G.B. TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

For

Session 2013-14 (1st Year)

Bachelor of Pharmacy

STUDY & EVALUATION SCHEME (B.Pharm. Course) FROM 2013-2014

SEMESTER-I

S. No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total	Credit
			L	P	Sessional				ESE		
					CT	TA	EXAM	TOTAL			
	THEORY										
1	BOP-111	Pharmaceutical Chemistry-I(Inorg.Chem.)	3	0	5	5	20	30	70	100	4
2	BOP-112	Pharmaceutics-I(Gen.Pharm.)	3	0	5	5	20	30	70	100	4
3	BOP-113	Anatomy, Physiology and Pathophysiology -I	3	0	5	5	20	30	70	100	4
4	BOP-114	Pharmaceutical Analysis-I	3	0	5	5	20	30	70	100	4
5	BOP-115	Computer Fundamentals	3	0	5	5	20	30	70	100	4
	PRACTICAL/PROJECT										
6	BOP-111P	Pharmaceutical Chemistry-I (Inorg.Chem.)Practical	0	4	-	-	-	30	70	100	4
7	BOP-112P	Pharmaceutics-I(Gen.Pharm.) Practical	0	4	-	-	-	30	70	100	4
8	BOP-113P	Anatomy, Physiology and Patho physiology-I Project	0	2	-	-	-	-	-	100	2
9	BOP-114P	Pharmaceutical Analysis-I Practical	0	4	-	-	-	30	70	100	4
10	BOP-115P	Computer Fundamentals Practical	0	4	-	-	-	30	70	100	4
		TOTAL	15	18						1000	38

SEMESTER-II

S. No.	Course Code	Subject	Periods		Evaluation Scheme					Subject Total	Credit
			L	P	Sessional				ESE		
					CT	TA	EXAM	TOTAL			
	THEORY										
1	BOP-121	Pharmaceutical Chemistry-II(Org.Chem.)	3	0	5	5	20	30	70	100	4
2	BOP-122	Pharmaceutical Chemistry-III(Phy. Chem.)	3	0	5	5	20	30	70	100	4
3	BOP-123	Anatomy, Physiology and Pathophysiology -II	3	0	5	5	20	30	70	100	4
4	BOP-124	Pharmacognosy-I	3	0	5	5	20	30	70	100	4
5	BOP-125	Pharmaceutical Mathematics & Biostatistics	3	0	5	5	20	30	70	100	4
PRACTICAL/PROJECT											
6	BOP-121P	Pharmaceutical Chemistry-II(Org.Chem.)Practical	0	4	-	-	-	30	70	100	4
7	BOP-122P	Pharmaceutical Chemistry-III(Phy. Chem.)Practical	0	4	-	-	-	30	70	100	4
8	BOP-123P	Anatomy, Physiology and Pathophysiology -II Practical	0	4	-	-	-	30	70	100	4
9	BOP-124P	Pharmacognosy-I Practical	0	4	-	-	-	30	70	100	4
10	BOP-125P	Pharmaceutical Biostatistics Project	0	2	-	-	-	-	-	100	2
		TOTAL	15	18						1000	38

I^st Semester

BOP-111

PHARMACEUTICALCHEMISTRY-I
(INORGANIC PHARMACEUTICAL CHEMISTRY)

An outline of methods of preparation, tests of identification and special tests (if any), of the individually mentioned inorganic pharmaceuticals.

Unit-I

Sources of impurities & their control.

Limit tests for iron, arsenic, lead, heavy metals, chloride & sulphate.

Pharmaceutical aids and necessities: Pharmaceutically acceptable glass,

Water (Purified water, Water for injection, Sterile water for injection)

Acids and bases (Sodium hydroxide, Phosphoric acid).

Unit-II

Topical Agents: Protectives (Calamine, Titanium dioxide, Talc, Kaolin),

Astringents (Zinc sulphate, Alums),

Anti-infectives (Boric acid, Hydrogen peroxide, Iodine, Povidone-Iodine, Potassium permanganate, Silver nitrate).

