

JODHPUR NATIONAL UNIVERSITY
JODHPUR

Faculty of Pharmaceutical Sciences

B.Pharm



Plan and scheme of Examination for B. Pharm. Semester - I

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
101	Pharmaceutical Chemistry-I (Inorganic medicinal chemistry)	3	3	45	45	80	80	20	20	200
102	Pharmaceutical Chemistry-II (Organic Chemistry-I)	3	3	45	45	80	80	20	20	200
103	Pharmaceutics-I (Dispensing Pharmacy)	3	3	45	45	80	80	20	20	200
104	Human Anatomy & Physiology & Health education-I	3	3	45	45	80	80	20	20	200
105	Computer Application	3	3	45	45	80	80	20	20	200
106	Mathematics	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester – II

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th	Prac.	Th	Prac.	
201	Pharmaceutical Analysis-I	3	3	45	45	80	80	20	20	200
202	Pharmaceutical Chemistry-III (Organic Chemistry-II)	3	3	45	45	80	80	20	20	200
203	Pharmaceutics-II (Pharm. Tech.)	3	3	45	45	80	80	20	20	200
204	Human Anatomy & Physiology & Health education-II	3	3	45	45	80	80	20	20	200
205	BIOSTATISTICS	3	3	45	45	80	80	20	20	200
206	Communication Skills	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester – III

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
301	Pharmaceutical Chemistry-IV (Chemistry of Natural Product)	3	3	45	45	80	80	20	20	200
302	Pharmaceutical Chemistry-V (Biochemistry-I)	3	3	45	45	80	80	20	20	200
303	Pharmaceutics-III (Pharmaceutical Microbiology)	3	3	45	45	80	80	20	20	200
304	Pharmaceutics IV (Physical Pharmacy- I)	3	3	45	45	80	80	20	20	200

305	Pharmacognosy -I	3	3	45	45	80	80	20	20	200
306	Environmental Sciences	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester - IV

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
401	Pharmaceutical Chemistry-VI (Biochemistry-II)	3	3	45	45	80	80	20	20	200
402	Pharmaceutics-V(Biological	3	3	45	45	80	80	20	20	200
403	Pharmaceutics-VI (Pharm. Engineering – II)	3	3	45	45	80	80	20	20	200
404	Pharmacognosy - II	3	3	45	45	80	80	20	20	200
405	Pharmaceutics VII(Physical Pharmacy– II)	3	3	45	45	80	80	20	20	200
406	Drug Store & Business Management - I	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester - V

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
501	Pharmaceutical Chemistry-VII (Medicinal Chemistry– I)	3	3	45	45	80	80	20	20	200
502	Pharmaceutics- VIII (Pharm. Engineering-III)	3	3	45	45	80	80	20	20	200
503	Pharmaceutics -IX (Dosage form design –I)	3	3	45	45	80	80	20	20	200
504	Pharmacology - I	3	3	45	45	80	80	20	20	200
505	Pharmacognosy - III	3	3	45	45	80	80	20	20	200
506	Drug Store & Business Management-II	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester - VI

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
601	Pharmaceutical Chemistry-VIII(Medicinal Chemistry–II)	3	3	45	45	80	80	20	20	200
602	Pharmaceutical Analysis - II	3	3	45	45	80	80	20	20	200

603	Pharmaceutics -X (Dosage form design –II)	3	3	45	45	80	80	20	20	200
604	Pharmacology - II	3	3	45	45	80	80	20	20	200
605	Pharmaceutics -XI (Hospital & Community)	3	3	45	45	80	80	20	20	200
606	Forensic Pharmacy	3	-	45	-	80	-	20	-	100
Total		18	15	270	225					1100

Plan and scheme of Examination for B. Pharm. Semester - VII

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th.	Prac.	Th.	Prac.	
701	Pharmaceutical Analysis–III	3	3	45	45	80	80	20	20	200
702	Pharmaceutical Chemistry-IX (Medicinal Chemistry–III)	4	3	60	45	80	80	20	20	200
703	Pharmaceutics- XII(Biopharmaceutics & Pharmacokinetics)	4	3	60	45	80	80	20	20	200
704	Pharmaceutics XIII(Cosmetology)	3	3	45	45	80	80	20	20	200
705	Pharmacology - III	4	3	60	45	80	80	20	20	200
706	Professional training & Project	-	3	-	45	-	80	-	20	100
Total		18	18	270	270	-	-	-	-	1100

Plan and scheme of Examination for B. Pharm. Semester - VIII

Sub. Code	Subject	Hrs/week		Hrs/sem		Semester Exam.		Sessional Exam.		Total
		L	P	L	P	Th	Prac	Th	Prac	
801	Pharmaceutical Chemistry-X (Medicinal Chemistry–IV)	3	6	45	90	80	80	20	20	200
802	Pharmaceutics –XIV (Biotechnology)	3	3	45	45	80	80	20	20	200
803	Pharmacognosy – IV	3	3	45	45	80	80	20	20	200
804	Pharmacology – IV	3	-	45	-	80	-	20	-	100
805	Industrial Management including Marketing	3	-	45	-	80	-	20	-	100
806	Quality Assurance	3	3	45	45	80	80	20	20	200
Total		18	15	270	225	-	-	-	-	1000

B.PHARM. SEMESTER-II
PHARMACEUTICAL CHEMISTRY-I
(Inorganic Medicinal Chemistry-I)

THEORY

Subject code -101T

Hours – (03/week)

1. Sources of impurities in pharmaceutical substances; their permissible parameters & Limit tests: for Iron, Arsenic, Lead, Heavy metals, Chloride, Sulphate and the special tests if any, of inorganic pharmaceuticals compounds included in syllabus.
2. An outline of important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and identification tests of following classes of drugs included in IP.
 - i. Acids, Bases and buffers:
Acids and Bases: HCl, H₂SO₄, HNO₃, H₃PO₄, NaOH, Strong NH₃ solution.
 - ii. Gastrointestinal agents: Acidifying agents: Dilute hydrochloric acid.
Antacids: Sodium bicarbonate, Aluminum hydroxide gel, Calcium carbonate, Tri-basic calcium phosphate, Milk of magnesia, Magnesium oxide, Magnesium trisilicate.
Protective and adsorbents: Bismuth subcarbonate, Bismuth subnitrate, Kaolin, Activated charcoal.
Cathartics: Sodium carboxy methylcellulose, Bisacodyl, Sodium phosphate, Potassium sodium tartrate.
 - iii. Topical agents: Protectives: Talc, Zinc oxide, Calamine, Zinc stearate, Titanium dioxide.
Astringents: Alum, Aluminum Sulphate.
Anti-microbial agents: Hydrogen peroxide, Potassium permanganate, Iodine, Silver nitrate, Boric acid, Chlorinated lime, Borax, Sodium antimony gluconate.
 - iv. Major intra - and extra-cellular electrolytes: Major physiological ions. Electrolytes used for replacement therapy, acid-base balance and electrolyte combination therapy - Sodium chloride and its preparations, Potassium chloride and its preparation, Calcium chloride, Calcium lactate, Calcium gluconate, Zinc Sulphate, Sodium acetate, Potassium acetate, Sodium bicarbonate, Sodium dihydrogen phosphate dihydrate, Sodium citrate.
v. Essential and trace elements: Transition elements and their compounds of pharmaceutical importance: Iron and haematinic- Ferrous Sulphate, Ferrous gluconate, Ferrous fumarate, Iron-dextran injection, Ferric ammonium citrate, compound of iodine and Calamine.
 - vi. Dental products: Dentrifrices, anti-caries agents- Sodium fluoride, Stannus Fluoride, Calcium carbonate, Dicalcium phosphate and Zinc Chloride.
 - vii. Miscellaneous agents: Gases & vapours:
(A) Inhalant – Oxygen (B) Anesthetic - Nitrous oxide
Sclerosing agents
Emetics

Expectorants- Ammonium chloride, Potassium iodide.

Antidotes- Sodium nitrite, Sodium Thiosulphate, Activated charcoal, Light Kaolin

Anti-oxidants- Sodium metabisulphite, Sodium bisulphite.

PRACTICALS RECOMMENDED

1. Introduction to the use and care of apparatus & equipments.
2. To perform limit test for iron in the given of samples sodium chloride.
3. To perform limit test for sulphate in the given samples
4. To perform limit test for chlorides in the given sample of dextrose.
5. To perform limit test for chlorides in the given samples of magnesium sulphate
6. To perform limit test for chlorides in the given sample of calcium carbonate.
7. To perform limit test for sulphate in the given sample of potassium permagnate.
8. To perform limit test for iron in the given sample of potassium bromide.
9. To perform limit test for arsenic in the given sample.
10. To perform limit test for Chloride in the given sample of potassium permagnate.
11. To perform identification tests for basic radicals in the given samples.
12. To perform identification tests for basic radicals in the given samples.
13. To perform identification test for acidic radicals in the given samples.
14. To perform identification test for acidic radicals in the given samples.
15. To perform identification test for acidic radicals in the given samples.

BOOKS RECOMMENDED

1. J.H.Block, E.B.Roche, T.O.Soine & C.O.Wilson, 'Inorganic medicinal and pharmaceutical chemistry' Lea & Febiger.
2. N.C.Choudhary, 'Pharmaceutical chemistry-I' Valabh prakashan, Delhi.
3. P.Gundu Rao, 'Inorganic Pharmaceutical chemistry' Vallabh prakashan, Delhi.
4. H.K.singh, V.K.Kapoor, 'Basic and pharmaceutical chemistry' Vallabh prakashan, Delhi.
5. R.D.Gupta, 'A Textbook of Analytical chemistry for Degree students' The National Book House, Jeoni Mandi, Agra.
6. Indian Pharmacopoeia, Govt. of India, Ministry of Health.
7. L.M.Atherden, Bentley and Driver's, "A Textbook of pharmaceutical chemistry", Oxford university press.
8. A.H.Backett and J.B. stanlake, "Pharmaceutical chemistry" Part I, The Anthlono press, university of London.

PHARMACEUTICAL CHEMISTRY-II (Organic Chemistry-I)

THEORY

Subject code -102T

Hours -(03/week)

1. Stereochemistry- Enantiomerism, Chirality, The Racemic Modification, Configuration (R&S; D&L; d&l), sequence rules, Diastereomers, Meso- structures, Conformational Isomers, Resolution of a racemic mixture & racemization.
2. Nucleophilic Aliphatic Substitution- Nucleophiles and leaving groups, SN₁ & SN₂

- reactions, Duality of mechanism, Mechanism of Kinetics and stereochemistry of SN_1 & SN_2 reactions, carbonations and their rearrangements.
3. Elimination Reactions-Geometric isomerism, Dehydro-halogenation of alkyl halides(1, 2elimination), Kinetics of dehydro-halogenation, Duality of mechanism, Mechanism, orientation and reactivity of E2 and E1 reactions, Elimination: E2 v/s E1: Elimination v/s substitution.
 4. Free Radical Substitution- Halogenation of Alkanes up to four carbons & their relative reactivities, Mechanism & orientation of Halogenation, Ease of formation of free radicals, Transition state for halogenation, Orientation and reactivity, Reactivity and selectivity, Inhibitors.
 5. Electrophilic and Free-radical Addition Electrophilic addition: Mechanism, Reaction at the carbon-carbon double bond (addition) of Hydrogen, Halogen, Hydrogen Halides, Sulphuric acid & water, Rearrangements in electrophilic addition, orientation & reactivity, Mechanism & orientation of free radical addition.
 6. Conjugation & Resonance-Dienes-The carbon-carbon bond as a substituent, Free-Radical halogenation of alkenes: Substitution v/s addition, free radical substitution in alkenes; orientation, reactivity and allylic rearrangements. Theory of resonance, The allyl radical as a resonance hybrid, stability & orbital picture of the allyl radical, Resonance stabilization of allyl radicals, The allyl-cation as a resonance hybrid, stabilization of carbocation.
 7. Nucleophilic addition:-
Aldehydes and ketones: Structures, Physical properties, Nomenclature, preparation and reaction of aldehyde and ketones with due emphasis on Nucleophilic addition reactions.

PRACTICALS- RECOMMENDED

1. To study various laboratory glasswares used in pharmaceutical Chemistry.
2. To study the accidents and hazards in the laboratory and first aid.
3. To determine the melting point of given known sample.
4. To determine the melting point of given unknown sample.
5. To carry out the element detection from the given unknown sample. (test for nitrogen).
6. To carry out the element detection from the given unknown sample. (test for sulphur).
7. To carry out the element detection from the given unknown sample. (test for nitrogen & sulphur both).
8. To carry out the element detection from the given unknown sample. (test for chlorine).
9. To carry out the element detection from the given unknown sample. (test for other halogens).
10. To identify the functional group present in the given unknown sample (test for alcoholic & phenolic group).
11. To identify the functional group present in the given unknown sample (test for amide group).

12. To identify the functional group present in the given unknown sample (test for acid group).
13. To identify the functional group present in the given unknown sample (carbonate & bicarbonate group).
14. To identify the functional group present in the given unknown sample (sulphate & aldehyde).
15. To identify the functional group present in the given unknown sample (sample A & sample B).
16. To identify the functional group present in the given unknown sample (sample A & sample B).

