

I SEMESTER



PHARMACEUTICAL INORGANIC CHEMISTRY

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.1.1. T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To impart knowledge on various categories of inorganic medicinal compounds.
- To provide knowledge on significance of various inorganic impurities and methods to test such impurities.
- To make the students aware of Indian Pharmacopoeia and other pharmacopoeias with reference to various inorganic compounds official in those pharmacopoeias.

Course Outcomes

- The students will get the knowledge about various pharmaceutical inorganic compounds with reference to their Pharmaceutical category, method of their quality tests, Assay and uses
- The student gets the knowledge about various inorganic impurities which may enter the pharmaceutical inorganic compounds and their potential hazards.
- The student will become aware of the various pharmacopoeias and how to refer those books.

Unit – I

- a) Classification of Inorganic Pharmaceuticals based on their applications, therapeutic classes and uses with examples.
- b) Sources of impurities.
- c) Limit test for Arsenic, heavy metals, lead, iron, chloride and sulphate. (as per the modified procedure of Indian Pharmacopoeia 2014)

Note: Following units all the compounds are of official in Indian Pharmacopoeia.

Unit – II

Definition, Preparation, Properties, tests for purity & Assay of selected compounds (*) and Uses.

a) Gastro – intestinal agents:

- (i) Antacids: Aluminium hydroxide gel*, Dried Aluminium hydroxide gel, Magnesium oxide, Magnesium-hydroxide mixture*.
- (ii) Laxatives: Magnesium Sulphate.

b) Electrolytes: Sodium, Potassium and Calcium replenishers.

(i) Sodium and Potassium replenishers: Sodium chloride* (Ringer solution), Sodium chloride and dextrose injection, Potassium chloride and oral electrolytes.

(ii) Calcium Replenishers: Calcium gluconate*.

(c) Acid base Regulators: Ammonium chloride*, Potassium citrate.

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

Unit – III

Definition, Preparation, Properties, tests for purity & Assay of selected compounds (*) and Uses.

(a) Mineral Nutrients: Haematinics: Ferrous Sulphate* Ferric ammonium citrate, Ferrous gluconate.

(b) Pharmaceutical aids:

(i). Adsorbents & Absorbents: Activated charcoal, Aluminium sulphate.

(ii). Antioxidants: Sodium bisulphite and sodium metabisulphite.

(iii). Desiccants: Silica gel.

(iv). Excipients: Magnesium stearate*, Talc.

(v). Suspending agents: Bentonite, colloidal silica.

(vi). Colourants: Titanium oxide, ferric oxide.

Unit – IV

Definition, Preparation, Properties, tests for purity & Assay of selected compounds (*) and Uses.

a) (i). Expectorants: Potassium Iodide*.

(ii). Emetics: Copper Sulphate.

(iii). Antidotes: Sodium thiosulphate*, sodium nitrite.

(b) Topical agents:

(i). Astringents: Zinc sulphate, Calcium Hydroxide.

(ii). Topical protectants: Zinc oxide, Calamine.

(iii). Silicone polymers: Activated Dimethicone.

(iv). Anti-infectives: Potassium permanganate*, Silver nitrate*, Iodine*, Iodine solutions, Povidone – iodine, boric acid*.

Unit – V

Definition, Preparation, Properties, tests for purity & Assay of selected compounds(*) and Uses

(a) Dental products:

- (i) Fluorides: Sodium fluoride and stannous fluoride, sodium mono chloro phosphate.
- (ii) Oral antiseptics and Astringents: Hydrogen peroxide, zinc peroxide.
- (iii) Dentifrices: Calcium carbonate, calcium phosphate.
- (iv). Cements and Fillers: Zinc oxide.

(b) Other Medicinal agents:

- (i). Anti-thyroid agents: Potassium perchlorate.
- (ii). Diagnostic agent: Barium Sulphate*.
- (iii). Surgical aid: Plaster of Paris.

Examination: One question from each unit with internal choice.

Text Books

1. Pharmaceutical Chemistry, Inorganic G.R Chatwal volume-I Reprint 2010 , Himalaya publish House, Hyderabad.
2. Bentley & Driver's Text book of Pharmaceutical chemistry Ed: L. M. Atherden, 1983, Oxford University press, Delhi.
3. Pharmaceutical Inorganic chemistry, V. Alagarsamy, 2014, Pharmamed Press, Hyderabad.
4. Inorganic Medicinal & Pharmaceutical chemistry; J. H. Block, F. B. Roche, T.O. Soine, C.V. Wilson, 1986, Varghese publishing house, Bombay.
5. Inorganic Pharmaceutical chemistry; P. Gundu Rao, Vallabh Prakashan 1995, Delhi

Reference Books

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

BASIC COMPUTER APPLICATIONS

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 3

Credits: 3

Instruction Mode: Lecture

Subject Code: PY.05.881.1.2.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To Impart the basic knowledge about the concept of computers.
- To make the students to understand and acquire knowledge about various simple computer applications.

Course Outcomes

- The students will get basic concepts on working of a computer.
- The students will get thorough knowledge on simple computer applications like MS word, Excel, and Power Point.
- The student will be able to apply these applications in other subjects also.

UNIT – I: COMPUTER CONCEPTS:

Evolution, Basic structure and Characteristics of computers; Types of memory chips; Study of various input – output 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 MS DOS, UNIX and WINDOWS; Computer Viruses;

UNIT – II: 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 – III: 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 relationships, Sorting and filtering, Queries, forms, form controls, Sub forms, reports, importing, exporting, linking.

UNIT – IV: 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; E-Mail.

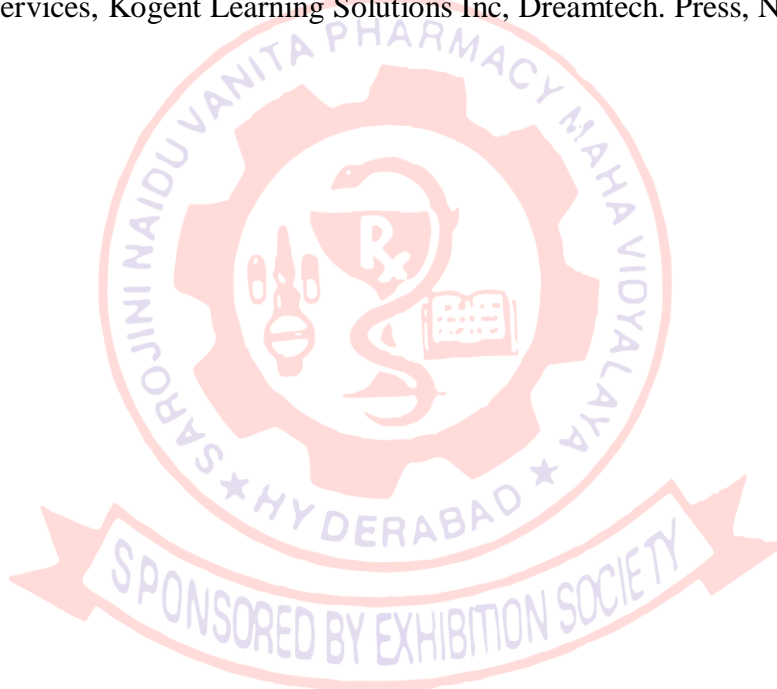
UNIT – V: INTRODUCTION TO HTML:

Hyper Text Manuscript Language (HTML), Hypertext, Elements (Tags), Structure of HTML, Comments, Document body, Text formatting, Hyperlinks, lists, Tables, Colors, Images, Frames and Forms.

Examination: One question from each unit with internal choice.

Text Books:

1. Fundamentals of Computers by P.K. Sinha 2nd Edn, 1992, BPB Publications, New Delhi.
2. Working in Microsoft Office By Ron Mansfield, TATA MC Graw Hill Edition, New Delhi. .
3. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and Query by DT Editorial Services, Kogent Learning Solutions Inc, Dreamtech. Press, New Delhi.



GENERAL PHARMACY

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.1.3.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To give a basic understanding and a historical account on starting of pharmacy education in India and other countries.
- To make the students aware of various pharmacopoeias.
- To make the students understand various types of simple calculations in preparation and dispensing of different types of dosage forms.

Course Outcome

- The students will get an exposure and a comprehensive knowledge on the history of pharmaceutical education.
- The students will become aware of various pharmacopoeias and how to refer those books.
- The student will gain knowledge on various simple calculations involved in the preparation and dispensing of dosage forms and the excipients used.

Unit – I

Pharmacy profession: Pharmacy as a career, Pharmaceutical Education (Courses and affiliating bodies (PCI and AICTE)), Development of Pharmaceutical Industry in India, Brief introduction to Evolution of Pharmacy, European and American Pharmacy. Pharmacopoeia (IP, BP, USP), BPC, Martindale, Merck Index. Pharmacopoeial monograph contents, API and formulation monograph. Explanation of each term.

Unit – II

SI and imperial systems, inter conversions. Weighing - selection and care of weights and balances, sensitivity, minimum weighable quantities and calibration of weights.

Pharmaceutical calculations: Enlarging and reducing recipes; Percentage solutions, allegation, alcohol dilutes, proof spirit, molarity, molality, Normality, millimoles, milliequivalents and isotonic solution.

Unit – III

Posology: Factors influencing dose, Calculations of doses for infants and children based on age, body weight and body surface area.

Prescription: Definition, Parts, sources of errors and care required in handling prescriptions, modern methods of prescribing, Responding to prescription, pricing of prescription.

Unit – IV

Containers and closures:

Definition, Ideal properties, Types of containers and closures, Materials used in preparation of containers and closures, labeling: Preparation, Cautionary and advisory labels, modern unit dose packaging (blister, strip, bubble) and storage conditions for medicinal products.

Unit – V

Excipients: Colouring agents, flavouring agents, sweetening agents, antioxidantants, preservatives, diluting agents, vehicles, surfactants, hydrocolloids (with respect to FDA approvals, wherever applicable).

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, E.A. Rawlins, 8 th Edition, 1996, Bailliere Tindall, London.
2. Cooper & Gunn's dispensing for Pharmaceutical students, S.J.Carter, CBS Publishers, New Delhi.
3. Pharmaceutical Education, Harikishan Singh (History of Pharmacy in India & Related aspects), Volume- II, Vallabh Prakashan, Delhi. 4. A Textbook of professional pharmacy, N. K. Jain, S.N. Sharma, 6th Edition, 2016, Vallabh prakashan, Delhi. 5. R. M. Mehta, Dispensing Pharmacy, 3rd Edition, 2008, Vallabh Prakashan, Delhi.

Reference Books

1. Pharmaceutical dosage forms & Drug delivery systems, H.C. Ansel, 8th Edition. 2008, Lippincott Williams &Wilkins, London.
2. Cooper & Gunn's Tutorial pharmacy, S.J.Carter, CBS Publishers, New Delhi.
3. Dispensing of Medication, Ed. E.W. Martin, Mach Publishing Co., Eastern PA.
4. Lachman Leon, "The Theory and Practice of Industrial Pharmacy, Special Indian 3rd Edition, 2009, Varghese Publishing House, Mumbai.
5. Indian Pharmacopeia (2014), British Pharmacopeia, United States Pharmacopeia & Merck Index.

HUMAN ANATOMY AND PHYSIOLOGY-I

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 3

Credits: 3

Instruction Mode: Lecture

Subject Code: PY.05.881.1.4.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To impart knowledge and understanding on the anatomy and physiology of various systems of human body.
- To impart the knowledge on the inter relationship of various organs and their functions in the human body.

Course Outcome

- The students will be gaining a thorough understanding on various physiological functions of the organs of human body.
- This knowledge will become the basic foundation for understanding of pharmacology in higher semesters.

Unit-I

Introduction: Scope of anatomy and physiology, basic terminologies (directional terms, planes, sections) and body cavities.

The cell: Definition, structure and functions of the cell and its components, transport of substances across cell membrane.

The Tissues: Definition, Classification, location, description, functions and properties of epithelial, connective, muscular and nervous tissues.

Unit-II

Osseous system: Definition, structure, composition, functions and types of bones. Anatomy of axial and appendicular skeletal system bones. Types and movements of joints.

Skeletal muscles: Gross anatomy of muscle and physiology of muscle contraction. Neuromuscular junction.

Unit-III

Haemopoietic system: Definition, composition and functions of blood. Haemopoiesis, blood groups and haemostasis. Lymphatic system: Composition, formation, circulation and functions of lymph. Structure and functions of lymph node, spleen and thymus gland.

Unit-IV

Cardiovascular system: Anatomy of heart and blood vessels, conducting system of heart, action potential, cardiac cycle, heart sounds and ECG. Circulation of blood: Pulmonary, systemic coronary and portal circulation; blood pressure and its regulation.

Unit-V

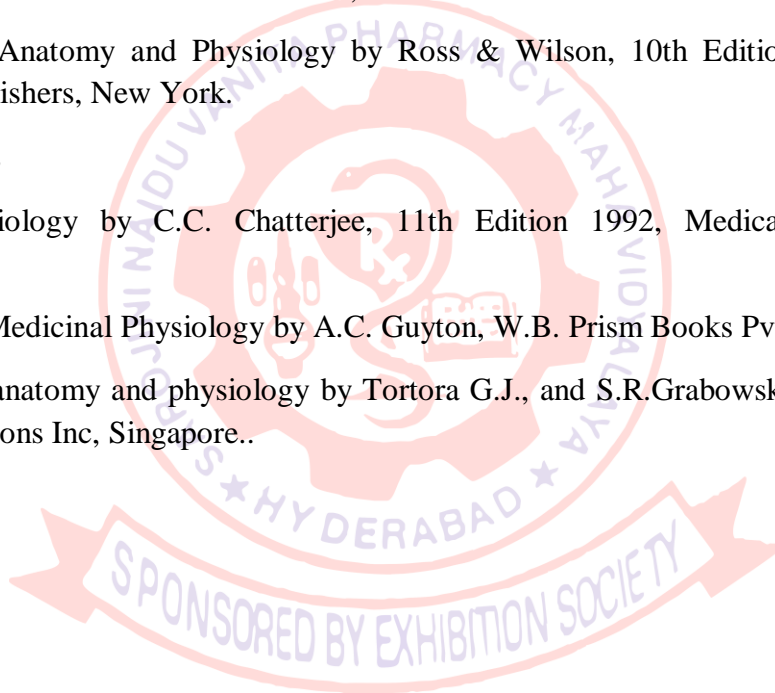
Special senses: Anatomy and physiology of eye, ear, tongue, nose. Structure and functions of skin.

Text Books

1. Thakaore B, Gandhi P, Harit RD. Elements of human anatomy physiology and health Education, 21st Edition B.S. Shah Publishers, Ahmadabad.
2. Principles of Anatomy and Physiology by Ross & Wilson, 10th Edition 2007, Churchill Living stone Publishers, New York.