Dental Products: Dentifrices, Anti-caries agents (Sodium fluoride).

Gasesand Vapors: Inhalants (Oxygen), Anesthetics (Nitrous oxide).

Unit-III

Gastrointestinal Agents: Acidifying agents (Dilute hydrochloric acid),

Antacids (Bismuth sub-carbonate, Aluminium hydroxide, Calcium carbonate, Magnesium hydroxide, Magnesium oxide{ light and heavy}, Magnesium carbonate{ light and heavy}, Combination antacids.

Cathartics (Disodium hydrogen phosphate, Magnesium sulphate).

Protective and Adsorbents (Activated charcoal, Aluminium sulphate).

Miscellaneous Agents: Expectorants (Ammonium chloride, Potassium iodide),

Antioxidants (Sodium metabisulphite).

Unit-IV

Major Intra and Extracellular Electrolytes: Physiological ions, Electrolytes used for replacement therapy (Sodium chloride, Potassium chloride, Calcium gluconate, Calcium lactate, Magnesium chloride), Physiological acid-base balance (Sodium dihydrogen phosphate, Sodium acetate, Sodium bicarbonate), Combination therapy including ORS.

Essential and Trace Elements: Iron and haematinics (Ferrous fumarate, Ferrous gluconate, Ferrous sulphate, Ferric ammonium citrate).

Mineral supplements (Cu, Zn, Cr, Mn, I).

Unit-V

Inorganic Radio-Pharmaceuticals: Radioactivity, Units of radioactivity & radiation dosimetry, Measurement of radioactivity, Hazards and precautions in handling of radiopharmaceuticals, Clinical applications of radiopharmaceuticals.

Co-ordination Compounds and Complexation: Co-ordination theory, Chelates and their pharmaceutical importance, Poison antidotes (Sodium thiosulphate), Novel applications of metals in pharmacy.

BOP-111P

PHARMACEUTICAL CHEMISTRY-I PRACTICAL (INORGANIC PHARMACEUTICAL CHEMISTRY)

Suggested list of practicals is as follows-

1. To perform limit test of chloride, sulphate, iron, heavy metal and arsenic in the given sample.
2. Identification tests for acidic and basic radicals.
3. Preparation of following compounds-

   Boric acid

   Magnesium sulphate

   Heavy magnesium carbonate

   CalciumCarbonate

   Alum

   Zinc sulphate.

BOOKS RECOMMENDED:

1. Pharmacopoeia of India, 1996 Edition.
2. Block, J.H. Roche, E., Soine, T. and Wilson, C., "Inorganic, Medicinal & Pharmaceutical Chemistry", Lea & Febiger.
3. Atherden L.M., "Bentley and Driver's Text Book of Pharmaceutical Chemistry", Oxford University Press.
4. Miessler, G.L. and Tarr, D.A. "Inorganic Chemistry", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Svehla, G. and Sivasankar, B. "Vogel's Qualitative Inorganic Analysis", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Rao, K.S. and Suresh, C.V. "Pharmaceutical Inorganic Chemistry", PharmaMed Press.
7. Chenchu Lakshmi, N.V. "Pharmaceutical Inorganic Chemistry: Theory and Practice", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

BOP-112

PHARMACEUTICS-I
(GENERAL PHARMACY)

Unit-I

History of Pharmacy and Pharmacopoeia: Origin & development of pharmacy, scope of pharmacy, introduction to Pharmacopoeias - IP, BP, USP & International Pharmacopoeia. Introduction to National Formularies and Extra Pharmacopoeia. Typical parts of a monograph of Indian pharmacopoeia. An introduction to contents of the IP.

Unit-II

Prescription: Definition, types of prescription, handling of prescription, legality of prescription and specific Latin terms used in modern day prescription (sos, od, bd, tid, qid)

Pharmaceutical Additives: Coloring, flavoring & sweetening agents, Co-solvents, preservatives & their applications.

