reduction; electrochemical cells, types of electrodes measuring the EMF of cells, reference electrodes and standard potentials electrometric determination of pH specific ions and redox potentials – hydrogen and glass electrodes, operation of pH meter ion selective electrodes, potentiometric titration, potentiometric determination of dissociation constants oxidation – reduction in pharmacy.

Text Books: 1. A. Martin, J. Swarbrick and A. Cammarata, Physical Pharmacy Lea and Febiger, Philadelphia. III Edn. 1983.

Reference Books:

1. S. Glasstone, A Text Book of Physical Chemistry Van Nostrand, New York.

2. A. Findlay and J. A. Kitcher, Practical Physical Chemistry, Longmans Green & Co., London.

ORGANIC CHEMISTRY – I

PY.1.107

Period / Week: 4

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

1. Organic chemistry laboratory Techniques.
2. Experiments in simple qualitative analysis including preparation of derivatives.
3. Preparation of simple organic compounds illustrating different techniques.

Pharmaceutical Chemistry – I (Inorganic)

PY.1.108

Period / Week: 4

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

1. The background and systematic qualitative analysis of inorganic mixtures containing upto 4 radicals. 6 mixtures to be analysed. Preferably by semi-micro methods.
2. Pharmacopeial limit tests and limit test for impurities (excluding organic impurities) in Pharmaceutical compounds-12 compounds to be tested.
3. Preparation and purification of six inorganic compounds.

PHARMACEUTICS – I

PY.1.109

Period / Week: 4

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

Based on theory

BIOLOGY

PY.1.110

Period / Week: 4

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

PART - A

1. Study of Plant parts and their modifications.
2. Systematic study of the representative of the few families mentioned in the theory.
3. Histology of the following crude drugs.
 - a) Cinchona
 - b) Senna
 - c) Clove
 - d) Quasila
 - e) Coriander
 - f) Linseed.

PART - B

1. Histological study of different organs through permanent slides.
2. Identification and characterisation of specimens studied in theory.
3. Preparation of animal and dissection of various organs for the drug evaluation.

COMPUTER APPLICATIONS

PY.1.111

Period / Week: 2

Sessional: 15

Duration of Exam: 3 hrs

Examination: 35

Nature of Exam: Practical

Based on Theory

PHYSICAL PHARMACY - I

PY.1.112

Period / Week: 2

Sessional: 15

Duration of Exam: 3 hrs

Examination: 35

Nature of Exam: Practical

Based on Theory

ORGANIC CHEMISTRY - II

PY.2.101

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

This will be in continuation of the organic chemistry – I course. Following the usual style, emphasis will be placed on the following.

UNIT – I Aromaticity, Electrophilic aromatic substitution, Arenes and their derivatives, elements of spectroscopy and structure, carbanions, Nucleophilic aromatic substitution.

UNIT – II Preparation and reaction of amines and phenols, conjugate and addition; polynuclear aromatic hydrocarbons.

UNIT – III Heterocyclic compounds: system of numbering and naming of heterocyclics commonly encountered in therapeutic agents. Structure, synthesis and reactions of pyrrole, furan, thiophene, pyridine, quinoline and isoquinoline.

UNIT – IV Acquaintance with the following heterocyclic ring systems with suitable examples of medicinally important compounds, pyridine, benzopyran, pyrazole, isoxazole, thiazole, pyridazine, pyrimidine and phenothiazine.

UNIT – V Name Reaction: Beckman rearrangement, Schmidt rearrangement, Clemenson reduction, Meerwein – pondorff reduction, New organic reagents used in Drug synthesis.

Text Books:R. T. Morrison and R.N. Boyd, Organic Chemistry, Allyn and Bacon, Inc., Boston. V. Edition, 1990.

Reference Books:I. L. Finar, Organic Chemistry, Vol. I, The English Language Book society, London.

2.B. S. Furniss, A. J. Hannaford, V. Rogers, P. W. G. Smith and A. H. Tatchell, Vogel's Text Book of Practical Organic Chemistry, Longmans, Green & Co. Ltd., London.

3. Compounds, Interscience Publishers, New York. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic

MATHEMATICS

PY.2.102

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I DIFFERENTIAL CALCULUS: - Successive differentiation, Leibnitz theorem simple examples, maxima and minima, simple examples.

UNIT – II INTEGRAL CALCULUS: - Integration of rational, irrational and trigonometrical functions. Calculations of areas and volumes of standard bodies using integration. Use of gamma functions.

UNIT – III DIFFERENTIAL EQUATIONS: - Function of differential equations of the first order and first degree. Linear differential equations with constant co-efficient (first order and higher orders).

UNIT – IV COORDINATE GEOMETRY: - Co – ordinate axes and quadrants, distance between two points the ratio formula and area of a triangle, equations of a straight lines parallel to the co – ordinate axes. Definition of a conic section, standard equations to parabola, hyperbola and ellipse, simple examples (using direction and focus property)

UNIT – V STATISTICS: Standard deviation, theory of probability, Histogramme, Standard error, t – test, cauchy-square test, Analysis of variance, Regression analysis, Co-efficient of correction, Curve fitting.

Text Book:

Higher Engineering Mathematics by Grawal – 1991 24th Edn.,

A Text Book of Mathematics by N. Krishna moorthy. Chand series, Volume - I

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

PY.2.103

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I Introduction to the anatomical terms in relation to parts of

The body, systems and organs, elementary knowledge of the human skeleton.

Tissues of the body: properties and functions of epithelial, connective, muscular, nervous and osseous (bone) tissues.

General principles of membrane permeability, diffusion, transport membrane potentials, action potentials.

UNIT – II Nervous systems: Neurone, synapses, ganglion, plexus,

Physiology of nerve impulse, neurotransmission, reflex arc; central nervous system (parts and functions) and autonomic nervous system.

Cardiovascular system and Blood: Heart, blood vessels, cardiac cycle circulation, blood pressure and its regulation and blood (composition and function)

UNIT – III Respiratory system: Gross anatomy of respiratory passages, physiology of respiration, nervous control of respiration.

Digestive system: Gross anatomy of alimentary canal, movements of alimentary canal, gastric secretions and the enzymes involved in digestion.

Endocrine system: Physiological considerations of thyroid, pancreas, pituitary, suprarenal and gonads.

UNIT – IV Urinogenital system: General disposition of organs of excretion. Physiological consideration of Urine formation output and factors controlling it.

Physiology of special senses (ear, eye, smell, taste and pain). Structure and functions of skin.

UNIT – V Health Education and Family Planning.

Elementary pathology: Diseased and pathological processes; inflammation and repair. Retrograde changes including disturbances of metabolism. Disturbances of circulation like Hamorrhage, thrombosis, Embolism, Infraction, Oedema and shock, Nutritional disorders (Deficiency of Vitamins etc.,). Disturbances of growth including various tumours (Neoplasms)

Text Books:

A Text Book of Physiology by Best. & Tailor 4th Edn.,

Text Book of Human Physiology by Chatterjee.

Reference Books:

Text Book of Medical Physiology by A.C. GUYTON.

MICROBIOLOGY

PY.2.104

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I **Introduction to the Science of Microbiology – Ancient theories concerning the origin of life, contribution of great scientists to this science.**

Microscopy: Microscopes, their magnification, resolution, illumination and filters, working of different types of microscopes, micrometry.

Classification of the following groups of microbes and their macro and micro morphology and taxonomy.

Protozoa, fungi, actinomycetes, bacteria, yeasts, rickettsiae, spirochaetes and viruses.

UNIT – II **Different biochemical reactions employed in identification of organisms, stains and staining characteristics, nutrition, cultivation, isolation and preservation, identification, physiology and**

reproduction of bacteria, actinomycetes, fungi, yeasts and viruses. Different methods of bacterial count. Preservation of pure cultures. Organisms important in pharmacy.

Microbial genetics and variation: Introduction, genetic organisation, mutation, mutagens, different types of mutants and their isolation. Genetic recombination in actinomycetes, Heterokaryosis in fungi.