Reference Books

1. Human Physiology by C.C. Chatterjee, 11th Edition 1992, Medical Allied Agency, Kolkata, India.
2. Text Book of Medicinal Physiology by A.C. Guyton, W.B. Prism Books Pvt. Ltd. Bangaluru.
3. Principles of anatomy and physiology by Tortora G.J., and S.R. Grabowski, Volume I & II, John Wiley and Sons Inc, Singapore..



MATHEMATICS

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode : Lecture

Subject Code: PY.05.881.1.5.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To provide the students with the knowledge on basic mathematical equations and their applications in pharmacy.

Course Outcome

- The students will become aware of various simple mathematical equations and their uses in pharmacy.
- The students will get a hands-on practice in solving the problems.

UNIT – I:

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

Trigonometry: Measurement of angles, Trigonometrical ratios and simple relations connecting the complimentary and supplementary angles, Negative 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, Geometrical, Partial Differentiation.

UNIT – III:

Integral Calculus: Integration considered as converse of differentiation, simple integrations, standard forms like $x dx$, $\sin(ax) dx$, $\cos(ax) dx$,. Methods of substitution (simple examples) integration by parts. Calculations of areas of standard bodies using integration.

UNIT – IV:

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

UNIT – V:

Linear and non-linear graphs; Equation of line.

Differential Equations: Definitions, order, degree of equation , equations in separable forms, Linear equations.

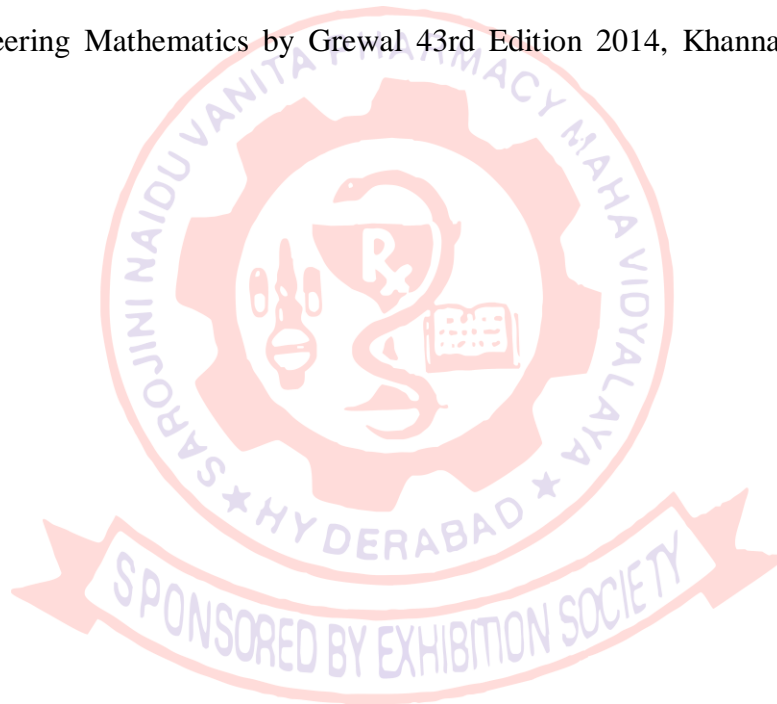
Examination: One question from each unit with internal choice.

Text Books:

1. A text book of Mathematics by N.Krishna Murthy, S .Chand series, Volume- I and II, 28th Edition 2006, S.Chand Publication, New Delhi.
2. Deferential calculus by Shanti Narayan, S.Chand Publication, New Delhi.

Reference Books:

1. Higher Engineering Mathematics by Grewal 43rd Edition 2014, Khanna Publication, New Delhi.



BIOLOGY

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.1.5.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To provide the student with basic knowledge on classification of plants, morphology and histology of plant parts.
- To provide the student with basic knowledge on animal cell, tissue and organ systems which are related to human systems.

Course Outcome

- The student will get on exposure to basic understanding on plants and their parts and this knowledge will be useful in understanding the pharmacognosy subject in higher semesters.
- The students will get an exposure and basic understanding on animal cell, tissue and organ systems which will have relation to human system.

Unit – I

Plant kingdom: classification

Plant cells: Its structure, living and non-living inclusions. Different types of plant tissues and their functions.

Histology: root, stem, barks, woods & leaf.

Unit-II

Morphology: root, stem, leaf, inflorescence, flower and fruit.

Modifications: root, stem & leaf.

Unit – III

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

Unit – IV

The study of animal cell: Cell division, difference between plant cell and animal cell, Histology of liver, kidney, skeletal muscles, smooth muscles, pancreas, intestine and endocrine glands of rabbit.

Unit – V

Morphology and Life History of Human Parasites: plasmodium, entamoeba, tapeworm, ascaris and Trypanosoma Life history of Mosquitoes and housefly as agents for spreading diseases.

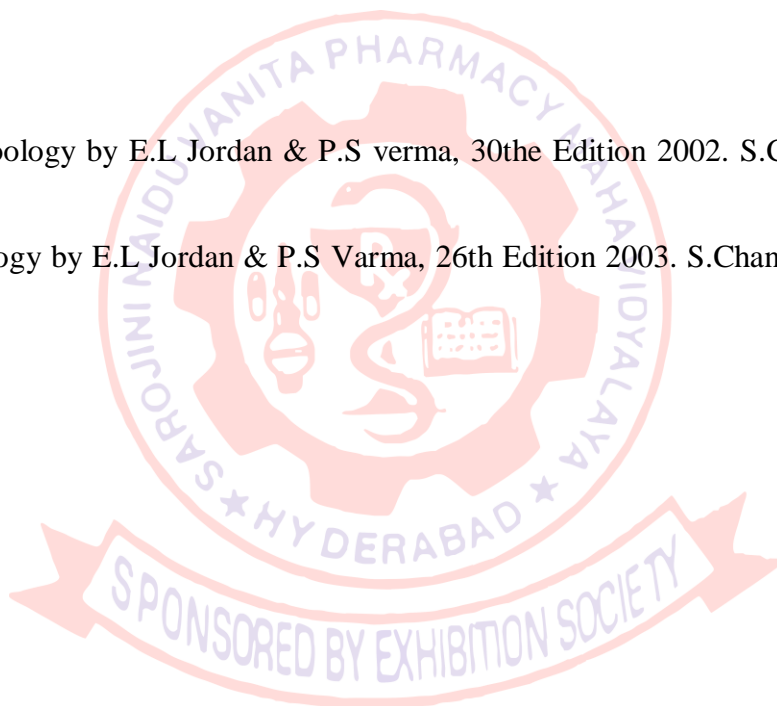
Examination: One question from each unit with internal choice.

Text books

1. A class book of botany, by A.C. Dutta, 17th Edition 2000, Oxford University, New Kolkatta.
2. A text book of biology by Vikram series
3. Taxonomy of Angiosperms by V.K Jain, 2nd Edn. 1992-93, Rastogi Publications. Meerut. India.

Reference books

1. Invertebrate zoology by E.L Jordan & P.S verma, 30th Edition 2002. S.Chand & Company Ltd, New Delhi.
2. Chordate Zoology by E.L Jordan & P.S Varma, 26th Edition 2003. S.Chand & company Ltd. New Delhi.



PHARMACEUTICAL INORGANIC CHEMISTRY - PRACTICAL

Scheme of Instruction

Total Duration: 48Hrs

Periods / Week: 4

Credits: 2

Instruction Mode: Practical

Subject Code: PY.05.881.1.6.P

Course Objectives

- To give a practical training on the preparation and assay of some of the pharmaceutical compounds studied in theory.

Course Outcome

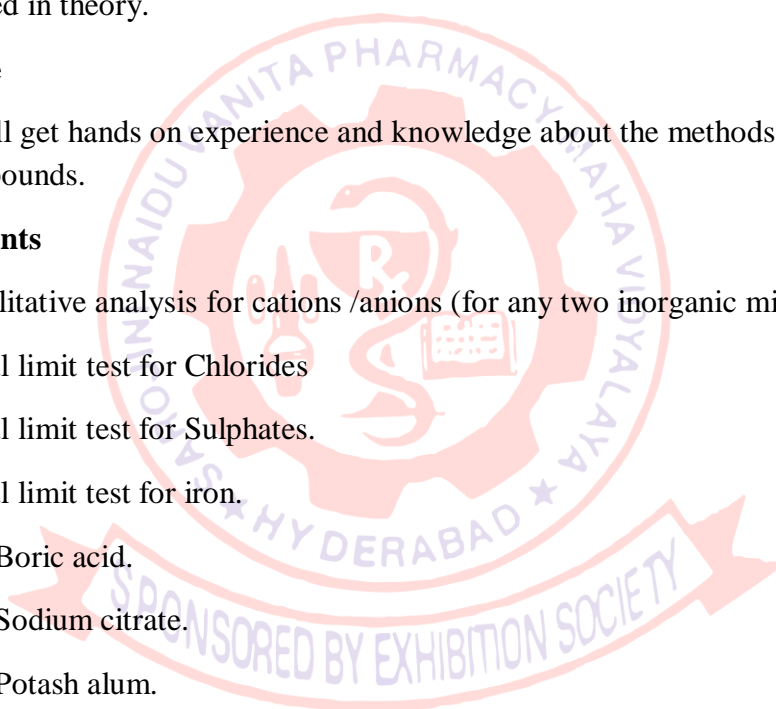
- The students will get hands on experience and knowledge about the methods of preparation and assay of the compounds.

List of Experiments

1. Systematic qualitative analysis for cations /anions (for any two inorganic mixtures)
2. Pharmacopoeial limit test for Chlorides
3. Pharmacopoeial limit test for Sulphates.
4. Pharmacopoeial limit test for iron.
5. Preparation of Boric acid.
6. Preparation of Sodium citrate.
7. Preparation of Potash alum.
8. Preparation of Ferrous sulphate.
9. Preparation of Ammonium chloride.

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. B. Subba Rao and V. Alagarsamy, Practical Pharmaceutical Inorganic Chemistry, Pharma med Press, 2009, Hyderabad.



4. G. Devala Rao, Practical Pharmaceutical Inorganic Chemistry, Birla Publications, New Delhi, 2006.
5. K. R. Mahadik and S.H Bhosale, Hand book of Practical Chemistry (Inorganic & Organic), Nirali Prakashan, Pune, 2007. 6. Indian Pharmacopoeia-2014, Controller of Publications, Delhi.



BASIC COMPUTER APPLICATIONS

Scheme of Instruction

Total Duration: 48 Hrs
Periods / Week: 4
Credits: 2
Instruction Mode: Practical
Subject Code: PY.05.881.1.7.P

Scheme of Examination

Maximum Marks: 100
Internal Exam : 30
End Semester: 70
Exam Duration : 4 Hrs

Course Objectives

- To provide hands on practice on working on the computer system for various kinds applications studied in theory

Course Outcomes

- The students will gain hands on experience on the computer system for various kinds applications studied in theory
- The students will gain hands on experience on the computer system for writing simple programs.

List of Experiments

A minimum of 25 exercises are to be conducted, as per the list given below.

1. Exercised Based on DOS commands (6)
2. Exercises based MS Word (3)
3. Exercises based on MS Excel (3)
4. Exercises based on MS Access (2)
5. Exercises based on Power Point. (2)
6. Exercises based on Information search engines,
7. Exercises based on HTML

Reference Books

1. Sanjay Saxena, A First Course Computers, Vikas Publishing House Pvt Ltd, New Delhi, 2003.
2. Sanjay Saxena, MS Office 2000 for Everyone, Vikas Publishing House Pvt Ltd, New Delhi, 2003.

HUMAN ANATOMY AND PHYSIOLOGY-I PRACTICAL

Scheme of Instruction

Total Duration: 48 Hrs
Periods / Week: 4
Credits: 2
Instruction Mode: Practical
Subject Code: PY.05.881.1.8.P

Scheme of Examination

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
Exam Duration : 4 Hrs

Course Objectives

- To train the students to study various physiology / anatomy related measurements studied in theory.
- To get a personalized exposure and knowledge on those measurements.

Course Outcome

- The students will acquire certain skills to handle and use some basic equipment.
- The students will get practical and personal experience on various kinds of experiments.

1. Study of compound microscope.
2. Study of histological slides of different tissues/organs
3. Study of various models, specimens of bones/organs
4. Determination of blood groups.
5. Determination of Hemoglobin content of blood.
6. Estimation of Bleeding Time
7. Estimation of Clotting Time
8. Determination of Total RBC count of blood.
9. Determination of Total WBC count of blood.
10. Determination of differential WBC count
11. Measurement of Blood Pressure
12. Measurement of vital Capacity
13. Estimation of Erythrocyte Sedimentation Rate (ESR).
14. Recording of human Heart Rate and Pulse Rate.
15. Study of different Family Planning methods.

Note: Discuss the disorders of various systems.

Reference Books

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

Sem-2

II SEMESTER



PHARMACEUTICAL ORGANIC CHEMISTRY – I

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.2.1.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To impart the students with basic knowledge of various classes organic compounds, their basic structure, preparation methods and physico chemical properties.
- To impart the students with knowledge on certain mechanisms of reactions and how they are applicable in synthesis of medicinal compounds.

Course Outcome

- The students will get the knowledge on various aspects of organic compounds.
- The students will get understanding on the various mechanism involved in synthesis of organic compounds.

Unit – I

Structure and Reactivity of Organic Molecules - Atomic and Molecular orbitals, Hybridization of Orbitals and Covalent bond, Bond angles, Heterolysis, Polarity of covalent bond, Polarity of Molecules, Dipole moments, Intermolecular forces, Hydrogen bond, Boiling Point, Melting Point, Solubility.

Electron displacements: Inductive effect, Electromeric effect, Mesomerism and Resonance.

General Nature of Organic Reactions: Transition state theory, Energy diagrams of reactions.

Unit – II

Aliphatic Hydrocarbons-Nomenclature, Physical properties, General Methods of Preparation and Characteristic reactions of Alkanes, Alkenes, Alkynes. Free radical reactions of Alkanes (Halogenation), Catalytic reduction and Electrophilic addition reactions: Markonikov's Addition, Anti Markonikov's Addition, Peroxide effect or Kharasch effect, Acidity of 1-Alkynes, Electrophilic addition reactions of alkynes, stability of conjugated dienes and their addition reactions.

Cycloalkanes: Nomenclature, General methods of preparation, ring size, stability, Bayer's strain theory, Sachse - Mohr theory, Puckered rings, Configuration and Conformations of Cycloalkanes.