BOOKS RECOMMENDED:

1. R.T.Morrison & R.N.Boyd,"Organic Chemistry",prentice Hall of India pvt.ltd.,new delhi.
2. I.L.Finar,"Organic chemistry",Vol-1,E.L.B.S.London.
3. R.D.Gupta,"A Text book of Analytical Chemistry"
4. F.G.Mann & B.C. Saunders, "Practical organic Chemistry" Longmans,Green and Co.Ltd.,London.
5. B.S.Furniss,et.al,"Vogal's Textbook of "Practical organic chemistry",E.L.B.S.,London.
6. Wingrove A.S. & Caret R.L.,"Organic chemistry",Harper & Row publishers,New York.
7. Pine,Handrickson et.al,"Organic chemistry"McGrall Hill Book co.,N.Y.
8. Eliel L."Stereochemistry of carbon compounds"Tata McGrall Hill,Bombay.
9. Singh and Kapoor,"Basic and pharmaceutical practical chemistry",Vallabh prakashan,Delhi.

PHARMACEUTICS-I (Dispensing Pharmacy)

THEORY

Subject code -103T

Hours – (03/week)

1. Definition and Scope; pharmacy as a career, pharmacy in relation to allied health profession.
2. Pharmacist: A Health Care Provider, Concept of pharmaceutical health care, Growth of Pharmacy Practice.
3. Prescription: Handling of prescription, source of errors in prescription, Latin terms, General dispensing procedures including labeling of dispensing products.
4. Pharmaceutical calculations: Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solutions, alligation, alcohol dilution, proof spirit, isotonic solutions, displacement value, etc.
5. Compounding & Dispensing of medication: Definition of dispensing & compounding.

- Good dispensing & compounding practices, fundamental operations in compounding. Containers & closures for dispensed products, labeling & storage of compounded products. Dispensing of prefabricated dosage forms, patient counseling, and documentation of compounding & dispensing records.
6. Principles involved and procedures adopted in dispensing of: Typical prescriptions like.....
Mixtures, solutions, emulsions, suspension, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc.
 7. Dispensing of proprietary medicines.
 8. Incompatibilities: Physical and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non-metals, acids, alkalis, organic incompatibilities. Purine bases, alkaloids, pyrazolone derivatives, amino acids, quaternary ammonium compounds, carbohydrates, glycosides, anesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities.
 9. Future trends in dispensing.

PRACTICALS- RECOMMENDED

1. To prepare and dispense 50 ml simple syrup.
2. To prepare and dispense 10 gm bulk oral powder.
3. To prepare and dispense 50 ml Calamine lotion.
4. To prepare and dispense 50 ml of chloroform water.
5. To prepare and dispense 100 ml of Camphor water.
6. To prepare and dispense 25 ml Cresol with soap solution.
7. To prepare and dispense 50 ml Castor oil emulsion.
8. To prepare and dispense liquid paraffin emulsion.
9. To prepare and dispense aromatic chalk.
10. To prepare and dispense 50 ml camphor liniment.
11. To prepare and dispense salicylic acid dusting powder.
12. To prepare and dispense 30 ml weak iodine solution.
13. To prepare and dispense 30 ml strong iodine solution.
14. To prepare and dispense 30 ml aqueous iodine solution.
15. To prepare and dispense 30 ml strong ammonium acetate solution.
16. To prepare and dispense 30 ml cinnamon water.

BOOKS RECOMMENDED

1. Carter, S.J. Cooper and Gunn's dispensing for Pharmaceutical Students CBS Publishers, Delhi.
2. Stoklosa, M.J. Pharmaceutical Calculations. Lea & Febiger, Philadelphia.
3. British National Formulary.
4. Hoover, J.E. Dispensing of Medication Mack Publishing Co., Easton, PA
5. Martindale's Extra Pharmacopoeia.
6. Martin, E.W. Dispensing of Medication Mack Publishing Co., Easton, PA.
7. National Formulary of India.

8. Remington's The Science & Practice of Pharmacy. Mack Publishing Co., Easton, P.A.
9. Smith, H.A. Principles and Methods of Pharmacy Management K.M. Vargese Co., Mumbai

HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION-I

THEORY

Subject code -104T

Hours – (03/week)

1. **Scope of anatomy and physiology:** Basic terminology used in these subjects. Elementary tissues of the human body: Epithelial, connective, muscular and nervous tissues, their sub-type and characteristics.
2. **Skeletal system:** Structure, composition and function of skeleton. Classification of joints, types of movements at joints, disorders of joints. Skeletal muscles: Their gross anatomy, physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.
3. **Blood:** Composition and function of blood and its elements, their disorders, blood group and their significance, mechanism of coagulation, disorders of platelets and coagulation.
4. **Cardiovascular system and circulation:** Basic anatomy of the heart, Physiology of heart, blood vessels and circulation. Blood pressure and factor affecting B.P. Basic understanding of Cardiac cycle, heart sounds and electrocardiogram. Heart disorders.
5. **Lymphatic system:** Composition, formation and circulation of lymph, lymph node and spleen.
6. **Health education:** Concepts of health and disease. Classification of food, food requirements, balance diet, nutritional deficiency disorders, their treatment and prevention. Specifications of drinking water.
7. **Demography and family planning:** Demography cycle, family planning, various contraceptive methods.
8. **First aid:** Emergency treatment of shock, snake bite, burns, poisoning, fractures and resuscitation methods.

PRACTICALS- RECOMMENDED

1. To study the basic equipments & general techniques used in human anatomy & physiology laboratory.
2. To find out erythrocyte sedimentation rate, bleeding & clotting time of your own blood.
3. To find out blood group, haemoglobin content, iron estimation and oxygen carrying capacity of your own blood.
4. (a) To determine the blood pressure of your own and to study the effects of posture and exercise.
(b) To determine the body temperature and pulse rate of your own body.
5. To find out total red blood corpuscles (RBC) count and color index of your own blood.
6. To find out total leucocyte count (TLC) of your own blood.
7. To find out differential leucocyte count (DLC) of your own blood.

8. To study the human cardiovascular system & lymphatic system with the help of charts and models.
9. To study the bones of skull & trunk with the help of charts and models.
10. To study the bones of limbs (upper & lower) with the help of charts and models.
11. To study the muscular system with the help of charts and models.
12. To carry out microscopic examination of the histological slides of circulatory system.
13. To carry out microscopic examination of the given histological slides of tissue system.
14. To carry out microscopic examination of the given histological slides.
15. To find out the effect of osmotic pressure on red blood corpuscles of your own blood.

BOOKS RECOMMENDED:

1. Chatterjee, C.C, Human Physiology, Medical allied agency, Calcutta
2. Shalya, Subhas, Human Physiology CBS publisher Delhi
3. Ross and Wilson, Human anatomy and Physiology
4. Chaurasia, B.D, Human anatomy, Regional and applied. Part-1, CBS publisher New Delhi
5. Parmar N.S. Health education and community pharmacy, CBS publisher New Delhi.

**COMPUTER APPLICATION
THEORY**

Subject code -105T

Hours – (03/week)

1. Introduction to computer: Brief history of development of computers, computer system concept, computer system characteristics, capabilities and limitations, Applications in general and pharmacy in particular.
2. Elements of computer systems: The architecture of a computer system, CPU – ALU, CU, Memory – Primary and Secondary, Input/Output and Storage Devices - Keyboard, Magnetic Tape, Magnetic Disk, Monitor, Printer, Floppy Disk, Hard Disk. Data, Need of Data Processing, Information & its Need, Levels of information, Quality of information, Comparison of manual & electronic storage of data. Drives: CD/DVD, pen drive/data drive
3. Peripheral devices: mouse, OCR, OMR, MICR, scanner, monitor, Printers – impact and non-impact printers – DMP, daisy wheel, line and drum printers, inkjet and laser printers, plotters. Types of computers – Analog, Digital, Hybrid, General, Special, Purpose, Micro, Mini, Mainframe, Super, Personal computer (PCs) – Configuration, Pentium and Newer PCs specifications and main characteristics, types of PCs – Desktop, Laptop, Notebook, Palmtop, Workstations etc. – their characteristics.
4. Software, Types of Software : System Software, Application Software, Introduction to operating systems MS-DOS, Windows, Linux etc. Concept of programming, programming languages. Types of computer languages, Machine, Assembly, high level language. Examples &

areas of use of various high level language & their features. Language translators : Comparative study, assembler, compiler, Interpreter.

5. Windows : Windows concepts, Features, Windows Structure, Desktop, Taskbar, Start menu, My Computer, Recycle Bin, Windows Accessories – Calculator, Notepad, Paint, Wordpad, Character Map, Windows Explorer, Entertainment, Managing Hardware & Software, System Tools, Communication, Sharing Information between programs.

6. MS-Word : Features, Creating, Saving and Opening Documents in Word, Interface, Toolbars, Ruler, Menus, Keyboard Shortcut, Editing, Previewing, Printing & Formatting a Document, Advanced Features of MS Word, Find & Replace, Using Thesaurus, Using Auto – Multiple Functions, Mail Merge, Handling Graphics, Tables & Charts, Converting a word document into various formats like – Text, Rich Text format etc.

7. Electronic Spread Sheet: MS–Excel — Worksheet basics, creating worksheet, entering data into worksheet, heading information, data, text, dates, alphanumeric, values, saving & quitting worksheet, Opening and moving around in an existing worksheet, Toolbars and menus, Keyboard shortcuts, Working with single and multiple workbook, working with formulae & cell referencing, Auto sum, Coping formulae, Absolute & relative addressing, Working with ranges, formatting of worksheet, Previewing & Printing worksheet, Graphs and charts, Database, Creating and using macros, Multiple worksheets – concepts, creating and using.

8. Presentation Graphics (MS-PowerPoint): introduction, various uses, creating and saving presentation, creating slides – different types of slides, different views of slides, editing and formatting slides, backgrounds, inserting pictures from files, presentation shows, animation, customization of slides.

9. Introduction to networking, concept of LAN and WAN. Internet Technology :History, requirements, e-mail, search engines, websites and web servers, basics of html, scientific information retrieval using databases, search engines

PRACTICALS- RECOMMENDED

1. To study the basic of hardware.
2. To create simple document (notice) of MS-word editing/ formatting/ finalized a document.
3. To create simple document (Application) of MS-word editing/ formatting/ finalized a document.
4. To create simple document (letter) of MS-word editing/ formatting/ finalized a document.
5. To create a simple presentation with the help of power point.(minimum two practical)
6. To study the common MS-excel processing terminology such as entering the data in work sheet, work sheet with formula, cell editing work sheet and editing cell content.
7. To determine the sum of given data using of MS- excel sheet
8. To determine the log value of given data using of MS- excel sheet.
9. To plot a graph between given data using MS- excel. (minimum two practical)

BOOKS RECOMENDED:

Fundamentals of Computers by Rajaraman, Prentice Hall of India
Learn MS-Office 2000 by Stultz, BPB Publications.
Using Microsoft Windows 1998 by Ivens, Prentice Hall of India.
Praveen S. Thakur and Rachna Manchanda; Computer in Pharmacy.
Elias M. Award; System Analysis and Design; Edition-II.
Thomas C. Bartee; Digital computer fundamentals; Edition –VI.
Sinha & Sinha; Computer Fundamentals, Edition-IV.

MATHEMATICS**THEORY****Subject code -106T****Hours – (03/week)**

1. **Sets:** representation of sets, types of set, subsets, rules of subsets, universal set, venn diagrams, operations of sets.
2. **Functions:** Introduction, description of a function, domain, co-domain and range of a function, equal function, types of functions.
3. **Linear equation:** Introduction, pair of linear equation in two variables, algebraic method of solving a pair of linear equation by substitution method & by elimination method.
4. **Linear programming:** Introduction, properties of linear programming requirement constraints, some useful definitions, mathematical formulation of a LPP, Solution of problems by graphical method only. Advantages, applications & limitations of linear programming.
5. **Limit:** Concept of limit, definition of a limit of a function, one sides limits, finding the right hand and left hand limits of a function. Theorems on limits and problems based on them.
6. **Continuity:** Introduction, finding the continuity of function at a point.
7. **Differentiability:** The derivative of a function, right hand and left hand derivative, finding differentiability of a function at a point.
8. **Differentiation calculus:** Introduction, Basic fundamental theorems on differentiation & problem based on them, Differentiation of trigonometric function and logarithmic differentiation.
9. **Integral Calculus:** Introduction, constant of integration, theorems on Integration, integration based on trigonometric function and logarithmic differentiation.

BOOKS RECOMENDED

1. A Textbook of Mathematics for XI-XII Students. NCERT Publications. Vol I-IV 1991.
2. Grewal, B.S.; Higher Engineering Mathematics. Khanna Publishers, New Delhi, 1990.
3. Jain and Rawat; Engineering mathematics-I.
4. Shanti Narayan; Differential calculus.
5. Bansal and Dhama; Differential Equations Vol.-I.
6. Bansal, Bhargava and Agarwal; Integral Calculus, Mathematics-II.
7. Ansel and Stoklossa; Pharmaceutical Calculations.