UNIT – III Disinfection, factors influencing disinfecting, dynamics of disinfection, different groups of disinfectants and antiseptics and their evaluation application sterilisation: Different methods, equipment detailed evaluation and applications of different sterilisation methods, sterilisation indicators and their importance. Sterilisation of premises. Sterility testing of pharmaceutical products.

UNIT – IV: Microbial attack and host defence, virulence and pathogenicity, primary and specific defensive mechanisms of body.

General principles of immunology and their applications. Immune systems – humoral immunity, cellular immunity, Privileged graft sites, graft – host reactions, tolerance, Immunogenetics. Classification and principles of different types of immunity, phagocytosis, Hypersensitivity and other reactions. Chemical nature of antigens, antibodies.

Different antigen – antibody reactions and their applications. Different antigens of bacterial cells, monophasic and biphasic variation. Bacterial exotoxins and endotoxins, toxoids.

UNIT – V General principles of infection and communicable diseases. Disease causing agents and their life cycles. Significant symptoms, cursory treatment of the important epidemic and endemic diseases.

- a) Classification, general principles, general modes of transmission of communicable and infectious diseases.
- b) Tuberculosis, cholera, typhoid.
- c) Septicemia, tetanus, diphtheria, whooping cough.
- d) Plague, malaria, filaria, influenza.
- e) Small pox, infective hepatitis, poliomyelitis.

Systematic studies of a few selected organisms B.Subtrilis, E.Coli, penicillium, chrysogenum, streptomyces griseus, saccharomyces cerevisiae. Aspargillus Niger.

9 Microbiology of water and milk.

TEXT BOOKS: Text book of Microbiology by pelezar & Reid, V Edition.

REFERENCE BOOKS:

Text book of Microbiology – Probisher.

Laboratory Manual of Bacteriology – Shalle.

Tutorial Pharmacy – Carter.

ORGANIC CHEMISTRY – II

PY.2.105

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

1. Carrying out of simple organic preparations involving two or more stages – (6)
2. Qualitative analysis of organic compounds with multi functional groups – (6)
3. Identification tests of organic pharmaceutical substances – (12)

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

PY.2.106

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

Histology, Hematology (RBC/WBC/DC), Physiological experiments of muscle – nerve preparation; Demonstration of measurement of blood pressure and respirator function, study of bones and organs (specimen)

MICROBIOLOGY

PY.2.107

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

Experiments devised to prepare various types of culture media, subculturing of common aerobic and anaerobic bacteria, fungus and yeast, various staining methods, various methods of isolation and identification of microbes, sterilizing techniques and evaluation of antiseptics and disinfectants testing for sterility of pharmaceutical products as per I.P, requirements, evaluation of potency of antibiotics and vitamins etc. and others to illustrate the topics included in theory.

PHARMACEUTICAL ANALYSIS – I

PY.2. 201

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

This course shall cover the theoretical basis of analysis with special reference to methods of assay mentioned in Indian Pharmacopoeia.

Unit – I

Computation of analytical results - Significant figures, Concept of error, precision, accuracy, specificity, sensitivity, detection limit, linearity and range, ruggedness, standard deviation Rejection of doubtful values with special reference to volumetric and gravimetric analysis. Calibration of analytical equipment.

Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

Unit – II

Physico-chemical concepts required for analysis such as electrolytic dissociation, Modern theory of acids, bases and salts - Bronstead - Lowry theory, Lewis electronic theory; chemical equilibrium, pH and buffer action, solubility product, common ion effect, hydrolysis of salts and amphoteric substances.

Principles of Neutralization reactions; Theory of indicators and Neutralization indicators.

Unit – III

Principles of oxidation-reduction titration's, redox, self-indicators and their use, reactions in pharmaceutical analysis precipitation.

Principles of gravimetric analysis - typical methods involving precipitation, coagulation, digestion, drying procedures, co-precipitation.

Unit – IV

Theory and applications of complexometric titration's, argentometry, iodometry, potassium iodate, potassium bromate, EDT A, non-aqueous titrations redox titration's, ammonium sulphate, titanous chloride. Principles of gas analysis.

Unit – V

Stoichiometry of Ionic equations and Solutions: The Mole concept, Measuring of Moles of Elements and Compounds; Percentage Composition; Empirical and Molecular Formula; Balancing of Chemical Equations; Some analytical problems and calculations based on mass balance, limiting reagent theoretical yield and percentage yield;

Examination : One question from each unit with internal choice.

Text Books

- 1. Pharmaceutical Chemistry, L.M.Antherden, Bentleys & Drivers, Oxford Univ. Press, U.K.**
- 2. Vogel's Quantitative Inorganic Analysis by Bassett, R.C.Denny & B.H.Jeffery,**

ELBS, U.K.,

Reference Books

1. Practical Pharmaceutical Chemistry, Vol I & II by A.H.Beckett and J.B.Stanlake,
The Athlone Press of the University of London.

DISPENSING AND HOSPITAL PHARMACY

PY.2. 202

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

PHARMACEUTICAL DISPENSING:

UNIT – I **Definitions and general dispensing procedure.**

Sources of information required for pharmacists.

Sources of errors and care required in dispensing prescriptions.

Types of dispensing products. Containers, closures and labelling of dispensed products. Colours flavours and sweeteners used in prescriptions.

UNIT – II **Principles involved and procedures adopted in dispensing of typical preparations like mixtures, solutions, syrups, elixirs, suspensions, emulsions, creams, ointments, powders, granules, capsules, pastes, jellies, suppositories, ophthalmics, ear and nasal drops, pastilles, lozenges pills, lotions, liniments, inhalations, paints, sprays, tablets, tablet triturates etc.**

Incompatibilities- Physical, chemical and therapeutic incompatibilities. Drug-drug and drug-food interactions. Methods of overcoming and handling of incompatible prescriptions.

UNIT – III Dispensing of proprietary medicines. Bioavailability concept and its significance in dispensing proprietaries.

Pharmaceutical calculations-weights and measures
calculations of doses, enlarging and reducing recipes, percentage, solutions, alligations, alcohol dilutors., proof spirit, excise duty isotonic solutions, displacement value etc.

HOSPITAL PHARMACY

UNIT – IV Hospital and its organisation, functions, Pharmaceutical Therapeutics committee.

Pharmacy, Organisation and personnel, Administration, location and space, equipment, Maintenance of standards.

Hospital formulary.

Laws of regulations. Purchasing and inventory control, storage of drugs.

Pharmacy of procedural manual.

Drug distribution.

UNIT – V Dispensing to in-patients.

Dispensing to out-patients.

Dispensing of controlled drugs.

Drug charges.

Prepackaging.

Manufacturing of drugs-bulk and sterile. Central sterile supply.
Quality control in Hospital Pharmacy.

Drug information centre.

Annual report.

Safe use of Medicines.

Professional practices.

Current state of Hospital Pharmacy in India.

Text Books:

1. Hospital Pharmacy-Hassan.
2. Cooper and Gunn's Dispensing for Pharmaceutical student-carter.
25th Edition, 1987.

Reference Books:

1. Dispensing of Medication – Martin.
2. Pharmaceutical Arithmetic and Latin-schroff and Srivastava.
3. Clinical Pharmacy-Jenkins, Superandio and Italiclasis.

PHARMACEUTICAL ENGINEERING – I

PY.2. 203

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I

Materials for pharmaceutical plant construction; Factors affecting the material selection for pharmaceutical plants. Ferrous metals cast iron, steels, stainless steels, Nonferrous metals—copper, aluminum, lead, tin, silver, nickel, zinc platinum, chromium and their important alloys, Nonmetals – glass, stoneware, stone state, bring, concrete, asbestos, rubber, timber, plastics.

Corrosion and its prevention: Types of corrosion, factors influencing corrosion, theories of corrosion, methods of prevention of corrosion.

Industrial hazards and safety precautions: Mechanical, Chemical, electrical, fire and dust hazards, safety requirements. Fire extinguishers. Industrial dermatitis. Accident records etc.,

Stoichiometry: unit operations and unit processes. Material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate of a process, steady and unsteady states, dimensionless equations, dimensional formulas, dimensional analysis, dimensionless groups, different types of graphical representation. Mathematical problems included.