Unit – III

Halogen and Hydroxy Compounds - Nomenclature, General Methods of preparation of Alkyl halides and Hydroxy Compounds, Relative reactivity of Alkyl halides; Nucleophilic substitution

reactions (SN 1, SN2) - Walden inversion, Elimination reactions (E 1 and E 2) - Saytzeff's rule. Nucleophilic substitution Vs Elimination. Reactions of alcohols; Oxidation of alcohols;

Ethers: Nomenclature, Properties and preparation methods. (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, Mechanism of Nucleophilic addition reactions-Aldol condensation, Reformatsky reaction, Wittig reactions. Oxidation, reduction and addition reactions of carbonyl compounds.

B) Amines: Nomenclature, primary, secondary and tertiary amines, Relative Basicity of amines, Reactions of amines, (Hofmann elimination) Hinsberg's method of separation of amines. Diazonium salts-coupling of diazonium salts.

Unit – V

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

Nomenclature, General Methods of Preparation of Carboxylic acids, Relative acidity of Carboxylic acids, structure of Carboxylate ions, effect of substituents on acidity. Nucleophilic acyl substitution, Reactions of Carboxylic acids, methods of preparation of acid chlorides, esters, amides, alcohols from carboxylic acids. Synthesis and synthetic applications of malonic ester and aceto-acetic ester.

Examination: One question from each unit with internal choice.

Text books

1. 'Organic Chemistry' by T.T.Morrison & R.Boyd. , 6th Edition 2007, Prentice Hall of India Private Limited, New Delhi.
2. A Text book of Organic Chemistry 21st Edition by Arun Bahl, B.S Bahl , S.Chand & Company, New Delhi.
3. I.L Finar, Organic Chemistry vol-I The Fundamental Principles 6th Edition, Pearson Education(Singapore) Pvt. Ltd. New Delhi.

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.

INTRODUCTION TO DOSAGE FORMS

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.2.2.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To provide the students with a basic understanding and preliminary knowledge on various types of dosage forms.

Course Outcome

- The student will get first time exposure to general methods of preparation of various dosage forms.

Unit – I

Introduction to drug and Dosage form: Definition of drug, excipient and Dosage form, Classification of dosage forms on the basis of formulation and route of administration.

Liquid preparations: Introduction, General methods of preparation, labeling, and marketed products of Aromatic waters, spirits, syrups, elixirs, suspensions, emulsions, lotions, liniments, , inhalations, throat paints, gargles, glycerin and collodions.

Unit – II

Solid dosage forms:

Tablets: Types of tablet dosage forms, advantages, disadvantages, General methods of preparation.

Capsules: Types of capsules, General methods of preparation, Advantages and disadvantages of soft and hard gelatin capsules.

Other solid dosage forms: General introduction, methods of preparation and marketed products of Powders, insufflations, dusting powders, effervescent granules, Pastilles, Lozenges, tablet triturates, pills and eutectic mixtures.

Unit – III

Semisolids: Introduction, General methods of preparation and marketed products of Ointments and their bases, creams (vanishing cream and cold cream), pastes, jellies. Suppositories and their bases, types of suppositories, Displacement values.

Unit IV

Sterile preparations:

Water: Purified water, Distilled water. Introduction to sterilization and sterility, Water for Injection (WFI), Sterile Water.

Parenteral products: Introduction, general methods of preparation and marketed products of Vials, Ampoules, Intravenous Fluids (Normal Saline, Dextrose Normal Saline, Ringer Lactate), Eye drops, Ear drops and Nasal drops.

Unit V

Incompatibilities: Introduction, Definition,

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

Examination: One question from each unit with internal choice.

Text Books

1. Bentley's Text book of Pharmaceutics, E.A. Rawlins, 8 th Edition, 1996, Bailliere Tindall, London.
2. Cooper & Gunn's dispensing for Pharmaceutical students, S.J.Carter, CBS Publishers, New Delhi.
3. Pharmaceutical Education, Harikishan Singh (History of Pharmacy in India & Related aspects), Volume- II, Vallabh Prakashan, Delhi.
4. A Textbook of professional pharmacy, N. K. Jain, S.N. Sharma, 6th Edition, 2016, Vallabh prakashan, Delhi. 5. R. M. Mehta, Dispensing Pharmacy, 3rd Edition, 2008, Vallabh Prakashan, Delhi.

Reference Books

1. Pharmaceutical dosage forms & Drug delivery systems, H.C. Ansel, 8th Edition. 2008, Lippincott Williams & Wilkins, London.
2. Cooper & Gunn's Tutorial pharmacy, S.J.Carter, CBS Publishers, New Delhi.
3. Dispensing of Medication, Ed. E.W. Martin, Mach Publishing Co., Eastern PA.
4. Lachman Leon, "The Theory and Practice of Industrial Pharmacy, Special Indian 3rd Edition, 2009, Varghese Publishing House, Mumbai.
5. Indian Pharmacopeia (2014), British Pharmacopeia, United States Pharmacopeia & Merck Index.

HUMAN ANATOMY AND PHYSIOLOGY-II

Scheme of Instruction

Total Duration: 50 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.05.881.2.3.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Course Objectives

- To impart knowledge and understanding on the anatomy and physiology of various systems of human body.
- To impart the knowledge on the inter relationship of various organs and their functions in the human body.

Course Outcome

- The students will be gaining a thorough understanding on various physiological functions of the organs of human body.
- This knowledge will become the basic foundation for understanding of pharmacology in higher semesters

Unit-I

Respiratory system: Anatomy of respiratory system, physiology of respiration, mechanisms of regulation of respiration. Lung volumes and capacities.

Unit-II

Nervous system: Introduction to neuron, synapse, ganglion and plexus. Physiology of nerve impulse, neurotransmission. Parts and functions of brain and spinal cord, reflex arc and cranial nerves. Autonomic nervous system.

Unit-III

Digestive system: Gross anatomy of alimentary canal. Physiology of digestion and process of absorption, Phases of Digestion.

Unit-IV

Endocrine system: Secretions, regulation and functions of Pituitary, thyroid, parathyroid, pancreas, gonads, pineal and adrenal glands.

Unit-V

Urinary system: Gross anatomy and functions of urinary system. Structure of nephron, physiology of urine formation and micturition.

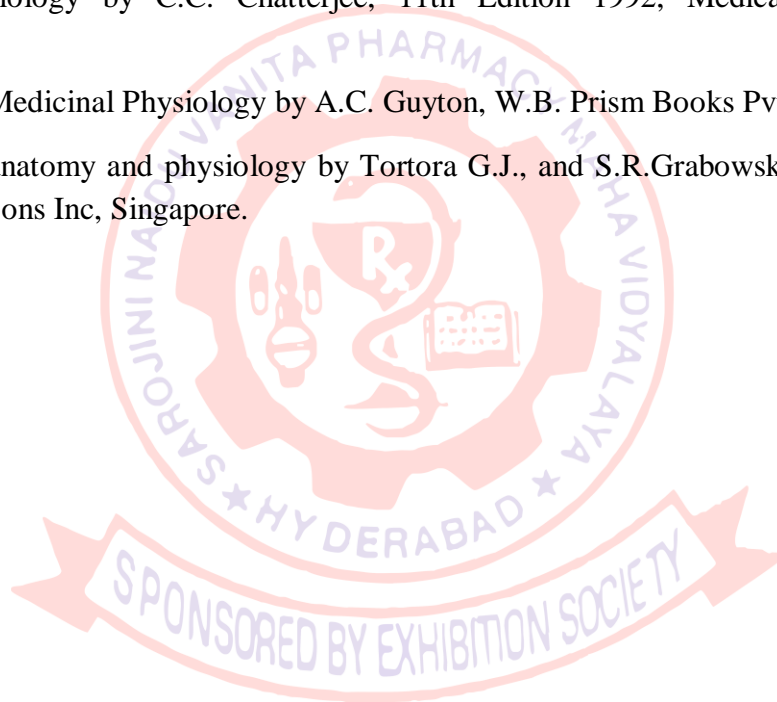
Reproductive system: Gross anatomy and functions of male and female reproductive system. Spermatogenesis, oogenesis. Menstrual cycle, pregnancy and parturition, In-vitro Fertilization methods.

Text Books

1. Thakaore B, Gandhi P, Harit RD. Elements of human anatomy physiology and health Education, 21st Edition B.S. Shah Publishers, Ahmadabad.
2. Principles of Anatomy and Physiology by Ross & Wilson, 10th Edition 2007, Churchill Living stone Publishers, New York.

Reference Books

1. Human Physiology by C.C. Chatterjee, 11th Edition 1992, Medical Allied Agency, Kolkata,India.
2. Text Book of Medicinal Physiology by A.C. Guyton, W.B. Prism Books Pvt. Ltd.Bangaluru.
3. Principles of anatomy and physiology by Tortora G.J., and S.R.Grabowski, Volume I & II , John Wiley and Sons Inc, Singapore.



BASIC COMPUTER APPLICATIONS- II

Scheme of Instruction

Total Duration	: 40 hours
Periods / Week	: 3
Credits	: 3
Instruction mode	: Lecture
Subject Code	: PY.05.881.2.4.T

Scheme of Examination

Maximum Marks	: 100
Internal Exam	: 30
End Semester	: 70
Exam Duration	: 3 Hrs

Course Objectives

- To Impart the basic knowledge about the programming languages.
- To make the students to understand and acquire knowledge about various simple computer applications in those programming languages.

Course Outcomes

- The students will get basic understanding on writing simple programs using the C and SQL
- The student will be able to apply these simple programs in other subjects also.

Unit – I

Programming In 'C' Language Introduction, History, Importance of C-Language; Structure of 'C' program, writing and executing C-program, preprocessors in C; Keywords, Identifiers, Constants, Variables, Data Types, Storage classes, Type conversion, Input and output functions in C.

Unit- II

Programming In 'C' Language

Types of operators and expressions: Introduction, Operators (Arithmetic, Logical, Assignment, Conditional and Special operators), Expressions;

Control Statements

IF, IF-ELSE statement and Nested IF statement. Break, Continue, Goto, Switch () case; Loop Control Statements – For loop, While loop, Do-while loop and nested loops.

Arrays: Definition, Initialization, One, Two dimensional Arrays, Working with Strings & Standard Functions.

Unit-III

Introduction to Database Basic Concepts – Data, Information, Records and files. Traditional file-based Systems, Limitations of traditional File Based Approach, Database Approach- Characteristics of Database Approach, Database Management System (DBMS), Advantages and

Disadvantages of DBMS. Database Development Life Cycle (DDL), Conversion of E-R model to Table.

Data Models: E-R Model, Relational Model Concepts, Codd's Rules for Relational databases, Basic Concepts of Hierarchical and Network Data Model.

Unit-IV

Structured Query Language (SQL)

SQL: Data Definition and data types, Specifying Constraints in SQL, SQL Commands (DDL, DML, DCL & TCL), Reserved Words; Comparison for Access and SQL Server;

Unit- V

Use of Computers in Education and Research:

Basics of Data analysis, Heterogeneous storage (I-Cloud, Google drive etc.), cloud computing, big data, data mining and Inventory control;

Introduction to Chems sketch, Chemdraw, Chemical Database Design & their Tools

Examination: One question from each unit with internal choice.

Text Books

1. Fundamentals of Computers by P.K. Sinha, 2nd Edition 1992, BPB Publications, New Delhi.
2. Let Us C by Yashvanth Kanetkar, 4th Edition 2002, BPB Publications, New Delhi.
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 Gottfried- Schum series 2nd Edition, TATA Mc Graw Hill Publishing Company, New Delhi.
2. Computer programming in 'C' by Y. Raja Raman , Prentice-Hall Pvt. Ltd, New Delhi.

COMMUNICATIVE ENGLISH

Scheme of Instruction

Total Duration: 40 hours
Periods / Week : 3
Credits : 3
Instruction mode : Lecture
Subject Code : PY.05.881.2.5.T

Scheme of Examination

Maximum Marks : 100
Internal Exam : 30
End Semester : 70
Exam Duration : 3 Hrs

Course Objectives

- Understanding different ways of communication and basic grammar skills.

Course Outcomes

- The students will be able to know various types of communication skills
- The students will be able to write, speak good English with proper grammar.
- The students will be able to write good documents and other reports.

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

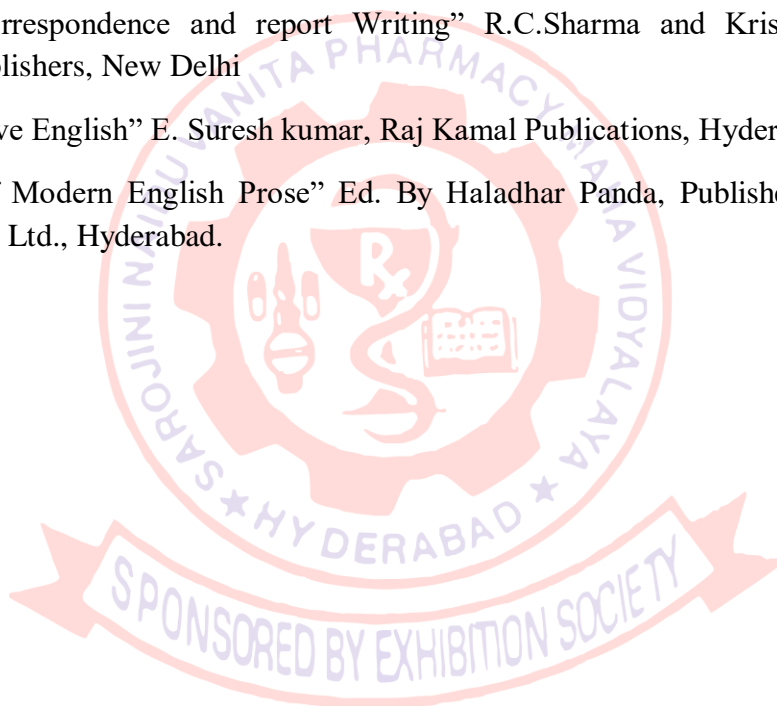
The following Four Essays from “Selections from Modern English” prose Edited by Haladhar Panda are prescribed.

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 PRACTICAL

Scheme of Instruction

Total Duration : 48 hrs
Periods / Week : 4
Credits: 2
Instruction Mode : Practical
Subject Code : PY.05.881.2.6.P

Scheme of Examination

Maximum Marks : 100
Internal Exam : 30
End Semester : 70
Exam Duration : 4Hrs

Course Objectives

- To give a practical training on the preparation of some of the pharmaceutical organic compounds studied in theory.

Course Outcome

- The students will get hands on experience and knowledge about the methods of preparation and various reaction mechanisms involved.

