Board of Studies in Pharmacy
FACULTY OF TECHNOLOGY
OSMANIA UNIVERSITY

RULES AND REGULATIONS FOR B. PHARMACY COURSE
(EFFECTIVE FROM ACADEMIC YEAR 2009 - 2010)

SCHEME OF INSTRUCTION AND EXAMINATION FOR B. PHARMACY I YEAR
(Effective for the Batch admitted during the Academic Year 2009-10)

Course No	Subject	Periods / week Th. Pr.	Sess. Marks	Univ. Exam. Marks	Duration of Exam (HRS)
PYT.1.101	Anatomy, Physiology and Health Education	3 --	30	70	3
PYT.1.102	Pharmaceutical Inorganic Chemistry	3 --	30	70	3
PYT.1.103	Pharmaceutics-I (General and Dispensing Pharmacy)	3 --	30	70	3
PYT.1.104	Mathematics / Biology	4/4 --	30	70	3
PYT.1.105	Basic Computer Applications	3 --	30	70	3
PYP.1.106	Anatomy, Physiology and Health Education Practicals	-- 3	25	50	4
PYP.1.107	Ph. Inorganic Chemistry Lab	-- 3	25	50	4
PYP.1.108	Pharmaceutics-I (General & Dispensing Pharmacy) Lab	-- 3	25	50	4
PYP.1.109	Biology Lab	-- 3	25	50	4
PYP.1.110	Computer Lab (Basic Comp. Applications)	-- 3	25	50	4
		31	275	600	

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

Subject Code : PYT.1.101 Sessional : 30
Periods / Week: 3 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Introduction: Anatomical terms in relation to parts of the body, system and organs. Elementary knowledge of the human skeleton; Tissues of the body – properties and functions of epithelial, connective, muscular, nervous and osteous (bone) tissues; General principles of membrane permeability, diffusion, transport, membrane potentials and action potentials.

Unit – II

Nervous Systems: Neuron, 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 regulations. Blood (composition and function).

Unit – III

Respiratory System: Gross anatomy of respiratory passages, physiology of respiration, nervous control of respiration, vital capacity, respiratory volume, introduction to terms such as anoxia, hypoxia & dyspnoea.

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

Endocrine System: Mechanisms of hormonal secretion, Physiological considerations of thyroid, pancreas, pituitary, parathyroid, adrenal glands & gonads; Disorders of hypo & hyper secretion.

Unit – IV

Urinogental System: Various parts, structure and functions of the kidney and urinary tract. Physiology of urine formation, output and factors controlling it.

Physiology of Special Senses: basic anatomy and physiology of the eye (vision), ear (hearing), taste buds (Tongue), nose (smell) and skin (touch and pain).

Unit – V

Health Education (Epidemiology) and Family Planning.

Elementary pathology – Diseased and pathological processes.

Inflammation and repair, Retrograde changes including disturbances of metabolism, circulation like haemorrhage, thrombosis and growth including various tumors (Neoplasms).

Embolism, infarction, Oedema and shock. Nutritional disorder (Vitamin deficiency)

Examination : One question from each unit with internal choice.

Text Books

1. Principles of anatomy and physiology by Tortora G.J., and N.P. Anagnokokos,
2. Principles of Anatomy and Physiology by Ross & Wilson.

Reference Books

1. Human Physiology by C.C. Chatterjee, Medical Allied Agency, India.
2. Text Book of Medicinal Physiology by A.C. Guyton, W.B. Prism Books Pvt. Ltd.,

PHARMACEUTICAL INORGANIC CHEMISTRY

Subject Code : PYT.1.102 Sessional : 30
Periods / Week: 3 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

a) Classification of Inorganic Pharmaceuticals based on their applications, therapeutic classes with example and uses.
b) Quality control and tests for purity, qualitative tests for anions and cations.
c) Limit test for Arsenic, heavy metals, Mercury, lead, iron, chloride and Sulphate and Pharmacopoeial Standards.
Note: following units all the compounds are of IP except which are mentioned as BP.

Unit – II

Definition, Preparation, Properties, Assay methods, Limit tests and Uses

a) Gastro – intestinal agents:

(i) Acidifiers and Antacids: IP: Dilute hydrochloric acid, sodium acid phosphate, sodium bicarbonate, sodium citrate, Potassium citrate, Aluminum hydroxide gel, Dried Aluminum hydroxide gel, Magnesium oxide (Magnesia), Magnesium-hydroxide mixture, Magnesium carbonate, Magnesium trisilicate, Calcium carbonate.
(ii) Adsorbents and Related Drugs: Light kaolin, Heavy kaolin, Activated charcoal.
(iii) Laxatives: Magnesium Sulphate and sodium phosphate.

b) Electrolytes: Sodium, Potassium and Calcium replenishers.

(i) Sodium and Potassium replenishers: Sodium chloride (compound, injection and Ringer solution), Sodium chloride and dextrose injection, Potassium chloride and oral electrolytes.
(ii) Calcium Replenishers: Calcium chloride, Calcium gluconate, Dibasic calcium phosphate.

(c) Acid base Regulators: Sodium bicarbonate, sodium lactate injection, sodium citrate / Potassium citrate, sodium acetate, Ammonium chloride, Ammonium chloride injection.

(d) Dialysis fluids: Haemodialysis fluids and intraperitoneal dialysis fluids.

Unit – III

Definition, Preparation, Properties, Assay methods, Limit tests and Uses

(a) **Mineral Nutrients:**

i. Haematinics: Ferrous Sulphate, Ferrous fumarate, Ferrous gluconate, Ferric ammonium citrate, iron and dextrose injection.
ii. Metallics: Copper, Manganese and Zinc compounds (zinc chloride);
iii. Phosphates: Sodium acid phosphate and Sodium phosphate,
iv. Halogens: Iodine and Iodides or fluorides.

(b) Pharmaceutical aids:

i. Adsorbents & Absorbents: Activated charcoal, aluminium sulphate, aluminium phosphate.
ii. Antioxidants: Sodium Sulphite, sodium bisulphate and sodium metabisulphite.
iii. Desiccants: Silica gel.
iv. Excipients: Dicalcium & Tricalcium Phosphate, Magnesium stearate, Talc & ppted chalk.
v. Suspending agents: Bentonite, colloidal silica, aluminium stearate,.
vi. Colourants: Titanium oxide, ferric oxide
vii. Solvent and Vehicle: Purified water

Unit – IV

Definition, Preparation, Properties, Assay methods, Limit tests and Uses

i. **Expectorants:** of Ammonium chloride, Potassium Iodide.
ii. **Emetics:** Potassium antimony tartarate, copper Sulphate, Zinc Sulphate.
iii. **Antidotes:** Sodium thiosulphate, sodium thiosulphate injection , sodium nitrite.

iv. **Inhalants:** Oxygen, Nitrous oxide, dilute solution of ammonia (BP), Ammonium carbonate (BP).

Unit – V

Definition, Preparation, Properties, Assay methods, Limit tests and Uses

(a) Topical agents:

i. Astringents: $ZnSO_4$, Zinc Oxide, Calcium Hydroxide, $CuSO_4$ and Bismuth subcarbonate.

ii. Topical protectants: Zinc oxide, Calamine, Zinc stearate, Talc, Titanium-dioxide, Heavy kaolin and Light kaolin

iii. Silicone polymers: Activated Dimethicone.

iv. Anti infectives: Hydrogen peroxide, Potassium permanganate, Silver Nitrate (Silver protein), Iodine, (solutions, povidone – iodine), boric acid, zinc – undecylenate, Mercury compounds (Yellow mercuric oxide, Ammoniated Mercury). Sulphur, Selenium sulphide.

(b) Dental products:

i. Fluorides: Sodium fluoride, Sodium Monofluorophosphate and stannous fluoride.

ii. Oral antiseptics and Astringents: Hydrogen peroxide, Sodium peroxide (BP), Magnesium peroxide, Zinc peroxide and Mouth washes

iii. Dentifrices: Calcium carbonate, dibasic calcium phosphate, calcium phosphate, sodium metaphosphate and strontium chloride.

iv. Cements and Fillers: Zinc oxide.

(c) Other Medicinal agents:

i. Internal parasiticides: Sodium Antimony Gluconate

ii. Anti-neoplastic agents: Cisplatin.

iii. Sedative-hypnotics: Potassium bromide

iv. Anti-depressants: Lithium carbonate

v. Anti-rheumatic agents: Sodium aurothiomalate

vi. Anti-thyroid agents: Potassium perchlorate

vii. Diagnostic agent: Barium Sulphate

viii. Surgical aid: Plaster of Paris

Examination : One question from each unit with internal choice.

Text Books

1. Bentley & Driver's Text book of Pharmaceutical chemistry Ed: L. M. Atherden, 1983, Oxford University press, Delhi.
2. Inorganic Medicinal & Pharmaceutical chemistry; J. H. Block, F. B. Roche, T.O. Soine, C.V. Wilson, 1986, Varghese publishing house.
3. Inorganic Pharmaceutical chemistry; P. Gundu Rao, Vallabh Prakashan 1995, Delhi

Reference Books

1. Pharmacopoeia; (Indian, British, US and European)
2. Martindale: The Extra Pharmacopoeia; 31st Edn, 1996, The Royal Pharmaceutical Society.
3. Remington Pharmaceutical sciences; 20th Edition Lippincott Williams and Wilkins.
4. Hand Book of Pharmacy & Health care Ed: Robin. J. Haiwan 1990, The Pharm Press, UK

PHARMACEUTICS – I
(GENERAL & DISPENSING PHARMACY)

Subject Code : PYT.1.103 Sessional : 30
Periods / Week: 3 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Pharmacy profession: Pharmacy as a career, Pharmaceutical Education, Registration as a Pharmacist, Brief introduction to Evolution of Pharmacy, European and American Pharmacy. Pharmacopoeia (IP, BP, USP and International) and other sources, SI and imperial systems, inter conversions. Weighing - selection and care of weights and balances. Sensitivity and minimum weighable quantities.

Pharmaceutical calculations: Calculations of doses, enlarging and reducing recipes; Percentage solutions, alligation, alcohol dilutes and proof spirit.

Unit – II

Prescription: Definition, Parts, sources of errors and care required in dispensing prescriptions, General Dispensing procedures, types of dispensing products. Dispensing of proprietary medicine. Prescription containers, closures and labeling of dispensed products, colors, flavors and sweeteners used in prescription.

Dosage form: Definition, Advantages and limitations of dosage form.

Principles involved and procedures adopted in preparation, labeling and dispensing of typical products (Unit III-IV). Uses of official and other products in common use.

Unit – III

Liquid preparation: Aromatic waters, spirits, solutions, mixtures, syrups, elixirs, suspension, emulsion, lotions, liniments, eye, ear and nasal drops, inhalations, throat paints, gargles, glycerin and collodions.

Unit – IV

Semisolids: Ointments and their bases, creams, jellies, suppositories and their bases, effervescent granules, tablet tritrates, pastilles, lozenges and pills.

Incompatibilities: Physical, Chemical and Therapeutic incompatibilities. Methods of overcoming and handling of incompatible prescriptions.

Unit – V

Tinctures and Extracts: Methods of preparation and uses of Tinctures & Extracts official in IP.

Medicinal Gases: Official medical gases and uses, containers and fitting, handling and storage.

Radio Pharmaceuticals: Preparation, Therapeutic and Diagnostic uses.

Examination : One question from each unit with internal choice.

Text Books

1. Bentley's text book of pharmaceutics, Rawlkins, 8th edn. ELBS Publishers.
2. Cooper & Gunn's dispensing for Pharmaceutical students, Carter CBS Publishers, Delhi.

Reference Books

1. Introduction to pharmaceutical dosage forms, HC. Ansel, 5th Edition. 1990.
2. Dispensing of Medication, Ed. E.W. Martin, Mach Publishing Co., Eastern PA.

BIOLOGY

Subject Code : PYT.1.104 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Plant Kingdom: Definition and Classification
Plant cells: Its structure, living and non-living inclusions. Different types of plant tissues and their functions, Mitosis and Meiosis.
Morphology and Histology: Roots, Stems, Barks, Woods, Leaf, Flower, Fruit and Seed.
Modification: Root, Stem, Leaf and Inflorescence.

Unit – II

Plant Taxonomy: Classification, study of the following families with special references to medicinal and economical important plants
a) Apocynaceae b) Solanaceae c) Umbelliferae
d) Leguminosae e) Scrophulariaceae f) Rubiaceae

Unit – III

Plant Physiology: Absorption, transpiration, respiration photosynthesis, basis in DNA replication.
Genetic code and Heredity: Polyploidy, hydridization and mutation.

Unit – IV

The study of animal cell: Animal tissue and cell division, difference between plant cell and animal cell, study of different systems of frog. Histology of liver, kidney, skeletal muscles, smooth muscles, pancrease, intestine and endocrine glands of rabbit.

Unit – V

Morphology and Life History of Human Parasites: Plasmodium, Entamoeba, tapewarm, ascaris, leishmania, anchylostoma and trypanosoma. Life history of Mosquitoes and housefly as agents for spreading diseases.
Examination : One question from each unit with internal choice.

Text books

1. A text book of botany, by A.C. Dutta
2. A text book of biology by Vikram series

MATHEMATICS

Subject Code : PYT.1.104 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Logarithms: Logarithm of a real number to an arbitary base, Napierion Base - Theorems on Logarithms - Use of Tables.

Trigonometry: Measurement of angles, Trigonometrical ratios and simple relations connecting the complimentary and supplementary angles, Negetive angles sum and difference of two angles, sine and cosine formulae for multiple angles and half angles.

Unit – II

Differential 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, Partial Differentiation, Maxima and Minima.

Unit – III

Integral Calculus: Integration considered as converse of differentiation, simple integrations, standard forms like x dx, Sin (a x) dx, Cos (a x) dx, Sec (a x) dx etc. Methods of substitution, simple example integration by parts. Integration of rational, irrational, trigonometrical functions. Calculations of areas of standard bodies using integration.

Unit – IV

Matrices: Matrices, basic definitions, matrix operations, transpose, adjoint, rank, inverse of a matrix, solution of linear systems of equations, matrix inversion, Gaussian elimination.

Unit – V

Biomathematics: Basic Mathematical Principles that are commonly used in Biological testing, integers, linear and non-linear graphs; 2d Coordinate geometry, Equation of line, circle.

Examination : One question from each unit with internal choice.

Text Books

1. A text book of Mathematics by N.Krishna Murthy, Chand series, Volume- I and II
2. Fundamentals of statistics by D.N. Elhance, Veena Elhance & B.M.Agarwal.

Reference Book

1. Higher Engineering Mathematics by Grewal.

BASIC COMPUTER APPLICATIONS

Subject Code : PYT.1.105 Sessional : 30
Periods / Week: 3 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I Computer Concepts

Evolution, Basic structure and Characteristics of computers; Types of memory chips; Study of various input - out put devices like magnetic tapes, magnetic discs, MICR, OCR, CDROMS etc., Types of printers; Principles of flow charting; Importance of operating systems, detailed study of the operating systems MSDOS , UNIX and WINDOWS; Computer Viruses;

Unit – II Programming In 'C' Language

Operators, Expressions, Data input, Output, Control statements like - (IF-ELSE, WHILE DO, FOR, BREAK AND CONTINUE and GOTO) Functions, Library functions, Arrays.

Unit – III Introduction to Ms-Office (Word & Excel)

MS-Word: Basics, working with files, working with text, formatting paragraphs, styles, lists, tables, Graphics, spellings and grammar and page formatting macros, table of contents.
MS-Excel: Basics, Spreadsheets, data types, formulas, Formatting, charts, graphs.

Unit – IV Introduction to Ms-Office (Power Point & Access)

MS-Power Point: Power point basics, Views, Slide control, Apply design, Page setup, Templates, Background, Control, Color Screens, Transitions and animations, working with texts and working with graphics.
MS-Access: Data base concepts, Screen layouts, Creating tables, Data sheet records, table relation ships, Sorting and filtering, Queries, forms, form controls, Sub forms, reports, importing, exporting, linking.

Unit – V Information Infrastructure

Internet and World Wide Web (WWW): Structure and Organization of the WWW, Browsers, Information search in WWW, search engines, Pharmaceutical resources in WWW Types of indexing tools & search strategies; Hyper Text Manuscript Language (HTML) and E-Mail.
Introduction to Structured Query Language (SQL): Overview of SQL Reserved Words; SQL Commands, Comparison for Access and SQL Server; Chemical Database Design & their Tools

Examination : One question from each unit with internal choice.

Text Books

1. Fundamentals of Computers by P.K. Sinha
2. Let Us C by Yashvanth Kanetkar
3. Working in Microsoft Office By Ron Mansfield
4. SQL, PL/SQL The Programming Language of Oracle by Ivan Bayross

Reference Books

1. Programming with ‘C’ by Byron Goltfield- Schum series
2. Computer programming in ‘C’ by Y. Raja Raman

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

Subject Code: PYP.1.106 Sessional : 25
Periods/Week: 3 Examination : 50
Nature of Examination: Practical Exam Duration: 4 Hrs

List of Experiments

1. Study of histological slides of different tissues / organs
2. Study of various models, specimens of bones / organs
3. Hematology - blood grouping
4. Hemoglobin content estimation
5. Estimation of bleeding time
6. Estimation of clotting time
7. Determination of RBC count
8. Determination of total WBC count
9. Measurement of blood pressure
10. Measurement of vital capacity
11. Estimation of ESR

Reference Books

1. S.R. Kale and R.R. Kale, **Practical Human Anatomy & Physiology**, Nirali Prakashan, Pune, 2003.
2. CL Ghai, **Text book of Practical Physiology**, Jay Pee, New Delhi, 2005.