UNIT – II Fluid flow: Fluid statics, Manometers, types of Bernoulli's theorem, losses in mechanical energy of flowing fluids, measurement of flow rate of fluid – orifice, venturi, pitot and rotameter. Flow meters. (Mathematical problems included).

Heat transfer: Nature of heat flow. Conduction : Fourier's law, thermal conductivity, compound resistances in series, heat flow through a cylinder – mean radius and mean area.

Convection: Natural and forced convection, temperature gradients in forced convection, surface and overall coefficients, dimensionless groups concerning surface coefficients, fluids in natural convection, liquids outside pipes – nucleate boiling, condensing vapors, varying temperature drops in a heat exchanger – logmean temperature difference, parallel current and counter current flow. Radiation – Black body, Kirchhoff and Stefan – Boltzmann law, gray body. Heaters, Heat exchangers, scraped surface exchangers, extended surface equipment. Mathematical problems included.

Heating media and lagging : Fuels – solids, liquids and gases, steam as heating medium – properties and uses of steam traps, vacuum,

pumps, condensers, entrainment, separations, foam and its prevention, physical nature of surfaces, heat conservation and insulation, requirements of a good conductor. Heating by electricity.

UNIT – III Transportation of Materials:

Solids – Classification, Principles of construction and uses of different types of conveyers, detailed study of belt, screw and pneumatic conveyers.

Fluids – Pipes, tubes, joints, fittings, valves, classification types of reciprocating and rotary pumps, air lift pumps, screw pumps, peristaltic pumps.

Gases – fans, blowers, different types of compressors, ejectors, vacuum pumps, jet pumps.

Storage of materials : Solids – outdoor storage, bins, silos, hoppers, weighting of bulk solids, packing of solids, indoor storage in warehouse liquids – storage in tanks, storage of volatile liquids. Gases – gas holders, cylinders.

Packing of materials: Functions, qualities of package hazards encountered by package, protection to be given by package, materials and designs of different types of

pharmaceutical products. Factors influencing choice of container, legal and other official requirements for containers, package testing.

UNIT – IV Humidification, dehumidification and air conditioning: Definitions of various terms, wet bulb and adiabatic saturation temperatures, humidity chart, determination of humidity, methods of increasing and decreasing humidity. Air-conditioning. Simple problems.

Refrigeration: Compression and absorption types of refrigeration cycles, coefficient of performance refrigerants and their choice. Brine systems. Refrigeration load, applications in pharmacy.

UNIT – V Filtration: Laboratory filtration equipment, Classification of industrial filters, sand filters, chamber press, plate and frame filter presses, brief description of leaf filters, rotary continuous filters, top feed filter, streamline and meta filters, choice of filtration unit, membrane filters, air filtration.

Filter operation – effect of pressure, filter aids. Filter media, factors affecting rate of filtration, pretreatment of materials. Filtration theory – Mechanism of filtration. Kozeny equation and its limitations constant pressure filtration, compressible cakes, constant rate filtration.

Centrifugation: Theoretical considerations, large scale centrifuges classification, perforated and nonperforated, basket centrifuges. Disc centrifuges, continuous centrifuges bowls, tubular bowl centrifuges, horizontal centrifuges, continuous centrifuges vertical solid bowl centrifuge, laboratory equipment.

Text Books:

- 1. Elements of Chemical Engineering – Mc Cade & Smith 4th Edn. 1985.**
- 2. Tutorial pharmacy – Carter, 5th Edn. 1986.**

Reference Books:

- 1. Elementary Chemical Engineering – Peters,
(For mathematical problems)**
- 2. Hand – book of Chemical Engineering – Perry**

3. Industrial Pharmacy – Lachman and others.
4. Chemical Engineering Techniques – Lawer and Heckman.

PHARMACOGNOSY – I

PY.2. 204

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I Definition, history, scope and development. Phytopharmaceuticals of commercial significance. Role of medicinal and aromatic plants in National economy. A brief account of plant-based industries and research institutions involved in phytochemical work in our country.

Different methods of classification of crude drugs. Systematic description of a crude drug.

Cultivation, collection, processing and storage of crude drugs, soils, fertilizers of common use and role of pesticides, plant hormones and their applications, commerce in drugs.

UNIT – II An introduction to chemical constituents of drugs, their isolation and classification concerning, carbohydrates, proteins, enzymes, lipids, volatile-oils, phenolic compounds, alkaloids, glycosides, resins and resin-combination

An introduction to bio genesis of primary and secondary plant metabolites.

UNIT – III Adulterations of crude drugs and their detection. Quality control of crude drugs and phytochemicals. Study of the following methods for evaluation, moisture content determination, determination of foreign organic matters and analysis of volatile oils, quantitative microscopical exercises including lycopodium spore method, leaf constant; crude fibre content, and applications of paper and thin layer chromatography.

UNIT – IV A list of crude drugs and phytochemicals official reference books like IP, and B. P. with biological source, chief active constituents and pharmaceutical uses only.

UNIT – V Study of fibres such as cotton, jute, rayon, wool, silk, nylon, glass wool, polyester and asbestos.

Systematic Pharmaceutical study of the following products of animal origin – cantharides, cochineal, musk, gelatin, cod-liver oil, shark-liver oils, bees wax, honey, lard, and wool, fat.

TEXT BOOKS:

1. T. E. Wallis – Text Book of Pharmacognosy, 5th Edn. 1985.
2. Shah & Quadri – Text Book of Pharmacognosy, 6th Edn. 1989.

REFERENCE BOOKS:

1. Trease & Evans – Text Book of Pharmacognosy 13th Edn. 1989.
2. G. Youngken Sr. – Text Book of Pharmacognosy.
3. Edward (Taylor) : Indian Pharmacopoeia Pharmacognosy.

PHARMACEUTICAL ANALYSIS - I

PY.2. 205

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

- 1. Introduction to the use and care of apparatus and equipment for simple chemical analysis.**
- 2. Selected experiments on titrimetric and gravimetric analysis. About 20 exercises illustrative of all techniques.**

DESPENCING & HOSPITAL PHARMACY

PY.2. 206

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

EXPERIMENTS BASED ON THEORY

PHARMACEUTICAL ENGINEERING DRAWING

PY.2. 207

Period / Week: 4

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

- 1. Construction of scale, symbols of materials of construction, lettering.**
- 2. Orthography projections of machine parts, sections in Orthographic projections.**
- 3. Isometric projections of simple machine parts.**
- 4. Conventions and dimensioning in drawing, making of assembly drawing, blue or ammonia printing.**
- 5. Drawing of plan elevations etc. in full and in sections of simple pharmaceutical machines.**

TEXT BOOKS:

1. Machine drawing – N. D. Bhatt.

REFERENCE BOOKS:

1. A Manual of Engineering Drawing for students and draftsmen – French and Vierck.
2. Technical drawing – Giesecke, Mitchell and Spencer.

PHARMACOGNOSY – I

PY.2. 208

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

- 1) Determination of leaf constants such as stomatal index, stomatal number, vein-islet number, vein termination number and palisade ratio.
- 2) Measurement of starch grains, dimensions of calcium oxalate crystals and phloem fibres.
- 3) Study of fibres and animal drugs as referred to in theory.
- 4) Identification of plant constituents like carbohydrates, lipids, proteins, alkaloids, glycosides, volatile oils, tannins, resins and resin-combinations; Evaluation of phytochemicals by paper and thin layer chromatography.
- 5) Determination of ash values, moisture content, extractive values, swelling factor and foreign organic matter.

PHARMACEUTICAL CHEMISTRY – II

(Natural Products)

PY.3.101

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I: Carbohydrates : Classification and general properties, study of the constitution of glucos, fructose and maltose.

UNIT – II: Oils and fats: Chemistry and analysis according to pharmacopial methods.

Terpenes : Occurrence, General methods of isolation and classification; constitution of citral, menthol and camphor.

UNIT – III: Amino acids and proteins; Classification and general reactions of amino acids and their relationship to proteins and polypeptides, protein hormones, oxytocics, thyroid hormones and anti – thyroid drugs.