B.PHARM. SEMESTER-II

PHARMACEUTICAL ANALYSIS-I

THEORY

Subject code -201T

Hours – (03/week)

1. The theoretical basis and techniques of quantitative analysis, Solute, solvent, solution, solubility product range, concentration, definition of normality, molarity, molality, milliequivalence, strong acids and bases, weak acids and bases, buffers, primary and secondary standards, calculation based on stoichiometry problems, theory of indicators (both external and internal indicators), concept of end point.

2. Classification of theoretical considerations and applications to volumetric analysis.

3. Acid Base Titrations: Acid base concepts, Role of solvent, Ionization, Law of mass action, Hydrolysis of salts, Henderson-Hasselbach equation, Buffer solutions, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Mixed indicators, Polyprotic system, applications in assay of H_3PO_4 , NaOH, $CaCO_3$, Sod. Carbonate, Sod. Bicarbonate, Ammonia solution, Boric acid, Ammonium chloride, Ammoniated Mercury. etc.

4. 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. Assay of Ferrous Sulphate, hydrogen peroxide solution, iodine solution, chlorinated lime, and copper sulphate.

5. Precipitation Titrations: Precipitation reactions, Solubility products, Effects of acids, temperature and solvent upon the solubility of a precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate, and barium sulphate, Indicators, Gay-Lussac method; Mohr's method, Volhard's method and Fajans' method. Assay of sodium chloride injection

6. Gravimetric Analysis: Theory, sampling, precipitation, the colloidal state, Super-saturation, co-precipitation, Post-precipitation, Digestion and washing of the precipitates, Filtration, Filter papers and crucibles, Ignition, Specific examples like barium sulphate, aluminium as aluminium oxide, and calcium as calcium oxalate

6. Non-aqueous Titrations:- theoretical consideration, scope and limitations, Acid base equilibrium in non-aqueous media, solvents, titration of weak bases, titration of weak acids, indicators. Assay of Phenobarbitone and Sulphathiazole.

7. Complexometric Titrations: concept of complexation and chelation, electronic structure of some complex ions, stability constants, titration curves, masking and demasking agents, types of complexometric titrations, EDTA titrations, metal ion indicators and application in drug analysis. Assay of Calcium gluconate, Magnesium sulphate and zinc sulphate.

8. Miscellaneous methods: Sodium nitrite titrations-Assay of some sulphonamides drugs(Eg. Dapsone, Sulphomethoxazole, Sulphamethiozole, Sulphomethoxy pyridazine etc.

PRACTICALS- RECOMMENDED

1. To study the Working of Analytical balance and calibrate the given burette, pipette and volumetric flask.
2. To Prepare and Standardize 0.1 N HCl.
3. To Prepare and Standardize 0.1 N NaOH.
4. To Prepare and Standardize 0.1 N H₂SO₄.
5. To Carry out assay of the given sample of Ammonia Solution.
6. To Carry out assay of the given sample of Sodium Bicarbonate.
7. To carry out assay of the given sample of Ammonium Chloride by acid base titration.
8. To Carry out assay of the given sample of Sodium Carbonate.
9. To Carry out assay of the given sample of Boric acid
10. To Prepare and standardize 0.1 N Potassium Permanganate solution.
11. To find out the amount of Ferrous Sulphate in 100 ml solution.
12. To Carry out The assay of Given Sample of Ferrous Sulphate.
13. To Carry out the assay of given sample of Hydrogen Peroxide
14. To Prepare and Standardize 0.1 N Sodium thiosulphate.
15. To Prepare and Standardize 0.05 M Iodine Solution.
16. To Carry out the assay of weak iodine solution.
17. To Carry out the assay of strong iodine solution.
18. To Carry out assay of the given sample of Copper sulphate.
19. To Prepare and Standardize 0.05 M Disodium ethylenediamine tetraacetate (EDTA).
20. To Carry out assay of the Given Sample of Magnesium Sulphate
21. To Carry out assay of the Given Sample of Calcium Carbonate

BOOKS RECOMMENDED

1. A. H. Bekett and J. B. Stanlake, Practical Pharmaceutical Chemistry, 4 th edition, CBS Publishers and Distributors, 1997.
2. G. H. Jeffery and J. Bassett, Vogels' Textbook of Quantitative Chemical Analysis, 5 th Edition, Longman Scientific and Technical, 1989.
3. Indian Pharmacopoeia, British Pharmacopoeia, USP, Martindale.
4. Atherden, L.M. Bentley and Driver's Textbook of Pharmaceutical Chemistry. 8th ed. Oxford University Press, Delhi. 1969
4. Gary, D.C. Analytical Chemistry 4th ed. John Wiley and Sons, New York, 1986.
6. Connors, K.A. Textbook of Pharmaceutical Analysis. 3rd Edition. John Wiley & Sons, New York.
7. Kalthoff, I.M. and Stenger, V.A. Volumetric Analysis Vol.II Titration Methods. Interscience Publishers Inc., New York.
8. Varma, R.M. Analytical Chemistry, Theory & Practice. 3rd edition CBS Publishers &

PHARMACEUTICAL CHEMISTRY-III
(Organic chemistry-II)

THEORY

Subject code -202T

Hours – (03/week)

1. Aromaticity- Stability of benzene ring, Orbital picture of benzene, Huckel rule.
2. Electrophilic aromatic substitution- Effect of substituent groups, classification of substituent groups, orientation in disubstituted benzene, Mechanism of nitration, sulfonation, friedel-craft alkylation, Halogenation, protonation, Mechanism of electrophilic aromatic substitution. Theory of reactivity, Theory of orientation, Electron release viz resonance, Effect of halogen on electrophilic aromatic substitution.
3. Arenes and their derivatives-The aromatic ring as a substituent, Aromatic- aliphatic hydrocarbons, structure and nomenclature of arenes and their derivatives, Friedel-craft alkylation, Mechanism & limitations, Reactions of alkyl benzene, Oxidation, Halogenation, side chain halogenation, Resonance stabilization of benzyl radical.
4. Nucleophilic acyl substitution-Role of carbonyl group, Alkyl v/s acyl, Reaction of acid chlorides, acid anhydrides, amides & esters.
5. Nucleophilic aromatic substitution-Bimolecular displacement mechanism, Reactivity and orientation in nucleophilic aromatic substitution, Electron withdrawal by resonance, Nucleophilic substitution, Aliphatic and aromatic, Elimination-addition mechanism for nucleophilic aromatic substitution.
6. Nomenclature, Prep. & properties- phenol, carboxylic acid, Amines, Naphthalene, Phenanthrene & anthracene.
7. Heterocyclic-General nomenclature- occurrence and Pharmaceutical importance of the following heterocycles-Furan, Thiophene, Pyrrole, Oxazole, Isoxazole, Pyrazole, Pyrazine, Pyridine, pyrimidine, pyridazine, Indole, Bezofuran, Quinoline, Isoquinoline, Purine, Phenothiazine, Benzodiazepine.

PRACTICALS RECOMMENDED

1. To synthesize Nitrobenzene from benzene and report its % yield & its melting point.
2. To synthesize m-dinitrobenzene from nitrobenzene & report its % yield & its melting point.
3. To synthesize 1-chloro 2, 4-dinitrobenzene from chlorobenzene & report its % yield & its melting point.
4. To synthesize 3,5- dinitro benzoic acid from benzoic acid & report its % yield & its melting point.
5. To synthesize Picric acid from phenol & report its % yield & its melting point.
6. To synthesize sodium P-toluene sulphonate from toluene & report its % yield & its melting point.
7. To synthesize sodium benzene sulphonate from benzene & report its % yield & its melting point.

8. To synthesize Acetyl salicylic acid from salicylic acid & report its % yield & its melting point.
9. To synthesize Benzanilide from Aniline & report its % yield& its melting point.
10. To synthesize Phenyl benzoate from Phenol & report its % yield& its melting point.
11. To synthesize p-bromoacetanilide from acetanilide & report its % yield& its melting point.
12. To synthesize Benzene-azo- β -naphthol from aniline & report its % yield& its melting point.
13. To synthesize methyl orange from sulphanilic acid & report its % yield& its melting point.
14. To synthesize phthalimide from phthalic anhydride & report its % yield& its melting point.
15. To synthesize N- methyl anthranilic acid from anthranilic acid & report its % yield& its melting point.
16. To synthesize 9, 10- Anthraquinone from anthracene & report its % yield& its melting point.
17. To synthesize 4- methyl -7-hydroxy coumarin from resorcinol & report its % yield& its melting point.

BOOKS RECOMMENDED

1. R. T. Morrison & R. N. Boyd,"Organic chemistry" Prentice Hall of India Pvt.Ltd., New Delhi.
2. I.L.Finar,"Organic chemistry", Vol-I & II,E.L.B.S.London.
3. F.G.Mann & B.C.Saunders, "Practical organic chemistry", Longmans,Green and co.Ltd.,London.
4. B.S.Furniss, et.al,"Vogal's Textbook of "Practical organic chemistry",E.L.B.S.,London.
5. Wingrove A.S & Caret R.L.,"Organic chemistry", Harper & Row Publishers,New York.
6. R.M.Acheson "An introduction to the chemistry of Heterocyclic compounds", Interscience publications,New York.
7. Silverstein & Bassler, "Spectroscopic Identification of organic compounds".
8. Gutschi,"Chemistry of carbonyl compounds", prentice Hall of India Pvt.Ltd.,New Delhi.

Pharmaceutics- II

(Pharm. Technology)

THEORY

Subject code -203T

Hours – (03/week)

1. Scope of Pharmacy and Introduction to Pharmacopoeias (IP, BP, USP, BPC), NF of India, Extra Pharmacopoeia and European Pharmacopoeia.
2. **Introduction to Pharmaceutical Dosage Forms:** Classification of dosage forms and definition, general formulations, manufacturing procedures and official products of tablets,

capsules, solutions mixtures, spirits, aromatic waters, glycerites, paints, syrups, elixirs, linctuses, mouth washes, lotions, liniments, ointments, pastes, gels and inhalations

- 3. Pharmaceutical Excipients:** Organoleptic additives, Preservatives, Antioxidants, stabilizers, solubility enhancers.
- 4. Powders and granules:** Formulation, preparation and evaluation of various powders and granules. Products like dusting powder, oral dehydration powder, dry syrup formulation, talcum powder, tooth powder, effervescent powder.
- 5. Liquid dosage forms:** Introduction, types of additives used in formulations, vehicles, stabilisers, preservatives, suspending agents, emulsifying agents, solubilisers, colors, flavours and the others, manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.
- 6. Semisolid dosage forms:** Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection, general formulation of semisolid bases, clear gels manufacturing procedure, evaluation and packaging.
Suppositories: Ideal requirements, bases, manufacturing procedure, packaging and evaluation.
- 7. Extraction and galenical products:** Principle and method of extraction, percolation, maceration, continuous hot extraction, preparation of infusion, tincture, dry and soft liquid extracts.
- 8. Pharmaceutical Aerosols:** Definition, propellants, general formulation, method of preparation, packaging and containers, evaluation
- 9. Ophthalmic preparations:** Requirements of formulation, methods of preparation, containers, evaluation.

PRACTICALS RECOMMENDED

1. To prepare, evaluate and submit 10 ml of weak iodine solution I.P.
2. To prepare, evaluate and submit 10 ml of Strong iodine solution I.P.
3. To prepare, evaluate and submit 10 ml of camphor water I. P.
4. To prepare, evaluate and submit 10 ml of chloroform water I.P.
5. To prepare, evaluate and submit 10 ml of aromatic ammonia solution B.P.
6. To prepare, evaluate and submit lactose granules.
7. To prepare, evaluate and submit effervescent granules by addition of heat method.
8. To prepare, evaluate and submit 20 gm simple ointment I.P.
9. To prepare, evaluate and submit 10 gm sulfur ointment I.P.
10. To prepare, evaluate and submit 20 gm eye ointment I.P.
11. To prepare, evaluate and submit 20 gm mercuric oxide eye ointment I.P.
12. To prepare, evaluate and submit 10 gm Gregory's powder B.P.
13. To prepare, evaluate and submit 10 gm Seidlitz powder B.P.
14. To prepare, evaluate and submit compound powder of tragacanth B.P.C.
15. To prepare, evaluate and submit 10 ml calamine lotion I.P.
16. To prepare, evaluate and submit orange tincture.
17. To prepare, evaluate and submit antacid suspension.
18. To prepare, evaluate and submit Glycerol gelatin suppositories.

HUMAN ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION-II

THEORY

Subject code -204T

Hours – (03/week)

1. **Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food.
2. **Respiratory System:** Anatomy of respiratory organs, functions of respiration, mechanism and regulation of respiratory volumes and vital capacity.
3. **Central Nervous System:** Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, Cranial nerves and their functions.
4. **Autonomic Nervous System:** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the A.N.S.
5. **Urinary System:** Various parts, structures and functions of the kidney and urinary tract. Physiology of urine formation and acid-base balance.
6. **Reproductive System:** Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization, Sex differentiation, spermatogenesis and oogenesis.
7. **Endocrine System:** Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, Testes and ovary, their hormones and functions.
8. **Sense Organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), tongue (taste), nose (smell) and skin (superficial receptors).