PHARMACEUTICAL INORGANIC CHEMISTRY

Subject Code: PYP.1.107 Sessional : 25
Periods / Week: 3 Examination : 50
Nature of Examination: Practical Exam Duration: 4 Hrs

List of Experiments

1. Systematic quantitative analysis for inorganic mixtures upto 4 radicals preferably by semi-micro methods.
2. Pharmacopoeial limit test for Chlorides
3. Pharmacopoeial limit test for Sulphates.
4. Pharmacopoeial limit test for lead.
5. Pharmacopoeial limit test for iron.
6. Preparation and purification of Boric acid
7. Preparation and purification of sodium citrate
8. Preparation and purification of potash alum.
9. Preparation and purification of yellow mercuric oxide
10. Preparation and purification of Ammoniated Mercury

Reference Books

1. A.H Beckett and J.B Stenlake, **Practical Pharmaceutical Chemistry**, 4th Edition, CBS Publications, New Delhi, 2004.
2. G Svehla, **Vogel's Qualitative Inorganic Analysis**, 7th Edition, Pearson Education, New Delhi, 2003.
3. G. Devala Rao, **Practical Pharmaceutical Inorganic Chemistry**, Birla Publications, New Delhi, 2006.
4. K. R. Mahadik and S.H Bhosale, **Hand book of Practical Chemistry (Inorganic & Organic)**, Nirali Prakashan, Pune, 2005.
5. **Indian Pharmacopoeia**, Controller of Publications, Delhi. 1996.

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PHARMACEUTICS – I
(GENERAL & DISPENSING PHARMACY)

Subject Code: PYP.1.108 Sessional : 25
Periods / Week: 3 Examination : 50
Nature of Examination: Practical Exam Duration: 4 Hrs

List of Experiments

1. Dispensing Procedures involving pharmaceutical calculation, dosage calculations for pediatric and gaeriatric patients
2. Incompatibility studies in few simple dosage forms.
3. Preparation of Aromatic waters
4. Preparation of spirits
5. Preparation of different types of iodine solution
6. Preparation of cresol soap solution
7. Preparation of compound Sulphur & Calamine lotion
8. Preparation of turpentine liniment
9. Preparation of gargles and throat paint
10. Preparation of sulphur ointment
11. Preparation simple ointment
12. Preparation of whitfield ointment
13. Preparation of non staining iodine ointment
14. Preparation of creams & pastes
15. Preparation of any glycerogelatine based suppository
16. Preparation of Tragacanth jelly
17. Preparation of effervescent granules
18. Preparation of simple syrup
19. Preparation of ear / eye drops

Reference Books

1. C.V.S Subrahmanyam, J. Thimma Setty and G.C. Prabhu Shankar, **Laboratory Manual of Pharmaceutics**, Vallabh Publications, New Delhi, 2006.
2. R.S Gaud and G.D Gupta, Practical Pharmaceutics,

BIOLOGY

Subject Code: PYP.1.109 Sessional : 25
Periods / Week: 3 Examination : 50
Nature of Examination: Practical Exam Duration: 4 Hrs

List of Experiments

1. Study of plant parts and their modification
2. Study of representative of families – Apocynaceae, Solanaceae, Umbelliferae, Rubiaceae
3. Histology of following crude drugs – Cinchona, Clove, Coriander, Linseed
4. Histological study of different organs through permanent slides
5. Study of various tissues through permanent slides
6. Study of digestive system of frog
7. Study of arterial and venous system of frog
8. Study of male urinogenital system of frog
9. Study of female urinogenital system of frog
10. Study of renal portal system of frog
11. Study of skeletal system of frog
12. Study of spinal nerves system of frog

Reference Books

1. G. Venkateshwar Rao, G. V. Subbaiah and K Sheeba, **Intermediate Practical Manual for Botany**, Sai Apollo New Century Series, Hyderabad,
2. S. B. Gokhale, C. K. Kokate and D. B. Bidankar, **Pharmaceutical Biology**, Nirali Prakashan, Pune, 2005.
3. S. B. Gokhale, C. K. Kokate and D. B. Bidankar**, Practical Pharmacognosy**, Nirali Prakashan, Pune, 2003.
4. S. H. Ansari, **Guideline Series for Pharmacognosy**, Tata Publishers, New Delhi, 1997.

BASIC COMPUTER APPLICATIONS

Subject Code: PYP.1.110 Sessional : 25
Periods / Week: 3 Examination : 50
Nature of Examination: Practical Exam Duration: 4 Hrs

LIST OF EXPERIMENTS:

01. Exercised Based on Dos commands
02. Programming in "C" Language.
03. Exercises on MS-Office.
04. Exercises based MS word
05. Exercises based on MS Excel
06. Exercises based on MS Access and Power Point.
07. Programming in SQL

Reference Books

1.sanjay saxena,A first Course computers, vikas publishing House (P) Ltd,N.Delhi,2003
2.Yahhavant Kanetkar,Let Us C , 4th ed, BPB publications,N.Delhi,2002
3.Sanjay saxena , Ms Office 2000 for everone, vikas Publishing House (P) Ltd,N.delhi,2003

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SCHEME OF INSTRUCTION AND EXAMINATION
FOR
B. PHARMACY - II YEAR I SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs.
PYT.2.101	Ph.Organic Chemistry - I	4	--	30	70	3
PYT.2.102	Pharmaceutical.Engineering – I	4	--	30	70	3
PYT.2.103	Pharmaceutical Analysis – I (Chemical Analysis)	4	--	30	70	3
PYT.2.104	Ph. Microbiology	4	--	30	70	3
PYT.2.105	Communicative English*	4		30	70	3
PYP.2.106	Ph. Org. Chemistry – I Lab	--	4	25	50	4
PYP.2.107	Pharmaceutical Analysis – I (Chemical Analysis) Lab	--	4	25	50	4
PYP.2.108	Ph. Microbiology Lab	--	4	25	50	4
		32		225	500	

Candidates admitted into B.Pharm II year directly from Diploma Stream (lateral entry) should study the papers PYT.1.104 – Mathematics, PYT.1.105 – Basic computer applications & PYP.1.110 – Basic Computer Applications Practicals.

SCHEME OF INSTRUCTION AND EXAMINATION
FOR
B. PHARMACY - II YEAR II SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs.
PYT.2.201	Ph. Organic Chemistry – II	4	--	30	70	3
PYT.2.202	Pharmaceutical Biochemistry	4	--	30	70	3
PYT.2.203	Pharmaceutical Engineering – II	4	--	30	70	3
PYT.2.204	Pharmacognosy – I	4	--	30	70	3
PYT.2.205	Environmental Studies*	4	--	30	70	3
PYP.2.206	Ph. Org. Chemistry – II Lab	--	4	25	50	4
PYP.2.207	Pharm. Biochemistry Lab	--	4	25	50	4
PYP.2.208	Pharm. Engineering Lab	--	4	25	50	4
		32		225	500	

PHARMACEUTICAL ORGANIC CHEMISTRY – I

Subject Code : PYT 2.101 Sessionsal : 30
Periods / week :4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Structure and Reactivity of Organic Molecules

Hybrid orbitals, Molecular orbitals and Covalent bond, Bond angles, Heterolysis, Polarity of covalent bond, Polarity of Molecules, Dipole moments, Intermolecular forces, Boiling Point, Melting Point, Solubility,

Electronic effects: Inductive effect, Electromeric or Mesomeric effect and Resonance. Isomerism (structural and spatial).

Reaction Progress - Activation Energy, Energy diagrams of Reactants and Products.

Unit – II

Aliphatic Hydrocarbons

Nomenclature, Physical properties, General Methods of Preparation and Characteristic reactions of Alkanes, Alkenes and Alkynes; Heats of combustion or Heats of Hydrogenation, Homologous series, Free radical reactions of Alkanes (Halogenation), Catalytic reduction and Electrophilic addition reactions of Alkenes and Alkadienes, Markonikov's Addition, Anti Markonikov's Addition, Peroxide effect or Kharasch effect, Cis-Trans reduction of alkynes, Acidity of 1-Alkynes. Electrophilic addition reactions of alkynes, stability of conjugated alkadienes and their addition reactions.

General methods of preparation of Cycloalkanes: Nomenclature, ring size, stability, Bayer's strain theory, Sachse - Mohr theory, Puckered rings, Congifguration and Conformations of Cycloalkanes, axial and equatorial bonds, Cis-trans Isomers.

Unit – III

Halogen and Hydroxy Compounds

Nomenclature, General Methods of preparation, Relative reactivity of Halides and Hydroxy Compounds, primary, secondary and tertiary classes, Nucleophilic substitution reactions (SN^1 and SN^2) - Walden inversion, Elimination reactions (E^1 and E^2) - Sayetzeffs rule.

Nucleophilic substitution V s Elimination. Oxidation of alcohols;

Ethers: Nomenclature, Properties and Synthesis (Williamson's synthesis and Ziesel's Method).

Unit – IV

A) Carbonyl Compounds (Aldehydes and Ketones)

Nomenclature, General Methods of Preparation, relative reactivities of Carbonyl Compounds, Nucleophilic addition reactions, Addition-Elimination reactions - Schiffs bases, oxidative reactions.

B) Carboxylic Acids and Acid Derivatives
(Acid Halides, Anhydrides, Esters and Amides)

Nomenclature, General Methods of Preparation of Carboxylic acids, Relative acidity of Carboxylic acids, Action of alkalis, salt formation, Alpha - Halogenation and functional (Nucleophilic substitution) reactions of Carboxylic acids and methods of preparation of acid derivatives, Hydrolysis of acid derivatives, Reactivity and synthetic applications of malonic ester and aceto-acetic ester.

Unit – V

Nitrogen Compounds

A) Nitro Compounds

Nomenclature, methods of preparation

B) Amines:

Nomenclature, primary, secondary and tertiary types, Relative Basicity of amines, Reactions of amines, Action of Nitrous acid, alkylation and acylation, Nucleophilicity of amines, Hinsberg's method of separation of amines.

Aryldiazonium salts - Reactions (synthetic applications) of aryldiazonium salts.

Examination : One question from each unit with internal choice.

Text books

1. 'Organic Chemistry' by T.T.Morrison & R.Boyd. Prentice Hall of India Private Limited, New Delhi.
2. Organic Chemistry by FERGUSON

Reference Books

1. The Fundamental Principles of organic chemistry, by I.L.Finar, ELBS, London.
2. Organic chemistry by Cram & Hammond.
3. Text Books of Pharmaceutical Chemistry, by T.M.Atherden, Bentley and Drivers, Oxford University Press, London.

PHARMACEUTICAL ENGINEERING – I

Subject code : PYT 2.102 Sessional : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Materials of Construction: Factors affecting the material selection for Pharmaceutical plants.
Ferrous Metals: Cast iron steels and Stainless steels,
Non-Ferrous Metals: Copper, Aluminum, Lead, Tin, Silver, Nickel, Zinc, Platinum, Chromium and their important alloys.
Nonmetals: Glass, Stoneware, Stone slate, Brick, Concrete, Asbestos, Rubber, Timber, Plastics.
Corrosion and its Prevention: Types of corrosion, factors influencing corrosion, theories of corrosion, methods of prevention of corrosion.
Definition of unit operations, unit processes. Steady and unsteady states, dimensionless equations, dimensional formulas, dimensional analysis, and dimensionless groups.

Unit – II

Fluid Flow: Fluid static's, manometers, types of flow, Bernoulli's theorem, losses in mechanical energy of flowing fluids, measurement of fluids flow rate - orifice, venturi, pitot and rotameter, flow meters.
Heat Transfer: Nature of heat flow,
Conduction: - Fourier's law, thermal conductivity, compound resistance in series, heat flow through a cylinder - mean radius and mean area.
Convection: - Natural and forced convection, temperature gradients in forced convection, surface and over all coefficients. Parallel current and counter current flow.
Radiation: -black body, Stefan Boltzaman law, and gray body. Heaters, heat interchangers, scraped surface exchangers, extended surface equipment.
Steam as heating medium: - properties and uses of steam traps, vacuum pumps, condensers, entrainment separators, foam and its prevention.

Unit – III

Transportation of Materials
Solids: - Classification, principles of construction & uses of different types of conveyers, detailed study of belt, screw and pneumatic conveyers.
Fluids: - Pipes, tubes, joints, fittings, valves, Different types of reciprocating & rotary pumps, air lift pumps, screw pumps, monopumps, peristaltic pumps.
Gases: - Fans, Blowers, types of compressors, ejectors, vacuum pumps, jet pumps.

Unit – IV

Humidification dehumidification and air conditioning: Definition of various terms, wet bulb and adiabatic saturation temperatures, humidity chart, determination of humidity, methods of increasing and decreasing humidity. Air conditioning - applications in pharmacy.
Refrigeration: Definition; compression and absorption; types of refrigeration cycles; coefficient of performance, refrigerants and their choice; Brine systems, load and applications in pharmacy.

Unit – V

Filtration: Laboratory filtration equipment, classification of industrial filters, sand filters, chamber press, plate & frame filter press, brief description of leaf filters, rotary continuous filters, top feed filters, streamline & 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.

Centrifugation: Theoretical considerations, large scale centrifuges classification, perforated & non perforated basket centrifuges, disc centrifuge bowls, tubular bowl centrifuges, horizontal centrifuges, continuous centrifuges, vertical solid bowl centrifuge, laboratory equipment.
Examination : One question from each unit with internal choice.

Text Books

1. **Pharmaceutical Engineering** by Prof. K.Samba Murthy
2. **Introduction to Chemical Engineering** by W.L.Badger & Banchero, Macrohill Int. book company, London.
3. C.V.S. Subrahmanyam, J. Timma Setty, V. Kusum Devi and Sarasija Suresh, **Pharmaceutical Engineering, Principles and practices**, Vallabh Prakashan, New Delhi, 2007.

Reference Books

1. Elements of Chemical Engineering – Mc Cabe & Smith 4th edn. 2000.
2. Handbook of Chemical Engineering by Perry.

PHARMACEUTICAL ANALYSIS – I
(CHEMICAL ANALYSIS)

Subject code : PYT 2.103 Sessional : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

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, Modem 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 tritrations 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; Emperical 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.

PHARMACEUTICAL. MICROBIOLOGY

Subject code : PYT 2.104 Sessional : 30
Period / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Introduction to the Science of Microbiology and Microscopy. Groups of microbes (bacteria, fungi, virus and actinomycetes) classification, macro and micro morphology and taxonomy. Different methods of bacterial count. Nutrition, Cultivation, Isolation, Identification and Preservation of pure cultures. Organisms important in Pharmacy.

Unit – II

Different biochemical reactions employed in identification of organisms, stains and staining, tolerance, Physiology and reproduction of bacteria, actinomycetes, fungi, yeasts and viruses. Microbial genetics and Variation: Introduction, genetic organization, mutation, mutagens, different types of mutants, physical and chemical mutagenesis repair mechanism and their isolation.

Unit – III

Disinfections: Factors influencing disinfections, dynamics of disinfections, different groups of disinfectants and antiseptics and their evaluation and applications.
Sterilization: Premises and Equipment, detailed evaluation and application of different sterilization methods. Sterilization indicators and their importance.

Unit – IV

Microbial attack and host defense, virulence and pathogen city, primary and specific defensive mechanisms of body.
General Principles of immunology and their applications. Immunogenetics: Classification and principles of different types of immunity, Immune systems - humoral immunity, cellular immunity and tolerance. Phagocytosis, Hypersensitivity and other reactions.
General Principles of Serology and Chemical nature of antigens, antibodies. Different antigen - antibody reactions and their applications. Precipitation, agglutination and their significance in diagnosis and diagnostic tests. Different antigens of bacterial cells, monophasic and biphasic variation. Bacterial exotoxins and endotoxins, Toxoids.

Unit – V

General principles of infection and communicable diseases. Significant symptoms, General modes of transmission of the following epidemic and endemic diseases.
a) Tuberculosis, cholera, typhoid. b) Diphtheria, whooping cough. c) Plague, malaria, filariasis, infuenza. d) Infective hepatitis, poliomyelitis.
Systematic studies of a few selected organisms - E.Coli, Pencillium sps, Streptomyces sps, Saccharomyces sps. Microbiology of water and milk.

Examination : One question from each unit with internal choice.

Text Books

1. Text book of Microbiology by Pelezair & Reid
2. Text book of Microbiology – Probisher

COMMUNICATIVE ENGLISH

Subject Code: PYT.2.105 Sessional : 30
Periods/Week: 3 Examination : 70
Nature of Examination: Theory Exam Duration: 3 Hrs

Unit – I

Role and Importance of Communication; Verbal and Non-Verbal Communication; Group Communication, Effective Communication; Barriers to communication; Communication Mediums; Participating in discussions, Conduct of Seminars, Conferences etc., Making Presentations through collection, evaluation, organizing the information; Interacting with learners and teachers; Role of Wit and Humor in Communication

Unit – II

Spoken English Vs Written English; Formal / Informal English (one way/two way); British/ American/Indian English; How to introduce one self and others; How to tender apology; How to thank in different ways; Greetings; Some Polite Expressions; Agreements and Disagreements; How to use a dictionary; How to use a Thesaurus; Vocabulary Development; Synonyms and antonyms; Single word substitutes; comprehensions;

Unit – III

Communication through Letters; Official and Personal Letters; Letters of complaint; Letters of Enquiries; and Responses; Writing Memos, Circulars and Notices; What to avoid while writing; Writing Paragraph, Document and Scientific/Technical Report; Drafting & Delivering a Speech;

Unit – IV

Grammar in English: Tenses; Voice; Articles; Direct and Indirect speech; Degrees of Comparison; Common errors in English made by Indian Learners of English
Concepts of Learning and Listening: Types and Methods of Learning and Listening; Learning and Listening of Knowledge, Attitudes, Skills and Practices.

Unit – V

The following Four Essays from "Selections from Modern English" prose Edited by Haladhar Panda are prescribed.

1. "Our Own Civilization" - C.EM. Joad
2. " Andrew Carnegie" - E.H Carter
3. " The Secret of work" - Swami Vivekananda
4. "The Generation Gap' - Benjamin Spock

Examination : One question from each unit with internal choice.