List of Experiments

1. Organic Chemistry laboratory techniques.
2. Experiments in simple qualitative analysis including preparation of derivatives.
3. Nitration: Preparation of Nitro phenol from Phenol.
4. Halogenation: Preparation of p-Bromo acetanilide from Acetanilide.
5. Oxidation: Preparation of Benzoic acid from toluene or Benzoyl chloride
6. Reduction: Preparation of m-Nitroaniline from m-Dinitro Benzene.
7. Esterification: Preparation of n-Butyl acetate from n-Butyl alcohol.
8. Acetylation: Preparation of Acetanilide from Aniline.
9. Etherification: Preparation of β -Naphthyl methyl ether from β -Naphthol.
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, 5 th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R.K Bansel, Laboratory Manual of Organic Chemistry, 4 th Edition, New Age International Publishers, New Delhi, 2005.

3. F.G Mann and B. C Saunders, Practical Organic Chemistry, 4 th Edition, Orient Longman, Hyderabad, 2004.

4. Vogel A.I, Elementary Practical Organic Chemistry Part – I, Small scale Preparations, 2 nd Edition, CBS Publishers & Distributors, New Delhi, 2004.



INTRODUCTION TO DOSAGE FORMS PRACTICAL

Scheme of Instruction

Total Duration: 48 hrs

Periods / Week: 4

Credits: 2

Instruction Mode: Practical

Subject Code: PY.05.881.2.7.P

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 4Hrs

Course Objectives

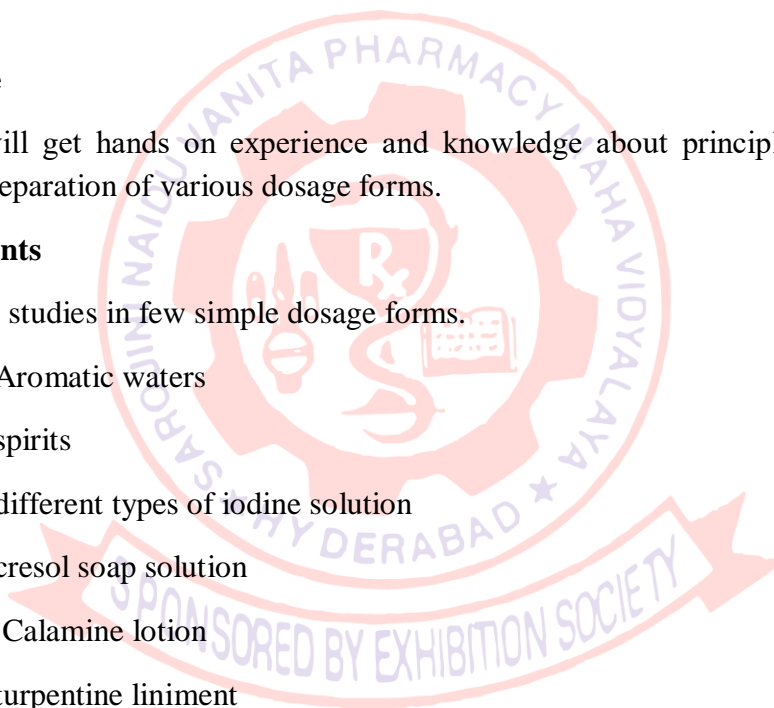
- To give a practical training on the preparation of various types of dosage forms studied in theory.

Course Outcome

- The students will get hands on experience and knowledge about principles and techniques involved in the preparation of various dosage forms.

List of Experiments

1. Incompatibility studies in few simple dosage forms.
2. Preparation of Aromatic waters
3. Preparation of spirits
4. Preparation of different types of iodine solution
5. Preparation of cresol soap solution
6. Preparation of Calamine lotion
7. Preparation of turpentine liniment
8. Preparation of gargles
9. Preparation of simple ointment
10. Preparation zinc oxide
11. Preparation of whitfield ointment
12. Preparation of non staining iodine ointment
13. Preparation of cold cream
14. Preparation of any glycerogelatine based suppository
15. Preparation of Tragacanth gel



16. Preparation of effervescent granules
17. Preparation of simple syrup
18. Preparation of ear / eye drops
19. Preparation emulsion and suspension.

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.



BASIC COMPUTER APPLICATIONS-II AND ENGLISH LANGUAGE PRACTICAL

Scheme of Instruction

Total Duration: 48 hrs

Periods / Week: 4

Credits: 2

Instruction Mode: Practical

Subject Code: PY.05.881.2.8.P

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

Exam Duration: 4Hrs

Course Objectives

- To provide hands on practice on writing simple programs based on C and SQL
- To provide hand on experience on various search engines to retrieve the data.

Course Outcomes

- The students will gain hands on experience on writing simple programs based on C and SQL which will be useful in pharmaceutical applications.
- The students will gain hands on experience and practice on usage of better communication skills.

List of Experiments

Exercises: 1 -4 Based on 'C' programming

Exercises: 5-8 Based on SQL

Exercise--9: Information Transfer- Using of Graphs, Tables and Figures for representing a data

Exercise – 10: Basics of Web Page Design; Writing and Designing for World Wide Web;

Exercise – 11: Document Authoring and Maintenance; HTML Language and Electronic Publishing;

Exercise – 12: Designing and Writing for Multimedia

Exercise – 13: Collaborations of Health care providers using Network Technologies; Intranets, Software used for remote collaboration and Tele medicine.

Text Books

1. Fundamentals of Computers by P.K. Sinha, 2nd Edition 1992, BPB Publications, New Delhi.
2. Let Us C by Yashvanth Kanetkar, 4th Edition 2002, BPB Publications, New Delhi.
3. Working in Microsoft Office By Ron Mansfield
4. SQL, PL/SQL The Programming Language of Oracle by Ivan Bayross

5. "Business Correspondence and report Writing" R.C.Sharma and Krishna Mohan, Tata McGraw Hill Publishers, New Delhi
6. "Communicative English" E. Suresh kumar, Raj Kamal Publications, Hyderabad
7. "Selections of Modern English Prose" Ed. By Haladhar Panda, Published by Universities Press (India) Pvt. Ltd., Hyderabad Reference Books 1. Programming with 'C' by Byron Gottfried- Schum series 2nd Edition, TATA Mc Graw



III SEMESTER



PHARMACEUTICAL ORGANIC CHEMISTRY - II

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.06.881.3.1.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

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 monosubstituted Benzenes. Nucleophilic substitution in Halobenzenes. Acidity and Reactions of Phenols.

Polynuclear Hydrocarbons: Naphthalene 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, Isoxazole, thiazole, diazine, pyrimidines, 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, oppenauer oxidation. MPV reduction, ArndtEistert synthesis.

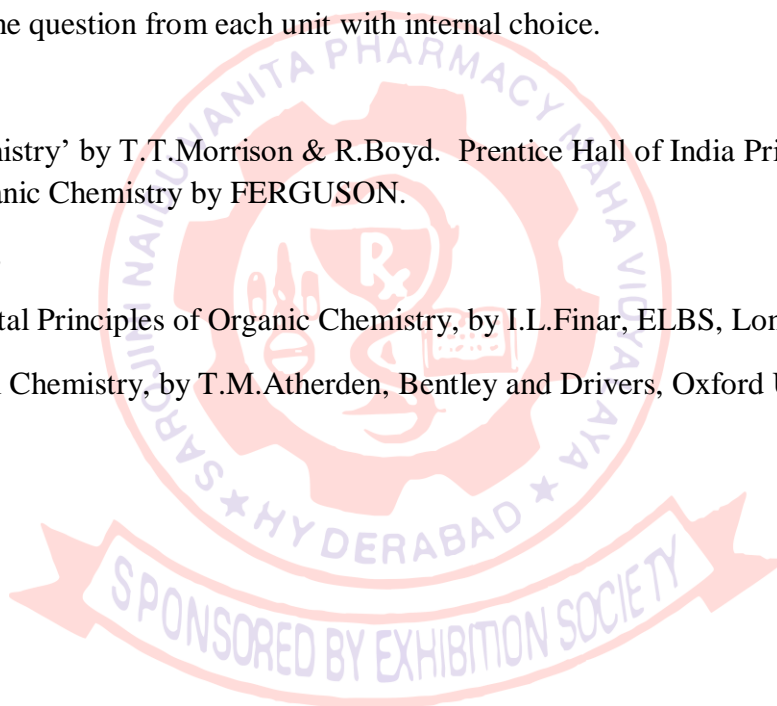
Examination: One question from each unit with internal choice.

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 ANALYSIS – I (CHEMICAL ANALYSIS)

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture Exam Duration: 3 Hrs

Subject Code: PY.06.881.3.2.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

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

Unit – I

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

Unit – II

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

Unit – III

Principles of oxidation-reduction titration's, redox, self-indicators and their use, reactions in pharmaceutical analysis precipitation. Principles of gravimetric analysis - typical methods involving precipitation, coagulation, digestion, drying procedures, co-precipitation.

Unit – IV

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

Unit – V

Stoichiometry of Ionic equations and Solutions: The Mole concept, Measuring of Moles of Elements and Compounds; Percentage Composition; Empirical and Molecular Formula;

Balancing of Chemical Equations; Some analytical problems and calculations based on mass balance, limiting reagent theoretical yield and percentage yield;

Examination: One question from each unit with internal choice.

Text Books

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

Reference Books

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



PHARMACEUTICAL. MICROBIOLOGY

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 3

Credits: 3

Instruction Mode: Lecture

Subject Code: PY.06.881.3.3.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

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.

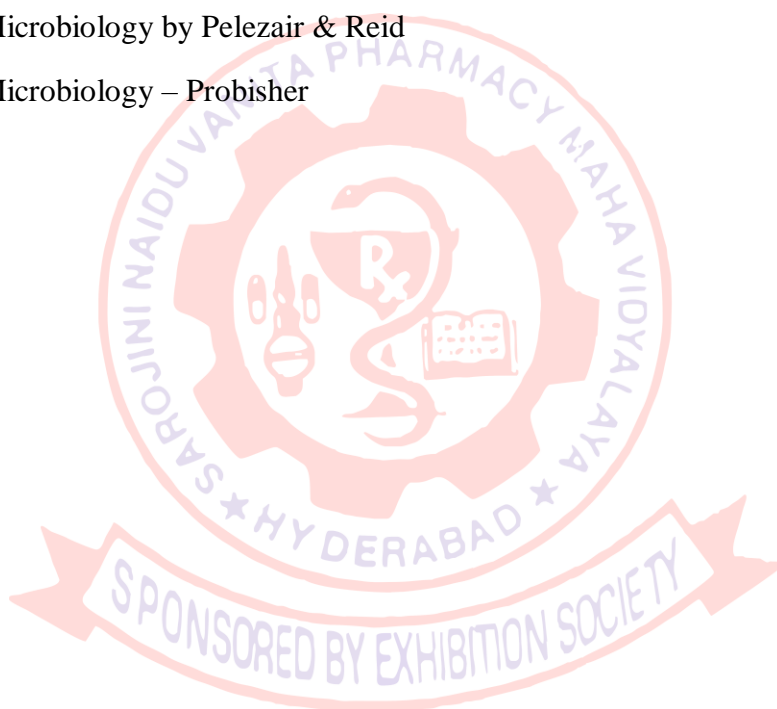
a) Tuberculosis, cholera, typhoid. b) Diphtheria, whooping cough. c) Plague, malaria, filariasis, influenza. d) Infective hepatitis, poliomyelitis.

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



PHARMACEUTICAL ENGINEERING – I

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 4

Credits: 4

Instruction Mode: Lecture

Subject Code: PY.06.881.3.4.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

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 Boltzmann 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, mono pumps, 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 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 4 th edn. 2000.
2. Handbook of Chemical Engineering by Perry.

ENVIRONMENTAL STUDIES

Scheme of Instruction

Total Duration: 40 hrs

Periods / Week: 3

Credits: 3

Instruction Mode: Lecture

Subject Code: PY.06.881.3.5.T

Scheme of Examination

Maximum Marks: 100

Internal Exam: 30

End Semester: 70

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; Indigenous 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 Benefit analysis of a Process or Method and Importance of Mass Balance; Case studies with reference 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 Assessment (EIA) Studies: Definition, Classification, Direct, Indirect and Cumulative Assessment of Impacts; Reversible, Irreversible, Negative and Positive Impacts;

o Audit and Eco Labelling (ISO: 14000); Environmental Management Plan (EMP); Design for Environment; Relevance of Command Control Paradigm in Environmental Governance; Issues involved in enforcement of environmental legislation. Public awareness. Case Studies.

Note: At least 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



PHARMACEUTICAL ORGANIC CHEMISTRY – II PRACTICALS

Scheme of Instruction

Total Duration: 48 Hrs
Periods / Week: 4
Credits: 2
Instruction Mode: Practical
Subject Code: PY.06.881.3.6.P

Scheme of Examination

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
Exam Duration: 4 Hrs

List of experiments

1. Synthesis of 2,5 – Dimethyl pyrrole from Acetyl acetone
2. Synthesis of 2,5 – Dimethyl thiophene from Acetyl acetone
3. Synthesis of 1,2,3,4-tetra hydrocarbazole from Cyclohexanone.
4. Synthesis of 4,5 – Diphenylimidazole from Benzil
5. Synthesis of 3,5 - Dimethylpyrazole from Acetylacetone
6. Synthesis of 3,4-ethyl-1-phenyl-5-pyrazole from ethylacetoacetate
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, 5 th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R.K Bansel, Laboratory Manual of Organic Chemistry, 4 th Edition, New Age International Publishers, New Delhi, 2005.
3. F.G Mann and B. C Saunders, Practical Organic Chemistry, 4 th Edition, Orient Longman, Hyderabad, 2004.
4. Vogel A.I, Elementary Practical Organic Chemistry Part – I, S

PHARMACEUTICAL ANALYSIS – I

Scheme of Instruction

Total Duration: 48 Hrs
Periods / Week: 4
Credits: 2
Instruction Mode: Practical
Subject Code: PY.06.881.3.7.P

Scheme of Examination

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
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 complexometric titration.
7. Non-aqueous 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, 4 th Edition, CBS Publications, New Delhi, 2004.
2. B.H Jeffery and R.C Denny, Vogel's Text book of Quantitative Chemical Analysis, 6 th Edition, Pearson Education, Delhi, 2004.
3. Indian Pharmacopoeia, Controller of Publications, Delhi, 1996.

PHARMACEUTICAL MICROBIOLOGY

Scheme of Instruction

Total Duration: 48 Hrs
Periods / Week: 4
Credits: 2
Instruction Mode: Practical
Subject Code: PY.06.881.3.8.P

Scheme of Examination

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
Exam Duration: 4 Hrs

List of Experiments

1. Basic equipment 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, 6 th Edition, Nirali Prakashan, Pune, 2006.
3. R.S Gaud, G.D Gupta and S.B. Gokhale, Practical Biotechnology, 2 nd 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, 3 rd Edition, Nirali Prakashan, Pune, 2005.