Unit-III: Pharmaceutical calculations:

Posology, calculation of doses for infants; Enlarging and reducing recipes, percentage solutions, alligation method, alcohol dilution, proof spirit , basic concept of isotonicity. Weights and measures, weighing of solids and measurement of liquids.

Unit-IV:

Introduction to Pharmaceutical Dosage Forms: Classification, Formulation methods of powders, mixtures and syrups and elixirs.

Definitions: Solutions, **s**pirits, infusions, paints, elixirs, mouth washes, gargles, lotions, liniments, pastes, ointments, creams, inhalations, dusting powders and lozenges.

Unit-V

Size Reduction: Definition, principles and laws governing size reduction, factors affecting size reduction. Study of hammer mill, ball mill and fluid energy mill.

Introduction to sieving methods, laws & factors affecting energy requirements for size reduction, different methods of size reduction.

Mixing: Theory of mixing, solid-solid, solid-liquid & liquid-liquid mixing equipments.

BOP-112P

PHARMACEUTICS-I (GENERAL PHARMACY) PRACTICAL

I: Preparation of following classes of Pharmaceutical dosage forms (involving the use of calculations in metrology) as official in IP, BP, USP/NF.

a) Aromatic Waters

1. Chloroform Water BP
2. Concentrated Peppermint Water BP
3. Rose Water NF

b) Mixtures

1. Chalk Mixture, Paediatric BP
2. Light Magnesium Carbonate and Kaolin Mixture

c) Syrups

1. Simple Syrup BP/USP/IP
2. Ferrous Sulphate Syrup USP

d) Powders

1. ORS Powder IP
2. Absorbable Dusting Powder USP/N
3. Effervescent Compound Powder (BPC)

II. Study of the role of pharmaceutical additives in formulations

a. Colouring agent: 1. Compound Sodium Chloride Mouthwash BP
2. Phenol Gargle BPC

b. Flavouring agent: 1. Orange Tincture IP
2. Potassium Citrate Mixture BP

c. Sweetening agents: 1. Simple Elixir IP

d. Cosolvents: 1. Camphor Water IP
2. Compound Iodine Throat Paint IP(Mandl's Paint)

e. Preservatives: 1. Zinc Sulphate and Zinc Chloride Mouthwash BPC
2. Calamine Lotion

f. Surfactants: 1. Cresol with Soap Solution IP
2. Turpentine Liniment BP

III: Experiments to illustrate principles of size reduction using Ball Mill.

Effect of size of balls, number of balls and time on the efficiency of ball mill.

IV: Experiments to illustrate mixing efficiency. Solid-Solid mixing.

BOOKS RECOMMENDED:

1. Pharmacopoeia of India, The Controller of Publications, Delhi.
2. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
3. Carter S.J., "Cooper and Gunn's Tutorial Pharmacy", CBS Publishers, Delhi.
4. Rawlins E.A., "Bentley's Text Book of Pharmaceutics", ELBS Bailliere Tyndall.
5. LachmanL, Liberman H.A and Kanig J.L., "Theory and Practice of Industrial Pharmacy", Lea & Febiger.
6. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, New Delhi.
7. Aulton, M.E, Text Book of Pharmaceutics, Vol., I & II. Churchill Livingstone.
8. United States Pharmacopoeia (National Formulary).
9. Remington – "The Science and Practice OfPharmacy" Vol. I & II. Mack Publishing Co., Pennsylvania.
10. Jain N.K., Modern Dispensing Pharmacy, 2nd Ed.

BOP-113

ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY- I

Unit-I

a. Introduction to human body & organization of human body.

b. Functional & structural characteristics of cell.

c. Detailed structure of cell membrane & physiology of transport process.

Structural & functional characteristics of tissues- epithelial, connective, muscle and nerve.

Unit-II

Skeletal system: Structure, composition & functions of skeleton. Classification of joints, types of movements of Joints.

Muscular System: Anatomy & physiology of skeletal & smooth muscle, energy metabolism, types of muscle contraction, muscle tone.

Unit-III

Demography and Family Planning, Medical termination of pregnancy.

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

Unit-IV

Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell), and skin (superficial receptors).