Text Books

1. "Business Correspondence and report Writing" R.C.Sharma and Krishna Mohan, Tata McGraw Hill Publishers, New Delhi
2. "Communicative English" E. Suresh kumar, Raj Kamal Publications, Hyderabad
3. "Selections of Modern English Prose" Ed. By Haladhar Panda, Published by Universities Press 9India) Pvt. Ltd., Hyderabad

PHARMACEUTICAL. ORGANIC CHEMISTRY – I

Subject code : PYP 2.106 Sessional : 25
Periods / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Organic Chemistry laboratory techniques.
2. Experiments in simple qualitative analysis including preparation of derivatives.
3. Nitration : Preparation of Nitrobenzene from Benzene.
4. Halogenation : Preparation of p-Bromo acetanilide from Acetanilide.
5. Oxidation : Preparation of Benzoic acid from toluene or Benzylchloride
6. Reduction : Preparation of m-Nitroaniline from m-Dinitro Benzene.
7. Esterification : Preparation of n-Butyl acetate from n-Butyl alchol.
8. Acetylation : Preparation of Acetanilide from Aniline.
9. Etherification : Preparation of β-Naphthyl methyl ether from β-Napthol.
10. Hydrolysis (Saponification) : Preparation of Benzoic Acid from Methyl Benzoate OR Preparation of Benzoic acid from Benzamide.

Reference Books

1. B. S. Furniss, A. J. Hannaford, P. W. G. Smith and A. R. Tatchell, **Vogel's Text Book of Practical Organic Chemistry**, 5th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R.K Bansel, **Laboratory Manual of Organic Chemistry**, 4th Edition, New Age International Publishers, New Delhi, 2005.
3. F.G Mann and B. C Saunders, **Practical Organic Chemistry**, 4th Edition, Orient Longman, Hyderabad, 2004.
4. Vogel A.I, **Elementary Practical Organic Chemistry Part – I, Small scale Preparations**, 2nd Edition, CBS Publishers & Distributors, New Delhi, 2004.

PHARMACEUTICAL ANALYSIS – I

Subject code : PYP 2.107 Sessional : 25
Periods / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Calibration of Weights and Pipette and Burette.
2. Standardization of acid, bases, perchloric acid, potassium permanganate EDTA.
3. Experiments on Acidimetry and Alkalimetry.
4. Experiments on Oxidation and reduction reaction.
5. Experiments on Iodimetry and Iodometry.
6. Experiments based on complelxometric titration.
7. Non-aqeous titration using perchloric Acid.
8. Experiments based on gravimetry, silver salt method.

Reference Books

1. A.H Beckett and J.B Stenlake, **Practical Pharmaceutical Chemistry**, Part – I, 4th Edition, CBS Publications, New Delhi, 2004.
2. B.H Jeffery and R.C Denny, **Vogel's Text book of Quantitative Chemical Analysis**, 6th Edition, Pearson Education, Delhi.2004.
3. **Indian Pharmacopoeia**, Controller of Publications, Delhi, 1996.

PHARMACEUTICAL MICROBIOLOGY

Subject code : PYP 2.108 Sessional : 25
Period / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Basic equipments used in Microbiology Laboratory
2. Sterilization by dry heat and moist heat technique
3. Preparation of various media.
4. Aseptic transfer technique
5. Staining techniques
6. Study of bacterial motility by hanging drop technique
7. Biochemical reactions for identification of bacteria
8. Isolation of pure cultures
9. Enumeration & isolation of bacteria from air.
10. Bacteriology of milk and water
11. Preservation of cultures

Reference Books

1. F.C. Garg, **Experimental Microbiology**, CBS Publishers, New Delhi, 2003.
2. R.S Gaud and G.D Gupta, **Practical Microbiology**, 6th Edition, Nirali Prakashan, Pune, 2006.
3. R.S Gaud, G.D Gupta and S.B. Gokhale, **Practical Biotechnology**, 2nd Edition, Nirali Prakashan, Pune, 2004.
4. Vinita Kale and Kishore Bhusar, **Practical Microbiology Principles and Techniques**, Himalaya Publishing House, Hyderabad, 2005.
5. Ulhas Patil, J.S Kulkarni, A.B Chaudhari and S.B Chinchokar, **Foundation in Microbiology**, 3rd Edition, Nirali Prakashan, Pune, 2005.

PHARMACEUTICAL ORGANIC CHEMISTRY - II

Subject code : PYT 2.201 Sessionsal : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Aromatic Hydrocarbons (Benzene and Derivatives)

Structure of Benzene, stability of Benzene (Heats of hydrogenation), Aromatic character – Huckel's (4n + 2 electron) rule. Nomenclature of Benzene derivatives. Electrophilic substitution reactions (Halogenation, Nitration, Sulphonation, Friedel- Crafts alkylation and acylation), Effect of substituent on Reactivity and orientation of monosubstiuted Benzenes. Nucleophilic substitution in Halobenzenes. Acidity and Reactions of Phenols.

Polynuclear Hydrocarbons: Napthalene and Anthracene: Structure, relative stability and aromaticity, Electrophilic substitution reactions - orientation, reduction and oxidation.

Unit – II

Stereo Chemistry

Stereoisomerism, conformational isomerism, Cis-trans (E & Z) isomerism, sequence rules for E & Z configurations. Enantiomerism and optical activity:

Plane of symmetry, asymmetry or chirality, plane polarized light, Relative (D & L) configurations, Absolute (R & S) configurations, sequence rules, Diastereomers, Meso structures, racemic modifications, concept of stereospecificity.

Unit – III

Heterocyclic Compounds Containing One Hetero Atom

Introduction, classification and nomenclature of Heterocyclic compounds, Ring structure, methods of preparation and characteristic reactions of pyrrole, furan, thiophene, Pyridine, Indole, Quinoline, Isoquinoline and Acridine. Structure and specific uses of two medicinally important compounds representing each of the heterocyclic systems.

Unit – IV

Heterocyclic Compounds Containing Two Hetero Atoms

Structure and preparation of Pyrazole, Imidazole, Benzimidazole, Oxazole, Isoxozole, thiazole, diazine, pyrimidius, pyrazine and phenothiazine.

Nomenclature and Ring Structure and specific uses of two medicinally important compounds representing each of the above heterocyclic systems; Benzofuran, Benzopyran, dioxane, cinnoline, phenazine, oxazine, triazine, triazole, tetrazole, phenam and cepham.

Unit – V

Synthetic Reagents and Reactions

Specific synthetic Applications (at least two) of the following reagents:

Lithium Aluminium Hydride (LAH), Lead Tetra Acetate (LTA), N-Bromosucinimide (NBS), Selenium oxide, sodium periodate, perchloric acid,

Mechanism of the following reactions: Fries migration, Beckmann Re-arrangement, Birch reduction, Hoffman's hypobromite reaction, oppenneur oxidation. MPV reduction, ArndtEistert synthesis.

Examination : One question from each unit with internal choice.

Text Books

1. 'Organic Chemistry' by T.T.Morrison & R.Boyd. Prentice Hall of India Private Limited, New Delhi and 2. Organic Chemistry by FERGUSON.

Reference Books

1. The Fundamental Principles of Organic Chemistry, by I.L.Finar, ELBS, London.
2. Pharmaceutical Chemistry, by T.M.Atherden, Bentley and Drivers, Oxford Univ. Press, U.K.,

PHARMACEUTICAL BIOCHEMISTRY

Subject code : PYT 2.202 Sessionsal : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Biochemical organization of the cell and transport processes across cell membrane.
The concept of free energy, determination of free energy change from equilibrium constant and reduction potential, energy rich compounds, production of A TP and its biological significance.

Unit – II

Enzymes - Nomenclature & classification, Kinetics, mechanism of action and inhibition, clinical applications of enzymes, isozymes and coenzymes.
Carbohydrate metabolism: - Glycolysis, gluconeogenesis, glycogenolysis, glycogen synthesis, metabolism of galactose, role of sugar nucleotides in biosynthesis; pentose phosphate pathway. TCA cycle, its significance, Anapleuritic reations, Effects of inhibitor and regulation of TCA cycle, Glyoxalate cycle.

Unit - III

Lipid metabolism - fate of dietary lipids; beta oxidation, oxidation of unsaturated fatty acids; synthesis of ketone bodies, biosynthesis, of saturated and unsaturated fatty acids, cholesterol metabolism, phospholipids and sphingolipids.

Unit – IV

Electron transport and biologial oxidation. Nitrogen balance, metabolism of amino acids; biosynthesis of purins, pyrimidines and their nucleotides, formation of uric acid.
Integration of carbohydrate, lipid and protein metabolism. Biosynthesis of RNA and DNA, Physical and chemical mutagenesis, DNA repair mechanism, recombinant DNA, mechanism of protein synthesis and its regulation, inborn errors in metabolism.

Unit – V

Principles involved and methods used in qualitative & quantitative analysis of blood for -SGPT, SGOT, Bilerubin, glucose, urea, cratinine, albumin, alhuminl globulin ratio and their clinical significance. Principles involved and methods used in qualitative and quantitative analysis of urine for - glucose, ketone bodies, bile salts, bile pigments and albumin. Product inhibition, feed back inhibition, role of cyclic AMP in enzyme activation, repression and induction and control of enzyme synthesis by regulation of transcription.

Examination : One question from each unit with internal choice.

Text Books

1. Text Book of Biochemistry, by B.Harrow & A.Mazur, W.B.Saundons Co., Philadelphia.
2. Principles of Biochemistry, A.L.Lehninger, CBS publishers, New Delhi.
3. Text Book of Biochemistry, by Rama Rao.

Reference Books

1. Outlines of Biochemistry by E.E.Conn and P.K.Stumpf. John Wiley & Sons, New York.
2. Harper's Review of Biochemistry, D.W.Martin, P.A.Mayes & V.M.Redwell, Language Medical Publications

PHARMACEUTICAL ENGINEERING - II

Subject code : PYT 2.203 Sessionsal : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

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 construction, sieving of powders – Particle size distribution and its measurement using sieves. Representation on data. Screening equipment for coarse 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 – Principles, Small and large scale equipment, pod biel 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 formation. 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, azeotropic distillation, rectification, sieve plate and packed columns, HEPT. 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, vaccum tunnel, rotary and infrared dryer. Drying of slurries of solution – Drum, spray, freeze drying and fluidized bed drying.

Crystallisation – 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. Miers supersaturation theory and its limitations. Nucleation mechanisms, crystal growth. Classification of crystallisers, Tank, agitated batch, Swenson Walker, single vacuum, circulating magma and Krystal crystallizer. 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 mixers; Solid – solid mixing: Selection of mixer; Mixing of viscous masses; Kneading and ban burry mixtures; Ointment mills, triple roller mill.

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

Absorption and Ion exchange – Ion exchange operations, Ion exchange principles different

types of Ion exchangers 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 granules and strength of tablets.

Automatic process control systems – Process variables (temperature, pressure flow, level and vacuum) and their measurement; Elements of automatic process control and introduction automatic process control systems.

Examination : One question from each unit with internal choice.

Text Books

1. Pharmaceutical Engineering by Prof.K.Samba murthy
2. Introduction to Chemical engineering by W.L.Badger and Banchero, Macrohill Int. book Co, London.
3. C.V.S. Subrahmanyam, J. Timma Setty, V. Kusum Devi and Sarasija Suresh, **Pharmaceutical Engineering, Principles and practices**, Vallabh Prakashan, New Delhi, 2007.

Reference books

1. Unit operations to chemical engineering by W.I.Macebe and J.C.Smith, Macrohill Int. book Co, London
2. The theory and practice of Industrial Pharmacy by L.Lachman, H.Lieberman and J.L.Kanig, Lea and Febiger Philadelphaia.

PHARMACOGNOSY - I

Subject code : PYT 2.204 Sessionsal : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Introduction to pharmacognosy, methods of classification of crude drugs. Systematic description and storage of crude drugs. Plant hormones and their applications

Cultivation - Advantages and disadvantages of obtaining drugs from cultivated and wild Plants. Variability of drug constituents due to exogenous and endogenous factors like altitude, light, temperature, rainfall, propagation by seeds, vegetative means, selection, mutation, hybridization and polyploidy.

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.

Unit – II

Plant Biosynthesis - Techniques employed in Biosynthetic pathways, precursor - product sequence, competitive feeding, sequential analysis. Study of basic metabolic pathways, Carbohydrate synthesis, Shikimic acid pathway, Isoprenoid biosynthesis.

Unit – III

Hazards - like infestation with spores of micro organisms eggs and steps to prevent the same. Drugs deterioration by non living factors like moisture etc., and steps to prevent deterioration. Adulterations of crude drugs and their detection. Quality control of crude drugs and Phytochemicals. Study of the following methods for evaluation, identity, purity, quality by organoleptic, microscopic, physical, chemical and biological characters; Moisture content determination, determination of foreign organic matters and analysis of volatile oils, quantitative microscopic exercises including lycopodium spore method, leaf constant, crude fibre content.

Unit – IV

Systematic Phamacognostic study of following drugs

Carbohydrates - Agar, Tragacanth, acacia, starch, isabgol linseed, regenerated carbohydrate fibres, cellulose, alginates and tamarind; Fixed Oils, Fats and Waxes - Chaulmoogroil, neem oil, castor oil, olive oil, bees wax, spermaceti, carnaubawa, theorbroma oil, and lard.

Tannins - Myrobalan, Black catechu, Pale catechu, gal amla and arjuna.

Unit – V

Systemic Pharmacognostic study of the following Fibers: Cotton, Jute, Hemp, Rayon, Wool, silk and Nylon.

Drugs from mineral and animal origin - Kaolin, talc Bentonite, Cod liver oil, Shark liver oil, cantherides, Musk, Honey, and cochineal.

Proteins & Enzvme - Papain, Pepsi Gelatin, Pancreatin

Examination : One question from each unit with internal choice.

Text Books

1. Pharmacognosy by Trease G.T and Evans w.e 12 ed, Baillers Tindall Easboume, UK.
2. Pharmacognosy by e.K.Kokate, A.P.Purohit, S.B.Gokhale, Nirali Prakashan, Pune.

ENVIRONMENTAL STUDIES

Subject code : PYT 2.205 Sessionsal : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

The Multidisciplinary Nature of Environmental Studies

Definition, Scope and Importance; Indicators for Sustainable Development;
Natural Resources: Forest, Land, Mineral, Food, Water and Energy Resources; Uses, Benefits, Safety, Security and over-exploitation; Role of an individual in conservation of natural resources. Sustainability Theory and Practice; Equitable use of resources for sustainable lifestyles; Ecosystem: Concepts, Types, Characteristic Features, Structure and Functions

Unit – II

Biodiversity and Its Conservation

Introduction, Definition, Types and Levels of Biodiversity; Genetic, Species and Ecosystem diversity; Species Richness; Indigeneous Knowledge, Magnitude and Distribution of Biodiversity;
Medicinal and Economic Value of biodiversity; Consumptive and Productive use; Biodiversity at Global, National and Local levels.
Biogeographical Classification of India - India as a mega-diversity nation and Hot spots; Threats to biodiversity; Endangered and endemic species of India;
Conservation of biodiversity: In-situ conservation of biodiversity.
Relevance of Biotechnology and Nanotechnology in Sustainable Development, Production and Environment Protection

Unit – III

Environmental Pollution and Its Problems

Local and Global Issues - Definition, causes, effects and control measures of:
a) Air pollution, b) Water pollution, c) Soil pollution, d) Marine pollution, e) Noise pollution, f) Thermal pollution and g) Nuclear hazards

Role of an individual in pollution prevention and case studies of pollution.
Solid and Hazardous Waste Management: Causes, effects and control measures of urban and industrial wastes; Development of Value added products from Solid Wastes;
Waste Minimization in Manufacturing Industry: Alternative Methods and Routes for Process Development; Reduce, Recycle and Reuse; Cost Beneft analysis of a Process or Method and Importance of Mass Balance; Case studies with refernce to Pharma Industry;
Green House Gas Effects: Climate change, global warming, acid rain and forest, ozone layer and ground water depletion.
Environmental Problems in India: Drinking Water, Sanitation and Public Health;

Unit – IV

Social Issues and the Environment

Human Population and Environment: Population Growth and Population Explosion;
Social Problems related to poverty, energy, water, shelter, infrastructure, food, health, sanitation, hygiene, land scape, livelihood, information, environment and value education. Effects of Human Activities on the quality of Environment: Urbanization; Communication, Transportation, Industrialization and Green revolution;
Water conservation, Rain Water harvesting, Watershed Management;
Resettlement and Rehabilitation of People, its problems and concerns. Case Studies. Environmental ethics; Civic Sense, Issues and Possible Solutions.
Disaster management plan: Natural and Man Made disasters, floods, earthquake, cyclone,

tsunami, landslides, nuclear accidents, fire and bioterrorism;
Case studies related to social issues: Wasteland reclamation. Consumerism and waste products.

Unit – V

Institutional Setup and Legislation

Government Regulatory Bodies in Monitoring and Enforcement of Environmental Regulations; Environment Protection Acts: Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act, Coastal Regulation Zone (CRZ) Act, EIA Notification, Hazardous Waste Rules and Municipal Solid Waste Rules;
Right to Information Act, Wildlife Protection Act and Forest Conservation Act,
International Conventions on Environment: Stockholm, Rio, Basel, Arhus, Ramsur and Kyoto.
Environment Impact Assesment (EIA) Studies: Definition, Classification, Direct, Indirect and Cumulative Assessment of Impacts; Reversible, Irreversible, Negative and Positive Impacts;
Eco Audit and Eco Labelling (ISO: 14000); Environmental Management Plan (EMP); Design for Environment; Relavance of Command Control Paradigm in Environmental Governance; Issues involved in enforcement of environmental legislation. Public awareness.
Case Studies.

Note: Atleast one field visit is must for studying of Environment in a Local Area / Ecosystem / Industry and also an Assignment on Environment.