IV SEMESTER

SPONSORED BY EXHIBITION SOCIETY

PHARMACEUTICAL CHEMISTRY (CHEMISTRY OF NATURAL PRODUCTS)

Scheme of Instruction

Subject Code: PY.06.881.4.1.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of Examination

Sessional: 30

University Examination: 70

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 (Structure, Nomenclature 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 (Structure, 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 amino acids and their relationship to proteins and polypeptides. Chemistry of Protein Hormones: Insulin, Oxytocin, Thyroxin and anti-thyroid drugs

Unit - III

Flavanoids and Terpenoids

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

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

Unit - IV

Alkaloids - Purine and Xanthine Derivatives

Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Alkaloids. General methods of extraction, structure elucidation and Chemistry (Structure, Nomenclature and Reactions) of ephedrine, atropine, papaverine and quinine and also Caffeine and nicotinic acid.

Unit - V

Steroids Introduction, Definition, Occurrence, Classification, Isolation, General properties and Pharmaceutical importance of Sterols: color 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.

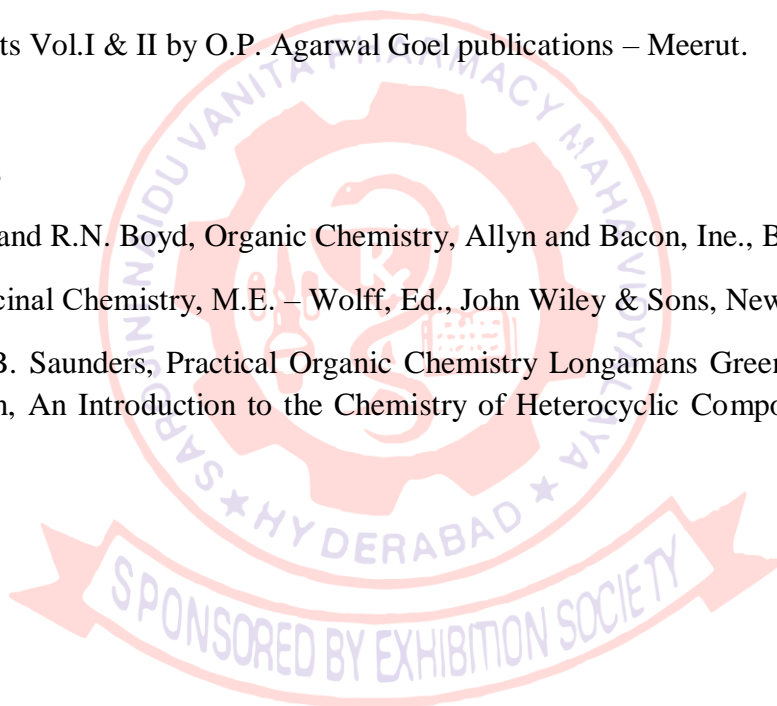
Examination: One question from each unit with internal choice.

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, Inc., Boston
2. Burger's Medicinal Chemistry, M.E. – Wolff, Ed., John Wiley & Sons, New York.
3. F.G.Mann & B. Saunders, Practical Organic Chemistry Longmans Green & Co. Ltd., U.K
4. R. M. Acheson, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience NY.



PHARMACEUTICAL ENGINEERING – II

Scheme of Instruction

Subject Code: PY.06.881.4.2.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of Examination

Sessional : 30

University Examination: 70

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, vacuum 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 diwall, 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 Banchemo, 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 Philadelphia.



PHARMACEUTICAL BIOCHEMISTRY

Scheme of Instruction

Subject Code: PY.06.881.4.3.T

Periods / Week: 4

credits:4

Nature of Exam: Theory

Scheme of Examination

Sessional: 30

Examination: 70

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 ATP 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, Anaplerotic reactions, 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 biological oxidation. Nitrogen balance, metabolism of amino acids; biosynthesis of purines, 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, Bilirubin, glucose, urea, creatinine, albumin, albumin 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, feedback 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.



BIOSTATISTICS
(PHARMACOSTATISTICS)

Scheme of Instruction

Subject Code : PY.06.881.4.4.T

Periods / Week: 3

credits:3

Nature of Exam : Theory

Scheme of Examination

Sessional : 30

Examination : 70

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 dispersion.

Unit – IV

Inference Concerning Means: Point Estimation - Interval estimation - Bayesian 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., small scale Preparations, 2 nd 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, 6 th Edition, Pearson Education, New Delhi, 2007.
7. J. March, Advanced Organic Chemistry, Reactions, mechanisms and structures, 4 th Edition, John Wiley & Sons, Singapore, 2003.



PATHOPHYSIOLOGY

Scheme of Instruction

Total duration:60 hrs

Periods / Week: 4

credits:4

Instruction Mode: Lecture

Subject Code: PY.06.881.4.5.T

Scheme of Examination

Maximum Marks: 30

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

Scope: Path physiology is the study of diseases and reactions of the body to such disease producing causes. this course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications and understanding of basic path physiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Unit- I

Basic principles of Cell injury and application:

Introduction, definitions, Homeostasis, components and Types of Feedback systems, causes of cellular injury. Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – adaptive changes (atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia) , cell swelling , Intra cellular accumulation, calcification , Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance.

Basic mechanism involved in the process of inflammation and repair:

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis

Unit II

Cardiovascular System: Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

Respiratory system: Asthma, Chronic obstructive airways diseases.

Renal system: Acute and chronic renal failure.

Unit II

Hematological Diseases: Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia

Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones

Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system: Peptic Ulcer

Unit IV

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease. □
Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout Diseases of bones and joints: Rheumatoid Arthritis, Osteoporosis, Gout

Principles of Cancer: Classification, etiology and pathogenesis of Cancer

Unit V 7

Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis

Urinary tract infections

Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea

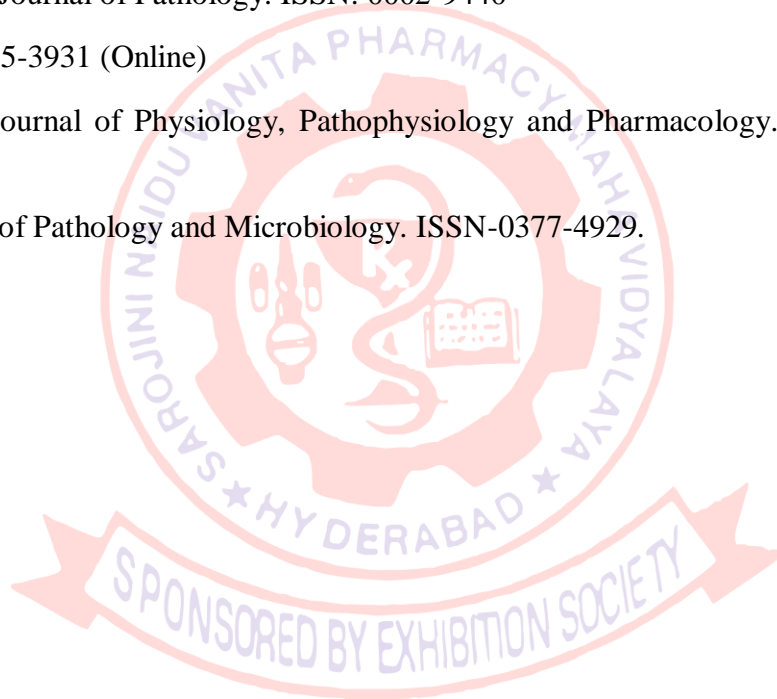
Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K.; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. College, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John. E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.

8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.



GREEN CHEMISTRY

Scheme of Instruction

Total duration:60 hrs

Periods / Week: 4

credits:4

Instruction Mode: Lecture

Subject Code: PY.06.881.4.5.T

Scheme of Examination

Maximum Marks: 30

Internal Exam: 30

End Semester: 70

Exam Duration: 3 Hrs

UNIT- I

Introduction to green chemistry

- Inspection of green chemistry: history and development
- Principles of green chemistry: description with examples
- Synthetic approaches of green chemistry: In water, solvent less, photochemical, microwave, ultrasonic, catalytic and electrochemical synthesis.

Unit-II

In water and solvent less organic reactions

- In water reactions: Principle and process involved in the Michael reaction and wurtz synthesis.
- solvent less organic synthesis
- Alternative solvents used in green chemistry strategies.

Unit-III

Microwave and ultrasonic mediated reactions

- Microwave reactions principle and process involved in the Fries rearrangement, Diels alder reaction and metal halide reduction.
- Ultrasonic reactions: principle and process involved in the Strecker and Reformatsky reactions.

Unit-IV

Catalytic and solid supported reactions

- Catalytic reactions: principle and process involved in the reactions catalyzed by metal catalysts, phase-transfer catalysts, Ionic liquids (Knoevenagel condensation) and bio catalysts (Villiger reaction)
- Solid supported reactions: principles and process.
- Alternative reagents used in green chemistry strategies.

Unit-V

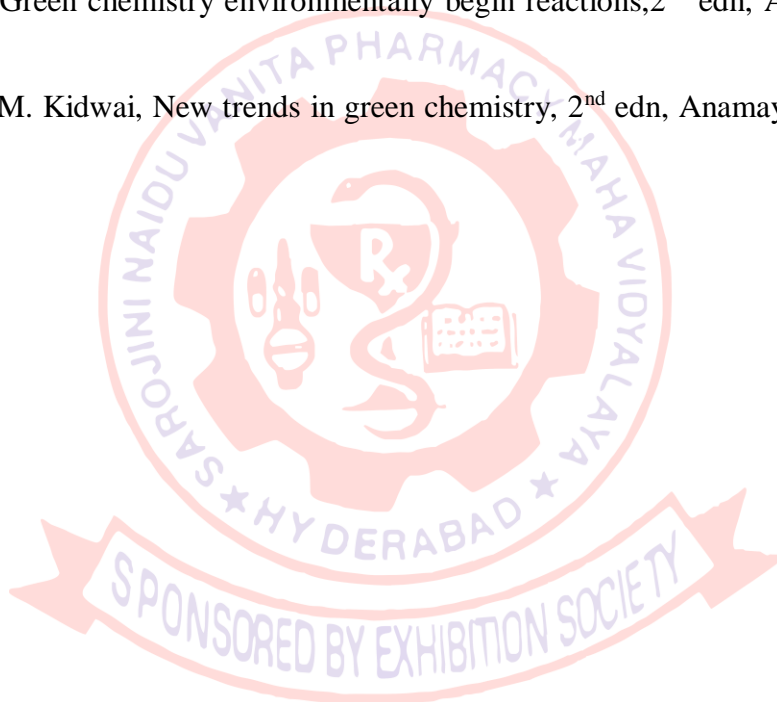
Greener synthesis of pharmaceuticals: principle and procedures of the following synthesis.

- Nicotinic Acid, Aspirin, Ibuprofen, Paracetamol.

Future trends in green chemistry

References:

1. Paul T Anastas, John Charles Warner, Green chemistry ;theory and practice. Oxford university press,1988.
2. Ahluwalia V.K. Green chemistry environmentally benign reactions, 2nd edn, Ane books Pvt Ltd, New Delhi,2012
3. Ahluwalia V.K. M. Kidwai, New trends in green chemistry, 2nd edn, Anamaya Publishers, New Delhi 2004.



PHARMACEUTICAL CHEMISTRY PRACTICALS
(CHEMISTRY OF NATURAL PRODUCTS)

Scheme of Instruction

Subject Code: PY.06.881.4.6.P

Periods / Week: 4

Credits: 2

Nature of Exam: Practicals

Scheme of Examination

Sessional: 25

Examination: 50

Exam Duration: 4Hrs

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 of triterpenoids & 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, 6 th Edition, Pearson Education, New Delhi, 2003.
2. O.P Agarwal, Organic Chemistry: Natural Product, Vol – I & II, 13 th 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, 5 th Edition, Longman Singapore publishers, Singapore, 1996.
4. M.A Iyenger, Study of Crude Drugs, 12 th Edition, Mainpal Press Ltd, Mainpal, 2004.
5. C B Powar and CB Chatwal, Biochemistry, 4 th Edition, Himalaya Publishing House, Mumbai, 2003.
6. Indian Pharmacopoeia, Volume - I & II, Controller of Publications, Delhi, 1996.
7. British pharmacopoeia, 2008.

PHARMACEUTICAL ENGINEERING – II PRACTICALS

Scheme of Instruction

Subject Code: PY.06.881.4.7.P

Periods / Week: 4

Nature of Exam: Practical

Credits: 2

Scheme of Examination

Sessional: 25

Examination: 50

Exam Duration: 4 Hrs

List of Experiments

- Determination of Reynolds number
- Determination of heat transfer coefficient by mechanisms.
- Determination of humidity of air by psychrometry & dew point method
- Verification of Stokes Law
- Efficiency of size reduction using different size reducing equipment.
- Determination particle size distribution by sieve analysis
- Rate of Drying of solids
- Purification by simple distillation.
- Drawing of symbols for unit operations
- 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.

PHARMACEUTICAL. BIOCHEMISTRY PRACTICALS

Scheme of Instruction

Subject Code: PY.06.881.4.8. P

Periods / Week: 4

Credit:2

Nature of Exam: Practicals

Scheme of Examination

Sessional: 25

Examination:50

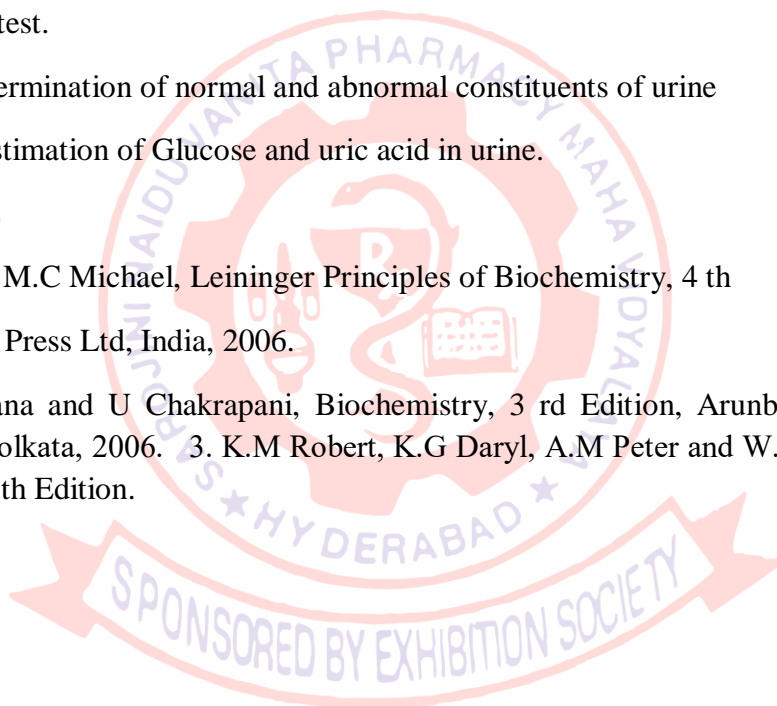
Exam Duration: 4 Hrs

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, Leininger Principles of Biochemistry, 4 th Edition, Replica Press Ltd, India, 2006.
2. U Satyanarayana and U Chakrapani, Biochemistry, 3 rd 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, 25 th Edition.