Unit-V

Communicable Diseases: Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelities, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy).

BOP-113P

ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY -I PROJECT

1. Preparation of charts/ models of the following :
    A. Joints
    B. Sense organs (eye, ear, taste buds, skin, nose)
    C. Resuscitation methods
    D. Malaria life cycle
    E. Neurotransmission

F. Structure of cell
G. Transport across cell membrane
H. Mechanism of muscle contraction
I. Human Skeleton
J. Structure of neuron

2. Preparation of charts/ models on selected topics from the course content.

BOOKS RECOMMENDED:

1. Marieb, E.N. "Human Anatomy and Physiology", Benzamin Cummings (Pearson Education Inc.).
2. Park, K. "Preventive and Social Medicine", Banarsidas Bhanot.
3. Seeley, R.R., Stephens, T.D. and Tate, P. "Essentials of Anatomy and Physiology", McGraw-Hill.
4. Tortora GJ, &Anagnodokos NP "Principles of Anatomy & Physiology", Harper & Row Publishers, New Delhi.
5. Ross & Wilson "Anatomy & Physiology in Health & Illness", Churchill Livingstone.
6. Chatterjee C.C. "Human Physiology", Medical Allied Agency, Calcutta.
7. Parmar N.S. "Health Education & Community Pharmacy" CBS Publishers, Delhi.
8. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.
9. Dandiya, P.C., Zafer, Z.Y.K., and Zafer, A. "Health Education and Community Pharmacy", Vallabh Prakashan.

BOP-114

PHARMACEUTICAL ANALYSIS-I

Unit-I

Significance of quantitative analysis in quality control different techniques ofanalysis, preliminaries and definitions, precision and accuracy.Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

Unit-II

Acid Base Titrations: Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson- Hasselbach equation, buffer solution, neutralization curves, acid base indicators, theory of indicators, choice of indicators, mixed indicators, polyprotic system.

Unit-III:

Oxidation reduction Titrations: Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate.

Unit-IV:

Precipitation Titrations: Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility ofprecipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate indicators, Gaylussac method, Mohr's method, Volhard's method and Fajan's method.

Unit-V

Gravimetric Analysis: Precipitation techniques, solubility products, the colloidal state, supersaturation, coprecipitation, post-precipitation, digestion, washingof theprecipitate, filtration, filter papers and crucibles, Ignition, thermogravimetric curves, specific examples like barium as barium sulphate, aluminium as aluminium oxide, organic precipitants.

BOP-114P

PHARMACEUTICAL ANALYSIS- I PRACTICAL

The students should be introduced to the main analytical tools through demonstration. They should have a clear understanding of a typical analytical balance, the requirements of a good balance, weights, care &use of balance, methods of weighing, and errors in weighing. The students should also be acquainted with the general apparatus requiring various analytical procedures.

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. Acid Base Titrations: Preparation and Standardization of acids and bases, some exercises related with determination ofacids and bases separately or in mixture form, some official assay procedures, e.g. boric acid, should also be covered.
3. Oxidation Reduction Titrations**:** Preparation & standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate etc. Some exercises related to determinations of oxidizing & reducing agents. Exercises involving potassium iodate, potassium bromate, iodine solution and ceric ammonium sulphate.
4. Precipitation Titrations: Preparation and standardization oftitrants like silver nitrateand Ammonium thiocyanate, titrations according to Mohr's, Volhard's and Fajan's methods.
5. Gravimetric Analysis: Preparation of Gooch crucible for filtration and use of sintered glass crucible. Determination of water of hydration, some exercise related to gravimetric analysis should be covered.

BOOKS RECOMMENDED:

1. Mendhanm J, Denny R.C., Barnes J.D.,Thomas M, Jeffery G.H., "Vogel's Textbook of QuantitativeChemical Analysis", Pearson Education Asia.
2. Conners K.A., "A Text book of Pharmaceutical Analysis", Wiley Inter-science.
3. Beckett, A.H., and Stenlake, J.B., Practical Pharmaceutical Chemistry, Vol. I&II. The Atherden Press of the University of London.
4. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
5. Alexeyev V. "Quantitative Analysis". CBS Publishers & Distributors.
6. The Pharmacopoeia of India.