UNIT – IV: Alkaloids: Classification, General methods of extraction and structure elucidation, constitution of ephedrine, atropine, papaverine and quinine.

Purine and xanthine Derivatives : Caffeine, Theophylline, Theobromine and uric acid. Nucleic acids: General aspects.

UNIT – V: Chemistry of steroid Drugs : Nomenclature, sterols, methods of isolation, colour reactions of cholesterol, stigmasterol, ergosterol, Important bile acids; Diosgenin and hecogenin, steroid alkaloids, Estrogens and Progestational agents – contraceptive steroids; androgens and anabolic agents, Adreno contraceptive steroids; Androgens and anabolic agents, Adreno corticoids, Deoxycoorticosterone, Cortisone, Prednisone, Aldosterone, Cardiac Glycosides of Digitalis and other Cardiac drugs – Strophanthus and Squill.

TEXT BOOKS:

1. I. L. Finar, Organic Chemistry, Vol. II The English Language Book Society, London.
2. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry
R. F Doerge, Ed., J. B. Lippencott Company, Philadelphia.

REFERENCE BOOKS:

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, Allyn and Bacon, Inc., Boston.
2. Burger's Medicinal Chemistry, M. E. – Wolff, Ed., John Wiley & Sons, New york.

3. F. G. Mann and B. C. Saunders, Practical Organic Chemistry, Longmans Green & Co. Ltd., London.
4. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience Publishers, New York.

PHARMACEUTICS II

(Pharmaceutical technology)

PY.3.102

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I: Suspensions; Formulation, deflocculated and flocculated suspensions, manufacturing procedure, evaluation methods official and other important suspensions.

Emulsions: Types, emulsifying agents, general formulation, manufacturing procedure, including emulsifying and homogenising equipment, and evaluation methods. Stability of emulsions, theories official and other important emulsions and multiple emulsions.

UNIT – II : Capsules : Advantages. Hard gelatin capsules, shell formulation and manufacturing, sizes, painting, filling, cleaning, binding general formulation, content formulation and filling, I.P Formulations.

Tablets: Types, ideal requirements, granulation methods, general formulation, compression machines, difficulties in preparation and evaluation. Sugar coating, compression coating, film coating and enteric coating, I.P. formulations.

UNIT – III Parenterals: (Products requiring sterile packaging) defining, Types, advantages and limitations, general formulation, vehicles, containers,

procedure, production facilities, controls, tests, selected I.P. injections, sterile powders, implants, emulsions suspensions.

UNIT – IV Pharmaceutical aerosols: Definition, types, propellents, general formulation, manufacturing and packing methods, pharmaceutical applications.

UNIT – V Ophthalmic preparations: Eye Ointments and Eye drops, Requirements, formulation, methods of preparation, containers, evaluation, I.P. and other important products.

TEXT BOOKS:

1. Bentley's Text Book of Pharmaceutics – Rawlins.

REFERENCE BOOKS:

1. Remington's Pharmaceutical sciences.
2. American pharmacy – Sprowls and Beal.
3. Industrial Pharmacy – Lachman and others.
4. Physical Pharmaceutics – Shotten and Ridgway.

PHYSICAL PHARMACY - II

PY.3.103

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I Solubility and Distribution phenomena : Definitions, expressions, phase rule, solvent – solute interactions – polar solvents and semipolar solvents, solubility of gases in liquids – effect of pressure and temperature, salting out, effect of chemical reactions, solubility calculations. Solubility of liquids in liquids – ideal and real solutions, complete and partial miscibility, influence of foreign substances, three component systems, dielectric constant and solubility. Solubility of solids in liquids – ideal and non ideal solutions

solvation and association in solutions. Solubility of salts in water, solubility of slightly soluble and weak electrolytes, calculating solubility of weak electrolytes as influenced by pH, influence of solvents on the solubility of drugs, combined effect of and solvents. Distribution of solutes between immiscible solvents – effect of ionic dissociation and molecular association on partition on extraction, solubility and partition coefficients, preservative action of weak acids in emulsions, drug action and partition coefficients.

UNIT – II **Kinetics: Rates and orders of reactions – rate, order of reaction, molecularly, specific rate constant, units of basic rate constants, mathematical treatment of rates.**

Apparent zero order kinetics. First order reactions. Second order reactions. Determination of order of a reaction. Elementary idea of complex reactions. Comparison of zero first and second order reactions, Influence of temperature and other factors on reactions rates – effect of solvents, ionic strength, dielectric constant, catalysts and light. Decomposition and destabilization of medicinal agents against hydrolysis, oxidation, kinetics in the solid state. Accelerated stability analysis.

UNIT – III **Interfacial phenomena: Introduction, liquid interphases – surface and interfacial tensions, Surface free energy, measurement of surface and interfacial tensions, spreading coefficient. Adsorption at liquid interfaces – surface active agents, systems of hydrophilic – lipophilic classification, solubilization and detergency. Types of monolayer at liquid surfaces, applications of amphiphiles. Adsorption at solid interfaces – solid/gas interface – solid/liquid interface. Electric properties of interfaces – electric double layer, Nernst and zeta potentials.**

UNIT – IV **Colloids: Dispersed systems, size and shape of colloidal particles – pharmaceutical application, types – lipophilic, lipophobic and association colloids, comparison of properties of colloidal sols; optical, kinetic and electric**

properties of colloids, solubilization gels – structure, properties and applications.

Micromeritics: Particle size and size distribution – average particle size, particle size distribution, number and weight distributions, particle number; methods for determining particle size – optical microscopy, sieving, sedimentation, particle volume measurement, particle shape and surface area, methods for determining surface area – absorption methods, air permeability methods; derived properties of powders – porosity, packing arrangements, densities bulkiness, flow properties.

UNIT – V **Rheology:** Newtonian systems – laws of flow, kinetic viscosity, effect of temperature. Non newtonian systems – plastic, pseudoplastic dilatant flow, thixotropy – measurement of thixotropy, thixotropy in formulation. Determination of rheologic properties – choice of viscometer, capillary, falling sphere, cup and bob, and cone and plate viscometers. Psychorheology. Applications to pharmacy.

Coarse dispersions, emulsions and semisolids. Interfacial properties of suspended particles settling in suspensions – theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters. Formulation of suspensions – wetting of particles, controlled flocculation, rheological considerations, preparation of suspensions. Emulsions – types, pharmaceutical applications, theories, physical stability, preservation, and rheological properties. Semisolidsgels.

TEXT BOOKS:

1. Physical Pharmacy – Martin, A. & others.

REFERENCE BOOKS

1. Tutorial Pharmacy – Cooper & Gunn.

2. Physical Pharmaceutics – Shotton & Ridgway.
3. Remington's Pharmaceutical Sciences.

PHARMACOLOGY - II

PY.3.104

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I **Pharmacology of cardiovascular system: Cardiac glycosides, antihypertensive drugs, coronary dilators, antihyperlipidemic drugs, antiarrhythmic drugs.**

UNIT – II **Drugs acting on blood and blood forming agents. Coagulants, anticoagulants, haematinics (iron, Vitamin B12 and folic acid).**

Drugs acting on gastrointestinal system : Purgatives, antidiarrhoeal drugs, treatment of peptic ulcers, emetics and antiemetics.

UNIT – III **Diuretics. Local anaesthetics.**

UNIT – IV **Autocoids : Histamine – antihistaminics, serotonin – antagonists, prostaglandins, prostacyclins.**

Respiratory system: Bronchodilators (treatment of asthma) anti – tussives and expectorants.

UNIT – V **Principles of Toxicology: Definition of a poison, general principles of treatment of poisons with special reference to barbiturate, opium and organophosphorus toxicity, adverse drug actions, drug – drug interactions.**

Respiratory system: Bronchodilators (treatment of asthma) – anti tussives and expectorants.