V SEMESTER



MEDICINAL CHEMISTRY – I

Scheme of Instruction

Subject Code: PY.07.881.5.1.T

Periods/week: 4

credits:4

Nature of Exam: Theory

Scheme of Examination

Sessional : 30

Examination : 70

ExamDuration: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 - (Prazosin and Atenolol)

Cholinergic drugs and Acetyl Choline esterase inhibitors - (Carbachol, Physostigmine).

Cholinergic blocking agents - (Pyridinium bromide and Dicyclomine HCl)

ganglionic blocking agents and neuromuscular blocking agents -(Mecamylamine HCl and Pentolinium Tartrate).

Skeletal muscle relaxants -Neuromuscular - (meprobamate)

Unit – III

Cardio Vascular Drugs - Anti-hypertensive drugs - (Captopril and Clonidine)

Antiarrhythmic drugs - (Verapamil, Nifedipine and Diltiazem),

Vasodilators - (Isosorbide dinitrate and Dipyridamole)

Anti- hyper lipidemic agents - (Clofibrate and Atorvastatin)

Anti-platelet drugs - (Aspirin and Ticlopidine)

Cardio tonic Agents - Synthetic analogs of cardiac glycosides

Unit – IV

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

Positive Inotropic Agents (Amrinone)

Hypoglycemic agents - (Tolbutamide and Gliclazide).

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

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

Unit – V

Anti-histaminics (H₁ & H₂)- (Diphenhydramine, Chlorpheniramine, Cetirizine, 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, 11 th Edn, Lippincott, Raven, Philadelphia, 2004.
2. W.O. Foye, Text Book of Medicinal Chemistry, 5 th edn, Lea & Febiger, Philadelphia, 2002.
3. S.N. Pandeya, Text Book of Medicinal Chemistry, 2 nd 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)

Scheme of Instruction

Subject Code: PY.07.881.5.2.T

Periods/week: 04

credits:4

Nature of Exam: Theory

Scheme of Examination

Sessional : 30

Examination: 70

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; Deflocculated 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, Specialized coating techniques and Quality Control of Tablets

Unit – IV

Parenterals and Ophthalmic 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.

Ophthalmic 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, 3 rd Edn, 1991.
2. Ansel's Pharmaceutical dosage forms and Drug delivery systems, 8 th edn, 2004, Lippincott Williams & Wilkins, USA.
3. Micheal E Aulton, Pharmaceutics – The science of dosage form design, 1 st 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, 8 th Edition, Baillere Tindill, London, 2002.
3. The Prevention of Food Adulteration Act 1954 with Rules.
4. Vijay Malik Drugs & Cosmetic Act 1940, 10 th edition.

PHYSICAL PHARMACY – I

Scheme of Instruction

Subject Code : PY.07.881.5.3.T

Periods / Week: 4

Nature of Exam: Theory

credits:4

Scheme of Examination

Sessional : 30

Examination: 70

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 Gases, Methods of Achieving Liquefaction, Vapor pressure of Liquids, Boiling Point and Heat of Vaporization including Clausius – Clapeyron 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; Differential thermal analysis and Thermogravimetric and Thermochemical Analysis;

Physical properties of drug molecules: Refractive index & Molar refraction

Unit – II

Thermodynamics

Definition 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, Definition 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 colligative 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 optimum 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 Oxidation – Reduction Potentials (Redox potentials) in pharmacy.

Catalysis: Definition of Catalysis and Catalyst; Types of Catalyst; Promoters and Inhibitors; Mechanism 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), 2 nd 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 – I

Scheme of Instruction

Subject code: **PY.07.881.5.4.T**

Periods / week: 4

Nature of exam: Theory

credits:4

Scheme of Examination

Sessional : 30

Examination: 70

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 microorganism's eggs and steps to prevent the same. Drugs deterioration by nonliving 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 Pharmacognostic study of following drugs

Carbohydrates - Agar, Tragacanth, acacia, starch, isabgol linseed, regenerated carbohydrate fibers, cellulose, alginates and tamarind; Fixed Oils, Fats and Waxes – Chaulmoogra oil, 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.

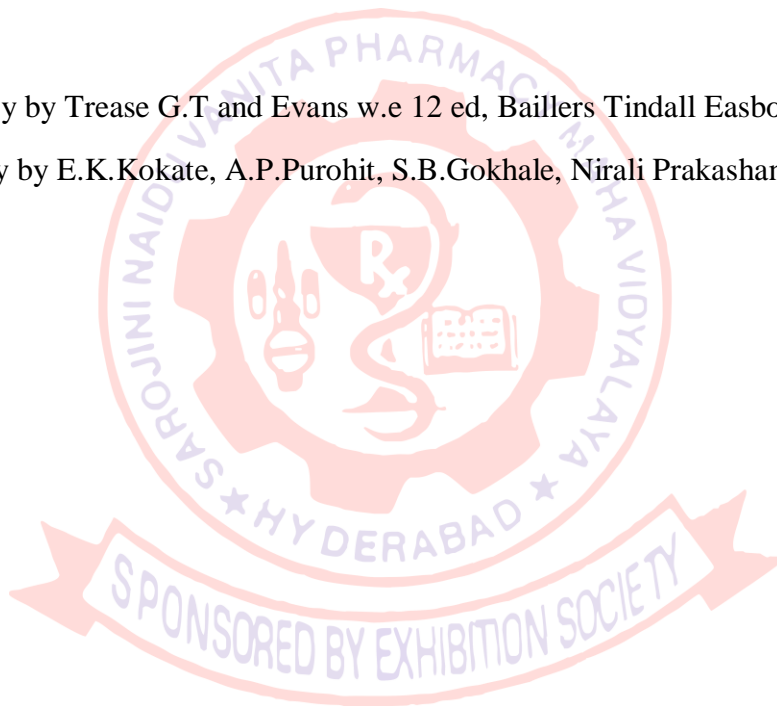
Drugs from mineral and animal origin - Kaolin, talc Bentonite, Cod liver oil, Shark liver oil, cantherides, Musk, Honey, and cochineal.

Proteins & Enzyme - Papain, Pepsin 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.



PHARMACOLOGY-I

Scheme of Instruction

Subject Code: PY.07.881.5.5.T

Periods / Week: 4

Nature of Exam: Theory

credits:4

Scheme of Examination

Sessional : 30

Examination: 70

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: Cholinceptor - Activating and cholinesterase inhibitory drugs, Cholinceptor 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-arrhythmic, Anti-hypertensives & Anti-hyperlipidemic drugs, Anti-anginal 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. Bronchodilators, Antitussives and expectorants

Unit – V

Drugs Acting on Renal and Gastro Intestinal System

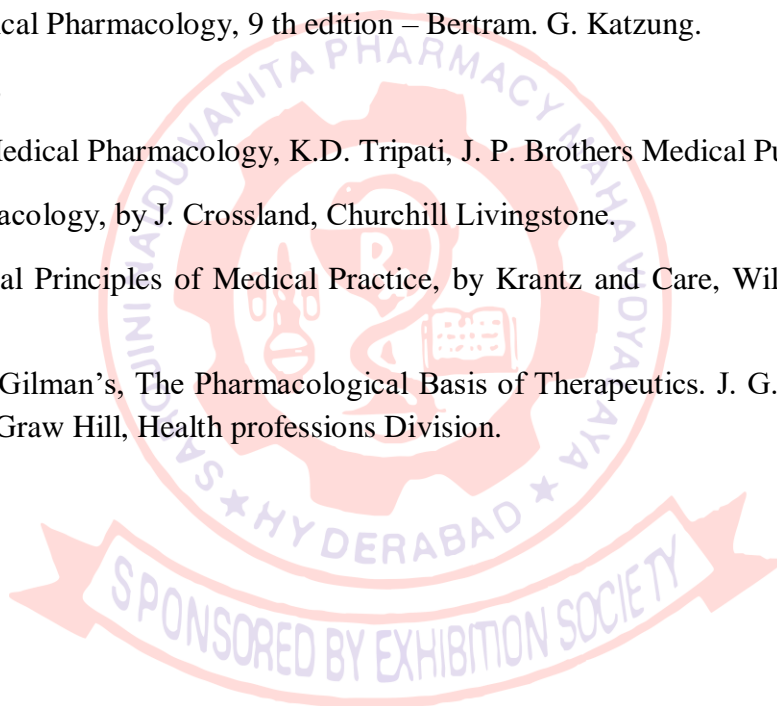
Diuretics and anti-diuretics, Water and Electrolytic Balances and pH modifying agents. Pharmacology of purgatives/laxatives, Anti-diarrhoeals, Emetics and Anti-emetics. Drugs used in peptic ulcers. Examination: One question from each unit with internal choice.

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

Reference Books

1. Essentials of Medical Pharmacology, K.D. Tripathi, 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.



MEDICINAL CHEMISTRY-I-PRACTICALS

Scheme of Instruction:

Total duration:60 hrs
Periods/week: 4
credits: 2
Instruction Mode: Practical
Subject Code: PY.07.881.5.6.P

Scheme of Examination:

Maximum Marks: 100
Internal Exam:30
End Semester: 70
Exam Duration: 4 Hrs

Course Objectives:

To provide and develop with skills in various synthetic strategies and purification methods. The course also provides hands-on training in the determination of active pharmaceutical ingredients present in the formulations. The importance of partition-coefficient and their experimental determination also included in the course.

Course Outcomes:

The students should able to design and adopt the reaction schemes for the synthesis of drugs and drug intermediate. The students should be able to understand and adopt purification techniques. The students should able to design the procedure for the estimation of API present in the formulations. The students should able to appreciate the significance of absorption of drugs in bio-phase and determine partition-coefficient (Log P) of drugs.

I) Preparation of drugs/intermediates

1. Phenytoin
2. Phenothiazine
3. Barbiturate
4. Nifedipine
5. Aspirin
6. 6-methyl uracil
7. 7-hydroxy-4-methyl-coumarin.

II) Assay of drugs

1. Phenobarbitone
2. Ibuprofen
3. Aspirin

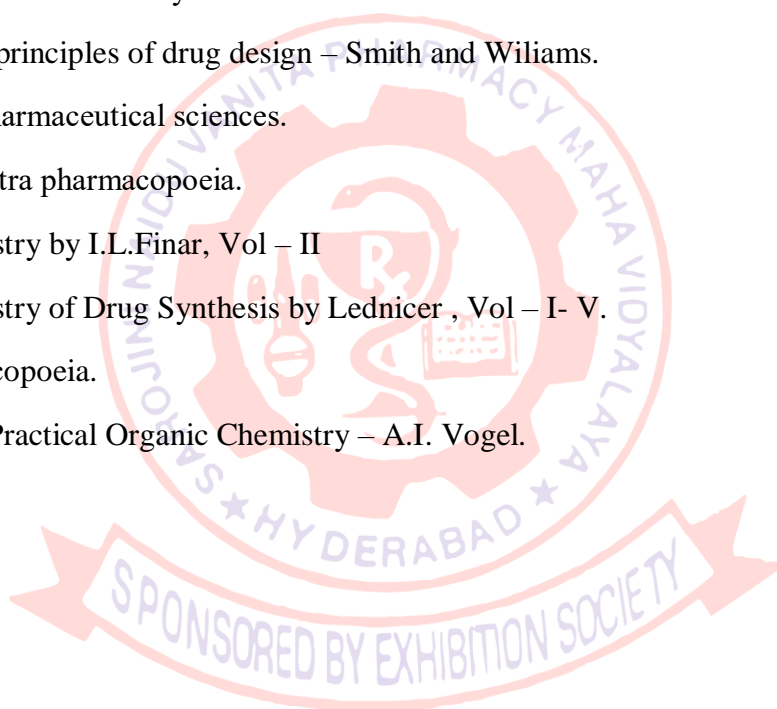
4.Furosemide

5.Ascorbic acid

III) Determination of partition co-efficient for any two drugs

Recommended Books (Latest Edition)

- 1.Wilson and Giswold's Organic Medicinal and Pharmaceutical Chemistry.
- 2.Foye's Principles of Medicinal Chemistry
- 3.Burger's Medicinal Chemistry Vol.I – IV
- 4.introduction to principles of drug design – Smith and Wiliams.
- 5.Remington's pharmaceutical sciences.
- 6.Martindale's extra pharmacopoeia.
- 7.Organic Chemistry by I.L.Finar, Vol – II
- 8.Organic Chemistry of Drug Synthesis by Lednicer , Vol – I- V.
9. Indian pharmacopoeia.
- 10.Text book of Practical Organic Chemistry – A.I. Vogel.



PHARMACEUTICAL TECHNOLOGY PRACTICALS (Pharmaceutics - II)

Scheme of Instruction:

Subject Code: PY.07.881.5.7.P

Periods/week: 4

Nature of Exam: Practical

Credits:2

Scheme of Examination:

Sessional: 25

Examination: 50

Exam Duration: 4 Hrs

List of experiments

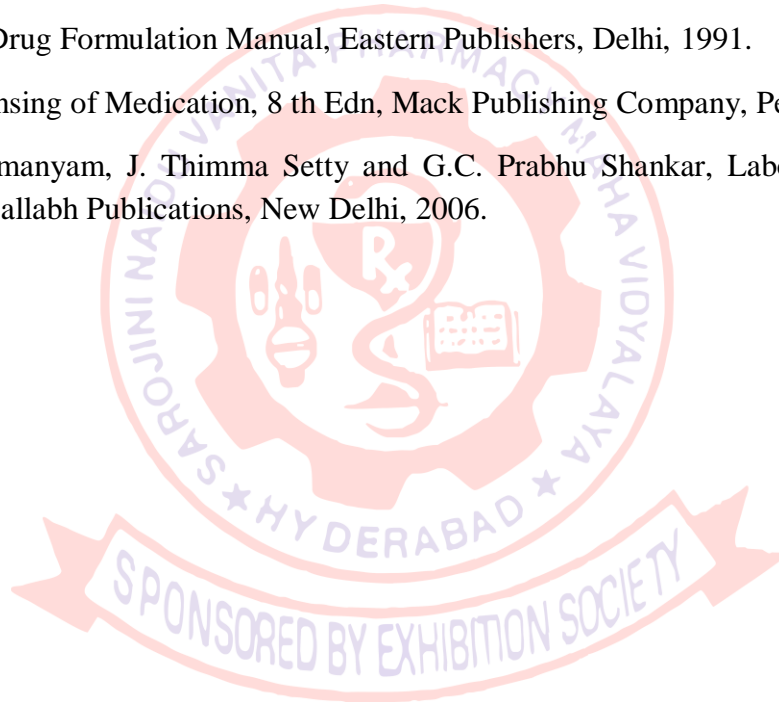
Minimum 12 experiments of the following shall be conducted.