BOP-115

COMPUTER FUNDAMENTALS

Unit-I

Definition and Overview of Computer, Computer classification, Computer organization, Computer code, Input devices, Output devices, Storage devices. Computer software, Types of software. Overview of computer networks, LAN, MAN, WAN, Internet, Intranet, network topology. Internetworking: Bridges, Repeaters and Routers.

Unit-II

Introduction: Operating system and function, Evolution of operating system, Batch, Interactive, Time sharing and Real time system. Single user operating system and Multi-user operating system, Basics in MS-DOS, Internal and External commands in MS-DOS.

Unit-III

Introduction to MS-OFFICE-2007, word 2007 Document creation, Editing, formatting table handling, mail merge, Excel-2007, Editing, working Retrieval, Important functions, short cut keys used in EXCEL.

Unit-IV:

MS-Power point 2007-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning , Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects. Database system concepts, Data models schema and instance , Database language, Introduction to MS-Access 2007, main components of Access tables, Queries, Reports, Forms table handling, working on Query and use of database.

Unit-V:

Computer applications in Pharmaceutical and clinical studies, uses of Internet in Pharmaceutical Industry.

BOP-115P

COMPUTER FUNDAMENTALS PRACTICAL

Software Lab to be used for the following:-

1. Windows, Managing Windows, Working with Disk, Folders and files.
2. MS-Office 2003 (MS Word, MS Power point, MS Excel, MS Access).
3. Computer Operating System like DOS and Windows.
4. Internet Features (E-mail, Browser etc.).

BOOKS RECOMMENDED:

1. Sinha, R.K., “Computer Fundamentals”, BPB Publications.
2. Raja Raman, V. “Computer Programming in ‘C’, PHI Publication.
3. Hunt N and Shelley J. “Computers and Common Sense” Prentice Hall of India.
4. Tiwari, N.K. “Computer fundamentals with Pharmacy Applications”.
5. Rao, G.N. “Biostatistics & Computer Applications”.
6. Mansfield, R., "Working in Microsoft Office", Tata McGraw-Hill Publishing Company Ltd.
7. Leon, M. and Leon, A. "Fundamentals of Computer Science and Communication Engineering", UBS Publishers Distributors Ltd.
8. Norton, P. "Peter Norton's Introduction to Computers", Tata McGraw-Hill.

IInd Semester

BOP-121

PHARMACEUTICAL CHEMISTRY-II

(ORGANIC CHEMISTRY-I)

Unit-I

Introduction, classification and nomenclature of organic compounds.

Electron displacement in organic chemistry (inductive effect, resonance, hyperconjugation).

Reaction intermediates (such as; free radicals, carbocations, carbanions, carbenes and nitrenes). Stereochemistry including geometrical isomerism, optical isomerism, specification of configuration and conformational analysis.

Unit-II

Introduction to aliphatic organic compounds and some of their characteristic reactions with mechanisms such as; alkanes (free radical substitution), alkenes, alkynes and dienes (electrophilic and free radical additions), cycloalkanes (types of strain including Baeyer strain theory), alkyl halides and alcohols (nucleophilic substitution and nucleophilic elimination), amines, aldehydes and ketones (nucleophilic addition), carboxylic acids and their derivatives, dicarboxylic acids and hydroxy acids (action of heat).

Unit-III

Introduction to aromatic organic compounds, aromaticity, structure of benzene, electrophilic and nucleophilic substitution, orientation and reactivity in electrophilic aromatic substitution, arenes, phenols.

Polynuclear hydrocarbons (naphthalene, anthracene).

Unit-IV

Name reactions including reaction mechanisms and synthetic applications of; Meerwein-Ponndorf-Verley reduction, Oppeneaur oxidation, Beckmann rearrangement, Hofmann rearrangement, Mannich reaction, Diels Alder reaction, Michael addition, Reformatsky reaction, Knoevenagel reaction, Cannizzaro reaction, Aldol condensation, Benzoin condensation.