Examination : One question from each unit with internal choice.

Text Books

1. Anjaneyulu . Y., Introduction to Environmental Sciences. B.S.Publications, 2003.
2. Murali Krishna K.V.S., Glimpses of Environment, Environment Protection Society, 2003

Reference Books

1. Agarwal, K.C.2001 Environmental Biology, Nidi Publ. Ltd Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net (R)
3. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ.House, Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press. 473p
9. Hawkins R.E, Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H. & Watson, R.T 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M.19965. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & Schoch, R.M.1996. Environmental Science systems & Solutions, Web enhanced edition.639p.
13. Mhaskar A.K, Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)

15. Odum, E.P 1971. Fundamentals of Ecology. W.B.Saunders Co.USA, 574p
16. Rao M.N.& Datta, A.K.1987. Waste Water treatment. Oxford & IBH Publ. Co.Pvt.Ltd.345p.
17. Sharma B.K., 2001. Environmental Chemistry. Goel Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
21. Trivedi R.K. and P.K.Goel, Introduction to air pollution, Techno-Science Publications (TB)
22. Wagner K.D.,1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA

(M) Magazine, (R) Reference,(TB) Textbook

PHARMACEUTICAL ORGANIC CHEMISTRY – II PRACTICALS

Subject code : PYP.2.206 Sessional : 25
Period / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of experiments

1. Synthesis of 2,5 – Dimethyl pyrrole from Acetonyl acetone
2. Synthesis of 2,5 – Dimethyl thiophene from Acetonyl acetone
3. Synthesis of 1,2,3,4-tetra hydrocarbazole from Cyclohezahone.
4. Synthesis of 4,5 – Dephenylimidazole from Benzil
5. Synthesis of 3,5 - Dimethylpyrazole from Acetonylacetone
6. Synthesis of 3,4-ethyl-l-phenyl-5-pyrazole from elthylacetoacetate
7. Synthesis of 3,5-Dimethyl isoxazole from Hydroxylamine
8. Synthesis of Benzimidazole from o – Phenylene diamine
9. Synthesis of Benzothiazole from o-Phenylene diamine
10. Synthesis of 2,3-Diphenyl Quinoline from o-Phenylene diamine and Benzil
11. Synthesis of Phenothiazon from Diphenylurea

Reference Books

1. B. S. Furniss, A. J. Hannaford, P. W. G. Smith and A. R. Tatchell, **Vogel's Text Book of Practical Organic Chemistry**, 5th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R.K Bansel, **Laboratory Manual of Organic Chemistry**, 4th Edition, New Age International Publishers, New Delhi, 2005.
3. F.G Mann and B. C Saunders, **Practical Organic Chemistry**, 4th Edition, Orient Longman, Hyderabad, 2004.
4. Vogel A.I, **Elementary Practical Organic Chemistry Part – I, Small scale Preparations**, 2nd Edition, CBS Publishers & Distributors, New Delhi, 2004.
5. J. Clayden, N Greeves, S Warren and wothers, **Organic Chemistry**, Oxford University Press, Delhi, 2001.
6. RT Morrison and RN Boyd**, Organic Chemistry**, 6th Edition, Pearson Education, New Delhi, 2007.
7. J. March, **Advanced Organic Chemistry, Reactions, mechanisms and structures**, 4th Edition, John Wiley & Sons, Singapore, 2003.

PHARMACEUTICAL. BIOCHEMISTRY PRACTICALS

Subject code : PYP.2.207 Sessional : 25
Period / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Qualitative reactions for carbohydrates, proteins and amino acids.
2. Estimation of blood cholesterol, Glucose, Urea, Creatinine.
3. Liver function test.
4. Qualitative determination of normal and abnormal constituents of urine
5. Quantitative Estimation of Glucose and uric acid in urine.

Reference Books

1. L.N David and M.C Michael, **Lehniger Principles of Biochemistry**, 4th Edition, Replika Press Ltd, India, 2006.

2. U Satyanarayana and U Chakrapani, **Biochemistry**, 3rd Edition, Arunbha Sen books and Allied Pvt Ltd, Kolkata, 2006.

3. K.M Robert, K.G Daryl, A.M Peter and W.R Victor, **Harper's Biochemistry**, 25th Edition, Lange Medical Publications, 2000.

PHARMACEUTICAL ENGINEERING – II PRACTICALS

Subject code : PYP.2.208 Sessional : 25
Period / week : 4 Examination : 50
Nature of exam: Practical Exam Duration: 4 Hrs

List of Experiments

4. Determination of Reynolds number
5. Determination of heat transfer coefficient by mechanisms.
6. Determination of humidity of air by psychrometry & dew point method
7. Verification of Stokes Law
8. Efficiency of size reduction using different size reducing equipment.
9. Determination particle size distribution by sieve analysis
10. Rate of Drying of solids
11. Purification by simple distillation.
12. Drawing of symbols for unit operations
13. Drawing of equipment used in unit operations (for scale up/scale down)

Flow sheet Industries for manufacturing procedures of drugs.

Reference Books

1. C.V.S. Subrahmanyam, J. Thima Sety, V. Kusum Devi, and Sarasija Suresh, **Laboratory Manual of Pharmaceutical Engineering (Unit Operations)**, Vallabh Publications, New Delhi, 2006.
2. M. Momin and Tejal Shah, **Practical Manual of Pharmaceutical Engineering**, B.S. Shah Prakashan, Ahmedabad, 2008.

SCHEME OF INSTRUCTION AND EXAMINATION
B. PHARMACY - III YEAR IST SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs.
PYT.3.101	Medicinal Chemistry – I	4	--	30	70	3
PYT.3.102	Pharmaceutical Technology (Pharmaceutics – II)	4	--	30	70	3
PYT.3.103	Physical Pharmacy – I	4	--	30	70	3
PYT.3.104	Pharmacognosy – II	4	--	30	70	3
PYT.3.105	Pharmacology – I	4	--	30	70	3
PYP.3.106	Ph.armaceutical Technology (Pharmaceutics – II) Lab	--	4	25	50	4
PYP.3.107	Pharmacognosy Lab	--	6	25	50	4
PYP.3.108	Multimedia Aided Language Lab	--	4	25	50	4
		34		225	500	

SCHEME OF INSTRUCTION AND EXAMINATION
B. PHARMACY - III YEAR IIND SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)		MARKS	DURATION OF EXAM.	
		Theory	Practicals	Sessionals	Exams.	Hrs
PYT.3.201	Pharmaceutical Chemistry (Chemistry of Natural Products)	4	--	30	70	3
PYT.3.202	Pharmacology – II	4	--	30	70	3
PYT.3.203	Physical Pharmacy – II	4	--	30	70	3
PYT.3.204	Forensic Pharmacy (Pharmaceutical Jurisprudence)	4	--	30	70	3
PYT.3.205	Biostatistics (Pharmacostatistics)	4	--	30	70	3
PYP.3.206	Pharmaceutical Chemistry (Chem. of Natural Products) Lab	--	6	25	50	6
PYP.3.207	Pharmacology Lab	--	4	25	50	4
PYP.3.208	Physical Pharmacy Lab	--	4	25	50	4
		34		225	500	

MEDICINAL CHEMISTRY – I

Subject Code : PYT 3.101 Sessional : 30
Periods/week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Basic Considerations of Drug Activity

Physico chemical properties of drug molecules in relation to biological activity - Solubility, lipophilicity, partition-coefficient, Ionization, hydrogen bonding, Chelation, Redox potential and Surface activity. Bioisosterism and Steric features of drugs, drug distribution and protein binding; Introduction to Pro and Soft drug approach in drug design; Drug metabolism and factors affecting on drug metabolism

NOTE: Introduction, definition, nomenclature, chemical classification (other types of classification wherever relevant), structure, synthesis, general mechanism, mode of action (wherever known), SAR including physicochemical and stereo chemical aspects, metabolism and therapeutic uses of the drugs from each category shall be studied for the following units. An outline of synthetic procedure and metabolism of only the drugs, which are official as per Indian pharmacopoeia and British pharmacopoeia and mentioned in brackets against each category.

Unit – II

Adrenergic agents - (Isoproterenol and Salbutamol)

Adrenergic blocking agents - (Prazocin and Atenatol)

Cholinergic drugs and Acetyl Choline esterase inhibitors - (Carbachol, Physostigmine). Cholinergic blocking agents - (Pyridinium bromide and Dicyclomine HCI)

Ganglionic blocking agents and neuromuscular blocking agents -(Mecamylamine HCI and Pentolinium Tartarate). Skeletal muscle relaxants -Neuromuscular - (meprobromate)

Unit – III

Cardio Vascular Drugs - Anti-hypertensive drugs - (Captopril and Clonidine) Anti-arrhythmic drugs - (Verapamil, Nifedipine and Diltiazem),

Vasodilators - (Isosorbide dinitrate and Dipyridamole)

Anti- hyper lipidemic agents - (Clofibrate and Aterostatin)

Anti-platelet drugs - (Aspirin and Ticlopidine)

Cardiao tonic Agents - Synthetic analogs of cardiac glycosides

Unit – IV

Diuretics - (Acetazolamide and Furosemide, Hydrochlorthiazide and Amiloride).

Positive Inotropic Agents (Amrinone)

Hypoglycemic agents - (Tolbutamide and Glyclazide).

Thyroid agents, Anti-thyroid gents -. (Prophylthiouracil)

Immuno suppressants - (Azathioprine) and Immunostimulants -(Levamisole)

Unit – V

Anti-histaminics (HI & H2)-(Diphenhydramine, Chlorpheniramine, Citrizine, Ranitidine). Proton Pump Initiators (Omeprazole)

Coagulants and Anti-coagulants - (Warfarin)

Examination : One question from each unit with internal choice.

Text Books

1. J.H. Block &J.M. Beale (Eds) Wilson and Giswold's **Text Book of Organic Medicinal & Pharmaceutical Chemistry**, 11th Edn, Lippincolt, Raven, Philadelphia, 2004.

2. W.O. Foye, **Text Book of Medicinal Chemistry,** 5th edn, Lea & Febiger, Philadelphia, 2002.

3. S.N. Pandeya, **Text Book of Medicinal Chemistry**, 2nd edn, S. G. Pubn, Varanasi, 2003.

Reference Books

1. D. Abraham (Ed) , **Burger Medicinal Chemistry and Drug Discovery,** Vol.I , 6th edition, John Wiley & Sons, New York, 2003.

2. B.N. Lads, M.G. Mandel and F.I.Way, **Fundamentals of drug metabolism & disposition,** William & Welking Co, Baltimere.

3. C. Hansch, **Comprehensive Medicinal Chemistry**, Vol I-VI Elsevier Pergamon Press, Oxford, 1991.

4. Daniel Lednicer, **Strategies for Organic Drug Synthesis & Design**, John Wiley N.Y., 1998.

5. D. Lednicer , **Organic Drug Synthesis**, Vol. I-VI, John Wiley N.Y.

PHARMACEUTICAL TECHNOLOGY

(Pharmaceutics - III)

Subject Code: PYT 3.102 Sessional : 30
Periods/week: 04 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Formulations

Excipients

Properties and selection, Antioxidants, Preservatives, Colouring agents, Flavouring agents, Sweetening agents, Diluting agents, Vehicles, Surfactants, Hydrocolloids, Above Adjuvants should be studied with reference to FDA approvals and Drugs & Cosmetics Rules wherever applicable.

Capsules

Hard Gelatin Capsules: Advantages, Sizes, Storage, Printing, Formulation, Selection of sizes, Filling, Sealing, Cleaning and Polishing, Evaluation.

Soft Gelatin Capsules: Advantages, Applications, Formulation, Manufacture & Evaluation.

Unit – II

Suspensions and Emulsions

Suspensions: Formulation Types; Deffloculated and Flocculated suspensions, Formulation parameters; Methods of Manufacture and Evaluation.

Emulsions: Formulation Types, Formulation-parameters, Manufacturing Methods and Selection of equipment, Evaluation methods including the shelf life, Concepts of Multiple emulsions.

Unit – III

Tablets and Tablet Coating

Tablets: Types & Classes, Advantages and Disadvantages, Challenges in formulation and manufacture, Excipients in the formulation, Ideal requirements of Excipients, Granulation methods, Compression Machines, Processing problems in compression - Capping & Lamination, Picking & Sticking, Mottling, Weight variation, Hardness variation etc. Evaluation of Tablets.

Tablet Coating: Coating principles, General equipment, Sugar coating-steps, Compression coating, Film coating-steps, materials used in film coating, enteric coating, Film defects, Specialised coating techniques and Quality Control of Tablets

Unit – IV

Parenterals and Opthalmic Preparations

Parenterals: Definition, Classification and Types of Parenterals, Advantages and limitations, Preparation, Formulation, Containers, Production procedures & facilities, Environmental and other controls, Filling procedures, Products requiring Sterile Packing, Evaluation tests, Sterile powders, Emulsions, Suspensions.

Opthalmic Preparations: Requirements of Eye ointments, Eye drops, Formulation, Methods of preparation, containers, Evaluation and quality control.

Unit – V

Aerosols and Packaging Materials

Aerosols: Definition, Types, Advantages and Disadvantages; Propellants, General Formulation, Manufacturing and packing methods - Pharmaceutical Applications.

Packaging Materials: Glass, Plastics, Metal and Rubber, their influence on dosage form stability.

Examination: One question from each unit with internal choice.

Text Books

1. L. Lachman, H.A. Lieberman and J.L. Kanig, **Theory and Practice of Industrial Pharmacy**, Varghese Publishing House, Mumbai, 3rd Edn, 1991.

2. Ansel's Phramceutical dosage forms and Drug delivery systems, 8th edn, 2004, Lippincott Williams & Wilkins, USA.

3. Micheal E Aulton, Pharmaceutics – The science of dosage form design, 1st edition, 1998, Churchill living stone.

Reference Books

1. A.R. Gennaro, **Remington: The Science and Practice of Pharmacy**, 20th Edition, Vol. 1, Lippincott Williams & Wilins, Philadelphia, 2004.

2. E.A. Rawlins, **Bentely's Textbook of Pharmaceutics**, 8th Edition, Baillere Tindill, London, 2002.

3. **The Prevention of Food Adulteration Act 1954 with Rules.**

4. Vijay Malik **Drugs & Cosmetic Act 1940**, 10th edition.

PHYSICAL PHARMACY – I

Subject Code : PYT.3.103 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

States of Matter and Phase Equilibria

Gaseous state: Ideal Gas law, Molecular Weight determination, Kinetic Molecular Theory and Vander-waals Equation for Real Gases;

Liquid state: Liquefaction of Gase, Methods of Achieving Liquefaction, Vapor pressure of Liquids, Boiling Point and Heat of Vaporization including Clausus – Claypeyron equation;

Solids and Crystalline state: Crystalline Solids --- X-ray diffraction, melting point and heat of fusion, Intermolecular forces, Polymorphism. Amorphous solids and Liquid crystalline state.

Phase equilibria: The phase rule; Systems containing one, two and three components, Rules relating to Triangular Diagrams; Solid dispersions;

Thermal Analysis: Differential scanning Calorimetry; Diffrential thermal analysis and Thermogravimetric and Thermochemical Analysis;

Physical properties of drug molecules: Refractive index & Molar refraction

Unit – II

Thermodynamics

Defintion of Thermodynamic Terms: Specific Heat, Sensible Heat, Latent Heat and Heats of Transition; Laws of Conservation of Energy; Meaning of Energy Balance and its importance and Inputs of Energy balance; Concept of Heat and Work;

First Law of Thermodynamics: Statement, Definition of Internal Energy, Enthalpy and Heat Capacity; Heat Capacities at constant Volume and Pressure and their relationship;

Thermochemistry: Standard State Heats of Formation and Combustion; Standard Enthalpy of Formation – Hess's Law of Heat summation and its application; Heat of reaction at constant pressure and at constant volume; Enthalpy of neutralization; Bond dissociation energy and its calculations from thermochemical data;

The second and third laws of thermodynamics: Statements, Definiton of Entropy, Free energy and Gibbs Free Energy; Free Energy functions and applications.

Unit – III

Solutions of non-electrolytes: Properties, types of solutions and concentration expressions; Ideal and real solutions; Colligative properties and Mol. Wt. determinations.

Solutions of electrolytes: Arrhenius theory of electrolytic dissociation; Modern theory of strong electrolytes; Debye- Huckel theory; Coefficients for expressing colligativce properties – L value, Osmotic Coefficient and Osmolality.

Ionic equilibria: 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 equilibria. 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; pH indicators; Factors influencing pH of buffer solutions; Measurement and calculating tonicity and methods of adjusting tonicity and pH; Buffer capacity and its calculations; Van Slyke equation; Influence of concentration on buffer capacity and maximum buffer capacity;

Buffers in Pharmaceutical and biological systems – in vivo biologic buffer systems

Drugs as buffers: Pharmaceutical buffers and their preparation, influence of buffer capacity and

pH on tissue irritation, stability vs optium therapeutic response, pH and solubility.

Unit – V

Electro Motive Force and Oxidation-Reduction: Electrochemical cells, Types of Electrodes, measuring the EMF of cells, reference electrodes and standard potentials, electrometric determination of pH and specific ions; Hydrogen and glass electrodes, operation of pH meter, ion elective electrodes, Applications of Oxdn – Redn Potentials (Redox potentials) in pharmacy.
Catalysis: Defeinition of Catalysis and Catalyst; Types of Catalyst; Promoters and Inhibitors; Mechnism of Simple Catalytic Reactions; Factors affecting the catalyst and Catalysis;

Examination: One question from each unit with internal choice.