PHARMACEUTICAL CHEMISTRY – II

(Natural Products)

PY.3.105

Period / Week: 8

Sessional: 25

Duration of Exam: 3 hrs

Examination: 50

Nature of Exam: Practical

- 1. Qualitative analysis of selected natural products – (6)**
- 2. Analysis of essential oils and fats, including unsaponifiable matter.**
- 3. Estimation of alkaloids – (4)**

PHARMACEUTICS II (Pharmaceutical technology)

PY.3.106

Period / Week: 6

Sessional: 25

Duration of Exam: 3 hrs

Examination: 50

Nature of Exam: Practical

I.P. and other pharmaceutical products to be selected to illustrate the preparation. Stabilization and physical evaluation of : powders, capsules, tablets, parenteral, suspensions, emulsions, suppositories, semisolids liquids, ophthalmics etc.,

PHARMACOLOGY - II

PY.3.107

Period / Week: 6

Sessional : 25

Duration of Exam : 3 hrs

Examination: 50

Nature of Exam: Practical

- 1. An introduction to different equipment used in pharmacology laboratory**
- 2. Effect of routes of administration on the action of drugs (pentobarbitone induced sleeping time 40 mg/kg administered through different routes)**
- 3. Determination of ED₅₀ (pentobarbitone, in rats/mice)**
- 4. Demonstration of different types of antagonism on an isolated tissue preparations (guinea pig ileum/rabbit intestine)**
 - a) Reversible antagonism.**
 - b) Competitive / surmountable antagonism.**
 - c) Physiological antagonism.**
 - d) Irreversible antagonism.**
- 5. Effect of different electrolytes/drugs on isolated frog's heart by Tyrod's technique.**
 - a) Effect of electrolytes like K⁺, Ca⁺⁺, etc.**
 - b) Effect of agonists like adrenaline, noradrenaline, isoprenaline, ephedrine, acetylcholine, carbachol, pilocarpine etc.**
 - c) Effect of agonists in the presence of antagonists and to demonstrate the type of antagonism.**
 - d) Effect of acetylcholine in the presence of anticholinesterase agent.**
 - e) To demonstrate the presence of cholinesterase in blood.**
- 6. Demonstration of ciliary movement in frog's esophagus.**
- 7. Effect of drugs on blood vessels. Frog hind – limb perfusion.**
- 8. Effect of drugs on isolated frog rectus abdominis.**

9. Demonstration of local anaesthetic activity on.

- i) Rabbit eye
- ii) Guinea pig
- iii) Frog's hind – limb withdrawal.

BIOCHEMISTRY

PY.3. 201

Sessional: 30

Examination: 70

Period / Week: 4

Duration of Exam: 3 hrs

Nature of Exam: Theory

UNIT – I Biochemical organisation of the cell and transport processes across cell membrane.

The concept of free energy, determination of ΔG from equilibrium constant and reductive potential, energy rich compounds, production of ATP and its biological significance.

UNIT – II Enzymes: Nomenclature, Kinetics, Mechanism of action and inhibition, clinical applications of enzymes and coenzymes. Conversion of polysaccharides to glucose – 1 – phosphate, glycolysis and fermentation and their regulation, gluconeogenesis, metabolism of galactose, role of sugar nucleotides in biosynthesis; pentose phosphate pathway, TCA cycle; the effect of inhibitor and regulation of TCA cycle, glyoxalic acid cycle.

UNIT – III The Fate of dietary lipids; beta and omega oxidations; oxidation of unsaturated fatty acids; formation of ketonebodies; biosynthesis of saturated and unsaturated fatty acids; phospholipids; sphingolipids.

Electron transport and biological oxidations.

UNIT – IV Nitrogen balance; metabolism of amino acids; formation of uric acid; porphyrin biosynthesis, biosynthesis of purins pyrimidines and their nucleotides.

UNIT – V **Integration of carbohydrates, lipid and protein metabolism – Biosynthesis of RNA and DNA; mutation physical and chemical mutagenesis, repair mechanism, recombinant DNA, mechanism of protein biosynthesis, inborn errors in metabolism, genetic code.**
Product inhibition feed back inhibition, role of cyclic AMP in enzyme activation, repression and induction and control of enzyme synthesis by regulation of transcription.

TEXT BOOKS:

1. B. Harrow & A. Mazur, Text books of Biochemistry W. B. Saunders Co., Philadelphia.
2. E. E. Conn and P. K. Stumpf, Outlines of Biochemistry, John Wiley & Sons, New York.

REFERENCE BOOKS:

1. D. W. Martin, P. A. Mayes & V. M. Rodwell, Harper's Review of Biochemistry, Lange Medical Publications: 1983.
2. A. L. Lehninger, Biochemistry, Wirth Publishers, Inc., New York.

BUSINESS MANAGEMENT

(Including Industrial Psychology)

PY.3. 202

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I Plant location and lay-out of an industry – various factors

Affecting locational aspect – layout of building and equal product lay – out v/s process layout. Compliance of control measures. Drug store location and selection of drug store management.

UNIT – II Production planning and control – scientific purchasing quality control, problems of productivity, stores organization location of store, receiving, inspection of materials issue from the store, control of stores and stocks stock Accounting and Records.

UNIT – III **Personnel Management – Selection, appointment, training, transfer, promotion, demotion policies, remuneration, evaluation, human relations.**

UNIT – IV **Sales organisation – market, definition – different approaches to the study of marketing, institutional approach, Making planning – product planning, methods of marketing, wholer retailers, functional approach – various functions of the cost and efficiency in marketing commodity approach.**

Distribution on policies – selective and exclusive pricing and discount policies, credit policies, trade indication marks, patent policies. Sales promotion policies – detailing to physician professional persons, sampling, window and interior display, product advertising, sales promotion publicity and commerce.

UNIT – V **Budgets and budgetary controls.**

PHARMACEUTICAL ENGINEERING - II

PY.3. 203

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I **Size reduction: Objectives, properties of solids. Classification of equipment. Important intermediate crushers & fine grinders, Cutting rolls, disk crushers, edge and end. Runner mills disintegrators, hammer mills, ball mills and their different modifications, colloid mill, impact mills, pin mills, fluid energy mills, particle size classifiers used with grinding mills.**

Size separation: I.P. Grades of powders. Sieves: Standards, materials of constructions, sieving of powders: Particle size distribution and its measuring using sieves. Representation of data. Screening equipment for course and fine powders. Shifting by gyratory turbulence. Fluid classification methods : Cyclone separators, air separators, bag filters, scrubbers, air filters, size

separation by settling, double cone classifier. Laws of settling, sedimentation
Elutriation.

Leaching and Extraction: Solid liquid Extraction, theory problems of crude drug extraction, solvents, properties, choice and recovery. Factors affecting choice of extraction process and efficiency of Extraction. Maceration, percolation and continuous Extraction process. Diffusion batteries extraction towers.

Liquid extraction: Theory, small and large scale equipment, pod diel niak extractor. Expression equipment for small and large scale operation.

UNIT – II **Evaporation:** General principles: heat supply and vapour removal. Heat transfer, film coefficients, scale formations. Evaporators : Classification, pan, stills, short tube, long tube, vertical forced circulation with internal heating element, film and vapour compression evaporators. Evaporation under reduced pressure.

Distillation and condensation: Different mass transfer operations; theory applied to binary mixtures: Distillation methods: Equilibrium and differential distillations, rectification, rectifying, sieve plate and packed columns HETP. Steam distillation – theory, equipment and applications. Molecular distillation – theory, equipment and applications.

Automatic water stills, steam jacketed kettle, distillation under reduced pressure.

UNIT – III **Drying:** Theory of drying. Drying of damp solids, tray, vacuum tunnel, and rotary, infrared and fluidized bed dryer.

Drying of slurries of solutions: Drum, spray, freeze drying, fluidized bed dryer.

Crystallization: Importance of crystal purity, size, shape, geometry, habit, forms and types. Solubility curves and calculation of yields. Material and heat balances around swenson walker crystalliser. Supersaturation theory and its limitations. Nucleation mechanisms, crystal growth.

Classification of crystallizes, Tank, agitated batch, Sweden walker, single vacuum, circulating magma and crystal. Caking of crystals and its prevention.