PRACTICALS RECOMMENDED

1. To study the digestive system with the help of charts and models.
2. To study the anatomy & physiology of eye and ear with the help of charts and models.
3. To study the anatomy & physiology of skin (superficial receptors), taste buds & nose with the help of charts and models.
4. (a) To study the respiratory system with the help of charts and models.
(b) To carry out microscopic examination of the given histological slides of respiratory system.
5. To record & measure the respiratory volumes & vital capacity by using spirometer.
6. To study the human brain & spinal cord with the help of charts and models.
7. To study the cranial & spinal nerves with the help of charts and models.
8. To study the urinary system with the help of charts and models.
9. To study the reproductive system with the help of charts and models.
10. To study the endocrine system with the help of charts and models.
11. To carry out microscopic examination of the given histological slides of digestive system.
12. To carry out microscopic examination of the given histological slides of reproductive system.
13. To carry out microscopic examination of the given histological slides.

14. To find out the normal constituents in the given sample of urine.
15. To find out the abnormal constituents in the given sample of urine.

BOOKS RECOMMENDED:

1. Chatterjee, C.C, Human Physiology, Medical allied agency, Calcutta
2. Shalya, Subhas, Human Physiology CBS publisher Delhi
3. Ross and Wilson, Human anatomy and Physiology
4. Chaurasia, B.D, Human anatomy, Regional and applied. Part-1, CBS publisher New Delhi
5. Parmar N.S. Health education and community pharmacy, CBS publisher New Delhi.

BIostatistics THEORY

Subject code -205T

Hours – (03/week)

1. Measure of central tendency (Mean, Mode, Median,)
2. Measure of dispersion (Variance, Standard deviation), Standard Error.
- 2 Correlation and Regression Analysis: Correlation relationship, Correlation coefficient, Pearson's coefficient, rank coefficient, Types of Correlation, linear regression Lines and regression coefficient and its application
3. Test of significance: Comparison of means of two samples (t-test), Comparison of means by three or more samples (F-test, one way ANOVA)
4. Probability and distributions: Events and Probability, Normal distribution, Binomial distribution, Poisson distribution
5. sampling and its techniques

PRACTICALS RECOMMENDED

1. To study the common MS-Excel processing terminology such as entering the data in work sheet, work sheet with formula, cell editing work sheet and editing cell content.
2. To calculate the sum, mean (simple, discrete and continuous series) from the given data.
3. To compute median (simple, discrete and class interval) from the given data.
4. To compute mode (simple, discrete and class interval) from the given data.
5. To compute the rank correlation coefficient from the given data.
6. To compute the correlation coefficient from the given data.
7. To compute the correlation coefficient from the given data by Karl Pearson's method.
8. To compute and calculate Spearman's rank correlation coefficient.
9. To compute and calculate the rank regression coefficient from the given data.
10. To compute and calculate the chi-square test from the given problem.
11. To compute and calculate the one way ANOVA from the given problem.
12. To compute and calculate the two way ANOVA from the given problem
13. To compute and calculate Standard deviation in simple series.
14. To compute and calculate Standard deviation in discrete series.
15. To compute and calculate Standard deviation in continuous series.

BOOKS RECOMMENDED

- Bolton's Pharmaceutical Statistics. Practical and Clinical Applications. Marcel Dekker, New York, 1990
- Daniel, W.W. Biostatistics. A Foundation for Analysis in Health Sciences. John Wiley, New York 1983
- Grewal, B.S. Higher Engineering Mathematics. Khanna Publishers, New Delhi, 1990.
- Gupta, S.P. Statistical Methods. Sultan Chand & Co., New Delhi, 1990.
- Kapoor V.K.; Operation Research Techniques for Mgt Sharma S.D.; Operation Research
- Gupta P. K., Swarup Kanti and Manmohan; Operation Research
- Sharma B. K and Dr Singh Ranjeet; Production & Operation Mgt
- Hira D.S. and Gupta Prem Kumar; Operation Research
- Aggrawal N.P.; Operation Research
- Kapoor V.K.; Operation Research Problems and Solution
- Bronsan Richard and Naadimuthu Govindsami; Operation Research Edition-II

COMMUNICATION SKILLS (ENGLISH)

THEORY

Subject code -206T

Hours – (03/week)

1. English Grammar: Sequences of tenses & use of three forms of verbs, voice, articles, direct and indirect speech.
2. Role and importance of communication: verbal and non-verbal communication, debates, role play, Group communication, effective communication, barriers of communication, communication media, participating in discussions, conduct of seminars, conferences etc., interacting with learners and teachers, role of wit and humor in communication.
3. Scientific/technical report writing: Reading comprehension, Assay writing, Thesis writing, Letter writing, drafting and delivering a speech, Tips for presentation technique, resume writing and interview techniques.
4. Types and methods of learning and listening: Linguistic understanding of different dialect of English language, comprehending & summarizing the matter supplied as audio / audio visual aid.
5. Agreement and disagreements: how to use a dictionary; how to use a thesaurus; vocabulary development; synonyms & antonyms; one word substitutes; phrase formation and use.

BOOKS RECOMMENDED

1. Wray and Martin.
2. Business communication and executive effectiveness by scdl.

B.PHARM. SEMESTER-III

PHARMACEUTICAL CHEMISTRY-IV (Chemistry of Natural Products)

THEORY

Subject code -301T

Hours – (03/week)

1. Carbohydrates: Structure, detailed chemistry, properties and reactions of mono, di and polysaccharides and qualitative analysis of carbohydrate.
2. Cardiac glycosides Source, chemistry, biogenesis and pharmacological activity of digitoxin, digoxin, diosgenins, strophanthidin and sennosides.
3. Lipids: Classification & composition of fats and oils, properties, determination and significance of acetyl value, acid value, saponification and iodine value.
4. Amino acids, peptides and proteins: Structure, classification, properties & reactions of amino acids, nomenclature of peptide and protein, solid phase peptide synthesis, classifications of proteins and levels of protein structure and protein denaturation.
5. Terpenoids & Terpenes: Sources, classification and structural elucidation and pharmacological activity of menthol, camphor, citral.
6. Alkaloids: Source, general classifications, chemistry and structural elucidation and pharmacological activity of atropine, quinine, reserpine, morphine, papavarine, ephedrine, ergot and vinca alkaloids.
7. Lignins and flavonoids: Chemistry and biogenesis of medicinally important lignans and flavonoids.

PRACTICALS- RECOMMENDED

1. To identify the given carbohydrate.
2. To identify the given alkaloid.
3. To identify the given glycoside.
4. To identify the given tannins.
5. To find out the % of alkaloid present in given crude drug (tobacco).
6. To determine anhydride content by hydrolysis of phthalic anhydride.
7. To determine % alcoholic hydroxyl group in the given sample by phthylation with phthalic anhydride in pyridine.
8. To determine the aldose content by titration with standard iodine solution.
9. To determine the Iodine value of the given sample of oil.
10. To determine the peroxide value of the given sample of oil.
11. To determine the hydroxyl value of the given sample of oil.
12. To determine the ester value of the given sample of oil.
13. To determine the saponification value of the given sample of oil.
14. To determine the unsaponifiable matter present in the given sample of oil.
15. To determine the acetyl value of given oil.

BOOKS RECOMMENDED

1. Morrison R.T. & Boyd R.N., Organic Chemistry, Prentice Hall India Pvt. Ltd., New Delhi.
2. Finar I.L., Organic Chemistry, Vol –II, E.L.B.S., London.

3. Mann F. G. & Saunders B. C., Practical Organic Chemistry, Longmans, Green and Co. Ltd., London.
4. Furniss B. S., et. al, Vogel's Textbook of "Practical Organic Chemistry, E.L.B.S., London.
5. Wingrove A.S. & Caret R.L.; Organic Chemistry, Harper & Row Publishers, New York.
6. Acheson R.N., An Introduction to the chemistry of Heterocyclic compounds, Interscience Publications, New York.
7. Gutschi, Chemistry of Carbonyl Compounds, Prentice Hall India Pvt. Ltd., New Delhi.
8. Remington Pharmaceutical Sciences.
9. Acheson R. N., An Introduction to the chemistry of Heterocyclic Compounds, Interscience Publishers, New York.
10. Finar I. L., Organic Chemistry, Vol. II., The Fundamentals and Principles, ELBS/Longman.
11. Textbook of Practical Organic Chemistry, The ELBS/Longman, Longman, London.
12. Jurs P. C. Computer Software Application in Chemistry, John Wiley & Sons, New York.
13. Roberts J. D. and Caserio M. C., Basic Principles of Organic Chemistry, W. A. Benjamin, Inc., New York.
14. Sykes P. A. Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi.
15. Agarwal O. P., "Natural Products" Vol.-I & II

PHARMACEUTICAL CHEMISTRY-V

(Biochemistry-I)

THEORY

Subject code -302T

Hours – (03/week)

1. Foundation of biochemistry: General properties of Bioelements, micro & macro biomolecules.
2. Bioenergetics: Introduction, concept of free energy, Role of high energy phosphate Nucleotide phosphates, production of ATP and its biological significance.
3. Biological oxidation: Redox-potential, enzymes and co-enzymes involved in oxidations, reduction and its control, respiratory chain, its role in energy capture and its control, energetics, and mechanism of oxidative phosphorylation, inhibitors of respiratory chain.
4. Enzymes: Properties, Nomenclature, Classification, Mechanism of action, kinetics, Michaelis-Menten equation, enzyme inhibition, factor affecting enzyme action, iso-enzymes, co-enzymes, metallo-enzymes, allosteric-enzymes, regulatory enzymes, enzyme inhibition, clinical and therapeutic uses of enzymes.
5. Vitamins: Classification and biological importance of vitamin A, vitamin D, vitamin E, vitamin K, vitamin B-complex and ascorbic acid.
6. Carbohydrates: Properties, classification, metabolism: glycolysis, citric acid cycle, hexose monophosphate shunt, uronic acid pathway, gluconeogenesis, glycogenolysis, gluconeogenesis, glyoxylate cycle, uremic acid cycle, regulation of metabolism, metabolism of fructose, galactose, abnormalities of carbohydrate metabolism, qualitative identification tests.

7. Lipids: Properties, classification, storage of lipids, structural lipids in membranes, lipids as signals, cofactors and pigments, digestion, mobilization and transport of fats, oxidation of glycerol, oxidation of fatty acids, ketone bodies, biosynthesis of fatty acids, eicosanoids, triglycerides, phospholipids, cholesterol, steroids, isoprenoids, regulation of fatty acids metabolism, phospholipids, sphingolipids, eicosanoids, abnormalities of lipid metabolism, qualitative identification tests.

PRACTICALS RECOMMENDED

1. To identify qualitatively the given known sample of carbohydrate. (**Lactose, Maltose, Glucose, Fructose, Starch & Sucrose**)
2. To identify qualitatively the given known sample of lipids. (**olive oil, Glycerol, Cholesterol**).
3. To identify qualitatively the given unknown sample of lipid/ carbohydrates.
4. To perform biochemical analysis for the given sample of food stuff.
Egg, potato, cheese
5. To identify qualitatively the normal organic and inorganic constituents in given sample of urine.
6. To identify qualitatively the abnormal constituents in given sample of urine.
7. To perform the identification of constituents of saliva.
8. To estimate glucose in the given sample of urine. (by benedict's method)
9. To study the effect of pH & temperature on the activity of given sample of saliva
10. To estimate diastase in the given sample of urine.
11. To carry out quantitative estimation of triglycerides in the given sample of serum.
12. To estimate creatine in the given sample of urine. (by colorimetric analysis)
13. To estimate creatinine in the given sample of urine. (by colorimetric analysis)
14. To study the various techniques of injection and withdrawal of blood samples.
15. To carry out quantitative estimation of glucose in the given sample of serum.
16. To estimate creatinine in the given sample of blood. (by colorimetric analysis)
17. To perform qualitative estimation of the given sample of bile juice.
18. To identify the unknown sample of physiological importance in the given unknown sample

BOOKS RECOMMENDED

- ___ Lehninger A. L., Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
- ___ Stryer L., Biochemistry, W H Freeman and Company, San Francisco.
- ___ Rama Rao. A.S.S.V; A Text book of Biochemistry; L. K. & S. Publishers, Visakhapatnam.
- ___ Conn E. E. and Stumpf P. K., Outlines of Biochemistry, John Wiley and Sons, New York.
- ___ Harrow B. and Mazur A., Textbook of Biochemistry, W. B. Saunders Co., Philadelphia.
- ___ Jayraman J., Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi.
- ___ Martin D. W., Mays P. A. and Redwell V. M., Harpers Biochemistry, Lange Medicak Publications.
- ___ Mussay R. K., Granner D. K., Mayous P. A. and Rodwell; Harpers Biochemistry, Prentice-Hall International, Inc.
- ___ Plumer D. T., An Introduction to Practical Biochemistry, Tata MacGraw Hill, New Delhi.
- ___ Deb A.C., Fundamentals of Biochemistry, New Central Book Agency Pvt. Ltd

PHARMACEUTICS-III
(Pharmaceutical Microbiology)

THEORY

Subject code -303T

Hours – (03/week)

- 1. Introduction to microbiology:** History and scope, Classification of microbes of following category – bacteria, fungi, viruses, actinomycetes, rickettsiae, spirochetes. Types of microscope and a brief about their working. Types of staining.
2. Morphology, nutrition, identification, cultivation and isolation of: Bacteria, fungi and viruses. Growth of microorganisms in culture: batch, continuous and synchronous culture
- 3. Immunity and infection:** Host-microbe interactions (infection), types of infection, mode of transmission, the process of infection, natural resistance and nonspecific defense mechanisms, basic and theoretical aspects of immunity (Humoral and Cellular) and immune response.
- 4. Common diseases:** their mode of transmission, methods of control, causative organism & their treatment and precise knowledge of following diseases: Rheumatic fever, Pneumonia, Gonorrhoea, Cerebrospinal-Meningitis, Diphtheria, Typhoid fever, Bacillary and Amoebic dysentery, Cholera, Plague, Influenza, pertussis, whooping-cough, Tetanus, Tuberculosis, Leprosy, Relapsing fever, syphilis, Rickettsia, Rabies, Poliomyelitis, Dengué, chicken pox, Measles, Mumps and Malaria.
- 5. Control of microbes:** physical and chemical methods, evolution of antimicrobial chemical agents.
- 6. Sterilization and Disinfection:** different methods and principles, sterility testing of pharmaceutical products as per IP.