Text Books

1. Martin, J. Swarbrick & A. Cammarata, **"Physical Pharmacy"** Lea and Febiger, Philadelphia, III Edition, 1983.
2. C.V.S. Subrahmanyam, **Essentials of Physical Pharmacy**, Vallabh Prakashan, Delhi, 2005
3. Hougen and Watson k.M & ragatz r.A, **Chemical Process principles**, Part-I (Material and Energy Balances), 2nd Edition , New Age International

Reference Books

1. Physical Pharmaceutics, by Shoton & Ridgway, Oxford press, London.
2. A Text Book of Physical Chemistry, by S. Glasstone, Van Nostrand, New Delhi.
3. Physical Chemistry by Walter Moore.
4. Remington's Pharmaceuticals Sciences, ed A.R. Gennaro, Mack Publishing co., PA.
5. Basic principles and calculations in Chemical engineering by D.M Himmelblau, Prentice Hall Publications

PHARMACOGNOSY-II

Subject Code : PYT.3.104 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Systematic Phamacognostic study, which includes sources (Biological and Geographical) diagnostic characters, chemical constituents, chemical tests, uses, substituents and adulterants of the crude drugs mentioned in the following units. MICROSCOPICAL CHARACTERS OF ONLY THE DRUGS UNDERLINED SHALL BE STUDIED.

Unit – I

Alkaloids
Introduction, definition, classification, isolation, tests, chemical nature and uses of Rauwolfia, Vinca, Nuxvomica, opium, ipecac, belladonna, dattura, lobelia, vasaka, kurchi, ephedra, cinchona, colchicum, aconite, punemava, shankhupushpi, tobacco.

Unit – II

Glycosides
Introduction, Definition, Classification, Isolation, tests, chemical nature and uses of Senna, aloes, rhubarb, digitalis, squill, dioscoreia, liquorice, momordica, black mustard, ammi, psoralia, gentian, picrorriza, ashwagandha, gokhru, kalmegh, stropanthus, shatavari, brahmi, quassia, gymnema.

Unit – III

Phytopharmaceuticals
Chemistry, Tests, Isolation, Characterization and Estimation of Following Constituents 1. Sennosides from Senna 2. Caffine from tea 3. Cineole from eucalyptus oil
4. Quinine from cinchona 5. Carvone from dill 6. Tannic acid from myrobalan
7. Rutin, hesperidin from citrus fruits.
Introduction, definition, classification, isolation, tests, chemical nature and uses of Volatile Oils and Resins from following Plant Sources: Fennel, Clove, Cinamon, Gaultheria oil, Artemisia, Taxus, Capscium, Turmeric, Podophyllum, Guggul Asafoetida and Pyrethrum.

Unit – IV

Tissue Culture
History, introduction, callus culture, suspension culture, Immobilization of culture, single cell culture, organogenesis and embryo culture.
Production of secondary metabolites, biotransformation and clonal propagation, Significance and application of plant tissue culture.

Unit – V

Herbal Medicines
Herbal medicines in India, practice, regulations, Quality Control and Standardization of Raw Materials. Types of herbal formulations and products.

Some Traditional Plant Medicines as a source of New Drugs
Introduction to dosage form of Ayurveda - Aristavas, Asawas, Chumas, Bhasma, Leyhas, Ghritams, Rasayanam and Kashayams.

Examination: One question from each unit with internal choice.

Text Books

1. **Trease and Evans, Pharmacognosy** by W.C. Evans, Elseview Ltd., London, UK/ Vailliers Tindal Easbourn UK.
2. **Pharmacognosy** by C.K. Kokate, Nirali Publication, Pune.
3. **Pharmacognosy** by T.E. Wallis CBS publishers and Distributors, Delhi.

Reference Books

1. **The Ayurvedic pharmacopoeia of India** I-III Govt. of India, Ministry of Health and Family Welfare Dept. of Indian system of medicine and Homeopathy, New Delhi.
2. **Herbal Drug Industry**, Eastern publishers, New Delhi.
3. **Natural Products** by O.P. Agarwal Vol.I & II Goel publications, Meerut.
4. **Text Book of Pharmacognosy** by Brady & Taylor.
5. **Tissue culture and plant science** by street
6. **An Introduction to plant Tissue culture** by M.K. Razdan, Oxford & IBH publishing Co. Pvt. Ltd. – New Delhi & Calcutta.

PHARMACOLOGY-I

Subject Code : PYT.3.105 Sessional : 30
Periods / Week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

General Principles of Pharmacology

Introduction, Nature and sources of drugs, Routes of administration of drugs. Concept of absorption, bioavailability, Drug distribution, Biotransformation and excretion drugs, Biological half-life and its significance. Mechanism of action including drug receptor Interactions and factors influencing them. Dose response relationship.

Unit – II

Pharmacology of Drugs Acting On ANS

Introduction, Transmission, Distribution and Functions of Drugs acting on Autonomic Nervous System: Cholinoceptor - Activating and cholinesterase inhibitory drugs, Cholinoceptor blocking drugs, Adrenoceptor - Activating and other sympathomimetic drugs, Adrenoceptor - Antagonist drugs.

Unit - III

Pharmacology of Drugs Acting On CNS

Introduction, Transmission, Distribution and Functions of Drugs acting on Central Nervous System: CNS Neuro transmitters; CNS Stimulants: Hypnotics and Anxiolytics; Antipsychotic Agents; Anti-epileptic Agents; Anti-depressants and Mood Stabilizers; Local Anesthetics; Analgesics and Non-steroidal anti-inflammatory agents; Pharmacological management of Parkinsonism and other movement disorders;

Unit – IV

Drugs Acting on Cardio Vascular & Respiratory System

General considerations, Pharmacology of drugs used in the treatment of congestive heart failure, Anti-arrythmics, Anti-hypertensives & Anti-hyperlipedemic drugs, Anti-anginals and Vasodilators. Drugs used in the therapy of shock.

Pharmacology of Drugs affecting Respiratory System: Drugs used in the treatment of disorders of Respiratory Function and Bronchial Asthma. Bronchodialators, Antitussives and expectorants

Unit – V

Drugs Acting on Renal and Gastro Intestinal System

Diuretics and anti-diuretics, Water and Electrolytic Balances and pH modifying agents. Pharmacology of purgatives/laxatives, Anti-diarrhoeals, Emetics and Anti-emetics. Drugs used in peptic ulcers.

Examination: One question from each unit with internal choice.

Text Books

1. Pharmacology and Pharmacotherapeutics, R.S. Satoskar and S.D. Bhandarker, Popular Prakashan, Mumbai.

2. Pharmacology, H.P. Rang, M.M. Dale & J. M. Ritter : Churchill Livingstone, 4th edition.

3. Basic and Clinical Pharmacology, 9th edition – Bertram. G. Katzung.

Reference Books

1. Essentials of Medical Pharmacology, K.D. Tripati, J. P. Brothers Medical Publishers.
2. Lewis's Pharmacology, by J. Crossland, Churchill Livingstone.
3. Pharmacological Principles of Medical Practice, by Krantz and Care, Williams and Wilkins co.
4. Goodman and Gilman's, The Pharmacological Basis of Therapeutics. J. G. Hardman and Lee E. Limbard, Mc. Graw Hill, Health professions Division.

PHARMACEUTICAL TECHNOLOGY PRACTICALS
(Pharmaceutics - II)

Subject Code: PYP 3.106 Sessional : 25
Periods/week: 4 Examination : 50
Nature of Exam: Practical Exam Duration: 4 Hrs

List of experiments

Minimum 12 experiments of the following shall be conducted.

1. Determination of optimum concentration of suspending agent (tragacanth) required for maximum physical stability of calcium carbonate suspension.
2. Preparation, identification and physical stability evaluation of an emulsion.
3. Manufacture of Tablets sodium bicarbonate tablets IP (500 mg).
4. Manufacture of paracetamol tablets IP (500 mg)
5. Manufacture of ascorbic acid tablets IP (50 mg).
6. Manufacture of aspirin tablets IP (300 mg).
7. Manufacture of calcium lactate tablets IP (300 mg).
8. Evaluation of uncoated marketed tablets (in-process and quality assurance).
9. Evaluation of coated marketed tablets (in process and quality assurance).
10. Manufacture of aspirin hard gelatin capsules USP (300 mg).
11. Evaluation of marketed hard gelatin capsules.
12. Manufacture of ascorbic acid injection IP.
13. Manufacture of calcium gluconate injection IP.
14. Manufacture of nandrolone deconate injection IP.
15. Manufacture of dextrose intravenous infusion IP.
16. Manufacture of Ophthalmic preparation.
17. Preparation of emulsion with combination of emulsifying agents using HLB values concept.
18. Preparation of suspension using suitable suspending agent.
19. Manufacture of declofenac gel.
20. Preparation of Multiple emulsions.

Reference Books 1. **Indian Pharmacopoeia**, 2nd, 3rd and 4th Editions, The Controller of Publications, Delhi, 1966, 1985 and 1996.

2. **British Pharmacopoeia**, Office of the British Pharmacopoeial Committee, London, 1988.

3. **British Pharmaceutical Codex**, 11th and 12th Edns, The Pharmaceutical Press, London, 1994.

4. **United States Pharmacopoeia, 23 and National Formulary 18**, Asian Edition, US Pharmacopoeial Convention, Inc., New York, 1995.

5. D.P.S. Kohli, **Drug Formulation Manual**, Eastern Publishers, Delhi, 1991.

6. Hoover, **Dispensing of Medication**, 8th Edn, Mack Publishing Company, Pennsylvania, 1976.

7. C.V.S Subrahmanyam, J. Thimma Setty and G.C. Prabhu Shankar, **Laboratory Manual of Pharmaceutics**, Vallabh Publications, New Delhi, 2006.

PHARMACOGNOSY PRACTICALS

Subject Code : PYP.3.107 Sessional : 25
Periods / Week: 4 Examination : 50
Nature of Exam: Practicals Exam Duration: 4 Hrs

List of Experiments

1. Detailed Microscopical study (Transverse section) of following drugs (Any four)
   (a) Rauwalfia (b) Cinchona (c) Senna (d) Liquolice (c) Fennel (f) Clove (g) Nux-Vomica.
2. Microscopical powder characters of (Any eitht)
   (a) Vasaka (b) Clove (c) Ephedra (d) Cinnamon (e) Liquorice (f) Digitalis (g) Quassia (h) Nuxvomica (i) Cinchona G) Coriander (k) Senna (1) Kruchi (m) Rauwolfia.
3. Morphological Identification of drugs listed in theory.
4. Determination of swelling factor.
5. Determination of refractive index and optical rotation.
6. Isolation and Identification of starch from potatoes.
7. Isolation and Identification of Caffine from tea
8. Isolation of Tannic acid from Galls.
9. Estimation of cincole in encalyptus oil.
10. Distillation of volatile oils (Demo).
11. Qualitative Microscopical powder Analysis (Binary Mixture).
12. Determination of stomatal index, palaside ratio and number
13. Measurement of fibers and grains

Reference Books

1. K.R Khandelwal, **Practical Pharmacognosy**, Nirali Prakashan, Pune, 2002.
2. M.A. Iyengar, **Study of Crude Drugs**, Manipal Press Ltd, Manipal, 2004.
3. M.A. Iyengar, **Pharmacognosy of Powder Crude Drugs,** Manipal Press Ltd, Manipal, 2005.
4. M.A. Iyengar and S.G.K. Nayak, **Anatomy of Crude Drugs**, Manipal Press Ltd, Manipal, 2004.
5. C.K. Kokate, A.P. Purohit and B. Gokhale, **Pharmacognosy**, Nirali Prakashan, Pune, 2006.
6. Vinod D. Rangan, **Pharmacognosy & Phylochamistry**, Career Publication, Nashik, 2008.
7. Ashistosh Kar, **Pharmacognosy & Phannacobiotechnology**, New Age International Publishers, New Delhi, 2003.

MULTIMEDIA AIDED LANGUAGE LAB

Subject Code : PYP.3.108 Sessional : 25
Periods / Week: 4 Examination : 50
Nature of Exam: Practical Exam Duration: 4 Hrs

Exercise Oriented Practicals

Exercise – 1
Writing Effective Headings; Writing Effective Passages - To describe; To compare and contrast; To define; To show cause and effect and To show sequence

Exercise – 2
Writing Grammatically Sound Sentence; Using the Right Tense and Voice - Using the active voice; Paring the passive; Writing in the third person and Using the imperative voice

Exercise – 3
Punctuating Effectively - Common punctuation marks and how to use them; Using punctuation to clarify messages and improve readability; Bullets, numbers, white space and Using symbols and abbreviations

Exercise – 4
Writing Summaries; Description – Event and Product

Exercise – 5
Writing Specific Documents - Letters and Memos; Job Applications, Cover letters and Resume;.

Exercise – 6
Writing - Procedures; Proposals and Analytical Reports;

Exercise – 7
Using of Graphs, Tables and Figures for representing a data

Exercise – 8
Writing out a talk; Extra verbal Cues; Handouts, Visuals and demonstration Models;

Exercise – 9
Basics of Web Page Design; Writing and Designing for World Wide Web;

Exercise – 10
Document Authoring and Maintenance; HTML Language and Electronic Publishing;

Exercise – 11
Designing and Writing for Multimedia

Exercise – 12
Personal and Group Communication: E-mail; Mailing Lists, News Groups and Pharmacy – Related Discussion Forums;

Exercise – 13
Phonetics and Spoken English – Rhythm, Intonation, Reading aloud, Accent difference between American, British and Indian English; International Varieties of English

Exercise – 14
Formal and Informal types of Speech; Elocution; Debating; Group Discussion; Brain Storming;

Exercise – 15
Collaborations of Health care providers using Network Technologies; Intranets, Software used for remote collaboration and Telemedicine.

PHARMACEUTICAL CHEMISTRY
(CHEMISTRY OF NATURAL PRODUCTS)

Subject Code :PYT 3.201 Sessional : 30
Periods/week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Poly Functional Natural Products

Carbohydrates: Introduction, Definition, Classification, Isolation, General Properties (including isomerism) and Pharmaceutical importance of Carbohydrates, Chemistry (Structme, Nomenclatme and Reactions) of glucose, fructose, sucrose, maltose, cellulose and starch.

Oils & Fats: Introduction, Definition, Classification, Isolation, General properties and Pharmaceutical importance of oils and fats. Chemistry (Structme, Nomenclature and Reactions) of Oils and Fats and analyse according to Pharmacopoeial methods

Unit - II

Amino Acids and Proteins

Introduction, Definition, Classification, Isolation, General properties and Pharmaceutical importance of mnino acids and their relationship to proteins and polypeptides.

Chemistry of Protein Hormones: Insulin, Oxytocins, Thyroxin and anti-thyroid drugs

Unit - III

Flavanoids and Terpenoids

Flavonoids: Somces, Uses, chemistry and General methods of structural determination (chemical & spectral analysis) of Amygdalin, arbution and quercetin

Terpenoids: Isoprene rule, Special Isoprene Rule for terpenes, General methods of isolation and. Chemistry of citral, menthol and cmnphor.

Unit - IV

Alkaloids - Purine and Xanthine Derivatives

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Alkaloids. General methods of extraction, structme elucidation and Chemistry (Structme, Nomenclatme and Reactions) of ephedrine, atropine, papaverine and quinine and also Caffeine and mic acid.

Unit - V

Steroids

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Sterols: colom reactions of cholesterol, stigmasterol, ergosterol. Importance & general concepts of bile acids. Steroidal saponins: Diosgenin and hecogenin. Androgens, Estrogens, Progestational agents, Steroidal contraceptives. Adrenocorticoids, Deoxycorticosterone, Cortisone, Prednisone, Aldosterone. Cardiac Glycosides of Digitalis other Cardiac drugs, Strophanthus and Squill.

Examination: One question from each unit with internal choice.

Text books

1. **Organic Chemistry, Vol.II** by I.L. Finar, The English Language Book Society, London.
2. **Natural Products Vol.I & II** by O.P. Agarwal Goel publications – Meerut.

Reference Books

1. R.T. Morrison and R.N. Boyd, **Organic Chemistry**, Allyn and Bacon, Ine., Boston
2. **Burger's Medicinal Chemistry**, M.E. – Wolff, Ed., John Wiley & Sons, New York.
3. F.G.Mann & B. Saunders, **Practical Organic Chemistry** Longamans Green & Co. Ltd., U.K
4. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience NY.

PHARMACOLOGY – II

Subject Code: PYT 3.202 Sessional : 30
Periods/week: 04 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Chemotherapy of Infections and Cancer
Basic Principles of Chemotherapy; Systemic Pharmacological study of Anti-bacterial, Antiviral, Anti-fungal, Anti-protozoal and Anti-helmenthic drugs; Cancer Chemotherapy

Unit – II

Pharmacology of Autocoids: Local Hormones
Anti-histamines: Histamine, Serotonim and ergot alkaloids; Vasoactive principles; Eicosanoids; Prostagladins, Thromboxanes, Leukotrines and related compounds. Nitric oxide, Donors and inhibitors. Para Drugs acting on blood and blood forming agents -Coagulants, Anti-coagulants, Haematinics (iron, vitamin-B12, Folic acid) and Thrombolytic Agents.

Unit – III

Pharmacology of Endocrine System
Systemic Pharmacological study of Pituitary Hormones, Sex Hormones, Oral Contraceptives, Oxytocics and Uterine relaxants; Pharmacology of thyroid and Anti-thyroid drugs, Insulin, Oral hypoglycemics, Glucagon and Adrenocortico steroids;

Unit – IV

Bioethics and Bioassay Of Some Selective Drugs
Principles of Bioethics, Bioethics of Animals used in Bioassay studies; Principles of Bioassays; Official Bioassays; Biological assay of anti-haemophilic fraction, Heparin sodium, Chorionic gonadotropin, Corticotropin, Insulin, Oxytocin, Vasopressin and Adrenaline; Biological assay of diptheria anti-toxin, anti-rabies vaccine, tetanus anti-toxin and old tuberculin vaccine;

Unit – V

Toxicology of Drugs and Clinical Pharmacology
Principles of Toxicology; Definition of Poison; General principles of treatment of poisoning with special reference to barbutirates, Opium and Organophosphorus toxicity;
Treatment of Poisoning for the following toxins: Methyl Alcohol, Heavy metals, Paracetamol and Digitalis
Introduction to Clinical pharmacology and Phases of clinical trials;

Examination: One question from each unit with internal choice.