Gas absorption: Importance in pharmacy. Properties and type of tower packing. Tower construction and other commercial absorbers and their operations. Two phase flow through packed tower. Pressure and mass transfer coefficients Desorption.

UNIT – IV **Mixing:** Definition and objectives. Types of mixtures. Solid – solid mixing selection of mixer.

Mixing of viscous masses : Change kneading and banburry mixtures.
Ointment mills.

Liquid – liquid and gas liquid mixing quipment: Different types of mixing impellers, their characteristics and field of operation.

Absorption and Ion exchange: Ion exchange operations, Ion exchange principles different types of Ion exchange, behaviors of Ion exchange resins, applications.

UNIT – V

Compaction: Scope, measurement of Punch forces, transmission of force through powders, distribution of forces in powder mass, effect of pressure on relative volume, lubrication of diewall, adhesion and cohesion of particles, factors effecting strength of granuls and strength of tablets.

Automatic process control systems: Process variables (Temperature, pressure flow level and vacuum) variables measurement. Elements of automatic process control and introduction to automatic process control systems.

TEXT BOOKS:

1. Introduction to chemical Engineering by Badger and Bacchro.
2. Tutorial Pharmacy-Carter.

REFERENCE BOOKS:

1. Elementary chemical Engineering-peters (for mathematical Problems).
2. Hanbook of chemical Engineering-Perry.
3. Industrial Pharmacy Lachman and others.
4. Unit processes in pharmacy – by David Gandertan.

PHARMCOGNOSY - II

PY.3. 204

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

Systematic study of crude drugs including English / Indian names synonyms, official identification. Biological / geographical sources, identification (by macroscopic, sensory and microscopic characteristics) of drugs underlined, chemical constituents, chemical and microchemical tests, uses, adulteration and evaluation of the following drugs:

- UNIT – I** **Glycosides containing Drugs: - Senna, Aloe, Rhubarb, Cascara, Digitalis, Strophanthus, Scilla, Thevetia, Dioscorea, Glycyrrhiza, Psoralea, Gentian, Picrorhiza, Chirata, Quassia, Catechu, Myrobalans, Ammi majus, Quillaia.**
- UNIT – II** **Alkaloid containing drugs: -**
Pyridine piperidine group: Lobelia, Nicotiana, Conium, Areca.
Tropane Group: Belladonna, Hyoscyamus. Datura, Coca.
Isoquinoline group: Cinchona.
Isoquinoline Group: Ipecac, Curare, Opium.
Indole group: Ipecac, Curare, Opium.
Indole group: Nux vomica, Ergot, Rauwolfia, Catharanthus, veratrum, Aconite.
Alkaloidamine group: Ephedra, Colchicum.
Miscellaneous Drugs: Gelatin, Jatamansi, Malefern, Sausurea withana.
- UNIT – III** **General Pharmacognosy: Advantages and disadvantages of obtaining drugs from cultivated and wild plants:**
Variability of drug constituents due to exogenous and endogenous factors like altitude, temperature, rainfall, light, propagation by seeds, vegetative means, selection, mutation, hybridization and polyploidy.
- UNIT – IV** **Collection of medicinal plants:**
Effect of season, time of collection and age of the plant on the quality of active principles.
Treatment subsequent to collection: Desirable and undesirable changes after collection / drying.
Hazards like infestation with spores of micro-organisms and eggs and steps to prevent the same. Drug deterioration by non living factors like moisture etc. and steps to prevent deterioration.
- UNIT – V** **Evaluation – Identity, purity and quality of drug plants by organoleptic, microscopic, physical, chemical and biological evaluation.**
Chromatography. Definition and some related terms. Classification and detailed study of various chromatographic methods covering column, paper thin layer and gas chromatography.
Mechanism and practical techniques involved in chromatography.
Photochemical screening of plants.

TEXT BOOKS: “ Pharmacognosy” T. E. Wallis Pub. J. A. Churchill

1. Pharmacognosy (8th Ed.) 1981.
V. e. Tylor, L. R. Brady and J. E. Robbers
Publ Lea and Febiger

REFERENCE BOOKS:

1. "Thin Layer Chromatography" Egon STHlPub. Springer Vering
2. "Quantitative Paper and Thin Layer Chromatography"
E. J. ShellardPub. Academic Press
3. The Organic Constituents of Higher Plants
Trevor Robinson
Burgess Publishing Co.

FORENSIC PHARMACY (Rearranged in Units Pattern)

PY.3. 205

Period / Week: 4

Sessional: 30

Duration of Exam: 3 hrs

Examination: 70

Nature of Exam: Theory

UNIT – I

(i) Evolution of Pharmaceutical and drug legislation in India.

(ii) The Pharmacy Act 19484: Legislation to regulate the

profession of pharmacy

(iii) Code of Pharmaceutical Ethics: As formulated by

Pharmacy council of India.

UNIT – II The drugs and cosmetics Act 1940 and drugs and cosmetics Rules 1945 as corrected upto date.

UNIT – III

(i) The Narcotic Drugs and Psychotropic substances Act 1985.

(ii) Industries (development and Regulations) Act 1952.

- (iii) **Factories Act 1948.**
- (iv) **The Indian Patents and Design Act, 1970 (with reference to drugs and pharmaceuticals only) with latest amendments.**

UNIT – IV

- (i) **The Drugs and Magic Remedies (Objection Advertisements Act 1954)**
- (ii) **The Medicinal and Toilet preparations (Excise duties) Act 1955 and Rules thereunder 1976.**
- (iii) **Drugs Price control order (as corrected upto date)**

UNIT – V

- (i) **New Drugs Policy 1986**
- (ii) **Prevention of Food Adulteration Act 1954.**

TEXT BOOKS:

- (1) **Text Book of Forensic Pharmacy – Mithal**
- (2) **Forensic Pharmacy-**

REFERENCE BOOKS:

- (1) **Original laws published by the Government of India.**
- (2) **Laws of Drugs in India – Hussain.**

BIOCHEMISTRY

PY.3. 206

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

1. Qualitative reactions for carbohydrates.
2. Colour reactions of proteins and amino acids.
3. Estimation of blood cholesterol, Glucose, urea.
4. Liver function tests.
5. Qualitative analysis of sugar, ketone bodies, bile salts, bile pigments, albumin in clinical urine samples.
6. Quantitative Estimation of glucose and uric acid in urine.

Pharmaceutical Engineering - II (Incl. I & II Practicals)

PY.3. 207

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

Experiments devised to study the efficiency of size reducing equipments, size separation of solids using sieves, Standardisation of powders as I. P. requirements, size classification by sedimentation and elutriation, extraction of solids by liquids, atmospheric and vacuum evaporation materials and energy balance in evaporation, batch and continuous fractionation, steam distillation rate of drying of solids, freeze drying, crystallization of solution, powder and liquids mixing, compaction of solids, measurement and control of temperature, pressure and vacuum; and other experiments to illustrate the topic covered in theory.

PHARMACOGNOSY – I

PY.3. 208

Period / Week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

Identification through examination of morphological and sensory characters of drugs mentioned in theory

Detailed study under morphology and microscopy of whole (entire or broken) and powdered drugs and chemical tests of drugs underlined in theory.

Practical exercises on chromatography.

Preparation of chromatographic column and T. L. C plates.

Effect of polarity of absorbent layer and RF values.

Effect of activation of absorbent polarity of solvent on RF values.

Effect of thickness of layer and polarity of solvent on R_F values.

Effect of Carbon number on migration.

T. L. C of alkaloidal extracts of the following drugs: Ergot, Datura, Cinchona, Opium, Ipecac, Nuxvomica, Reuwolfia.

T. L. C of volatile oil of dill, Lemongrass, Mentha, Eucalyptus.

Identification of unorganised drugs (mentioned in theory) by chemical tests.

Quantitative microscopy: determination of stomatel index palisade Ratio, Vein-islet Number etc.

Phytochemical screeing methods for various groups of phytocnstituents.