PRACTICALS RECOMMENDED

1. To study the working of compound microscope.
2. To study the working of various equipments used in laboratory such as: Hot-air Oven, Autoclave, Colony counter etc.
3. To perform simple staining of given sample .
4. To perform the Gram's staining of given sample.
5. To perform the sterilization technique for the glasswares and Nutrient media.
6. To perform the isolation of mixed culture by using simple streaking method.
7. To perform the isolation of mixed culture by using multiple streaking method.
8. To perform the isolation of mixed culture by using spread plate method.
9. To determine the MIC of Phenol against E. coli.
10. To perform evaluation of antimicrobial activity of given chemical agent by using zone of inhibition method.
11. To perform evaluation of antimicrobial activity of given chemical agent by using Phenol coefficient method.
12. To Demonstration of various assemblies used for sterility testing according to I.P.
13. To perform the sterility testing of tap water by membrane filtration according to I.P.

14. To perform the sterility testing of marketed syringe by direct inoculation method according to I.P.

BOOKS RECOMMENDED

1. Peleczar M.J. Jr., Chan E.C.S., & Krieg N.R., Microbiology, Tata McGraw Hill, Publishing Co. Ltd., Delhi.
2. Hugo and Russel, Pharmaceutical Microbiology, Blackwell Scientific Publication, Oxford.
3. Rawlins E. A., Bentley's textbook of Pharmaceutics, ELBS Bacilliere Tindal.
4. Carter S. J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, Delhi.
5. Remington's The Science and Practice of Pharmacy, Mack Publishing Co. Easton, Pernsybrania.
6. Vyas, Dixit, Pharmaceutical Biotechnology.
7. Jain N. K., Textbook of Microbiology.
8. Casida, Industrial Microbiology.
9. Prescott and Dunn, Industrial Microbiology, McGraw Hill Book Co. Inc

PHARMACEUTICS-IV (Physical Pharmacy-1)

THEORY

Subject code -304T

Hours – (03/week)

1. **Intermolecular forces & states of matter:-** Binding forces between molecules, states of matter, the gaseous state, the liquid state, solid amorphous crystalline state, polymorphism, latent heats and vapour pressure, sublimation, phase equilibria and phase rule.
2. **Micromeritics-** Particle size distribution, average particle size, number and weight distribution, particle number, methods for determining particle size, optical microscopy, sieving, sedimentation, particle volume measurement, particle shape, specific surface methods for determining surface area, permeability method, adsorption methods, derived properties of powder, porosity, packing arrangement, densities, bulkiness, flow properties.
3. **Solubility & Distribution Phenomenon:** Solubility & Distribution Phenomenon: Solubility, factors affecting solubility, expression of solubility, dissolution rate, solvent-solute interaction, polar and non polar solvents, solubility of gases in liquid, liquid in liquid, effect of pressure, temperature, salting-out, chemical reasons, solubility calculations, ideal and real solution, colligative properties and mol. wt. determinations, Miscibility, influence of foreign substances, dielectric constant and solubility, solubility of solid in liquids, ideal & non ideal solutions, solution and association in solution, solubility of slightly soluble and weak electrolytes, Henderson haselbatch equation, influence of solvents on the solubility of drugs, combined effect of pH and solvents, preservation, action of weak acids, distribution of solutes between immiscible solvents, effect of ionic dissociation and molecular association on partition co-efficient & drug action.

4. **Colloidal Dispersion & Gels:** Dispersion system size and shape of colloidal particles, pharmaceutical applications, type-lyophilic, lyophobic and association colloidal, optical, kinetic and electrical properties of colloids, gel-structure properties, applications.
5. **Coarse Dispersion & Emulsions:** Interfacial properties of suspended particles, settling in suspensions, Theory of sedimentation effect of Brownian movement, sedimentation of flocculated particles, wetting of particles, controlled flocculation, flocculation in structural vehicles-Rheological consideration.

PRACTICALS RECOMMENDED

1. To study and draw the diagram of common apparatus used in physical pharmacy lab.
2. To study the state of matter.
3. To determine the angle of repose given sample.
4. To determine the effect of glidant on angle of repose.
5. To determine the effect of granulation on angle of repose.
6. To determine particle size distribution by sieving method.
7. To determine particle size distribution by sedimentation method.
8. To determine true density and bulk density of given sample.
9. To determine solubility of given sample at different sample.
10. To determine partition coefficient of given sample.
11. To find out the effect of concentration of given flocculating agent on degree of flocculation.
12. To determine surface tension of given sample.
13. To determine particle size distribution of powder by optical microscopic method.
14. To determine critical solution temperature [C.S.T] and solubility curve of phenol water system.

BOOKS RECOMMENDED:

1. Cooper & Gunns Tutorial Pharmacy.
2. Martin Physical Pharmacy.
3. Remington's Pharmaceutical Sciences

PHARMACOGNOSY – I

THEORY

Subject code -305T

Hours – (03/week)

1. Scope and significance of Pharmaceutical biology in Pharmaceutical field.
2. Definition, history, scope & development of Pharmacognosy.
3. Study of Plants Cell, Plant Tissues and non Living cell Inclusion.
4. Source of Drugs: Biological, marine, mineral, microbes and plant tissue cultures as source of drugs.
5. Classification of Drugs: Alphabetical, Morphological, taxonomical, chemical, Chemotaxonomical & pharmacological.

6. Plant Taxonomy: Study of following families with special reference to medicinally important plants – Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Labiatae, Papaveraceae, Cruciferae, Graminae.
7. Quality Control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation including qualitative and quantitative microscopy.
8. Quantitative microscopy: Lycopodium spore method and leaf constants viz. stomatal number, stomatal index, vein-islet number, vein-termination number and palisade ratio.
9. Phytochemical Screening: An introduction to active constituents of drugs, their isolation, classification and properties with Qualitative chemical tests of and their role in national economy (if any) the followings – Glycosides, Flavonoids, Terpenes, Carbohydrates, Lipids, fat and waxes.
 - A. Glycosides: Senna, Aloe*, Rhubarb, Cascara, Digitalis*, Scilla, Strophanthus, Thevetia, Dioscorea*, Glycyrrhiza*, Psoralea, Gentian, Picrorrhiza, Chirata, Quassia, Catechu, Myrobalan, Ammimajus, Quillaia Ginseng*, Squill, Coleus species, Saffron, and Andrographis Paniculata.
 {*- These plants should be given special emphasis on utilization and desired products.}
 - B. Flavonoid and Coumarin: Rutin, Psoralin, Xanthotoxin.
 - C. Terpenes: Menthol, Thymol.
 - D. Carbohydrates & derived products: Agar, Guar gum, acacia, Honey, Isapgula, pectin, starch, sterculia & tragacanth.
 - E. Lipids, Fats and Waxes: Beeswax, castor oil, Cocoa butter, Kokum butter, hydnicarpus oil, Cod-liver oil, shark-liver oil, Linseed oil, wool fat, Rice-bran oil.

PRACTICALS RECOMMENDED

1. To Study various microscope used in Pharmacognosy
2. To measure the diameter of 50 starch grains in the given sample of potato starch.
3. To measure the diameter of 50 starch grains in the given powdered sample of Cinnamon.
4. To measure the fibres present in the given powdered sample.
5. To measure the dimensions of calcium oxalate crystals in the given powdered sample of Cinnamon.
6. To determine the vein islet number and veinlet termination number of the Indian Senna leaf.
7. To determine the stomatal number and stomatal index of the Datura stramonium leaf.
8. To determine the palisade ratio of Indian Senna leaf.
9. To Study the Physical Characters of given Crude Drugs (Starch, Agar, Acacia, Honey)
10. To Study the Physical Characters of given Crude Drugs (Beeswax, Wool fat, Castor oil, Cod liver oil)
11. To extract pectin from Orange peels.
12. To extract starch from potatoes and measure the starch grain.
13. To determine the number of starch grains per mg of ginger by the lycopodium spore method.
14. To determine the swelling factor of Isapgula seeds.
15. To study the histology of given leaf (Datura).

16. To study the histology of given leaf (Coriander).
17. To study the histology of given leaf (Vinca).
18. To Study the morphology of given crude drugs (Senna leaf & pod, Psoralea, Picrorrhiza)
19. To Carry out Physical and Chemical tests for given Crude drug (Aloe)
20. To Carry out Physical and Chemical tests for given Crude drug (Rhubarb)
21. To prepare the herbarium sheet of given class of family.

BOOKS RECOMMENDED

1. Trease, G.E. & Evans, W.C., "Pharmacognosy" Bailleire tindall East bourne, U.K.
2. Wallis, T.E., Text book of Pharmacognosy, J.A. Churchill, Ltd.
3. Kokate, C.K. "Practical Pharmacognosy" Vallabh Prakashan, Delhi.
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,Scientehnica- Bristol.
6. Kokate, C.K. Pharmacognosy, Nirali Prakashan, Pune.
7. Schewer PJ, "Marine Natural products", Academic press, London.
8. Dutta A.C. " Botany for Degree students" Oxford.Marshall & Williams "Text Book of Zoology" CBS Publishers & Distrubutors, Delhi.
10. Fahn "Plant Anatomy" Aditya Books Private Limited, New Delhi.
11. Weiz, Paul B "Laboratory Manual in Science of Biology" Mc Graw-hill book company.

Environmental Sciences

THEORY

Subject code -306T

Hours – (03/week)

1. Materials of pharmaceutical Plant construction: Factors affecting selection of material for pharmaceutical metal-ferrous metals-cast-iron-steels, stainless steels, non ferrous metals, copper, copper alloys, aluminium, lead, tin, silver, nickel, chromium, non-metals, inorganic-glass, slate brick and concrete, asbestos, organic-plastic, rubber and timber.
2. Corrosion and its prevention: Introduction, types of corrosion, causes of corrosion, theories of corrosion, methods of prevention of corrosion.
3. Industrial Hazards and Safety precautions: Mechanical, Chemical, electrical, fire, dust hazards, safety requirements, fire extinguishers, accident records.
4. Enviourment and Pollution control Act
5. Storage of Hazardous and non- hazardous materials: solids outdoor storage bins-siol indoor storage in warehouse; liquid storage in tanks, storage of volatile liquids, gases-gas holder cylinder.
6. Biomaterials: - Historical Background, Molecular weight and conformations, polymers in solutions, polymers in the solid state, fabrication, polymers in drug delivery.

BOOKS RECOMMENDED

1. Badger W.L. and Banchemo J.T. Introduction to Chemical Engineering Mc Graw

- Hill; International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
 3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill; International Book Co., London.
 4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
 5. Gavhane, K. "Unit Opeation-I", Nirali Prakash

B.PHARM. SEMESTER-IV

PHARMACEUTICAL CHEMISTRY-VI

(Biochemistry-II)

THEORY

Subject code -401T

Hours – (03/week)

1. Amino acids, peptides and proteins: Properties, structure, classification, three dimensional structure of proteins – primary, secondary, tertiary and quaternary, functions of protein-reversible binding of protein to a ligand, complementary interactions between proteins and ligands, protein interactions modulated by chemical energy, catabolism of amino acids, biosynthesis of amino acids, urea cycle, biosynthesis of porphyrin and bile pigments, regulation and abnormalities of metabolism of amino acids, peptides and proteins, qualitative identification test of amino acids and proteins.
2. Nucleic acids: Brief introduction of genetic organization (genes and chromosomes), structure and chemistry of nucleic acids, biosynthesis of purine and pyrimidine, biosynthesis and degradation of nucleotides.
3. Genetic code and protein biosynthesis: Genetic code, protein biosynthesis and its inhibition, regulation of gene expression – principles, regulation in prokaryotes and eukaryotes.
4. Regulation of gene expression: Introduction to DNA & RNA, biosynthesis, replication and repair mechanism of DNA, biosynthesis of RNA, mutagenesis and qualitative identification test of RNA & DNA.
5. Clinical pathology: Various Pathological tests and their clinical significance. Lymphocytes and platelets: role in health and disease. Erythrocytes: Role, abnormal cells and their significance.
6. Liver and kidney: Functions, normal and abnormal constituents of urine and their significance, kidney and liver function tests.
7. Metabolic effects of various hormones: insulin, glucagon, etc. Disorders due to deficiencies in metabolism of carbohydrates, lipids and proteins.
8. Study of porphyrins, haemoglobin and bile pigments.