Text Books

1. Essentials of Medical Pharmacology, K.D. Tripati., Jaypee Brothers Medical Publishers
2. Pharmacology and Pharmacotherapeutics., R.S.Saathoskar and S.D. Bandarkar., Popular Prakashan, Mumbai.,
3. Text Book of Pharmacology by Rang and Dale

Reference Books

1. Goodman and Gilman's: "The Pharmacological basis of Therapeutics" by Joel G. Hardman and Lee E. Limbard., Pergamon Press
2. Lewis's Pharmacology by J. Crossland., Churchil Livingstone Publications
3. Basic and Clinical Pharmacology by Katzung B.G., Prentice-Hall
4. Clinical pharmacology by Lanzence

PHYSICAL PHARMACY – II

Subject Code : PYT.3.203 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

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 week electrolytes, Calculating solubility of weak electrolytes as influenced by pH, Influence of solvents on the solubility of drugs, Combined effect of solvents. Distribution of solutes between immiscible solvents - Effect of ionic dissociation and molecular association on partition & extraction, Solubility and partition coefficients, Preservative action of weak acids in emulsions, Drug action and partition coefficients.

Unit – II

Chemical 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 complex reactions. Specific and general acid base catalysis. Influence of temperature and other factors on reaction 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. Absorption at solid interfaces - Solid/Gas interface - Solid/Liquid interface. Electric properties of interfaces - Electric double layer, N emst and zeta potentials.

Unit – IV

Colloids and Micromeritics

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.

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 and Polymers

Rheology of Pharmaceutical Fluids: Newtonian and Non-Newtonian Systems;
Newtonian systems - Laws of flow, Kinematic viscosity, Effect of temperature.
Non newtonian systems - Plastic and 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.
Polymers: Definition, Types of Polymers, Water Soluble and Water Insoluble Polymers; Polymers as Thickening Agents; Pharmaceutical Application of Polymers;
Examination: One question from each unit with internal choice.

Text Books

1. A.N. Martin, Arthur Cammarata and J. Swarbrick, **Physical Pharmacy** by 3rd ed, K.M. Varghese & Co, Bombay.

2. C.V.S. Subrahmanyam, **Textbook of Physical Pharmaceutics**, 2nd Edition, Vallabh Prakashan, Delhi, 2004.

Reference books

1. **Tutorial Pharmacy** by Cooper & Gunn, ed S.J. Carter, CBS Publishers, Delhi.
2. **Physical Pharmaceutics** by Shotton & Ridgway, Oxford University press, London.
3. **Remington's Pharmaceutical Sciences**, ed A.R. Gennaro, Mack publishing Co, PA.

FORENSIC PHARMACY
(PHARMACEUTICAL JURISPRUDENCE)

Subject Code : PYT 3.204 Sessional : 30
Periods/week : 04 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

1. Evolution of Pharmaceutical and Drug Legislation in India.
2. The Pharmacy Act 1948.
3. Code of Pharmaceutical Ethics.
4. Consumer protection Act 1986.
5. Narcotic and Psychotropic substances Act 1985.

Unit – II

Drugs and Cosmetics Act 1940 and Drugs & Cosmetic Rules 1945 (also amendments).

1. Administration of the Act – The controlling and licensing regulation at state level and central level (the organisation, function and duties of state and central drug control authorities).
2. Drugs & Cosmetic Act Rules – the provisions related to
   a. The manufacture of drugs (other than homeopathic) including schedule C, C(1), F, F(1) and X drugs and cosmetics.
   b. The sale and distribution of drugs (other than homeopathic) including schedule C, C(1), F, F(1) and X drugs and cosmetics.

Unit – III

Drugs & Cosmetics Act Rules

1. (i.) The import and export of drugs & cosmetics.
   (ii) Labelling and packing requirements for all categories of drugs & cosmetics.
2. (i.) List of schedules to the Drugs & Cosmetics Rules.
   (ii.) Detailed study of schedule M (new), U and Y.
3. Medicinal & Toilet preparations (Excise Duties) Act 1955.

Unit – IV

1. Drugs and magic Remedies (Objectionable Advertisments) Act 1954.
2. Prevention of Food Adulteration Act 1954 (salient features)
3. The Factories Act 1948 and the Amendment (salient features.).

Unit – V

IPR's and Patent Laws

1. Intellectual Property Rights – a brief introduction to various IPR's.
2. Indian Patent Act 1970 and the Amendments to the Act (upto date with reference to WTO Agreement)
   a. Introduction & Objectives
   b. Inventions and Not inventions according to the Act.
   c. Procedure of obtaining patent for drugs and pharmaceuticals.
3. Drug Price Control Order (Latest).
4. Pharmaceutical Policy 2002.

Examination: One question from each unit with internal choice.

Text Books

1. **Forensic Pharmacy** by B.M. Mithal, Vallabh Prakashan.
2. **Forensic Pharmacy** by Dr. B.S. Kuchekar, A.M. Khadatare and Sachin C. Itkar, Nirali Prakashan, Pune.
3. **Drugs and Cosmetics Act 1940** by Vijay Malik, Eastern Book Company, Lucknow.

Reference Books

1. **Bare Acts**, published by Govt. of India.
2. **Patent Act 1970 with patent Rules ,** published by Taxman Allied services (P) Ltd., 59132, New Rohtak Road, New Delhi – 110005.
3. **ISO,** International Organisation for Standardisation, Switzerland, 1994.

BIOSTATISTICS
(PHARMACOSTATISTICS)

Subject code : PYT 3.205 Sessional : 30
Periods / week : 4 Examination : 70
Nature of exam: Theory Exam Duration: 3 Hrs

Unit – I

Definition and determination of terms Mean, Median, Mode, relation between mean, median, and mode. Standard deviation, histogram, Coefficient of correlation, regression analysis, curve fitting, theory of probability.

Unit – II

Nature and Scope of Statistical methods and their limitations, compilation, classification, tabulation and applications in pharma and life sciences; Graphical representation; Measures of Average Stem and Leaf Plots; Box and Whisker Plots, Co-plots; Introduction to Probability Theory and Distributions (Concepts without Derivations), Binomial, Poisson & Normal Distributions (Only definition and Problems)

Unit – III

Sampling Methods: Simple, Random, stratified, Systematic and Cluster Sampling Procedures; Data Collection, Data Organization and Data Representation; Bar, Pie, 2-D and 3-D Diagrams; Sampling and Non-Sampling Errors; Sampling Distributions; measure of dispertion.

Unit – IV

Interference Concerning Means: Point Estimation - Interval estimation - Bayesians estimation - Tests of Hypothesis; Common Parametric and Non parametric tests employed in testing of significance in biological/pharmaceutical experiments.

Unit – V

Tests of significance - T -test, chi-square test, analysis of variance, elements of Anova (one way and two way). Principles of scientific experiments; concept of CRD, RBD and Latin square diagrams.

Examination: One question from each unit with internal choice.

Text and Reference Books

1. Probability and Statistics by M.R Spiegel Schaum Series
2. Biostatistics: A Foundation for analysis in Health Sciences, by Danial W.W., John Wiley
3. Statistics for Biologists, by Campbell, R.C., Cambridge University Press
4. Practical statistics for experimental Biologists, by Wardlaw, A.C., John Wiley and Sons Inc.,

PHARMACEUTICAL CHEMISTRY PRACTICALS
(CHEMISTRY OF NATURAL PRODUCTS)

Subject Code : PYP 3.206 Sessional : 25
Periods/week : 4 Examination : 50
Nature of Exam: Practicals Exam Duration: 4 Hrs

List of experiments

1. Qualitative analysis of carbohydrates
2. Qualitative analysis of proteins
3. Qualitative analysis of amino acids
4. Qualitative analysis of alkaloids
5. Qualitative analysis oftriterpenoids & steroids.
6. Determination of acid value
7. Determination of saponification value
8. Determination of peroxide value
9. Determination of iodine value
10. Estimation of Atropine
11. Estimation of Ephedrine.

Reference Books

1. I.L. Finar: **Organic chemistry, Vol.2: Stereochemistry and the Chemistry of Natural Product**, 6th Edition, Pearson Education, New Delhi, 2003.
2. O.P Agarwal, **Organic Chemistry: Natural Product, Vol – I & II**, 13th Edition, Goel Publishing House,. Meerut, 2006.
3. B.S Furniss, A.J Hannaford, PWG Smith and AR Tatchell, **Vogel's Text book of Practical Organic chemistry**, 5th Edition, Longman Singapore publishers, Singapore, 1996.
4. M.A Iyenger, **Study of Crude Drugs**, 12th Edition, Mainpal Press Ltd, Mainpal, 2004.
5. C B Powar and CB Chatwal, **Biochemistry**, 4th Edition, Himalaya Publishing House, Mumbai, 2003.
6. **Indian Pharmacopoeia** , Volume - I & II, Controller of Publications, Delhi,1996.
7. **British pharmacopoea**, 2008.

PHARMACOLOGY PRACTICALS

Subject Code : PYP.3.207 Sessional : 25
Periods / Week: 4 Examination : 50
Nature of Exam: Practicals Exam Duration: 6 Hrs

List of Experiments

1. An introduction to different equipments used in Pharmacology laboratory
2. Effect of routes of administration on the action of drugs.
3. Dose response curves of Acetyl cholins.
4. Demonstration of different types of antagonism on isolated tissue preparations.
5. Effect of different electrolytes or drugs on isolated forg's heart.
6. Effect of drugs on isolated frog rectus abdominus (any four drugs).
7. Bioassay of drugs by matching method
8. Bioassay of drugs by graphical (interpolation) method
9. Bioassay of drugs by three point and four point methods.
10. Effect of various drugs on isolated rabbit intestine / guinea pig ileum
11. Hypoglycemic activity of insulin in rabbit.
12. Effect of drugs on ciliary movement of frog's esophagus
13. Local anesthetic activity on Rabbit eye / Guinea pig! Frog's hind limb withdrawal (Demo).
14. Anti-psychotic effect by pole climbing apparatus (Demo)
15. To study the analgesic effect of narcotic analgesic by using tail-flic/hot-plate/acetic acid induced writing method. (demo)
16. Effect of drug on blood vessels
17. Antipyretic effect in rabbits.

Reference Books

1. S.K Kulkarni, **Hand Book of Experimental Pharmacology**, 3rd Edition, Vallabh Prakashan, Hilton and Company, Kolkata, 2005.
2. M.N Gash, **Fundamentals of Experimental Pharmacology**, 3rd Edition, Vallabh Prakashan, Hilton and Company, Kolkata, 2005.
3. K.K Pillai, **Experimental Pharmacology**, 1st Edition, CBS Publications & Distributors, Delhi, 2008.
4. R.K Goyal, **Elements of Pharmacology**, 13th Edition, B.S. Shah Prakashan, Ahmadabad, 2003.

PHYSICAL PHARMACY PRACTICALS

Subject Code : PYP.3.208 Sessional : 25
Periods / Week: 6 Examination : 50
Nature of Exam: Practical Exam Duration: 4 Hrs

List of Experiments

Minimum 12 experiments of the following shall be conducted

1. Determination of bulk density and flow properties of powders/ granules.
2. Determination of viscosity of liquids using Ostwald viscometer/ Redwood viscometer.
3. Determination of surface tension by stalagmometer method.
4. Determination of HLB of surfactant- Saponification method.
5. Determination of CMC of a surfactant-Drop count method using stalagmometer.
6. Ternary phase diagram for a three component system comprising of alcohol, water and benzene.
7. Determination of adsorption behavior of acetic acid on charcoal.
8. Determination of CST of Phenol-water system
9. Effect of sodium chloride on CST of phenol water system.
10. Determination of solubility- Heat of solution method.
11. Determination of first order reaction rate constant - Acid hydrolysis of ester.
12. Preparation of pharmaceutical buffer and determination of its buffer capacity.
13. Determination of second order reaction rate constant- Alkali hydrolysis of ester.
14. Determination of ionization constant by conductivity method/ distribution method.
15. Determination of distribution coefficient of benzoic acid in benzene and water.
16. Determination of particle size distribution - Microscopy.

Reference Books

1. C.V.S Subrahmanyam and S.G. Vasantharaju, **Laboratory Manual of Physical Pharmacy**, Vallabh Prakashan, New Delhi, 2005.
2. C.V.S Subrahmanyam and J. Thimma Setty, **Laboratory Manual of Physical Pharmaceutics**, Vallabh Prakashan, New Delhi, 2002.
3. Manavalan. Ramasamy, **Physical Pharmaceutics**, Vignesh Publishers, Chennai, 2004.

SCHEME OF INSTRUCTION AND EXAMINATION FOR
B. PHARMACY - IV YEAR IST SEMESTER

COURSE NO.	SUBJECTS	PERIODS/WEEK (50 Mts.)	MARKS		DURATION OF EXAM.
		Theory/Practicals	Sessionals	Exams.	Hrs.
PYT.4.101	BioPharmaceutics & Pharmacokinetics	4	30	70	3
PYT.4.102	Pharmaceutical Analysis – II (Instrumental Analysis)	4	30	70	3
PYT.4.103	Medicinal Chemistry – II	4	30	70	3
PYT.4.104	Dosage formulation Design (Pharmaceutics – III)	4	30	70	3
PYT.4.105	Ph.Business Management	4	30	70	3
PYP.4.106	Pharmaceutical Analysis – II (Instrumental Analysis) Lab	4	25	50	4
PYP.4.107	Medicinal Chemistry Lab	6	25	50	4
PYP.4.108	Dosage formulation Design (Pharmaceutics – III) Lab	4	25	50	4
		34	225	500	

SCHEME OF INSTRUCTION AND EXAMINATION FOR
B. PHARMACY - IV YEAR IIND SEMESTER

COURSE NO.	SUBJECTS	PERIODS / WEEK (50 Mts.)	MARKS		DURATION OF EXAM.
		Th/Pr	Sessionals	Exams	Hrs.
PYT.4.201	Pharmaceutical Biotechnology	4	30	70	3
PYT.4.202	Hospital and Clinical Pharmacy	4	30	70	3
PYT.4.203	Cosmetic Technology	4	30	70	3
PYT.4.204	Pharmacoinformatics	4	30	70	3
PYP.4.205	Pharmaceutical Biotechnology Lab	4	25	50	4
PYP.4.206	Cosmetic Technology Lab	4	25	50	4
PYP.4.207	Pharmacoinformatics Lab	4	25	50	4
PYP.4.208	Seminar	2	A˜B˜C˜D		
		30	195	430	

BIOPHARMACEUTICS AND PHARMACOKINETICS

Subject Code: PYT. 4 .101	Sessional : 30
Periods/week4	Examination : 70
Nature of Exam: Theory	Exam Duration: 3 Hrs

Unit – I

Biopharmaceutics

Introduction & their role in formulation development & clinical settings, fate of drugs after administration.

Drug absorption: drug absorption mechanisms, factors affecting drug absorption (physiochemical, biological, metabolic, formulations and dosage form considerations).

Unit – II

Drug distribution & protein binding of drugs

Distribution of drug through organ /tissue - factors affecting distribution

(Physicochemical properties of drugs, organ/tissue size, blood flow to the organ, physiological barriers to the distribution of drugs, drug binding blood / tissue / macromolecules).

Protein /tissue binding of drugs- factors affecting protein binding of drugs, significance and kinetics, tissue binding of drugs.

Unit – III

Drug metabolism & excretion of drugs

Biotransformation of drugs- drug metabolizing enzymes & organs, phase I & phase II reactions, factors affecting biotransformation, drug metabolism significance, extrahepatic metabolism, pharmacological activity of metabolite, deposition of metabolite.

Excretion of drugs - renal excretion of drug, factors affecting renal excretion of drugs, nonrenal routes of excretion of drug & factors affecting them, enterohepatic circulation.

Unit – IV

Pharmacokinetics

Introduction, basic concepts- rate processes in biological systems, pharmacokinetics parmneters- Cmax, tmax, AUC, biological half life, apparent volume of distribution, clearance (hepatic, renal, organ, metabolite).

Pharmacokinetics drug interaction and their significance in combination therapy.

Clinical pharmacokinetics: dosage adjustment in patient with and without renal and hepatic failure.

Unit – V

Compartment models

Basic concepts, one & two compartment models- pharmacokinetics of drug absorption, distribution and elimination under following conditions:

i) Intravenous bolus injection

ii) Intravenous infusion

iii) Oral single dose

Application of pharmacokinetic principles & computation of parameters by graphical approach.

Examination: One question from each unit with internal choice.

Text Books

1. **Biopharmaceutics and Pharmacokinetics** – **An Introduction** by Robert E. Notary, 2nd edn. 1975, Marcel Dekkar Inc., New York.
2. D.M. Brahmankar and S.B.Jaiswal, **Biopharmaceutics and Pharmcokinetics - A Treatise**, Vallabh Prakasham, Delhi, 1995.
3. L. Shargel and A.B.C. Yu, **Textbook of Applied Biopharmaceutics & Pharmacokinetics**, 4th Edn, Appleton-Century-Crofts, Connecticut, 2004.
4. Venkateswarlu, **Fundamentals of Biopharmaceutics & Pharmacokinetics**, Paras Pubs, Hyd.

Reference Books

1. Remingtons **Pharmaceutical sciences** 17th edn. 1985 Mac Pub. Co., Easton, Pennsylvania.
2. **Modern Pharmaceutics** by Banker, 1979, Marcel Dekker Inc., New York.
3. L. Lachman, H.A. Lieberman, J.L. Kanig, **The Theory and Practice of Industrial Pharmacy**, 3rd Edition, Varghese Publishing House, Mumbai, 1991.
4. A.R. Gennario, **Remington: The Science and Practice of Pharmacy**, 20th Edition, Volume II, Lippincott Williams & Wilkins, Philadelphia, 2004.