Library
G.Pulla Reddy College of Pharmacy
Hyderabad

PHARMACEUTICAL CHEMISTRY – III

(Medicinal Chemistry – I)

PY . 4 . 101

Sessional : 30

Examination : 70

Period/week: 4

Duration of Exam : 3 hrs

Nature of Exam : Theory

Theory: The following topics shall be treated covering outline of synthetic procedures (of selected drugs from I, P.) and uses, structure – activity relationship including physico-chemical and steric aspects, metabolism and mode of action, wherever known.

UNIT – I General treatment of Physico – chemical and steric aspects in relation to biological activity and drug metabolism.

UNIT – II Chemotherapy, Sulphonamides, Antibiotics, Antimycobacterial agents.

UNIT – III Antimalarials, Antiamoebic agents, Chemotherapeutic agents for Trypanosomiasis and other diseases. Anthelmintics.

UNIT – IV Antifungal agents, Antiseptics and Disinfectants, urinary antiseptics, Anti-viral agents, antineoplastic agents.

UNIT – V Diuretics, Antihypertensive agents, Coagulants Anticoagulants, and Hypoglycaemic agents, Plasma expanders.

TEXT BOOKS

1. Wilson and Gisvold's text book of Organic Medicinal and Pharmaceutical chemistry, R.F. Doerge, Ed., J. B. Lipponcott company Philadelphia, 8th Edition 1982.
2. W.C. Foye, principles of Medicinal Chemistry, 3rd Edition Lea & Febiger Philadelphia

REFERENCE BOOKS

1. Burger's Medicinal Chemistry, M.E. Wolf, Ed., John Wiley & Sons, New York, IV Edition. 1979.
2. Martindale, The Extra Pharmacopoeia, 29th Edition, 1989 J.E.F. Reynolds, the Pharmaceutical press, London.
3. B.S.Furniss, A.J.Hannaford, V.Rogers, P.W.G. Smith and A.R.Tatchell, Vogel's Text Book of Practical Organic Chemistry (Including Qualitative Organic analysis). The English Language Book Society.

PHARMACEUTICAL ANALYSIS – II

PY . 4 . 102

Sessional : 30

Period/week: 4

Duration of Exam : 3 hrs

Examination : 70

Nature of Exam : Theory

A study of the following techniques, including numerical problems, and applications in pharmaceutical analysis.

UNIT – I Separation procedures involving liquid – liquid extraction, liquid- solid extraction.

UNIT – II Chromatography and related procedures.

UNIT – III Colorimetry, nephelometry and turbidimetry, flame photometry.

UNIT – IV Potentiometry, conductometry, polarography, Amperometry.

UNIT – V UV, and visible spectrophotometry, IR spectrometry and their applications in pharmaceutical – analysis.

TEXT BOOKS

1. A.H. Backett and B. Stenlake, Practical Pharmaceutical Chemistry. The Althlone press University of London, London.
2. A text Book of Pharmaceutical Analysis, K.A. Connors 3rd Edition 1982 Jhon Wiley & New York

REFERENCE BOOKS

1. R.E.Schrimer, Modern methods of Pharmaceutical Analysis CRC Press.
2. J.W.Robinson, Undergraduate Instrumental analysis. Marcel Dekker, Inc., New York
3. Chromatography, D.R. Browning. Mcgraw Hill, London.
4. Pharmaceutical Chemistry L.G. Chatten Ed., Marcel Dekker Inc., India, New York

PHARMACEUTICS – III

(Dosage formulations & design)

PY . 4 . 103

Sessional : 30

Period/week: 4

Duration of Exam : 3 hrs

Examination : 70

Nature of Exam : Theory

- UNIT – I** Dosage form necessities: Antioxidants, Preservatives, colouring, flavouring and diluting agents, solvents bases and vehicles, their properties & selection. Surfactants, hydrocolloids, stabilizers.
- UNIT – II** Formulation: Importance, physical properties – physical form particle size – crystal form. Bulk control solubility. Wet flow – cohesiveness – compressibility – organoleptic properties, chemical properties – hydrolysis – oxidation, racemization, polymerization, isomerization, and decarboxylations, enzymic decomposition; (formulation excipients – destabilizers, suspending and dispersing agents – dyes – solid excipients.)
- UNIT – III** Stability of formulated products – requirements, product stability, shelf life, overage, containers, closures. Kinetic principles and stability testing – Reaction rate and order, acid – base catalysis, decomposition reactions, stabilization and stability testing.
- UNIT – IV** Prolonged action pharmaceuticals – benefits, limitations; oral products, terminology, drug elimination rate, types and construction of product, evaluation, parenteral products and evaluation.

Microcapsulation and microcapsules – Application & techniques – core and coat materials – Role of polymers in microencapsulation.

UNIT – V New drug delivery systems, Transdermal drug delivery systems, osmotic drug delivery systems, liposomes.

TEXT BOOKSText book of pharmaceutical formulation by B.M. Mithal, 2nd edn. 1980, Vallabh Prakashan, Delhi.

1. Theory and practice of Industrial pharmacy – Lachman and others, 3rd edition 1987.

REFERENCE BOOKS

1. Remington's pharmaceutical Sciences, 17th edition 1985, Mac Publications Company, Easton, Pennsylvania.

PHARMACOLOGY – II

PY . 4 . 104

Sessional : 30

Period/week: 4

Duration of Exam : 3 hrs

Examination : 70

Nature of Exam : Theory

UNIT – I Chemotherapy : General principles of chemotherapy, sulphonamides, antibiotics, antiprotozoal drugs, anti – malarials, antiamoebic, antifungal and antiviral drugs. chemotherapy of tuberculosis and leprosy, Chemotherapy of cancer and immunosuppressant drugs.

UNIT – II Pharmacology of endocrine system : Thyroid – antithyroid drugs, insulin and oral hypoglycemics, glucagon, adrenocortical steroids.

UNIT – III Pituitary hormones. Sex hormones and oral contraceptives, Vitamins.

UNIT – IV Bioassay : Principles of Bioassays : Official bioassays.

UNIT – V Clinical pharmacy and pharmacology: Definition and scope; Role of pharmacist in clinical pharmacy and clinical pharmacology team, clinical testing (trials), clinical

toxicity and importance of monitoring of adverse drug reactions; study of some clinically important drugs like digitalis, phenytoin, lithium etc.,

TEXT BOOKS:1.Pharmacology & Pharmacotherapeutics, R.S. Satoskar and S.D. Bhandarkar, popular prakashan, Bombay, vol I. & II, 1990

REFERENCE BOOKS

1. Goodman and Gilman's The Pharmacological Basis of Therapeutics, edt. By A.G. Gilman, T.W. Rall, A.S. Wies and P. Taylor, Pergamon Press, Cambridge, 8th edition 1990.

PHARMACEUTICAL ANALYSIS – II

PY . 4 . 105

Sessional : 25

Examination : 50

Period/week: 6

Duration of Exam : 6 hrs

Nature of Exam : Practical

Quantitative analysis involving the use of analytical methods and instrumental techniques covered in the theory.

PHARMACEUTICS – III(Dosage formulations & design)

PY. 4 .106

Sessional: 25

Examination: 50

Period/week: 6

Duration of Exam: 6 hrs

Nature of Exam: Practical

Experiments devised to study the formulation of dosage forms, stability testing; formulated dosage forms – evaluation of dosage forms; preparation and evaluation of prolonged action and dosage forms.

PHARMACOLOGY – II

PY . 4 . 107

Sessional : 30

Examination : 70

Period/week: 4

Duration of Exam : 3 hrs

Nature of Exam : Practical

Experiments based on theory.

Drug – interaction studies.

PHARMACEUTICAL CHEMISTRY – IV

(Medicinal Chemistry – II)

PY . 4 . 201

Sessional : 30

Examination : 70

Period / week: 4

Duration of Exam : 3 hrs

Nature of Exam : Theory

An outline of Synthetic procedures (of selected drugs of each category, from IP) uses, structure – activity relationships including physico chemical and steric aspects, Metabolism and mode of action of the following classes of drugs.

UNIT – I Adrenergic drugs, cholinergics and anticholinesterases:

Antispasmodics and antiulcer drugs; ganglionic blocking agents.