PRACTICALS RECOMMENDED

1. To identify qualitatively the given known sample of protein.
2. To identify qualitatively the given unknown sample of amino acid.
3. To estimate the total and free acidity in the given sample of gastric juice.
4. To perform biochemical analysis for the given sample of food stuff.
 1. milk
 2. bread
5. To estimate serum calcium in the given sample of serum. (by colorimetric analysis)
6. To carry out quantitative estimation of urea in the given sample of urine.
7. To carry out quantitative estimation of vitamin -C in the given sample of lemon juice.
8. To carry out quantitative estimation of lipase in the given sample of serum
9. To understand the concept of TLC & perform TLC for the given unknown sample of amino acid.
10. To perform TLC for the given unknown sample of amino acid.
11. To carry out quantitative estimation of total and direct bilirubin in the given sample.
12. To estimate total cholesterol in the given sample of plasma. (by colorimetric analysis)
13. To carry out quantitative estimation of amylase in the given sample of serum.
14. To perform the salivary amylase test for the given sample of saliva.
15. To perform biochemical analysis for the given sample of blood.
16. To carry out quantitative estimation of SGOT in the given sample of serum.
17. To carry out quantitative estimation of SGPT in the given sample.
18. To carry out quantitative estimation of lipid level HDL in the given sample of serum

BOOKS RECOMMENDED

- ___ Lehninger A. L., Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
- ___ Stryer L., Biochemistry, W H Freeman and Company, San Francisco.
- ___ Rama Rao. A.S.S.V; A Text book of Biochemistry; L. K. & S. Publishers, Visakhapatnam.
- ___ Conn E. E. and Stumpf P. K., Outlines of Biochemistry, John Wiley and Sons, New York.
- ___ Harrow B. and Mazur A., Textbook of Biochemistry, W. B. Saunders Co., Philadelphia.
- ___ Jayraman J., Laboratory Manual in Biochemistry, Wiley Eastern Limited, New Delhi.
- ___ Martin D. W., Mays P. A. and Redwell V. M., Harpers Biochemistry, Lange Medicak Publications.
- ___ Mussay R. K., Granner D. K., Mayous P. A. and Rodwell; Harpers Biochemistry, Prentice-Hall International, Inc.
- ___ Plumer D. T., An Introduction to Practical Biochemistry, Tata MacGraw Hill, New Delhi.
- ___ Deb A.C., Fundamentals of Biochemistry, New Central Book Agency Pvt. Ltd.
- ___ Varley H. Practical Clinical Biochemistry, CBS Publishers & Distributors.

PHARMACEUTICS-V (Biological Pharmacy)

THEORY

Subject code -402T

Hours – (03/week)

1. **Blood Products and Plasma Substitutes:** Collection, processing of storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human

normal immunoglobulins, human fibrin foam, plasma substitutes- ideal requirements, PVP, dextrans etc

- 2. Surgical products:** Definition, primary wound dressings, absorbents, surgical cotton, surgical gauzes, etc., bandages, adhesive tapes, protective cellulosic haemostatics, official dressings, absorbable and nonabsorbable sutures, ligatures & catgut. Medical prosthetics and organ replacement materials.
- 3. Medical Devices** – Introduction, types and scope.
- 4. Pharmaceuticals product for cosmetic surgery.**
- 5. Manufacturing and quality control of immunological products:** Introduction, vaccines, in-vivo diagnostics, and immuno-sera, human immunoglobulin including important bacterial and viral vaccines (highlights on its source material, processing, potency assay and safety tests).
- 6.** Microbial assays of antibiotics as per I.P.
- 7. Radiopharmaceuticals-** Production, therapeutic, and diagnostic uses, Instruments for detection.

PRACTICALS RECOMMENDED

- 1.** To study the various surgical instruments.
- 2.** To perform the sterilization of scalpel, knife, scissors and forceps.
- 3.** To perform the sterilization and evaluation of absorbent cotton gauge.
- 4.** To prepare absorbent cotton gauge pad (2.5x2.5 cm), sterilized it and evaluate through sterility testing.
- 5.** To perform evaluation tests of absorbent cotton wool and surgical dressings I.P.
- 6.** To prepare and evaluate Zinc oxide paste bandage I.P. (10X2.5 cm).
- 7.** To prepare and evaluate plaster of Paris bandage I.P. (10X2.5 cm).
- 8.** To prepare and evaluate standard dressing no. 13 BPC.
- 9.** To prepare, sterilized and evaluate Tulle-Grass dressing BP.
- 10.** To perform antimicrobial assay of given antibiotic as per I. P.
- 11.** To prepare and submit serum/ plasma from collected blood sample.

BOOKS RECOMMENDED

1. Peleczar M.J. Jr., Chan E.C.S., & Krieg N.R., Microbiology, Tata McGraw Hill, Publishing Co. Ltd., Delhi.
2. Hugo and Russel, Pharmaceutical Microbiology, Blackwell Scientific Publication, Oxford.
3. Rawlins E. A., Bentley's textbook of Pharmaceutics, ELBS Bacilliere Tindal.
4. Carter S. J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, Delhi.
5. Remington's The Science and Practice of Pharmacy, Mack Publishing Co. Easton, Pennsylvania.
6. Vyas, Dixit, Pharmaceutical Biotechnology.
7. Jain N. K., Textbook of Microbiology.
8. Casida, Industrial Microbiology.
9. Prescott and Dunn, Industrial Microbiology, McGraw Hill Book Co.

PHARMACEUTICS-VI
(Pharm. Engineering-II)
Theory

Subject code -403T

Hours – (03/week)

1. Unit Operations: Introduction, basic laws.
2. Fluid Flow: Types of flow, Reynold's number, Bernaulli's theorem, Viscosity, Concept of boundary layer, flow meters, manometers and measurement of flow and pressure.
3. Material Handling Systems:
 - a. Liquid handling- Different types of pumps.
 - b. Gas handling- various types of fans, blowers and compressors.
 - c. Solid handling- Bins, Bunkers, Conveyers, Air transport.
4. Size reduction: Importance in pharmacy, factors influencing size reduction grinding mills of various types like hammer mill, cutter mill, ball mill, edge and end runner mill, fluid energy mill.
Size separation: Sieves, sifting, size gradation, size distribution- methods of determining size distribution.
6. Powder & semisolid mixing: Mechanism of mixing, various types of trough mixers, sigma and ribbon blenders, paddle mixers, tumblers like cube and double cone. Planetary mixer.
7. Mechanism of liquid mixing, Different types of impellers, mixers, tanks, baffles, prevention of aeration and foam.
8. Humidification and dehumidification: definition of various terms, adiabatic conditions, humidity charts, determination of humidity, methods of increasing and decreasing humidity.
9. Refrigeration and Air Conditioning: Principles and applications of refrigeration and air conditioning.

PRACTICALS RECOMMENDED

1. To study working principle of various types of equipments used in pharmaceutical engineering.
2. To study the Particle size reduction by ball mill.
3. To study the effect of Speed (RPM) of ball mill on particle size reduction.
4. To study the effect of surface area on rate of filtration.
5. To study the effect of surface area on rate of filtration.
6. To study the effect of thickness of filter medium on rate of filtration.
7. To study the effect of viscosity on rate of filtration.
8. To study the effect of type of material on rate of filtration.
9. To study the effect of temperature on rate of filtration.
10. To study the effect of Filter aids on rate of filtration.
11. To study the effect of Pressure head on rate of filtration.
12. To determine average particle size and to study particle size distribution using standard sieve method.
13. To determine the Humidity and % humidity and Dew point by using Psychometric Chart.

14. To study the effect of time and speed on solid liquid mixing.

BOOKS RECOMMENDED

1. Badger W.L. and Banchemo J.T. Introduction to Chemical Engineering Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
4. Sambhamurthy, Pharmaceutical Engineering, New Age Publishers.
5. Gavhane, K.A. "Unit Opeation-I", Nirali Prakashan

PHAMACOGNOSY – II

THEORY

Subject code -404T

Hours – (03/week)

1. Phytochemical Screening: An introduction to active constituents of drugs, their isolation, classification and properties with Qualitative chemical tests and their role in national economy (if any) of the followings: –
 - A. Resins and Resin Combination like: Podophyllum, Cannabis, Capsicum, Shellac, asafoetida, Balsam of tolu, Balsam of peru, Benzoin, Turmeric, Ginger, colophony, Jalap, kaladana, Colocynth.
 - B. Volatile oils : General methods of obtaining volatile oils from plants, Study of volatile oils from Mentha*, Coriander, Cinnamon, Jatamansi, Cumin, Black pepper, Cassia, Lemon peel, Orange peel, Lemon grass*, Caraway, Dill, Clove, Fennel, Nutmeg, Eucalyptus*, Chenopodium, Cardamom, Valerian, Musk, Sandalwood*, Vetiver* and Geranium*.
{*- These plants should be given special emphasis on utilization and desired products.}
 - C. Tannins: Gambier (Pale Catechu), Black Catechu, Gall, Harde, Baheda, Arjuna & Ashoka.
 - D. Miscellaneous drugs: Gelatin, Male fern,
2. Fibres: Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestos.
3. Pharmaceutical aids:- Study of Pharmaceutical aids like Talc, Diatomite, Kaolin, Bentonite, Fullers earth, Gelatin and Natural colors.
4. Cultivation, Collection, Processing & Storage of crude drugs. Factors influencing cultivation of medicinal plants, Type of Soils & fertilizers of common use.
5. Deterioration of crude drugs, Pest Management & natural pest control agents.
6. Plant hormones and their applications.

PRACTICALS RECOMMENDED

1. To Study the morphology of given crude drugs (Cumin, Jatamansi, Black Pepper)
2. To Study the morphology of given crude drugs (Lemon peel, Orange peel, Caraway, Nutmeg)
3. To Study the morphology of given crude drugs (Black Catechu, Pale catechu, Harde)
4. To Study the morphology of given crude drugs (Baheda, Arjuna, Ashoka)
5. To Study the morphology of given crude drugs (Cannabis, Asafoetida)

6. To study the Pharmacognostical evaluation of given crude (Ginger)
7. To study the Pharmacognostical evaluation of given crude (Cardamom)
8. To study the Pharmacognostical evaluation of given crude (Cinnamon)
9. To study the Pharmacognostical evaluation of given crude (Dill)
10. To study the Pharmacognostical evaluation of given crude (Clove)
11. To study the Pharmacognostical evaluation of given crude (Eucalyptus)
12. To study the Pharmacognostical evaluation of given crude (Fennel)
13. To study the Pharmacognostical evaluation of given crude (Coriander)
14. To identify the given fibres by performing various chemical tests as per I.P. (Cotton, Jute, 50Silk, Glass Wool).
15. To perform the various identification tests for given Pharmaceutical aids (Talc, Kaolin, Bentonite, Gelatine)
16. To examine the various samples of volatile oil under ultra violet radiation.
17. To perform the Phytochemical screening of Black Catechu and Pale Catechu.
18. To extract medicated oil from Eucalyptus Leaf.
19. To prepare monograph of Aromatic plants.

BOOKS RECOMMENDED

1. Trease G.E., & Evans W.C., "Pharmacognosy" Balliere Tindall East Bourne U.K.
2. Tyler V.E. et al "Pharmacognosy" Lea & febiger, Philadelphia.
3. Wallis, T.E. "Text Book of Pharmacognosy" J&A Churchill Ltd, London.
Kokate C.K. et al "Pharmacognosy" Nirali Prakashan, Pune.
4. Atal C.K. & Kapur BM, "Cultivation & utilization of Medicinal plant, RRL, Jammu.
5. Harborne J B, Phytochemical method, Chapman & Hall International Edition, London.

PHARMACEUTICS-VII (Physical Pharmacy-II) THEORY

Subject code - 405T

Hours – (03/week)

1. **Surface Phenomenon:** Liquid interfaces: surface and interfacial tension, surface free energy, measurement of surface and interfacial tension, spreading co- efficient, absorption at liquid interfaces, surface active agents, HLB, solubilisation, detergency, adsorption at solid interfaces, complex films, electrical properties.
2. **Buffered and isotonic solutions:** - Buffer equation, Buffer Capacity, Buffers in Pharmaceutical and Biologic systems, Buffered isotonic solutions, Methods of adjusting tonicity and pH
3. **Complexation & chelation, types of complexes, its application.**
4. **Viscosity & Rheology:** Newtonian system-law of flow, kinematic viscosity, effect of temp. Non-newtonian system-pseudo plastic, plastic, dilatic, thixotropy, measurement of

thixotropy, thixotropy in formulation, determination of viscosity capillary, falling ball, rotational viscometers.

5. **Thermodynamics:** - The first law of thermodynamics, thermochemistry, the second law of thermodynamic, Entorpy, the third law of thermodynamics, the van't-hoff equation.