PHARMACEUTICAL ANALYSIS – II
(INSTRUMENTAL METHODS OF ANALYSIS)

Subject Code: PYT.4.102 Sessional :30
Periods/week: 4 Examination :70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

UV /Visible Spectroscopy

Regions of Electromagnetic spectrum, properties of EMR, atomic and molecular spectra, Beer - Lambert's law and deviations from Beer's law Principles and theoretical aspects of UVN/Visible Spectroscopy, electronic transition, effect of conjugation, concept of chromophore and auxochrome, bathochromic, hypsochromic, hyperchromic and hypochromic shifts Instrumentation - components of spectrophotometer, types of spectrophotometers, Solvents and sample handling, Applications - Qualitative and quantitative analysis - single component

Unit – II

IR spectroscopy

Principles and theoretical aspects - Molecular vibrations, Hook's Law, Intensity and position of IR bands, Measurement of IR spectrum, finger print region and characteristic absorption of various functional groups.

Instrumentation - Spectrophotometer components, Sample preparation and handling Application - Interpretation of IR spectra of simple organic compounds, quantitative applications.

Unit – III

i)NMR - A brief introduction to the principle and instrumentation, chemical shift, spin-spin interaction, shielding and de shielding.

ii)MS - A brief introduction to the principle and instrumentation, various methods of ion production and fragmentation rules.

iii)Fluorescence spectroscopy - Fundamentals, radiative and non radiative process, mirror image relation ship, fluorescence and molecular structure, properties of fluorescence. Instrumentation - components of spectrofluorimeter and applications

Unit – IV

Electrochemical methods

i) Amperometric titrations

ii) Potentiometry - principles and theoretical aspects - electrodes, measurement of cell potential, end point evaluation methods, potentiometric titrations, Null point potentiometry and application.

iii) Conductometry - principles and theoretical aspects, conductance, equivalent and molar conductance, effect of dilution on conductance, conductivity water, cell constant, conductivity cell, measurement of conductivity, conductimetric titrations and applications. Other analytical techniques - Principle, Instrumentation and application of following instrumental methods of analysis nephelometry, turbidometry, flame photometryand differential thermal analysis

Unit – V

Chromatography: Principle, instrumentation and experimental details and applications of paper chromatography, TLC, column chromatography, gas chromatography, HPLC and HPTLC.

Electrophoresis : Principle, instrumentation, experimental details and applications of paper and gel electrophoresis .

Examination: One question from each unit with internal choice.

Text Books

1. Practical Pharmaceutical Chemistry Vol. I & II by A.G.Beckett and J.B. Stresnlake, The Athlone press of the University of London.

2. Instrumental methods of Chemical Analysis by B.K. Sharma, 23rd edn, GOEL Pub. House,

References Books

1. Indian Pharmacopoeia Published by Controller of Publications.
2. B.P. / U.S.P./Extra Pharmacopoeia.
3. A Text Book of Pharmaceutical Analysis by K.A. Connors, Wiley Interscience, New York.
4. Jenkin's Quantitative Pharmaceuticals Chemistry by A.M.Knevel & F.E. Digengl, McGraw Hill Book Co., New York.
5. Pharm.Analysis by Higuchi.T and Hansen E.B.
6. Vogels textbook of Quantitative chemical analysis,sixth Edition J. Mendham, R.C.
7. Denny, J.D. Bannes M J K Thomas, Pearson education ,Delhi, India.
8. Principles of Instrumental Analysis, fifth edition D.A. Skoog, F. James Holler, Timothy A. Nieman, Harcourt Brace college publishers, Florida, US.
9. J.A. Howell, Hand Book of Instrumental techniques for Analytical Chemistry, prentice hall, upper saddle river (1197).

MEDICINAL CHEMISTRY-II

Subject Code : PYT. 4.103 Sessional : 30
Periods / Week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Note: Introduction, definition, classification, structures, synthesis, general mechanisms, mode of action (wherever known), SAR including physicochemical, steric aspects, metabolism and uses of various categories of drugs mentioned in brackets against each category of the following units.

Unit – I

Local Anesthetics - (Lidocaine and Bupivacaine).
Narcotic analgesics - (Pethidine and Fentenyl), Narcotic antagonists - (Nalaxone),
Peripheral analgesics, Antipyretics & Anti-inflammatory agents - (Aspirin, Paracetamol, Piroxicam, Ibuprofen and Diclofenac Sodium).

Unit – II

Anti-neoplastic agents - (Chlorambucil, Busulfan, Fluorouracil, Methotrexate and Tamoxifen),
Chemotherapeutic agents, Sulfonamides - (Sulphamethoxazole and Sulphadioxine) Antibiotics - General Classification of Antibiotics; Beta-Iactam antibiotics - (Penethicillin, Ampicillin, Cloxacillin); Cephalosporins - (Cephalexin); Tetracyclines - (Chlortetracycline, Oxytetracycline), Quinolones - (Norfloxacin and Ciprofloxacin); Aminoglycosides, Macrolides, Polypeptides; Miscellaneous - (Chloromphenicol and Novobiocin).

Unit – III

Antituberular drugs - (INH, PAS, Ethambutol); Antileprotic drugs - (Dapsone); Antifungal drugs - (Ketoconazole and Fluconazole); Antiviral drugs - (Zidovodine); Antimalarial drugs - (Chloroquine, Pyrimethamine, Primaquine); Anthelmentic drugs - (Diethyl carbamazine citrate, Albendazole, Niclosamide, Pyrantel formate and Piperazine citrate); Antiprotozoal drugs - (Metronidazole, Tinidazole).

Unit – IV

Drugs acting on CNS: CNS stimulants and psychotropic agents - (Imipramine and Amiryptiline),
General Anesthetics - (Halothane, Ketamine, Enflurane),
Sedative & Hyponotics - (Phenobarbitone, Glutethimide, Zolpiclone), Anxiolytics - (Diazepam, Medazolam, Buspirone).
Antipsychotic (Tranquilizing) agents: (Chlorpromazine, Thiothixene, Haloperidol and Pimozide)
Anticonvulsants - (Phenytoin, Carbamazepine, Ethosuximide),
Antiparkinsonism drugs - (Benztropine and Carbidopa).

Unit – V

Vitamins: Structure, Preparation, Storage, Uses and their biochemical role in health promotion (Fat Soluble – **A, D, E** & **K** and Water Soluble – **B_1 $_2$ $_3$ $_5$ $_6$ $_{12}$,B ,B ,B ,B ,B & C)**
Structure and Functional Role of Essential Amino Acids; Development of Protein Drugs.

Examination: One question from each unit with internal choice.

Text Books

1. J.H. Block &J.M. Beale (Eds) Wilson and Giswold's **Text Book of Organic Medicinal & Pharmaceutical Chemistry**, 11th edition, Lippincott, Raven, Philadelphia, 2004.

2. W.O. Foye, **Text Book of Medicinal Chemistry**, 5th edn, Lea & Febiger, Philadelphia, 2002.

3. S.N. Pandeya, **Text Book of Medicinal Chemistry**, 2nd edn, S. G. Pubs, Varanasi, 2003.

Reference books

1. D. Abraham (Ed), **Burger Medicinal Chemistry and Drug Discovery**, Vol.I , 6th edition, John Wiley & Sons, New York, 2003.

2. B.N. Lads, M.G. Mandel and F.I.Way, **Fundamentals of drug Metabolism & Disposition**, William & Welking Co, Baltimore U.S.A.,

3. C. Hansch, **Comprehensive Medicinal Chemistry**, Vol I-VI Elsevier Pergamon Press, Oxford, 1991.

4. Daniel Lednicer, **Strategies for organic Drug Synthesis and Design**, John Wiley N.Y., 1998.

5. D. Lednicer , **Organic Drug Synthesis**, Vol. I-VI, John Wiley N.Y

DOSAGE FORMULATION DESIGN

(PHARMACEUTICS – III)

Subject Code : PYT 4.104 Sessional : 30
Periods/week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Pre Formulation Studies

Study of Physical Properties of Drug: Particle size, Shape, pKa, Solubility, Partition Coefficient, Crystallinity, Polymorphism and Hygroscopicity,

Powder Characteristics: Bulk density, Flow Properties, Solid State stability, Solution stability, and Stability Protocol, Dissolution and Organoleptic property and their effect on formulation.

Study of Chemical Properties of Drug: Hydrolysis, Oxidation, Polymerization etc., and their influence on formulation and stability of the Products.

Unit – II

Sustained Action Pharmaceuticals

Concept, Benefits, Limitations, Advantages & Disadvantages, Definition of various types of prolonged action pharmaceuticals.

Sustained Action Oral Products: Theory-Zero order release approximation, First order release approximation, Approaches based on drug modification and dosage form modification, *in vitro* & *in vivo* evaluation of the sustained release products. Formulation -Drug complexes, Encapsulated slow release granules, Tabletted slow release granulations and matrix tablets.

Microencapsulation: Applications, Core and Coat materials, Techniques- Air suspension, Coacervation-Phase separation, Pan Coating, Spray Drying & Spray congealing, Solvent Evaporation,. Polymerisation.

Unit – III

New Drug Delivery Systems

Importance, Formulation and Applications.

Transdermal Drug Delivery Systems: Concept, Advantages and disadvantages, Approaches used in developing Transdermal drug delivery systems (4 types), *in vitro* evaluation of Transdermal drug delivery systems.

Liposomes: Formulation, Preparation of liposomes-physical dispersion and solvent dispersion, Characterisation of Liposomes, Applications in Pharmacy.

Occular Drug Delivery Systems: Concept, Advantages and disadvantages, Mucoadhesives, design of Occuserts (Pilo 40 and Pilo 20), Erodable inserts.

Nanoparticles: A brief introduction to Nanoparticle technology and Nanoparticles as drug carriers in controlled & targeted drug delivery systems.

Unit – IV

Performance Evaluation Methods

Bioavailability: Definitions, Objectives, Considerations, Assessments, Enhancement Methods, Dissolution Studies for solid dosage forms and methods of interpretation of dissolution data.

In vitro and *In vivo* methods of evaluation

Bioequivalence: Definition, Objectives, Testing Protocols and Procedures, Experimental Design of single dose bioequivalence study and Statistical Interpretation of data.

Concepts of Process Validation: Definition, Importance, types of validation in Pharmaceutical Operations and Introduction to different process validation methods. Concepts of Good

Manufacturing Practices in Production of Pharmaceutical Products

Unit – V

Quality Control and Assurance

Introduction, Quality Assurance, Sources of Quality variation,

Control of Quality variation: Raw Materials Control - Raw Material Quality Assurance Monograph, Active or Therapeutic Materials Control,

Quality Assurance at startup - Raw Materials Processing, Compounding, Packing materials. Quality Assurance during packing operation - Auditing, Concept of statistical Quality Control and Quality Control Charts.

Control & Assurance of Manufacturing practices: Personal, Equipment & Buildings. Control of records - Master formula record, Batch production record.

Control of production procedures - Manufacturing control, Packing Control and Labels control. Stabilization and stability testing protocols for various pharmaceutical products.

Examination: One question from each unit with internal choice.

Text Books

1. L. Lachman, H.A. Lieberman and J.L. Kanig, **Theory and Practice of Industrial Pharmacy**, Lea & Febiger, Philadelphia, 3rd Edition, 1997.
2. S.P. Vyas and Roop K. Khar, Targetted and Controlled Drug delivery Novel carrier systems, 1st edition, 2002, C.B.S. New Delhi.

Reference Books

1. A.R. Gennaro, **Remington: The Science and Practice of Pharmacy**, 20th Edition, Vol. 1, Lippincott Williams & Wilins, Philadelphia, 2004.
2. E.A. Rawlins, **Bentely's Textbook of Pharmaceutics**, 8th Edition, Baillere Tindill, London, 1992.
3. S.H. Willing, M.M. Tucherrman and W.S. Hitchings IV, **Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control**, 2nd Edition, Marcel Dekker, Inc., New York, 1988.
4. Gilbert S. Banker and Christopher T Rhodes , **Modern Pharmaceutics**, IV Edition, Marcel – Dekker, USA, 2005.
5. Yiew Chien, **Novel Drug delivery systems,** 2nd edition, Marcel Dekker, USA, 1992.
6. Robert .A. Nash, **Pharmaceutical Process Validation,** 3rd edition**,** Marcel Dekker, 2003.

PHARMACEUTICAL BUSINESS MANAGEMENT

Subject Code: PYT 4.105 Sessional : 30
Periods/week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

General Management (Production and Control)
Management concepts: Policies, goals and objectives, principles of management, functions of management, levels of management, management information systems **(MIS);**
Production Planning and Quality Control - Production Forecasting, Process production, Batch Production, Process planning, Economic Batch quantity. Problems of Productivity; Integration of modem management practices and principles of Total Quality Management (TQM) with requirements specified in GMP, GSP, ISO 19000, GB/T 19000 and ES 29000.

Unit – II

Industrial Management (Pharmaceutical Industry)
Pharmaceutical manufacture, Development, Location-Factors influencing, Special provisions.
Plant Layout: Types of plant layout, Factors influencing plant layout, Methods of factory layout, Special provisions, Storage space requirements, Layouts-Sterile or aseptic area, tablets production area.
Building: Compartmentalized facilities-Rooms, floors, walls and ceilings.
Pharmaceutical Process Flow and Work Study: General Flow Patterns, Work Station Design, Process Flow Diagrams - Production of Tablets, Work Study and Work Measurement.
Utilities and Services: Power, Water, Air conditioning systems, Dust collection systems, Compressed air systems, Vacuum and special gases.
Good Manufacturing Practices: Equipment and documentation (Records).

Unit – III

Materials and Stores Management
Materials Purchasing Procedure, Stores Organization - location and layout of stores, receiving, inspection of materials, Issue, Control of store and store stocks, Stock accounting and records. Selection of site for drug store, Layout design for drug store and compliance with control measures; Inventory control - Objectives, Economic order Quantity, ABC analysis.

Unit – IV

Personnel Management
Selection, Appointment, Training, Transfer, Promotion and demotion policies, Remuneration, Job Evaluation and merit rating.
Industrial Psychology - Concept, Individual and group behaviour, X and Y theory, Hawthrone experiments, morale, motivation and fatigue.

Unit – V

Marketing Management
Meaning and Scope, Types of Target Market, size, composition, demographic description and socio-psychological characteristics of the consumer, marketing mix.

Market consideration in product development - product classification, product planning, product differentiation, Branded V s Generic, new Product Development. Distribution Channels - Selection of Channels, Wholesaler and retailers, role and distribution.
Pricing policies - factors affecting price, selective and exclusive pricing, discount policies, Credit

policies, Patent policies,
Sales Promotion policies - Objectives, detailing to physician, professional personnels sampling, window and interior display, media planning and publicity.

Examination: One question from each unit with internal choice.

Text Books

1. **Industrial Engineering and Management** – O.P. Khanna.
2. C.V.S Subrahmanyam, **Pharmaceutical Production and Management**, Vallabh Prakashan, New Delhi, 2005.

Reference Books

1. Pharmaceutical Marketing in India by S.V. Subba Rao, Asian Institute of Pharmaceutical Marketing, Hyderabad
2. "Principles of Marketing" by Philip Kotler, Eastern Edn.,

PHARMACEUTICAL ANALYSIS – II PRACTICALS
(INSTRUMENTAL METHODS OF ANALYSIS)

Subject code : PYP. 4.106 Sessional : 25
Periods/Week : 4 Examination : 50
Nature of Exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Experiments based on paper chromatography / TLC / Column chromatography.
2. Determination of Lamda max.
3. Determination of Isosbestic point.
4. Determination of Molar absorptivity.
5. Estimation of drugs by using colorimeter / UV -Spectrophotometer / Fluorimeter.
6. Determination of sulphate or chloride ions by turbidimetry and Nephelometry.
7. Potentiometric determination of equivalence point.
8. Conductimetric titration.
9. Determination of concentration of Ions by Polarography.
10. Determination of concentration oflons by Specific - Ion Electrode.
11. Experiments based on Eelectrophoresis.
12. Determination of Na and K Ions using Flame photometer.
13. Determination of moisture content of a drug by using Karl Fischer titrator.

Reference Books

1. A.H Beckett and J.B Stenlake, **Practical Pharmaceutical Chemistry**, Part – II, 4th Edition, CBS Publications, New Delhi, 2004.
2. **Indian Pharmacopoeia**, Controller of Publications, Delhi,1996.
3. B.G Nagavi, **Laboratory Hand book for Instrumental Drugs Analysis**, 3rd Edition, Vallabh Prakashan, New Delhi, 2000.

MEDICINAL CHEMISTRY – II

Subject Code : PYP. 4.107 Sessional : 25
Periods / Week: 6 Examination : 50
Nature of Exam: Practicals Exam Duration: 4 Hrs

List of Experiments

1. **Synthesis of Phenytoin**
2. Synthesis of Phenacetin
3. Synthesis of antipyrine
4. Synthesis of 6-methyl uracil
5. Synthesis of Sulphanilamide
6. Synthesis of 7-Hydroxy - 4-Methyl Coumarin.
7. IR spectral study of drugs (Acetazolamide, Clonidine HCl, Ibuprofen, INH, Metronidazole).
8. Estimation of drugs in formulations (Phenytoin, Phenacetin, Sulphanilamide and Codeine Phosphate).

Reference Books

1. B.S Furniss, AJ Hannaford, PWG Smith and AR Tatchell, **Vogel's Text book of Practical Organic Chemistry**, 5th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R K Bansal, **laboratory Manual of Organic Chemistry**, 4th Edition, New Age International Publishers, New Delhi, 2005.
3. AI Vogel, **Elementary Practical Organic Chemistry, Part - I**, **Small Scale Preparations**, 2nd Edition, CBS Publishers & Distributors, New Delhi, 2004.
4. FG Mann and BC Saunders, **Practical Organic Chemistry**, 4th Edition, Orient Longman, Hyderabad, 2004.
5. **Indian Pharmacopoeia , Volume - I & II**, Controller of Publications, Delhi,1996
6. **British Pharamacopea,** 2008.