UNIT – II General Anesthetics, local anesthetics; diagnostic agents, gastrointestinal agents.

UNIT III Analgesics, antipyretis; non-steroidal antiinflammatory agents; antiallergenic agents.

UNIT IV Hypnotics and sedatives; anticonvulsants; analeptics.

UNIT V Antipsychotic drugs; antidepressant drugs, anti anxiety agents, Hallucinogenic agents.

TEXT BOOKS

1. Wilson & Gisvold's Text Book of Organic Medicinal & Pharmaceutical Chemistry, Ed. R. F. Doerge J. B. Lippincot & Co, Philadelphia, 8th edition. 1982.
2. W. O. Foye, Principles of Medicinal chemistry, 3rd edn. Lea & Febiger, Philadelphia.

REFERENCE BOOKS:

1. Burger's Medicinal Chemistry, M. E Wolff, Ed., John Wiley & Sons, Newyork, 4th Edition 1979.
2. Martindale, The Extra Pharmacopoeia, 29th edn. 1989, J. E. F. Reynolds Ed., The Pharmaceutical Press London.
3. A. H. Beckett & J. B. Stenlake, Practical Pharmaceutical Chemistry, The Athlone Press, University of London, London.
4. Pharmacopoeia of India, Govt. of India, Ministry of Health 2nd edn. 1985.

BIOPHARMACEUTICS AND PHARMACOKINETICS

PY. 4 .202

Period/week: 6

Sessional : 30

Duration of Exam : 3 hrs

Examination : 70

Nature of Exam : Theory

UNIT – I Biopharmaceutics; Introduction – Fate of drug after administration – drug absorption – mechanism – kinetics of passive diffusion, Active transport and other transport mechanisms – physico – chemical and biological factors in drug absorption – Dosage Form considerations.

- UNIT – II** Bioavailability and bioequivalence – definitions – significance – factors involved – Assessment – bioequivalence testing – legal consideration – Dissolution rate – Methods, Apparatus, significance.
- UNIT – III** Drug disposition – Distribution – Localisation of drugs – Metabolism and elimination of drugs – Renal clearance – Factors, Kinetics.
- UNIT – IV** Pharmacokinetics; Introduction-Basic concepts – Rate processes in biological systems – pharmacokinetic parameters-biological half-life- Apparent volume of distribution, clearance, absorption rate constant – Methods of determination – significance and applications.
- UNIT – V** Compartment models – basic concepts – one and two compartment models – Kinetics of blood levels – pharmacokinetics of absorption, distribution, metabolism and elimination under the following conditions; i) intravenous bolus injection. ii) Intravenous infusion .iii) oral – single dose and iv) oral – multiple dose.

TEXT BOOKS

1. Biopharmaceutics and Pharmacokinetics – An Introduction by Robert E. Notari, 2nd edn. 1975, Marcel Dekkar Inc., New York.
2. The theory and practice of Industrial Pharmacy By Leon Lachman, 2nd edn, 1985 and 3rd edn. 1987, Warghese publishing house, Bombay.

REFERENCE BOOKS

1. Remingtons Pharmaceutical sciences 17th edn. 1985 Mac Publishing Co., Easton, Pennsylvania.
2. Modern Pharmaceutics by Banker, 1979, Marcel Dekker Inc., New York.

COSMETICOLOGY

PY . 4 . 203

Period/week: 3

Sessional : 25

Duration of Exam : 2 hrs

Examination : 50

Nature of Exam : Theory

UNIT – I : Introduction.

Definition of cosmetics. Basic knowledge of the skin classification of cosmetics.

General aspects of cosmetic preparations: Colouring agents in cosmetics, preservatives and antioxidants and other additives used in cosmetics.

An approach to the formulation of the following cosmetics: (Units II-IV)

UNIT – II: Preparations for the face: Vanishing creams, cleansing creams, face powders and lipsticks.

UNIT – III Preparation for hands: Hand creams and lotions, liquid creams, nail lacquers and nail polish removers.

Body Cosmetics: Deodorants and antiperspirants, talcum and dusting powders, and bleaching preparations.

UNIT – IV Preparations for the hair: Shampoos, hair creams, hair dyes and dye removers and depilatories.

Dental preparations: Tooth powders and pastes.

UNIT – V Shaving preparations: Pre-Shave and after-shave lotions, shaving creams and soaps.

Baby specialties: Baby powder, baby oils and lotions.

TEXT BOOKS

1. **Cosmetic Science And Technology, Volume I & II by Sagarin 2nd edn., 1972 John wiley & Co.**

REFERENCE BOOK

1. **Martindale's Extra Pharmacopia, 29th edn. 1989, Pharmaceutical Press, London.**

PHARMACEUTICAL BIOTECHNOLOGY AND BIOLOGICAL PHARMACY

PY . 4 . 204

Sessional : 30

Examination : 70

Period/week: 4

Duration of Exam : 3 hrs

Nature of Exam : Theory

UNIT – I

Surgical dressings, sutures and ligatures and their standards:

Definitions, primary wound dressings, absorbents – surgical cotton, surgical gauze, bandages, adhesive tape, protective, cellulosic, haemostats, official dressings, absorbable sutures-catgut and others, non-absorbable sutures, problems involved in the sterilisation of above.

UNIT – II

Active Immunization products: Bacterial Vaccines, toxoids, Viral Vaccines, rickettsial Vaccines; passive immunization products- antitoxins, antivenoms, immune serums, immune blood derivatives and other products related to immunity, diagnostic biological; monoclonal antibodies, and interim control of products. Storage, labeling and specific applications of the above.

UNIT – III

Biologicals obtained by fermentation:

Fermentation - general requirements – media – equipment – sterilization processes – extraction. Principles and production of

antibiotics – penicillin, 6-APA and Semisynthetic penicillins, streptomycin, Tetracycline, Erythromycin and a mention of other antibiotics of I.P; Vitamins – Vitamin C, B₁₂ and Riboflavin: Organic acids – citric and lactic acids, solvents – alcohol and glycerol; enzymes- immobilized enzymes and their applications; micro biological transformation of steroids; amino acids – glutamic acid and lysine.

UNIT – IV: Glandular products: Preparation of extracts or isolation of pure substances and their dosage forms – pituitary, adrenal, pancreas, thyroid, parathyroid, ovary, liver, stomach, urine. Biological Standardisation of posterior pituitary injection, ACTH. Blood products and plasma substitutes:

Collection, processing and storage of whole human blood, concentrated human R.B.C., dried human plasma, human plasma protein fraction, dried human serum, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin foam; plasma substitutes-ideal requirements-PVP, detran 40 and 100. Control of blood products, transfusion products.

UNIT – V Microbial contamination – control and sterility testing of pharmaceutical products.

Microbial Standardisation of antibiotics (Penicillin), vitamins (B₁₂, Riboflavin, folic acid complex) Amino acids (lysine, glutamic acid).

Elements of Genetic Engineering and products obtained through genetic Engineering.

TEXT BOOK

1. Industrial Microbiology by Cassida.
2. A Text Book of Pharmaceutics, A. O. Bentley, 8th edn. 1982 Baillier Tindall & Co.

PHARMACEUTICAL CHEMISTRY – IV (Medicinal Chemistry – II)

PY . 4 . 205

Period/week: 6

Sessional: 25

Duration of Exam: 6 hrs

Examination: 50

Nature of Exam: Practical

1. Determination of physical constants and performance of chemical tests as prescribed in the pharmacopoeia of India.
2. Analysis of tablets, Injections and other pharmaceutical preparations.
3. Synthesis of a few selected drugs from different categories included in Medicinal Chemistry I & II.

BIOPHARMACEUTICS AND PHARMACOKINETICS

PY . 4 . 206

Period/week: 4

Sessional : 25

Duration of Exam : 6 hrs

Examination: 50

Nature of Exam: Practical

Experiments based on Biopharmaceutics and Pharmacokinetics.

COSMETICOLOGY

PY . 4 . 207

Period/week: 4

Sessional : 25

Duration of Exam : 6 hrs

Examination: 50

Nature of Exam: Practical

Preparation of various cosmetics studied in theory.