PRACTICALS RECOMMENDED

1. To determine the surface tension of given sample using of stalagmometer.
2. To find out the effect of surfactants on surface tension of given liquid using of stalagmometer.
3. To determine the CMC of given surfactants using of stalagmometer.
4. To determine the effect of surfactant on rate of CMC.
5. To determine the effect of electrolyte on rate of CMC.
6. To determine the viscosity of given sample unknown sample using of Ostwald viscometer.
7. To Study the effect of molecular size and molecular weight on viscosity of liquid using of Ostwald viscometer.
8. To Study the effect of Temperature on viscosity of liquid using of Ostwald viscometer.
9. To Study the effect of electrolyte on viscosity of liquid using of Ostwald viscometer.
10. To determine the acid value of given substance.
11. To determine the Saponification value of given substance.
12. To determine the hydroliphophilic balance (HLB) of given surfactants.
13. To determine the reaction rate and constant and half life period of ethyl acetate in 0.25 N sodium hydroxide solution at room temperature.
14. To determine viscosity parameters of suspension (rate of sedimentation, sedimentation volume, degree of flocculation and find the effect of flocculating agent on rate of sedimentation.

BOOKS RECOMMENDED:

1. Cooper & Gunns Tutorial Pharmacy.
2. Martin Physical Pharmacy.
3. Remington's Pharmaceutical Sciences

DRUG STORE AND BUSINESS MANAGEMENT-I

THEORY

Subject code -406T

Hours – (03/week)

1. **Introduction:** Commerce and industry, subdivision of commerce and functions of different division, Classification of industry on different basis, Forms of business organization. Levels of management and importance & functions of management.
2. **Drug house management:** Selection of location of drug store, Layout and legal aspects of a drug store, objectives and procedure of purchasing, selection of suppliers, Codification of various items of drug store, credit information, Tenders, Contracts, Storage, Legal requirements.
3. **Inventory control:** Objectives and functions, various techniques of inventory control.

4. **Sales promotion:** Objective and techniques, salesmanship, Qualities of salesman, Advertising, Window display.
5. **HRD:** Recruitment, Selection, Training, Evaluation and Compensation to the pharmacist.
6. **Channel of distribution:** Schematic diagram, Wholesalers, Retailers, Retail departmental store.
7. **Banking and finance:** Types of banks, Financial planning, Sources of finance.
8. Drug price control act (DPCO)
9. Factory's act

BOOKS RECOMMENDED

1. Jain & Khandelwal: Mathematics for B.Pharm.
2. R.M. Mehta: DSBM
3. I.M.Pandey: financial management, Vikas publishers
4. Jain & Khandelwal: Mathematics for B.Pharm.
5. R.M. Mehta: DSBM

B.PHARM. SEMESTER-V

PHARMACEUTICAL CHEMISTRY-VII (Medicinal Chemistry-I)

THEORY

Subject code -501T

Hours – (03/week)

1. Basic Principles of Medicinal Chemistry: Physicochemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action. Drug- receptor interaction including transduction mechanism, Introduction of QSAR.

Classification with structures, (mode of action, uses, structure activity relationship and Synthetic procedures of the following classes in the asterisk only)

2. Autonomous nervous system.

A. **Cholinergic & Anticholinesterases, Anticholinergic** – Acetylcholine*, Carbachol*, Neostigmine*, Physostigmine*, edrophonium*, Methacholine*, Pilocarpine*,

B. **Anticholinergic**- Atropine*, Scopolamine*, Pirnzepine*.

B. **Adrenergic Drugs**- Nor adrenaline*, Isoproterenol*, Amphetamine*, Salbutamol*, Terbutaline*, Adrenaline*, Ephedrine*, dopamine*

C. **Antiadrenergic Drugs:** Phentolamine, tolazoline, phenoxybenzamine*, Ergot alkaloid, Prazosin*, terazosin, Indoramine, Doxazosin, Yohimbine, propranolol*, timolol, pindolol, Atenolol, Acebutolol, Metoprolol, Butoxamine, Labetolol, Dilevalol.

D. **Neuromuscular Blocking Agents** – Gallamine Triethiodide*, Mephenesin*, Pancuronium*.

E. Drugs used in the treatment of Alzheimer's disease

3. **Analgesics:** Morphine*, Codeine*, Heroin*, Naloxone*, Mepiridine*, Methadone*, Dextro-propoxyphen*, Dextromethorphan*, Pentazocine, Buprenorphine, butorphanol,

- fentanyl, ketorolac, tramadol, meloxane.
- Nonsteroidal anti-inflammatory agents and antipyretics:** Aspirin*, Salicylamide*, Aminopyrin*, Phenylbutazone*, oxyphenbutazone*, mefenamic acid*, indomethacin*, Tolmetin*, Ibuprofen*, Naproxen*, Piroxicam*, Analgin*, Paracetamol*, Diclofenec*, nimesulide.
 - Autocoids and related drugs:**
Antihistaminics: Diphenhydramine*, Promethazine*, Cyproheptadine*, Cetirizine*, menhydrinate*, mepyramine*, chlorpheniramine*.
Prostaglandins- Mesoprostol*, misoprostol*, rioprostil*, alprostadil*.
 - Anti-allergics-** cetirizine, Clemastine, Mizolastine, Desloratidine, Dimethindine maleate, ebastine, fexofenadine, hydroxyzine, loratidine, luvistin

PRACTICALS RECOMMENDED

- To separate the binary mixture of the given sample of organic compounds. (**At least five samples**).
- To separate and identify the binary mixture of the given sample of organic compounds. (**At least five samples**).
- To synthesize methanamine from formaldehyde and reports it's % yield & melting point.
- To synthesize 3,5-Dinitrobenzoic acid from benzoic acid and reports it's % yield & melting point.
- To synthesize Phenylbenzoate from phenol and reports it's % yield & melting point.
- To synthesize Benzanilide from aniline and reports it's % yield & melting point.
- To synthesize Phenyl hydroxyl amine from nitrobenzene and reports it's % yield & melting point.
- To synthesize Benzamide from benzoyl chloride and reports it's % yield & melting point.
- To synthesize Dimethyl phthalate from phthalic anhydride and reports it's % yield & melting point.

BOOKS RECOMMENDED:

- Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/Longman, London.
- Furniss B A, Hannaford A J, Smith P W G and Tatehell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
- Pharmacopoeia of India, Ministry of Health, Govt. of India.
- Wolff ME. Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
- Degado J.N. and Remers W A R, 10th eds., Wilson and Giswold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Lippincott, William & Wilkins.
- Foye W C. Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
- Singh Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
- Nogrady T, Medicinal Chemistry – A Biochemical Approach, Oxford University Press, New York, Oxford.
- Finar I L. Organic Chemistry, Vol I & II, ELBS/ Longman, London.

PHARMACEUTICS-VIII (Pharm. Engineering-II)

Theory

Subject code -502T

Hours – (03/week)

1. Basic Definition: Unit processes material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups,
2. Heat Transfer: Source of heat, heat transfer, steam and electricity as heating media.
3. Evaporation: Factor affecting evaporation, evaporators: Natural circulation, forced circulation and film evaporators, Economy in evaporation: vapour recompression and multiple effect evaporation.
4. Distillation: boiling point-composition diagrams, simple, steam and flash distillations, principles of rectification, Calculation of number of theoretical plates, Azeotropic and extractive distillation.
5. Drying: Moisture content and mechanism of drying, rate of drying classification and types of dryers, behavior of solids during drying, MC, EMC, CMC and LOD, dryers used in pharmaceutical industries and special drying methods like freeze drying.
6. Filtration and Centrifugation: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters.
7. Crystallization: Solubility curves and Super-saturation Theory and its limitations, Nucleation mechanisms, Crystal growth. Study of various types of Crystallizers, tanks, Caking of crystals and its prevention.
8. Fundamentals of Automated Process control system and Computer aided manufacturing (CAM).
9. Reactors and fundamentals of reactors design for chemical reaction.

PRACTICALS RECOMMENDED

1. To study the effect of following factors on the rate of evaporation:- Surface Area, Temperature, Time, Agitation, Concentration of Dissolved Salts
2. To study the effect of following factors on the rate of drying: Surface area, Temperature, Time, Initial Moisture Content
3. To determine the rate of drying curve, free moisture content and bound moisture content, CMC and EMC for the Calamine Lotion I.P.
4. To determine the rate of drying curve, free moisture content and bound moisture content, CMC and EMC for the Light Kaolin Mixture B.P.
5. To perform Steam Distillation of Turpentine Oil and determine the percentage yield and efficiency of the system in one hour of distillation.
6. To study the effect of following factors on the rate of filtration: Different filter media, Viscosity of Filtrate, Pressure, Different Filter Aids

7. To find compare the rate of filtration of a given slurry filtered through an uncoated filter medium with that when same slurry is filtered through a pre-coated filter medium (both medium having same surface area).
8. To study the principle of centrifugation for the following:
Liquid –Liquid separation and stability of emulsions, Solid – liquid separation and stability of suspension,
9. To demonstrate the use of Psychrometric Charts for determination of Humidity, Percentage Humidity and Dew Point in lab and open area.
10. To perform the crystallization of Ferrous Sulphate and to find out percentage yield; to study the characteristics of crystals formed.

BOOKS RECOMMENDED:

1. Badger W.L. and Banchero J.T. Introduction to Chemical Engineering Mc Graw Hill International Book Co., London.
2. Perry R.H. & Chilton C.H. Chemical Engineers Handbook, Mc Graw Kogakusha Ltd.
3. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
4. Gavhane, K.A. “Unit Operation-II”, Nirali Prakashan.
5. Sambhamurthi Pharmaceutical Engineering, New Age Publishers.

PHARMACEUTICS-IX (Dosage form design-I) THEORY

Subject code -503T

Hours – (03/week)

1. Pre-formulation studies:

- a. Study of physical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant. Solubility, dissolution and organoleptic property and their effect on formulation, stability and bioavailability.
- b. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products.
- c. Study of pro-drugs in solving problems related to stability, bioavailability and elegance of formulation.

2. Tablets:

- a. Formulation of different types of tablets, granulation technology or large scale manufacturing by various techniques, physics of tablets making, different types of tablet compression machinery and the equipment employed, evaluation of tablets.
- b. Coating of Tablets: - Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process evaluation of coated tablets.

3. Capsules:

Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule

content, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.

4. Parenteral Products:

- a. Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity.
- b. Formulation details, containers, closures and selection.
- c. Prefilling treatment, washing of containers and closures, preparation of solution, emulsion and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products.
- d. Aseptic Techniques:- source of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance.

5. Ophthalmic Preparations: Requirements, formulation, methods of preparation, containers, evaluation.

6. Packaging of Pharmaceutical Products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing.

PRACTICALS RECOMMENDED

1. To Study the Principal and Working of various apparatus used in Pharmaceutical Technology.
2. To perform the Preformulation study of given powder blend.
3. To Prepare and Submit lactose granules by using Wet Granulation Method.
4. To Study the various evaluation parameters of Prepared granules (Bulk density, Tapped density, Carr's index, Hausner's Ratio, Angle of repose)
5. To prepare and Evaluate 20 Ferrous Sulfate Tablets.
6. To prepare and Evaluate 10 Chewable antacid Tablets.
7. To prepare and Evaluate 20 Effervescent Tablets.
8. To fill empty Hard gelatin capsule Shell with given formula and Perform Weight variation test USP.
9. To prepare and Submit 20 Floating Tablets and report their floating lag time, size Distribution, Hardness and Weight variation.
10. To prepare and Submit:-a) Sodium Chloride Injection IP. b) Compound Sodium Chloride Injection IP
11. To prepare and Submit:-a) Sodium Chloride Injection IP. b) Compound Sodium Chloride Injection IP.
12. To prepare and submit following:-
 - a) Zinc Sulfate eye drops.
 - b) Sodium Chloride eye lotion.
 - c) Sodium Bicarbonate eye lotion.
 - d) Boric Acid eye lotion.
13. To prepare and Submit:-
 - a) Eye ointment.
 - b) Iso-osmotic eye suspension.
 - c) Iso-osmotic calculation.

14. To prepare and Submit Dextrose injection 5 % w/v.
15. To prepare and evaluate paracetamol sustain release tablets.
16. To perform the evaluation test of glass.

BOOKS RECOMMENDED

1. Remington: The Science and Practice of Pharmacy Pharmaceutical Sciences Vol. I & III, Mack Publishing Company, U.S.A.
2. R.E. Avis, Pharmaceutical Dosage Forms: Parenteral Medication, Vol-I, Marcel Dekker-Inc, New York & Basel.
3. H.C. Ansel, Introduction to Pharmaceutical Dosage Forms, Lea & Febiger, Philadelphia, U.S.A.
4. R.C. Juliano, Drug Delivery Systems, Oxford University Press, Oxford.
5. Herbert A. Liebermann & Leon Lachman, Theory & Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia, U.S.A

PHARMACOLOGY -I

THEORY

Subject code -504T

Hours – (03/week)

1. **General Pharmacology:** Introduction to pharmacology and routes of drug administration.
2. **Pharmacokinetics:** Absorption, distribution, metabolism and excretion of drugs, principles of basic and clinical pharmaco-kinetics, adverse drug reactions and ADME drug interactions.
3. **Pharmacodynamics:** Mechanism of drug action, drug receptor interactions, combined effect of drugs, factors modifying drug action, tolerance, dependence, therapeutic index, efficacy, potency.
4. **Pharmacology of Peripheral nervous system:**
 - (a) Neurohumoral transmission (autonomic and somatic).
 - (b) Parasympathomimetics, parasympatholytics, sympathomimetics, sympatholytics, ganglionic stimulants and blocking agents.
 - (c) Neuromuscular blocking agents.
 - (d) Local anesthetics.
5. **Drugs used in ocular pharmacology:** Mydriatics, miotic agents and drugs used in glaucoma.
6. **Autocoids:**
 - (a) Histamine, 5-HT and their antagonists.
 - (b) Prostaglandins, thromboxanes, leukotrienes and PAF.
 - (c) Pentagastrin, cholecystokinin, angiotensin, bradykinin and substance P.