DOSAGE FORMULATION DESIGN PRACTICALS

(PHARMACEUTICS – III)

Subject Code: PYP. 4.108 Sessional : 25
Period/week: 06 Examination : 50
Nature of Exam: Practical Exam Duration: 6 Hrs

List of Experiments

1. Preparation and evaluation of albumin microspheres by heat stabilization technique and their particle size characteristics.
2. Preparation of matrix tablets using various polymers like PVP etc and studying their release pattern.
3. Preparation and evaluation of drug (ibuprofen, salicylic acid) loaded alginate microspheres.
4. Evaluation of marketed sustained release tablets for in vitro dissolution behaviour.
5. Preparation and evaluation of matrix tablets containing drugs.
6. Preparation and evaluation of solid dispersion of drugs using PEG polymers.
7. Preparation and evaluation of reservoir type devices using PEG-ethyl cellulose in chloroform-dichloromethane).
8. *In vitro* transport of marketed transdermal preparation using suitable diffusion cell.
9. Preparation of drug loaded liposomes using solvent evaporation method and evaluation of extent of entrapment (demonstration).

PHARMACEUTICAL BIO TECHNOLOGY

Subject Code : PYT. 4.201 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Genetic Engineering

Introduction, History, Development, Application and Scope Genetics, DNA/RNA replication, Restriction Endonucleases, DNA Ligases, Vectors, Hosts, Cloning strategies, Gene Expression in Recombinant DNA. Application of recombinant DNA in manufacture of biological products such as Insulin, Human growth hormones, Interferons and Interleukins.

Unit – II

Biochemical Engineering – Fermentation Technology

Introduction, development and maintenances of industrial micro-organisms, batch and continuous fermentations, process controls, oxygen supply and demand, single and multiple bubble aeration, sparger aeration, foam control equipment, scale-up of Fermentors.

Microbiological Assay of antibiotics and Vitamin B_{12}.

Study of culture, media, production conditions, extraction and purification of the following:

Antibiotics – Semi synthetic penicillin's, streptomycin and erythromycin as per IP.
Hormones - Insulin Production
Enzymes – Amylase and Diastase; Immobilization and their applications in drug manufacture.

Biomass – **Lactobacillus sporogenes**

Unit – III

Immunization Products

Manufacture, Standardization, Storage, Labeling and Specific Applications of the following vaccines: Bacterial vaccines, toxoids, viral vaccines, Rickettsial vaccines, Rabies, MMR, BCG, DPT, Cholera, Hepatitis B and Polio
Standardization and Storage of the following Passive immunization products – Anti toxins, Anti venom, Immune sera and other products related to immunity and Immuno Diagnostics;

Unit – IV

Blood and Glandular Products

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, Dextran 40, Control of blood products, Transfusion products.

Preparation of extracts and isolation of pure substances and their dosage forms from Pituitary, Adrenal, Pancreas and Thyroid glands;.

Unit – V

Biotransformations and Animal Cell Biotechnology

Microbial transformation of steroids: Introduction, Types and methods of transformations mediated by microorganisms, design of biotransformation processes and selection of organisms.
Animal cell culture: Techniques, Media used and Applications.
Hybridoma culture: Production of monoclonal antibodies and their applications.

Examination: One question from each unit with internal choice.

Text Books

1. **Pharmaceutical Biotechnology** by S.S. Kori.
2. **Principles of Fermentation Technology** by P.F. Standury & A. Whitaker, Pergamon Press,
3. **Industrial Microbiology** by Cassida.

Reference books

1. **Monoclinical Antibody Technology** by A.M. Campbeli.
2. **Handbook of enzyme Biotechnology** by A. Wiseman.
3. **Recombinant DNA Technology** by J.D. Watson.
4. **Molecular Biology and Biotechnology** by Smith and Hood.
5. **General Pharmacy** by Copper and Gunn.
6. **A text book of Pharmaceutics**, A.O. Bentley, 8th Edition, 1982 Bailler Tindall & Co.,
7. **Microbial Biotechnology** Alexander N. Glazer & Hiroshi Nikaido, W.H. Freeman Co., 1995.
8. **Principles of Fermentation Technology** by P.F. Stanbury Whitaker.
9. **Bioitechnology** by Wulf Crueger and Anneliese Crueger, 2nd edition, Publisher – Panima Publication Corporation, New Delhi.

HOSPITAL & CLINICAL PHARMACY

Subject Code : PYT.4.202 Sessional : 30
Periods / Week: 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

UNIT – I

Introduction to Hospital and Hospital Pharmacy

Hospital and its Organisation,

Hospital Pharmacy: Objectives, Functions, Organisation, Planning, Personnel and Administration of Hospital Pharmacy Services; Hospital Drug Policy – General Considerations;

Hospital Committees: Purpose, Organization and Functions of Pharmacy and Therapeutic Committee (PTC), Role of Hospital Pharmacist in Hospital Committees and Practice of Rational Drug Therapy and Drug Exchange Program;

UNIT – II

Hospital Formulary

Organization, Formulary Content, Preparation and Distribution; Pharmacy Procedural Manual Preparation; Drug distribution, Dispensing to Inpatient and Ambulatory Patient care, Dispensing of ancillary and controlled substance; Procurement and Distribution of alcohol; Manufacturing of Bulk and sterile supplies; Storage and Handling of Radio isotopic Pharmaceuticals; Budget Planning, Purchasing and Inventory Control; Use of Surgical Instruments & Hospital Equipment.

UNIT – III

Clinical Pharmacy

Introduction, Scope, History and Development of Clinical Pharmacy; Investigational use of Drugs and Drug Therapy Monitoring with examples, Adverse Drug Reaction Management; Drug and Poison Information, Medication history review and Patient Counseling; Patient Compliance, Patient Data Analysis and its Use in evaluation of Clinical Tests for Common Disease States and Organ Functional Tests (Liver, Pulmonary and Renal) for Drug Therapy; Definition and Differences of Generic and Prescription Drugs;

UNIT – IV

Basic Principles of Drug Therapy

Concepts of Essential Drugs and Rational Drug Use;

Drug Distribution: Out Patient and In Patient Services; Unit dose drug distribution systems, floor ward stock systems, satellite pharmacy services, central sterile services and bed side pharmacy;

Drug- Drug Interactions: Mechanism of Pharmacokinetic and Pharmacodynamic interactions with suitable examples; Food and Drug interactions. Incidence, Classification and Surveillance Methods of Adverse Reactions of Drugs; Therapeutic Aspects of Pharmaco Genetics;

Drug induced Disease – Dermatological, Hepatic, GI, Renal, Gout, Parkinsonism, Cancer, Depression, Psychosis, Ototoxicity, Ocular toxicity and Teratogenicity. Adverse drug reactions.

UNIT – V

Pharmaco Therapy of Diseases

Diseases: – Symptoms, Manifestation, Patho-Physiology and Etiology of - Gastrointestinal diseases: Peptic ulcer, Ulcerative colitis, Hepatitis & Cirrhosis (Liver). Cardio Vascular System diseases – Angina Pectoris, Acute Myocardial Infunction, Atherosclerosis, Essential Hypertension, Cardiac arrhythmia. Respirtory diseases – Asthma and T.B.; STD – HIV, Syphilis and Gonorrhea.; Anemia, Parkinsonism, Diabetes, Gout and Rheumatiod arthritis.

Pharmaco Therapy and Critical Analysis of Rational Use of Drugs in the following Disorders: Cardio Vascular, Respiratory, Renal, Gastro-Intestinal, Nervous, Psychiatric, Rheumatic, Hematological, Endocrine and Infections.

Examination: One question from each unit with internal choice.

Text Books

1. **Hospital Pharmacy** by Hassan.
2. **Clinical Pharmacy and Therapeutics** by Herfindal, Herschnan.
3. **Essential Clinical Medicine** R.H. Salter.

Reference Books

1. **Remington Pharmaceutical Sciences.**
2. **Drug Interaction** by hamsten, Kven Stockley.
3. **Clinical Pharmacology and Drug therapy** Grahame Smith and Aronson.
4. **Drug Interactions** – J.K. Mehra, Basic Business Publishers, Bombay.

COSMETIC TECHNOLOGY

Subject Code : PYT.4.203 Sessional : 30
Periods / Week : 4 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

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, Regulatory provisions related to cosmetics.

An approach to the formulation, ingredients, use, method of manufacturing, packing, labeling, and quality control of the following cosmetics.

Unit – II

Face Preparations - Vanishing creams, Cleansing creams, Face powders and lipsticks.
Eye Preparations - Mascaras, Eye liners, Eye shadows.
Baby Specialties - Baby powder, Baby oils, Baby lotions and Baby shampoos.

Unit – III

Preparations For Skin - Bleaching preparations, Body Lotions and Body Creams.
Preparations For Nails - Nail laquers and Nail polish removers

Body Cosmetic Preparations - Deodorants, Antiperspirants and Talcum powders.

Shaving Preparations: Pre-Shave and after-shave lotions, Shaving creams and Soaps.

Unit – IV

Preparations For The Hair - Shampoos, Hair Conditioners, Hair Straightners, Hair creams, Hair dyes, Depilatories and Epilatories.
Dental Preparations - Tooth powders and pastes, Mouth washes.

Unit – V

Herbal Cosmetics
Skin care products: Body oils and Moisturising lotions.
Hair care products - Shampoos, Hair Conditioners.
Cosmetics for face: Face packs.

Examination: One question from each unit with internal choice.

Text Books

1. Cosmetics formulation manufacturing & Quality control by P.P. Sharma, Vandana Pub, Delhi.
2. Poucher's Perfumes, Cosmetics and Soaps by H. Butler, Chapman & HALL, London.

Reference Books

1. **Martindale's Extra Pharmacopia**, 29th edn. 1989, Pharmaceutical Press, London.
2. **Cosmetic Science & Technology**, Volume I, II & III by Sagarin 2nd edn. John wiley & Co.

PHARMACOINFORMATICS

Subject Code : PYT 4.204 Sessional : 30
Periods/ Week : 04 Examination : 70
Nature of Exam: Theory Exam Duration: 3 Hrs

Unit – I

Database Design

Databases: Structure of databases, Sequence databases, Relational databases; Sequence analysis, Software resources; Sequence alignment and database searches and Phylogenetic analysis; Principles of database organization, Data mining and knowledge discovery in databases, Bibliographic databases and library catalogs and Drug information databases Database Concept, Database Architecture, Codd Rules, Normalization, Access 2000 Database and Accord 2000 Cheminformatics Database; Importance of Biological Databases

Unit – II

Information Management

Search algorithms: Search logic and complex queries and Search in non-text databases (images and chemical structures); Algorithms for alignment of sequences and structures of nucleic acids, proteins and protein families; Substitution of similarity matrices; Dynamic Programming methods; Structural superposition algorithms; Hidden Markov Models (Construction and Use in Alignment and Prediction); Domain detection and Identification of Genes;

Storage and retrieval of information: Database Querying, Key work searching, Search Machines, Complex searches, Homology searches, Pattern matching and Bio-PERL;

Unit – III

Drug information services

Drug Information: Introduction, Resources Available; Design of Literature Searches; Critical Evaluation of drug information and literature, Preparation of Written and Verbal reports, Development of Drug information, Database useful for emergency treatment of poisoning;

Pharmacy automation: Automated medication dosage, filling and packaging, Coding of information and bar-codes, Medication distribution, management and Inventory control.

Unit – IV

Introduction to Genomics and Proteomics

Structure and Functional Genomics; Genome Analysis; DNA databaks, GENEBANK;

Libraries: Preparation of ordered cosmid libraries, bacterial artificial chromosome libraries; shotgun libraries; Homology algorithims (BLAST) for Proteins and Nucleic Acids

Sequencing: Conventional (Sanger, Maxam and Gilbert Methods) and Automated Sequencing

Protein Analysis; Protein Sequence Databanks, (SWISSPORT, PIR and INTERPRO) Conserved Protein motifs related to structure/function (PROSITE, PFAM and profile Scan) and database for Protein Structure (PDB); SCOP/CATH and Introduction to EMBOSS;

Unit – V

Computational Concepts in Drug Design

Introduction to drug design; Molar Reactivity of Compounds for Structure Activity Relationship (SAR) and Quantitative Structure Activity Relationship (QSAR) analysis; Free-Wilson and Hansch Methods of Analysis; Detrmination of Partition Coefficient and Dissociation Constant; using computational methods; Application of Quantum Mechanics;

Factors Affecting Bioactivity of Drugs: Resonance, Inductive Effect, Isosterism, bioisosterism, Special Considerations: Conformational Space, Energy Calculations, Local and Global

Minimization; Energy Minimization; Molecular dynamics simulations; Docking;
Theory of Drug Activity: Occupancy Theory; Rate Theory; Induced Fit Theory; Drug-Recptor Interactions; Influence of Isomers on Drug Receptors; Biochemical approaches in drug design;

Examination: One question from each unit with internal choice.

Text and Reference Books

1. Bioinformatics 2000, Higgins and Taylor. OUP
2. Internet and the New Biology: Tools for genomic and Molecular research By Peruski, Jr
3. Functional genomics: A Practical Approach, Edited by Stephen P. Hunt and Rick Liveey
4. Chemical space navigation in lead discovery by Tudor I. Oprea
5. Database Management and Information Systems, by Henry Korth

PHARMACEUTICAL BIO TECHNOLOGY

Subject Code : PYP.4.205 Sessional : 25
Periods / Week: 4 Examination : 50
Nature of Exam: Practical Exam Duration: 4 Hrs

List of Experiments

1. Standardization of cultures
2. Microbiological assay of Antibiotics / Vitamins
3. Production of alcohol by fermentation techniques
4. Immobilization of cells / enzymes by different techniques
5. Comparison of efficacy of immobilized cells.
6. Sterility testing of Pharmaceutical products.
7. Isolation of mutants by gradient plate technique.
8. Preparation of bacterial vaccine.
9. Preparation of blood products / human normal immunoglobulin injection
10. Extraction of DNA.

Reference Books

1. F.C. Garg, **Experimental Microbiology**, CBS Publishers, New Delhi, 2003.
2. R.S Gaud and G.D Gupta, **Practical Microbiology**, 6th Edition, Nirali Prakashan, Pune, 2006.
3. R.S Gaud, G.D Gupta and S.B. Gokhale, **Practical Biotechnology**, 2nd Edition, Nirali Prakashan, Pune, 2004.
4. Vinita Kale and Kishore Bhusar, **Practical Microbiology Principles and Techniques**, Himalaya Publishing House, Hyderabad, 2005.

COSMETIC TECHNOLOGY

Subject Code : PYP.4.206 Sessional : 25
Periods/week : 4 Examination : 50
Nature of Exam : Practicals Exam Duration: 4 Hrs

List of Experiments

Preparation of the following products

1. Cleansing creams
2. Vanishing creams
3. Shaving creams
4. Tooth paste
5. After shave lotion
6. Hand lotion
7. Baby lotion
8. Face powder / talcum powder / tooth powder / baby powder
9. Nail paint / Lip stick
10. Nail paint remover
11. Deodorant formulation.

Reference Books

1. B.M. Mithal and R.N Saha, Hand Book of Cosmetics, Vallabh Prakashan, New Delhi. 2006.
2. P.P. Sharma, **Cosmetics: Formulation Manufacturing & Quality Control**, Vandana Publications, Delhi, 2005.
3. W.A Poucher**, Modern Cosmetics, Vol – I, II & III**, B I Publications, New Delhi.
4. Anne Moung, **Practical Cosmetic Science**, Milh & Boon Ltd, London,

PHARMACOINFORMATICS PRACTICALS

Subject Code :PYP.4.207 Sessional : 25
Periods / Week : 4 Examination : 50
Nature of Exam: Practicals Exam Duration: 4 Hrs

List of Experiments

Minimum 8 experiments of Exercise and Problem Solving of the following shall be conducted.

1. Review of key internet sites for sequence analysis (Hypertext and World Wide Web)
   - Information search in WWW
   - Pharmaceutical resources in WWW
   - Retrieving and installing a program (Tree Tool)
   - Similarity Searching BLAST/FASTA
   - Multiple Sequence Alignment (CLUSTAL W and Bee)
   - Basic Sequence Analysis and Multiple Sequence Analysis
   - GCG sequence Analysis
2. Virtual Library
   - Searching MEDLINE on the PubMed System from the NCBI site
   - Searchingthe Science Citation Index and Current Contents Connect from the ISI
   - Accessing full text journals on the internet through INFLIBNET and other sources
3. Database and Search Tools
   - Types of indexing tools and search strategies
   - Literature evaluation Methods
4. Basic Programming in BioPERL
5. Problems related Gene Sequencing and Protein Sequencing
6. Basic Programming in SQL

Reference Books

1. S Misener and SA Krawets, **Bioinformatics: Methods & Protocols, Vol. 132**, Human Press Inc, New Jersey, 2003.
2. SC Rastogi, N Mediratta and P Rastogi, **Bioinformatics: Concepts, Skills & Applications**, CBS Publishers & Distributors, New Delhi, 2004.
3. D Higgins and W Taylors, (ed) **Bioinformatics – Sequence, Structure and Data-Banks – Practical Approaches**, Oxford University Press, New Delhi, 2006.
4. WD Mount, **Bioinformatics – Sequence and Genome Analysis**, 2nd Edition, CBS. Publishers & Distributors, New Delhi, 2005.
5. I Bayrogs, **SQL / PL/ SQL/ - The Programming Language of Oracle**, 3rd Edition, BPB Publication, New Delhi, 2006.
6. DC Jamison, **Perl Programming for Bioinformatics & Biologists**, John Wiley & Sons Inc, New Delhi, 2004.
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