Unit-V

ά, β- Unsaturated carbonyl compounds, Compounds containing active methylene group andtheir synthetic importance (acetoacetic ester and malonic ester), Organometallic (organolithium and organomagnesium) compounds and their synthetic importance, Aryl diazonium salts and their synthetic importance.

PHARMACEUTICAL CHEMISTRY-II
(ORGANIC CHEMISTRY-I) PRACTICAL

Suggested list of practicals is as follows-

1. Identification of elements and functional groups in given sample.
2. Purification of solvents like benzene, chloroform, acetone and preparation of absolute alcohol.
3. Synthesis of compounds involving benzoylation, acetylation, bromination, reduction & oxidation.

    Picric acid

    Aniline

    Acetanilide

    Aspirin

    Hippuric acid

    P-Bromo acetanilide

    Iodoform

    Oxalic Acid

BOOKS RECOMMENDED:

1. Morrison, R.T., Boyd R.N., and Bhattacharjee, S.K. "Organic Chemistry", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.).

2. Finar, I.L. "Organic Chemistry", Vol. I & II, Pearson Education Ltd.

3. Bruice, P.Y. and Prasad, K. J. R. "Organic Chemistry", Dorling Kindersley (India) Pvt. Ltd.

4. Sykes, P., "A Guidebook to Mechanism in Organic Chemistry", Longman Group Ltd.

5. Singh, M.S. "Advanced Organic Chemistry: Reactions and Mechanisms", Dorling Kindersley (India) Pvt. Ltd.

6. Jain, M.K. "Organic Chemistry", Sohan Lal Nagin Chand & Co.

7. Mann, F.G, and Saunders, B.C., "Practical Organic Chemistry", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.).

8. Vogel A.I., "Elementary Practical Organic Chemistry", Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.).

BOP-122

PHARMACEUTICAL CHEMISTRY-III
(PHYSICAL CHEMISTRY)

Unit-I

Atomic structure and chemical bonding: atomic structure, atomic orbital, molecular orbital, hybridization, covalent (sigma and pi) bond, electrovalent and co-ordinate bond.

Chemical kinetics: Zero, first and second order reaction, complex reactions, elementary idea of reaction kinetics, characteristics of homogenous andheterogeneous catalysis, acid base and enzyme catalysis.

Unit-II

Distribution law: Distribution law & application to solventextraction.

Matter, properties of matter: Physical properties (surface tension, parachor, viscosity, rheochor, refractive index, optical rotation, dipolemoment) and chemical constituents.Liquid complexes,liquid crystals, glassy state, solids-crystalline, amorphous and polymorphism.

Unit-III

Thermodynamics: Fundamentals, first, second, third and zeroth law, Joule-Thompson's effect, absolute temperature scale, conversion of temperature between different scales.

Thermo chemistry: Definition & conventions, heat of reaction, heat of formation, heat of solution, heat of neutralization, heat of combustion,bond energies.

Unit-IV

Electro-chemistry: Faraday's laws of Electrolysis, Electricconductance & its measurement, molar & equivalentconductivity and its variation with dilution. Kohlrausch law, Degree of ionization & Ostwald dilution law. Theory of strong electrolytes (Debye Huckle theory).

Unit-V

Adsorption: Definition, types and mechanism of adsorption, difference between physical and chemical adsorption, pharmaceutical applications of adsorption

Phase equilibria: Phase, component, degree of freedom, sublimation critical point, phase rule (excluding derivation).

Cooling curves & Phase diagrams for one &two component systeminvolving eutectics, congruent & incongruent melting point (examples-water, sulphur, KI-H_2O, NaCl-H_2O).