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 diclofenac 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, 23rd 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

Scheme of Instruction:

Subject Code: PY.07.881.5.8.P

Periods/week: 4

Nature of Exam: Practical

credits:2

Scheme of Examination:

Sessional: 25

Examination: 50

Exam Duration: 4 Hrs

List of experiments

1. Detailed Microscopical study (Transverse section) of following drugs (Any four)(a) Rauwolfia (b) Cinchona (c) Senna (d) Liquorice (e) Fennel (f) Clove (g) Nuxvomica.
2. Microscopical powder characters of (Any eight)(a) Vasaka (b) Clove (c) Ephedra (d) Cinnamon (e) Liquorice (f) Digitalis (g) Quassia (h) Nuxvomica (i) Cinchona (j) Coriander (k) Senna (l) Kurchi (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 Caffeine from tea
8. Isolation of Tannic acid from Galls.
9. Estimation of cineole in eucalyptus oil.
10. Distillation of volatile oils (Demo).
11. Qualitative Microscopical powder Analysis (Binary Mixture).
12. Determination of stomatal index, palisade 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 & Phylochemistry, Career Publication, Nashik, 2008.
7. Ashistosh Kar, Pharmacognosy & Phannacobiotechnology, New Age International Publishers, New Delhi, 2003.



VI SEMESTER

PHYSICAL PHARMACY – II

Scheme of Instruction:

Subject Code: PY.07.881.6.1.T
Periods / Week: 4
Nature of Exam: Theory
credits:4

Scheme of Examination:

Sessional : 30
Examination: 7
Exam Duration: 3 Hrs

Unit – I

Solubility and Distribution Phenomena

Definitions, Expressions, Phase rule, Solvent - Solute interactions - polar solvents and semi polar solvents, Solubility of gases in liquids - effect of pressure and temperature, Salting out, Effect of chemical reactions, Solubility calculations. Solubility of liquids in liquids ideal and real solutions, Complete and partial miscibility, Influence of foreign substances, Three component systems, Dielectric constant and solubility. Solubility of solids in liquids Ideal and non ideal solutions solvation and association in solutions. Solubility of salts in water, Solubility of slightly soluble and weak electrolytes, calculating solubility of weak electrolytes as influenced by pH, Influence of solvents on the solubility of drugs, Combined effect of 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, Nernst 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.

PHARMACOLOGY – II

Scheme of Instruction:

Subject Code: PY.07.881.6.2.T
Periods/week: 04
Nature of Exam: Theory
credits:4

Scheme of Examination:

Sessional : 30
Examination: 70
Exam Duration: 3Hrs

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, Serotonin and ergot alkaloids; Vasoactive principles; Eicosanoids; Prostaglandins, Thromboxane, Leukotrienes 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 Antithyroid 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-hemophilic fraction, Heparin sodium, Chorionic gonadotropin, Corticotropin, Insulin, Oxytocin, Vasopressin and Adrenaline; Biological assay of diphtheria 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 barbiturates, 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. Tripathi., 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., Churchill Livingstone Publications
3. Basic and Clinical Pharmacology by Katzung B.G., Prentice-Hall
4. Clinical pharmacology by Lanzence

PHARMACOGNOSY-II

Scheme of Instruction:

Subject Code: PY.07.881.6.3.T
Periods / Week: 4
Nature of Exam: Theory
credits:4

Scheme of Examination:

Sessional : 30
Examination: 70
Exam Duration: 3 Hrs

Unit – I

Alkaloids

Introduction, definition, classification, isolation, tests, chemical nature and uses of Rauwolfia, Vinca, Nuxvomica, opium, ipecac, belladonna, Datura, lobelia, vasaka, kurchi, ephedra, cinchona, colchicum, aconite, punernava, 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. Caffeine 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, Cinnamon, Gaultheria oil, Artemisia, Taxus, Capsicum, 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, Churnas, 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, Elsevier 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.

FORENSIC PHARMACY
(PHARMACEUTICAL JURISPRUDENCE)

Scheme of Instruction:

Subject Code: PY.07.881.6.4.T

Periods/week: 04

Nature of Exam: Theory

credits:4

Scheme of Examination:

Sessional : 30

Examination: 70

Exam Duration: 3Hrs

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 organization, 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 Advertisements) 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. Khadatore 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.

PHARMACOTHERAPUTICS

Scheme of Instruction:

Total duration:45 hrs
Periods/week: 3
credits:3
Instruction Mode: Theory
Subject Code: PY.07.881.6.5.T

Scheme of Examination:

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
Exam Duration: 3 Hrs

Course Objectives:

To train the students in the drug therapy management of various diseases. To develop skills in students to identify and resolve any drug related problems. To appreciate the quality of medicines.

Course Outcomes:

Describe and explain the rationale for drug therapy. Summarize the therapeutic approach for management of diseases including reference to latest available evidences. Discuss the preparation of individualized therapeutic plans based on diagnosis. Describe the etiology, incidence, and prognosis associated with all disease states discussed.

UNIT-I

Introduction: Etiopathogenesis and pharmacotherapy of disease associated with the following systems.

Cardiovascular system: hypertension, congestive heart failure, angina pectoris, myocardial infraction, hyperlipidemias, electrophysiology of heart and arrhythmias.

Respiratory system: introduction to pulmonary function test, asthma, chronic obstructive pulmonary disease, drug induced pulmonary diseases.

UNIT-II

Endocrine system:

Diabetes, thyroid disease, oral contraceptives, hormone replacement therapy, osteoporosis.

Ophthalmology:

Glaucoma, conjunctivitis-viral and bacterial

Unit III

General prescribing guidelines for

- a. pediatric patients
- b. geriatric patients
- c. pregnancy and lactation

UNIT IV

INFECTIOUS DISEASES:

Guidelines for the rational use of antibiotics and surgical prophylaxis, tuberculosis, meningitis, respiratory tract infections, gastro enteritis, endocarditis, septicemia, urinary tract infections, protozoal infections, HIV and opportunistic infections, fungal infections, viral infections, gonorrhoea and syphilis.

Unit V

- Musculoskeletal etiopathogenesis and pharmacotherapy: Rheumatoid arthritis, osteoarthritis, gout, spondylitis, systemic lupus.
- Oncology: basic principles of cancer therapy, introduction to cancer chemotherapeutic agents, chemotherapy of breast cancer, leukemia, management of chemotherapy, nausea and emesis.
- Dermatology: psoriasis, scabies, eczema, impetigo.

Text books:

- 1.clinical pharmacy and therapeutics-Roger and walker. Churchill Livingstone publications.
- 2.pharmacotherapy: A pathophysiologic approach-joseph T.Dipiro et AL Appleton & La..ge.

REFERENCE BOOKS:

1. Pathologic basis of disease- Robin SL ,,W.B Saunders publications.
2. Pathology and therapeutics for pharmacists: a basis for clinical pharmacy practice-Green Harris, chapmen and hall publications.
3. Clinical pharmacy and therapeutic-Eric Therfindal, Williams and Wilkins publications.
4. Applied therapeutics: the clinical use of drugs Lloyd and koda-kimble MA
5. Avery's Drug treatment,4th edi.1997 adis international limited.

QUALITY ASSURANCE

Scheme of Instruction:

Total duration :60hrs
Periods/week: 3
credits:3
Instruction Mode: lecture
Subject Code: PY.07.881.6.5.T

Scheme of Examination:

Maximum Marks: 100
Internal Exam: 30
End Semester: 70
Exam Duration: 3 Hrs

UNIT I

Basic quality assurance system: basic concept operability control & quality assurance ,functions, sources of variation, quality assurance for raw materials, APIs, packing material & finished products(specifications, receipt, testing, sampling and certificate of analysis), production(c change control, process control, temperature, pressure, humidity control test, test for air flow pattern, microbiological monitoring) buildings & facilities(design and construction features, construction materials, lighting, air handling systems, sanitation & maintenance) equipment(construction cleaning and maintenance, calibration & handling).

UNIT II:

In process quality control: importance, inspection, IPQC tests for tablets, (weight, variation, hardness, thickness, friability, disintegration tests, and content uniformity) suspensions and emulsions and parenterals,(pH volume check clarity, content uniformity, integrity of seals and particular matter),problems encountered and trouble shooting.

UNIT III:

Quality systems: ISO quality concepts, quality management –vocabulary, ISO-9000 series-standard, guidelines and selection, requirements, so-certificate procedure iso 14000.

Audits: GMP compliance audit, definition summary, audit policy, internal and external audits, second party audits, external third party audits.

UNIT IV:

Quality control laboratory: scope, organization, personnel-desirable qualities of analyst, responsibilities of key personnel in the quality control lab, operation system and procedure in the QC lab, analytical work sheet, test methods, evaluation of test results. Safety guidelines in QC lab.

Documentation: good documentation process, route cause analysis, corrective action preventive action (CAPA), out of specifications (OOS) and out of trend(OOT).

UNIT V:

Impurity profile:

Sources of impurities, their effect on drug stability and therapeutic action determination of impurities in bulk drugs and formulation, isolation, characterization analytical methods and guidelines as per ICH and WHO for impurity and related substances, concept of purity angle, threshold and flag.

Study of compendia:

Evaluation, study of parts of compendia like prices, general notices and monographs, comparative pictures of IP, USPBP.

Books and references:

1. Gupta SC. Fundamentals of statistics 6th edition, Himalaya publishing house Hyderabad 2004.
2. Sharma PP how to practice GMPs 4th edition. Vandana publications pvt.ltd,2004.
3. Sharma PP how to practices GLP, Vandana Publications, pvt., ltd, 2000.
4. Quality assurance of pharmaceutical (a compendium of guidelines and selected material vol I & II WHO, Geneva, pharma book syndicate Hyderabad.,2000.
5. Basic test for pharmaceutical substances, WHO, Geneva, all India traveler books seller India 1990.
6. The international pharmacopoeia I&III WHO, Geneva 1981.
7. Mehra ML GMP, university book agency.
8. Subrahmanyam CVS, pharmaceutical production and management 2005/Vallab Prakash New Delhi.
9. DA berry statistical methodology in pharmaceutical sciences.
10. DH SHAH quality assurance manual BHND.

PHYSICAL PHARMACY PRACTICALS

Scheme of Instruction:

Subject Code: PY.07.881.6.6.P

Periods/Week: 6

Nature of Exam: Practical

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 Examination:

Sessional : 25

Examination: 50

Exam Duration: 4 Hrs

PHARMACOLOGY PRACTICALS

Scheme of Instruction:

Subject Code: PY.07.881.6.7.P

Periods/Week: 4

Nature of Exam: Practical

Credits:2

Scheme of Examination:

Sessional: 25

Examination: 50

Exam Duration:6Hrs

List of Experiments

1. An introduction to different equipment used in Pharmacology laboratory
2. Effect of routes of administration on the action of drugs.
3. Dose response curves of Acetyl choline.
4. Demonstration of different types of antagonism on isolated tissue preparations.
5. Effect of different electrolytes or drugs on isolated frog'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/hotplate/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, 3 rd Edition, Vallabh Prakashan, Hilton and Company, Kolkata, 2005.
2. M.N Gash, Fundamentals of Experimental Pharmacology, 3rdEdition, 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, 13 thEdition, B.S. Shah Prakashan, Ahmadabad, 2003.

PHARMACOGNOSY –II- PRACTICES

Scheme of instruction

Total Duration:60 hrs

Periods/Weeks:4

Credits:2

Instruction Mode: Practical

Subject Code: PY.07.881.6.8.P

Scheme of examination

Maximum Marks:100

Internal Exam:30

End Semester:70

Exam Duration:4hrs

EXPERIMENTS:

1. Determination of stomatal number and index.
2. Determination of vein islet number and vein termination number.
3. Determination of fiber length and width.
4. Determination of practical size of starch grains by eye piece micrometer.
5. Determination of ash values.
6. Determination of extractive values.
7. To perform preliminary phytochemical investigation or screening of crude drug.
8. Determination of moisture content of crude drug.
9. Determination of swelling index and foaming index.
10. Analysis of crude drugs by chemical tests: acacia, agar, gelatin, starch, honey and castor oil.

Recommended books:

1. W.C Evans, Trease and Evans pharmacognosy,16th edition, W.B Saunders & co.London,2009.
2. Tyler V. E Brady,L.R and Robbers, J.E pharmacognosy,9th edition, Lea and Febiger, Philadephia,1988.
3. Text book of pharmacognosy by T.E Wallis.
4. Mohammed Ali, Pharmacognosy and Phytochemistry CBS publishers & distributors, New Delhi.
5. Text book of pharmacognosy by C.K Kokate, Purohit, Cokhlar (2007).37th edi. Nirali Prakashan, New Delhi
6. Herbal drug industry by RD Choudhary (1996) 1st edi. Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH Ansari, IInd edition Birla Publications New Delhi 2007.
8. Practical pharmacognosy C.K Kokate, Purohit, Gokhale,,9,. Anatomy of crude drugs by M.A Iyengar.



VII SEMESTER

MEDICINAL CHEMISTRY-II

Scheme of instruction

Subject Code : PY.08.881.7.1.T

Periods / Week : 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination : 70

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 Fentanyl), Narcotic antagonists - (Naloxone),

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 Sulphadiazine) Antibiotics - General Classification of Antibiotics; Beta-Lactam antibiotics - (Penicillin, Ampicillin, Cloxacillin); Cephalosporins - (Cephalexin); Tetracyclines - (Chlortetracycline, Oxytetracycline), Quinolones - (Norfloxacin and Ciprofloxacin); Aminoglycosides, Macrolides, Polypeptides; Miscellaneous - (Chloramphenicol and Novobiocin).

Unit – III

Antitubercular drugs - (INH, PAS, Ethambutol); Antileprotic drugs - (Dapsone); Antifungal drugs - (Ketoconazole and Fluconazole); Antiviral drugs - (Zidovudine); Antimalarial drugs - (Chloroquine, Pyrimethamine, Primaquine); Anthelmintic drugs - (Diethyl carbamazepine 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 Amipryptiline), General Anesthetics - (Halothane, Ketamine, Enflurane), Sedative & Hypnotics - (Phenobarbitone, Glutethimide, Zolpidone), Anxiolytics - (Diazepam, Medazolam, Buspirone). Antipsychotic (Tranquilizing) agents: (Chlorpromazine, Thiothixene, Haloperidol and Pimozide) Anticonvulsants - (Phenytoin, Carbamazepine, Ethosuximide), Antiparkinsonism drugs - (Benzotropine 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 – B1 , B 2 , B 3 , B 5 , B 6 , B 12 & 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, 11 th edition, Lippincott, Raven, Philadelphia, 2004.
2. W.O. Foye, Text Book of Medicinal Chemistry, 5 th edn, Lea & Febiger, Philadelphia, 2002.
3. S.N. Pandeya, Text Book of Medicinal Chemistry, 2 nd 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

PHARMACEUTICAL ANALYSIS – II (INSTRUMENTAL METHODS OF ANALYSIS)

Scheme of instruction

Subject Code : PY.08.881.7.2.T

Periods / Week : 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination : 70

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 relationship, 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 photometry and 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. Streslake, The Athlone press of the University of London.
2. Instrumental methods of Chemical Analysis by B.K. Sharma, 23 rd 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).