PHARMACEUTICAL CHEMISTRY-III
(PHYSICAL CHEMISTRY) PRACTICAL

Suggested list of practicals is as follows-

1. Determination refractive index of given liquids.
2. Determination of specific rotation of sucrose at various concentrations and determine the intrinsic rotation.
3. Determination of rate constant of simple reaction.
4. Determination of cell constant, verify Ostwald dilution law and perform conductometric titrations.
5. Determination of surface tension.
6. Determination of partition co-efficient.
7. Determination of viscosity.
8. Determine the parachor value.
9. Determine the rheochor value.
10. pH Determination by different methods.
11. Determination of solubility.

BOOKS RECOMMENDED:

1. Engel Thomas, Reid Philip. "Physical Chemistry" Pearson Education.
2. Tinoco I.J., Sauer K., Wang J.C. & Puglisi J.D. "Physical Chemistry principles and applications in biological sciences" Pearson Education.
3. Martin A., Bustamante P. & Chun A.H.C- Physical Pharmacy, Lea & Febiger, Philadelphia.
4. Mark L. "Introduction to Physical Chemistry", Cambridge University.
5. Levine Ira N. "Physical Chemistry" Tata McGraw-Hill Publishing Company.
6. Barrow G.M. "Physical Chemistry" Tata McGraw-Hill Publishing Company.
7. Atkins P. & Paula, J.D. "Atkins Physical Chemistry" Oxford University Press.
8. Bhasin S.K. "Pharmaceutical Physical Chemistry" Pearson Education.
9. Negi A.S. & Anand S.C. "Textbook of Physical Chemistry" Wiley Eastern Ltd.

BOP-123

ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-II

Unit-I

Central Nervous System: Anatomy of different parts of brain and spinal cord, reflex action, electroencephalogram, specialized functions of the brain. Cranial nerves and their functions.

Unit II

Autonomic Nervous System: Physiology of the autonomic nervous system. Neuro transmitters, Mechanism of neurohumoral transmission.

Unit-III

Haemopoietic system: Composition & function of blood & its elements, erythropoiesis, blood groups, blood coagulation, Anemia..

Lymphatic System: Composition , formation and circulation of lymph, lymph node and spleen, thymus and pathophysiology of hypersensitivity and allergy.

Unit-IV

Urinary System: Anatomy & physiology of urinary system, physiology of urine formation, acid- base balance, pathophysiology of renal feature, glomerulonephiritis, Urinary tract infection

Unit-V

Digestive System: Parts of digestive system, their structure and functions. Various gastro-intestinal secretions & their role.

Pathology of Peptic Ulcer, Ulcerative colitis, Crohn's disease, Zollinger- Ellison syndrome, Hepatitis, Cirrhosis of liver, Pancreatitis

BOP-123P

ANATOMY, PHYSIOLOGY & PATHOPHYSIOLOGY-II PRACTICAL

1. Microscopic study of different tissues.
2. Haematological experiments:
   A. Estimation of haemoglobin in blood.
   B. Determination of bleeding time, clotting time.
   C. R.B.C. Count.
   D. Total leucocyte count (TLC), Differential leukocyte count (D.L.C.)
   E. E.S.R. and blood group
3. Recording of body temperature, pulse rate and blood pressure.

BOOKS RECOMMENDED

1. Difore SH, "Atlas of Normal Histology" Lea & Febiger Philadelphia.
2. Tortora, GJ, & Anagnodokos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.
3. Dipiro JL, Pharmacotherapy – A Pathophysiological Approach, Elsevier.
4. Seeley, R.R., Stephens, T.D. and Tate, P. "Essentials of Anatomy and Physiology", McGraw-Hill**.**
5. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
6. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.
7. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
8. Zdanowicz, M. M. "Essentials of Pathophysiology for Pharmacy", CRC Press.
9. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
10. Sood, R. "Medical Laboratory Technology: Methods and Interpretation", Jaypee Brothers, New Delhi.

BOP-124

PHARMACOGNOSY– I

Unit-I

Definition history, scope & development of pharmacognosy.

Source of Drug: Biological, Marine, Mineral and Plant tissue culture as source of drugs.

Classification of Drugs: Alphabetical, Morphological, Taxonomical, Chemical & Pharmacological. Chemotaxonomy.

Unit-II

Plant description: Basic morphology and anatomy of plant parts.

Extraction methods- Infusion,decoction, percolation, digestion and maceration. Factors affecting selection of extraction process.

Unit-III

Propagation, Cultivation, Collection, Processing & Storage of crude drugs :

A. Factors influencing cultivation of medicinal plants, Type of Soils & fertilizers of common use.

B. Pest Management & natural pest control agents.

C. Plant hormones and their applications.

D. Polyploidy, Mutation & hybridization with reference to medicinal plants.

E. Poly Houses/ Green Houses for cultivation.

Unit-IV:

Quality Control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation including Quantitative microscopy.

Unit-V:

Systematic pharmacognostic study of following-

a) Carbohydrates & derived products: Agar, Guar-gum, Acacia, Honey, Isabgol, Pectin, Starch, Sterculia &Tragacanth.

b) Lipids – Beeswax, Castor oil, Coca butter, Kokum butter, Hydnocarpus oil, Cod liver oil, Shark liver oil, Linseed oil, Wool fat,Rice-bran oil, Lard & Suet.

BOP-124P

PHARMACOGNOSY-I PRACTICAL

1. Morphological characteristics of plant parts mentioned in theory.
2. Microscopical Measurements of cell & cell contents Starch grains, Calcium oxalate Crystals & Phloem fibres.
3. Determination of leaf constants such as Stomatal index, Stomatal number, Vein islet number, Vein termination number and palisade ratio.
4. Identification of crude drugs belonging to carbohydrates & lipids.
5. Preparation of herbarium sheets.

BOOKS RECOMMENDED

1. Pharmacopoeia of India, The Controller of publications, Vol. III, Delhi, 2010.
2. Trease, G.E. & Evans, W.C., "Pharmacognosy" Bailleire Tindall East Bourne, U.K.
3. Wallis, T.E., Text book of Pharmacognosy, J.A. Churchill, Ltd.
4. Wallis T.E., Analytical Microscopy, J&A Churchill Limited, London.
5. Brain K.R. and Turner T D. "The Practical Evaluation of Phyto Pharmaceutical", Wright, Scientechnica- Bristol.
6. Dutta A.C "Botany", Oxford University Press, 2007.
7. Schewer PJ, "Marine Natural products", Academic Press, London.
8. Wallis T.E. "Practical Pharmacognosy", PharmaMed Press, Hyderabad, 2011.
9. Kokate, C.K. "Practical Pharmacognosy" Vallabh Prakashan, Delhi.

BOP-125

PHARMACEUTICAL MATHEMATICS AND BIOSTATISTICS

Unit-I

Limit of functions, Differentiation of logarithmic, Trigonometric and exponential function (not proof), Chain rule, Integration as reverse of differentiation, Method of substitution.

Unit-II

Linear differential equation with constant coefficients: complementary function and particular integral (e^{ax}, x^n, Sin ax, Cos ax).

Unit-III

Methods of collection of data, Diagrammatic representation of data(Pie, Histogram, Bar diagram), Types of sampling; mean, median, mode and standard deviation.

Unit-IV

Karl Pearson's coefficient of correlation, regression, method of least square of straight line, t test, χ^2 test, F test.

Unit-V

Probability: Simple probability, Addition and Multiplication of probabilities, Binomial, Poisson and Normal distributions.

BOOKS RECOMMENDED

1. Blair, R.C., Taylor, R.A. "Biostatistics for the Health Sciences", Dorling Kindersley India Pvt., Ltd.
2. Gupta, S.P. "Statistical Methods", Sultan Chand & Sons.
3. Khan, I.A. and Khanum, A. "Biostatistics for Pharmacy", Ukaaz Publications.
4. Prasad, G. "Textbook of Differential Calculus", Pothishala Pvt. Ltd.
5. Prasad, G. "Textbook of Integral Calculus", Pothishala Pvt. Ltd.
6. "A Textbook of Mathematics for XI-XII Students", Vol. I-IV, NCERT Publications.