DOSAGE FORMULATION DESIGN (PHARMACEUTICS – III)

Scheme of instruction

Subject Code : PY.08.881.7.3.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

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, Tableted 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. **Ocular 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, Bentley's Textbook of Pharmaceutics, 8 th 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, 2 nd 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, 2 nd edition, Marcel Dekker, USA, 1992.
6. Robert .A. Nash, Pharmaceutical Process Validation, 3 rd edition, Marcel Dekker, 2003.



BIOPHARMACEUTICS AND PHARMACOKINETICS

Scheme of instruction

Subject Code : PY.08.881.7.4.T

Periods / Week: 3

Nature of Exam: Theory

Credits:3

Scheme of examination

Sessional : 30

Examination: 70

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 (physicochemical, 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 parameters- C_{max} , t_{max} , 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 Dekker Inc., New York.
2. D.M. Brahmkar and S.B.Jaiswal, Biopharmaceutics and Pharmacokinetics - 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 BUSINESS MANAGEMENT

Scheme of instruction

Subject Code : PY.08.881.7.5.T

Periods / Week: 3

Nature of Exam: Theory

Credits:3

Scheme of examination

Sessional : 30

Examination: 70

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 modern 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, Hawthorne 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 personnel's 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.,

MEDICINAL CHEMISTRY – II PRACTICAL

Scheme of instruction

Subject Code : PY.08.881.7.6.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

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, 5 th Edition, Longman Singapore Publishers, Singapore, 1996.
2. R K Bansal, laboratory Manual of Organic Chemistry, 4 th Edition, New Age International Publishers, New Delhi, 2005.
3. AI Vogel, Elementary Practical Organic Chemistry, Part - I, Small Scale Preparations, 2 nd Edition, CBS Publishers & Distributors, New Delhi, 2004.
4. FG Mann and BC Saunders, Practical Organic Chemistry, 4 th Edition, Orient Longman, Hyderabad, 2004.
5. Indian Pharmacopoeia , Volume - I & II, Controller of Publications, Delhi,1996
6. British Pharmacopoea, 2008.

PHARMACEUTICAL ANALYSIS – II PRACTICALS
(INSTRUMENTAL METHODS OF ANALYSIS)

Scheme of instruction

Subject Code : PY.08.881.7.7.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

Exam Duration: 4 Hrs

List of Experiments

1. Experiments based on paper chromatography / TLC / Column chromatography.
2. Determination of Lambda 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 of Ions by Specific - Ion Electrode.
11. Experiments based on Electrophoresis.
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, 4 th 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.

DOSAGE FORMULATION DESIGN PRACTICALS
(PHARMACEUTICS – III)

Scheme of instruction

Subject Code : PY.08.881.7.8.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

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).



VIII SEMESTER

PHARMACEUTICAL BIO TECHNOLOGY

Scheme of instruction

Subject Code : PY.08.881.8.1.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination: 70

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 microorganisms, 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 B12 .

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. Monoclonal 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, 8 th 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, 2 nd edition, Publisher – Panima Publication Corporation, New Delhi.

PHARMACOINFORMATICS

Scheme of instruction

Subject Code : PY.08.881.8.2.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination: 70

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 databanks, GENE BANK; Libraries: Preparation of ordered cosmid libraries, bacterial artificial chromosome libraries; shotgun libraries; Homology algorithms (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; Determination 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 Receptor 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

COSMETIC TECHNOLOGY

Scheme of instruction

Subject Code : PY.08.881.8.3.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination: 70

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, 29thedn. 1989, Pharmaceutical Press, London.
2. Cosmetic Science & Technology, Volume I, II & III by Sagarin 2ndedn. John wiley & Co.



HOSPITAL & CLINICAL PHARMACY

Scheme of instruction

Subject Code: PY.08.881.8.4.T

Periods / Week: 4

Nature of Exam: Theory

Credits:4

Scheme of examination

Sessional : 30

Examination: 70

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

CURRENT GOOD MANUFACTURING PRACTICE

Scheme of instruction

Subject Code : PY.08.881.8.5.T

Periods / Week: 3; (45 hours)

Nature of Exam: Theory

Credits:3

Scheme of examination

Sessional : 30

Examination: 70

Exam Duration: 3 Hrs

Unit I

cGMP of pharmaceutical manufacturing: History, evolution and principle of cGMP , scheduled M, USFDA guidelines on pharmaceutical manufacturing. WHO recommendations for pharmaceutical products. Import and export of pharmaceutical.

Unit II

- **Pharmaceuticals Equipment:** Selections, purchase, maintenance and cleaning place, maintenance of store for raw materials.
- **Packaging of Dosage Forms:** cGMP and compiled packaging and documentations, labelling requirements of various regulated and non regulated markets for tablets, capsules, liquid orals, parenterals/injectable, semisolids.

Unit III

Introduction to ISO 9000 and 14000 series: ISO9000 and 14000 series, guidance to pharmaceutical manufacturing facilities, cGMP considerations with emphasis on documentation practices. Integration of modern management practices and principle of total quality management(TQM).

Unit IV

Calibration and validation: Introduction, definition & general principle of calibrations. Qualifications and validations, importance and scope of validations, type of validations, validation master plan. Calibration of pH meter, qualification of UV-visible spectrophotometer, **Warehousing:** general principle of analytical method validation.

Good warehousing practice, material management.

Unit V

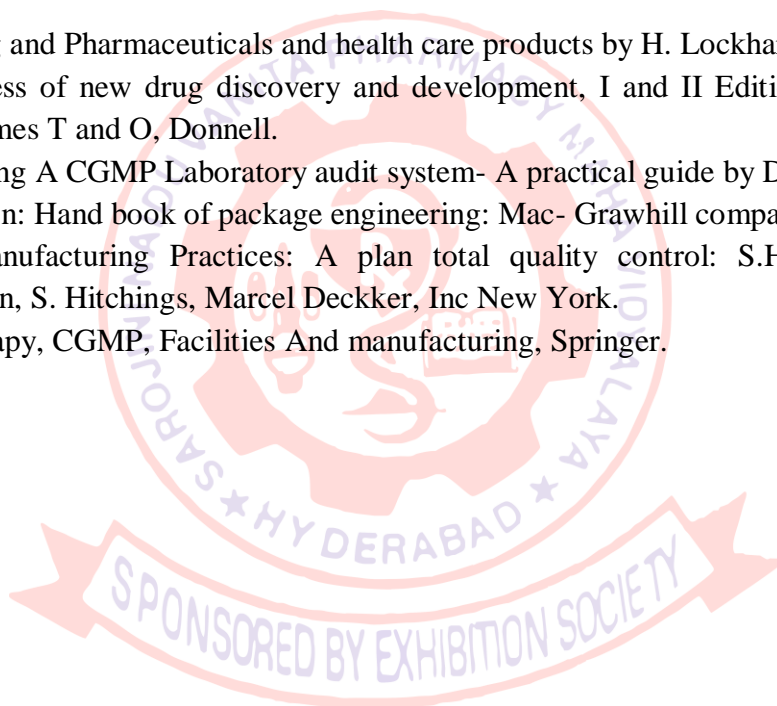
Validation: general concepts, types and approaches to validations, scope of validation and validation protocol. Relationship between calibration, validation, qualification. Validation master plan, Qualification of utilities- HVAC systems, validation of water systems. Validation of manufacturing process of sterile and non sterile products (briefly protocols and reports), Equipments qualification and cleaning validation.

Complaints: Complaints and evaluations of complaints, handling of return goods recalling and waste disposals.

Documentation in Pharmaceutical Industry: Batch formula record, master formula record, Distribution records. Common technical document and drug master file, medical devices, electronic common technical documentation.

RECOMMENDED BOOKS

1. Good manufacturing practice: Rationale and compliance by John sharp.
2. Pharmaceutical master validation plan: the ultimate guide to FDA, GMP and GLP compliance by Syed Imtiaz Haider.
3. Pharmaceuticals dosage forms: parenterals Vol-2 II edition by Kenneth EA and Leon Lachman.
4. Packaging and Pharmaceuticals and health care products by H. Lockhart, Frank A. Paine.
5. The process of new drug discovery and development, I and II Edition by Charles G . Smith, James T and O, Donnell.
6. Establishing A CGMP Laboratory audit system- A practical guide by David M . Bliesner.
7. J.F. Hanlon: Hand book of package engineering: Mac- Grawhill company.
8. Good Manufacturing Practices: A plan total quality control: S.H. Wilhing. M.M. Tuckerman, S. Hitchings, Marcel Deckker, Inc New York.
9. Cell Therapy, CGMP, Facilities And manufacturing, Springer.



PHARMCOVIGILANCE

Scheme of instruction

Subject Code : PY.08.881.8.5.T

Periods / Week: 3; (45 hours)

Nature of Exam: Theory

Credits:3

Scheme of examination

Sessional : 30

Examination: 70

Exam Duration: 3 Hrs

Unit-I

Introduction to Pharmcovigilance:

- History and development of pharmcovigilance.
- Importance of safety monitoring of medicines.
- WHO international drug monitoring programme
- Pharmcovigilance programme of India.(PvPI)

Introduction to adverse drug reactions.:

- Definitions and classifications of ADRs .
- Detection and reporting.
- Methods and casualty assessments.
- Severity and seriousness assessments.
- Productivity and preventability assessments.
- Management of adverse drug reactions.

Basic Terminology used in pharmcovigilance.

- Terminologies of adverse medication related events.\
- Regulatory Terminology
- Management of Adverse drug reactions.

Unit-II

Drug and disease classification:

- Therapeutic and chemical classification of drug.
- International classification of disease
- Daily defined doses.
- International non proprietary names of drugs.

Drug Dictionaries and coding in pharmcovigilance:

- WHO adverse reaction terminology.
- MedDRA and standardised MedDRA queries.
- WHO drug dictionary.

Information resource in pharmcovigilance:

- Basic drug information resources.
- Specialized resource of ADRs.

Establishing pharmcovigilance programme:

- Establishing in hospital.
- Establishment and operation of drug safety department in industry.
- Contact research organisation CROs.
- Establishing a national programme.

Unit-III

Vaccine safety surveillance

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

Pharmacovigilance methods

- Passive surveillance- Spontaneous reports and case series
- Stimulated reporting
- Active surveillance- Sentinel sites, drug event monitoring and registries
- Comparative observation studies- Cross sectional study, case control study and cohort study
- Targeted clinical investigations
- Communicating with regulatory Agencies, Business Partners. Healthcare facilities and Media

Unit-IV

Safety data generations:

- Preclinical phase
- Clinical phase
- Post approval phase

ICH guidelines for pharmcovigilance:

- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmcovigilance planning
- Good clinical practice in pharmcovigilance studies.

Unit-V

Pharmacogenomics of adverse drug reactions:

- Genetic related ADRs with example focussing PK parameters

Drugs Safety Evaluation in special populations

- Paediatrics
- Pregnancy and lactation
- Geriatrics

CIOMS

- CIOMS CIOMS working groups
- CIOMS form

CDSCO (India) & pharmcovigilance

- Scheduled Y or D& C Act
- Difference in India and Global pharmcovigilance requirements.

RECOMMENDED BOOKS

1. Textbook of pharmcovigilance: S K Gupta, Jaypee brothers, medical publishers.
2. Practical drug safety from A to Z by Barton Cobert, Pierre Biron, Jones and Bartlett publishers.
3. Mann's pharmcovigilance: Elizabeth B. Andrews, Nicholas, Wiley publishers
4. Stephan's Dictation of new adverse drug reaction: John Talbot, Patrick Wane, Wiley publishers.
5. An introduction to pharmcovigilance: Patrik waller, Wiley publishers
6. Cobert's Manual Of drug safety and pharmcovigilance: Barton Cobert, Jones Bartlett publishers.
7. Textbook of pharmacoepidemiology edited by Brian L .Strom, Stephan E Kimmel, Sean Hennessy, Wiley publishers.

8. Textbook of clinical pharmacy practice: Essential concepts and skills: G. Prathasarathy, Karren Nyfort Hansen, Milap C. Nahata.
9. National formulary of India
10. Textbook of medicine by Yashpal Munjal.
11. <http://www.whoumc.org/dynpage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297>
12. <http://www.ich.org/>
13. <http://www.cioms.ch/>
14. <http://cdsco.nic.in/>
15. http://www.who.int/vaccine_safety/en/
16. http://www.ipc.org.gov.in/PvPI/pv_home.html
17. Textbook of pharmcovigilance: concept and practice GP Mohanta and PK Manna.



PHARMACEUTICAL BIO TECHNOLOGY

Scheme of instruction

Subject Code : PY.08.881.8.6.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

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, 6 th Edition, Nirali Prakashan, Pune, 2006.
3. R.S Gaud, G.D Gupta and S.B. Gokhale, Practical Biotechnology, 2 nd Edition, Nirali Prakashan, Pune, 2004.
4. Vinita Kale and Kishore Bhusar, Practical Microbiology Principles and Techniques, Himalaya Publishing House, Hyderabad, 2005.

PHARMACOINFORMATICS PRACTICALS

Scheme of instruction

Subject Code : PY.08.881.8.7.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

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 - Searching the 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 DataBanks – Practical Approaches, Oxford University Press, New Delhi, 2006.
4. WD Mount, Bioinformatics – Sequence and Genome Analysis, 2 nd Edition, CBS. Publishers & Distributors, New Delhi, 2005.
5. I Bayrogs, SQL / PL/ SQL/ - The Programming Language of Oracle, 3 rd Edition, BPB Publication, New Delhi, 2006.

6. DC Jamison, Perl Programming for Bioinformatics & Biologists, John Wiley & Sons Inc, New Delhi, 2004.

7. <http://blast.ncbi.nlm.nih.gov/> blast. Csi. <http://www.ebi.ac.uk/>.



COSMETIC TECHNOLOGY

Scheme of instruction

Subject Code : PY.08.881.8.8.P

Periods / Week: 4

Nature of Exam: Practical

Credits:2

Scheme of examination

Sessional : 25

Examination: 50

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
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 Mounq, Practical Cosmetic Science, Milh & Boon Ltd, London,