PRACTICALS RECOMMENDED

1. To study the basic equipments & glasswares used in pharmacology laboratory.
2. (a) To prepare the different physiological salt solutions.
(b) To prepare the standard drug solutions & their dilutions.
3. (a) To study various animals used in pharmacology laboratory.
(b) To study various anaesthetics used in pharmacology laboratory.
4. To study the different routes of drugs administration in laboratory animals.

5. (a) To study the stunning of rodents & chemical euthanasia.
(b) To record the concentration response curve (CRC) of acetylcholine by using rat ileum preparation.
6. To record the concentration response curve (CRC) of phenylephrine by using rat vasdeferens preparation.
7. To record the concentration response curve (CRC) of histamine by using guinea pig ileum preparation.
8. To record the concentration response curve (CRC) of histamine in presence of pheniramine and calculate dose ratio & PD₂ value by using guinea pig ileum preparation.
9. To record the concentration response curve (CRC) of acetylcholine in presence of atropine and calculate dose ratio & PD₂ value by Using rat ileum preparation.
10. To record the concentration response curve (CRC) of acetylcholine in the absence & presence of neostigmine and find out dose ratio & PD₂ value by using rat ileum preparation.
11. To record the concentration response curve (CRC) of phenylephrine in presence of prazosin and calculate dose ratio & PD₂ value by using rat vasdeferens preparation.
12. To identify unknown drug sample by using guinea pig ileum preparation.
13. To identify unknown drug sample by using rat ileum preparation.
14. To study the effects of local anesthetics on rabbit's eye.
15. To study the effects of mydriatic and meiotic on rabbit's eye.

BOOKS RECOMENDED

1. Goyal R.K. – Practicals in pharmacology (1994-95) 1st Edn. M/s. B.S.Shah Prakashan, Ahmedabad.
2. Sheth U.K. etal – Selected topics in experimental pharmacology (1972) 1st Edn. The Kothari Book Depot, Mumbai.
3. Kulkarni S.K. – Handbook of experimental pharmacology(1993) 2nd Edn. Vallabh Prakashan, New Delhi.
4. Ghosh M.N. – Essentials of experimental pharmacology scientific book agency, Calcutta, 1984.
5. Rang.H.P.,DaleM.M.,etal–Pharmacology(1995)3rdEdn. Churchil livingstone,USA.
6. Satoskar R.S., etal – Pharmacology and pharmacotherapeutics (1999) 16th Edn. Popular Prakashan, Mumbai.
7. Harvel, R.A., Champe P. C. etal, Pharmacology (1997) 2nd edition, Lippincott- Raven Company, Philadelphia, New Yor.
8. Craig C. R. Stitzel, R. E.-Modern Pharmacology (1994) 4th edition. Little Browth and Company, U.S.A.
9. Seth S. D., Text Book of Pharmacology, B. I. Churchill, 1997.
10. Goodman and Gillman's The Pharmacological Basis of Therapeutics Edition/ Hardroan, et al/McGraw Hill.

PHARMACOGNOSY – III

THEORY

Subject code -505T

Hours – (03/week)

1. Brief Introduction and principles of Ayurvedic, Unani, Siddha and Homeopathic systems of medicines. Introduction to Herbal Pharmacopoeia with special reference to Arishtas, Asavas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas.
2. Introduction, classification, and study of different chromatographic methods and their merits and demerits and application in pharmaceutical field.
3. Utilization and production of phytoconstituents such as calcium sennosides, Diosgenin, Solasodine & Podophyllotoxins.
4. Studies of traditional drugs: Common Vernacular name, Biological sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and toxicological activity of marketed formulations of following indigenous drugs:
Amla, Kantkari, Satavari, Tylophora, Bhilwa, Kalijiri, Bach, Rasna. Punarnava, Apamarg, Gokhru, Shankhpushpi, Brahmi, Methi, Lehsun, Palash, Guggul, Gymnema, Shilajit, Tulsi, and Neem.
5. Introduction of natural anti oxidants, Herbal cosmetics.
6. Polyploidy, Mutation, chemodems & hybridization with reference to medicinal plants.

PRACTICALS RECOMMENDED

1. To Study the morphology of given crude drugs (Amla, Satavari, Kalijiri).
2. To Study the morphology of given crude drugs (Bach, Punarnava, Gokhru).
3. To Study the morphology of given crude drugs (Shankhpushpi, Brahmi, Methi)
4. To Study the morphology of given crude drugs (Lehsun, Palash, Guggul).
5. To Study the morphology of given crude drugs (Tulsi, Neem, Gymnema).
6. To prepare and standardized Triphala Churna.
7. To Carry out Physical and Chemical tests for given Crude drug (Guggul).
8. To determine the ash value of given crude drug.
9. To determine the extractive value of given crude drug.
10. To determine the loss on drying of given crude drug.
11. To perform TLC of Peppermint oil.
12. To perform TLC of Rhubarb powder.
13. To perform TLC of Amino acid.
14. To prepare Herbal Pea face scrub.
15. To prepare Herbal Hair setting preparation
16. To prepare Herbal Bath oil.
17. To prepare Herbal Neem powder shampoo.
18. To prepare and standardized Ayurvedic formulation
19. A Report on marketed preparation based on traditional drugs.

BOOKS RECOMMENDED:

1. Kokate C.K. "Practical Pharmacognosy" Vallabh Prakashan, New Delhi.
2. Wallis T.E. "Analytical Microscopy" J&A Churchill Ltd., London.
3. Trease, G.E., & Evans, W.C., Evans, W.C., "Pharmacognosy" Bailliere Tindall east Baorne, U.K.
4. Tyler V.E. et al: "Pharmacognosy" Lea & Febiger, Philadelphia.
5. Wallis. T.E. "Text Book of Pharmacognosy" J&A Churchill Ltd. London.
6. Kokate C.K. et al "Pharmacognosy" Nirali Prakashan, Pune.
7. Medicinal plants of India I&II, Indian council of Medical Reasearch, New Delhi.
8. Nadkarni A.K. Indian Materia Medica 1-2, Popular Prakashan (P) Ltd. Bombay.
9. Atal C.K. & Kapur BM. "Cultivation & utilization of Medicinal plants, RRL, Jammu.
10. Indian Herbal Pharmacopoeia, vol. I&II, ICMR & RRL, Jammu.
11. The wealth of India, Raw Materials (All volumes) Council of Scientific & Industrial Research, New Delhi.
12. Compendium of Indian Medicinal Plants I-IV, Rastogi & Malhotra.
13. Indian Ayurvedic Pharmacopoeia, Govt. of India.
14. Kokate CK, Gokhale AS, Gokhale SB, Cultivation of Medicinal Plants, Nirali Prakashan.

DRUG STORE AND BUSINESS MANAGEMENT-II

THEORY

Subject code -506T

Hours – (03/week)

1. **Accounting:** Introduction to accounting, objectives, limitations and different branches of accounting.
2. **Accountancy:** Introduction to the accounting concepts and conventions, Different kinds of accounts, Double entry bookkeeping system.
3. **Recording of transactions:** Journal, Ledger & their posting from journal, Trial balance: Objective & preparation of trial balance, Profit & loss account, Balance sheet: uses & preparation of balance sheet. Cash book: Types of cash books. Differences between Journal and ledger, Trial balance and Balance sheet, P & L account and Balance sheet.
4. **Cost accounting:** Cost ascertainment, various elements of cost sheet preparation, Statement of cost. Marginal costing, elementary knowledge of cash flow statement and fund flow statement. Computation of various ratios and analysis of final statement.
5. Accounting errors, rectification of errors, Bills of exchange.
6. **Budgeting:** Meaning, importance and types of budgets, Elementary knowledge of preparing sales, cash, production and flexible budgets.
7. **Auditing:** Meaning, Objects, Vouching: objectives, importance & types of vouchers, Duties and liabilities of an auditor, types of frauds, differences between errors and frauds, Auditor and location of errors and frauds. Internal audit, differences between internal check & internal audit.
8. Drug and pharmaceutical industry- A Review
- 9.. Minimum wages act

Books Recommended:

1. Introduction to Accountancy: Gerwal, T.S.
2. Auditing: T.R.Verma.
3. Management Accounting: S.N.Maheshwari
4. R.G.Saxena, Principles and practice of auditing.
5. Jain & Khandelwal: Mathematics for B.Pharm.
6. R.M. Mehta: DSBM
7. N.K.Jain: Forensic Pharmacy

B.PHARM. SEMESTER-VI**PHARMACEUTICAL CHEMISTRY-VIII
(Medicinal Chemistry-II)****Theory****Subject code -601T****Hours – (03/week)**

Classification with structures, (mode of action, uses, structure activity relationship and Synthetic procedures of the following classes in the asterisk only)

1. Central nervous system (i)-

General Anaesthetics-Thiopental*, Ketamine*, Methohexital*, Isoflurane*, Sevoflurane*, Nitrous oxide*, etomidate*.

Local Anaesthetics-Lignocaine*, Benzocaine*, Bupivacaine, Etidocaine*.

Hypnotics and Sedatives-Alprazolam*, Chlordiazepoxide*, Clonazepam*, Lorazepam*, Midazolam*, Phenobarbitone*, Pentobarbitone*, Zopiclone, zaleplon.

2. Central nervous System(ii)-

Neuroleptics(Antipsychotic)Chlorpromazine*,Fluphenazine*,Trifluoperazine*,Clozapine*, Haloperidol* Aripiperazole, divalproex, flupenthixol, loxapine, olanzapine, penfluridol, pimozide, risperidone, thioridazine, triflupromazine, zuclopenthixol

Antidepressants – Imipramine*, Amitriptyline*, Desipramine*, Phenelzine*, Amoxapine, citalopram, clomipramine, dothiepin, doxepine, escitalopram, fluoxetine, fluvoxamine maleate, lithium, mianserin, mirtazapine, moclobemide, paroxetine, reboxetine, sertraline, tianeptine, trazodone, timipramine, venlafaxine

Antianxiety agent- Chlordiazepoxide*, Diazepam*, Hydroxyzine*, Tybamate*, Meprobamate*

Anticonvulsants-Phenytoin*,Carbamazepine*,Ethosuximide*,Valproic Acid*, Lamotrigine., clobazam, clonazepam, Divalproex, Fosphenyton, Gabapentin, oxcarbazepine, phenobarbitone, primidone, topiramate

3. Hormones Related Drugs: Thyroid and Antithyroids– Carbimazole*, Levothyroxine*, Propylthiouracil*, Methimazole*, Calcitonin, salmon, carbimazole, iodine, thyroglobulin

Insulin & Oral Hypoglycaemics– Chlorpropamide*, Metformin*, Tolbutamide*,

- Glybenclamide*, Acarbose, chromium picolinate, gliclazide, Glimepiride, glucomannan, guar gum, nateglinide, pioglitazone, repaglinide, rosiglitazone
4. **Oxytocics:** Oxytocin*
 5. **Antitussives-**caramiphen*, dextromethorphan*, diphenhydramine*
 6. **Muscle relaxants-** Mephenesin*, Methocarbamol*, Carisoprodol*, Metaxalone*, Chlorzoxazone*, Orphenadrine*
 - Antiparkinsonism drugs-**Carbidopa*, Levodopa*.
CNS Stimulants-Caffeine*, Nikethamide*, Strychnine*, Picrotoxin*, theophylline*.
 7. **Respiratory system drugs:** Antiasthmatic drugs- Salbutamol*, Aminophylline*, Ipratropium bromide*, Terbutalin*, Sameterol*, Fluticasone*, Montelukast*.
 8. **Gastrointestinal agent:**
Antispasmodics: Dicyclomine*.
Antiulcer agent: Ranitidine*, Famotidine*, Omeprazole*, Lansoprazole*, Pantoprazole*, Azatidine maleate, Embramne
Anti-diarrhoeal drugs : Loperamide*, Diphenoxylate*, Racecadotril*.
Drugs used in the constipation: Bisacodyl*
Emetics and Antiemetics: Emetine*, apomorphine*, ondansetron*, Metoclopramide*, Cyclizine*, Promethazine*, Domperidone*

PRACTICALS RECOMMENDED

1. To synthesize Benzoic acid from phenyl benzoate and reports its % yield & melting point.
2. To synthesize phenyl azo-beta-naphthol from aniline and reports its % yield & melting point.
3. To synthesize Benzhydrol from the benzophenone and reports its % yield & melting point.
4. To synthesize O-Benzoyl benzoic acid from phthalic anhydride and reports its % yield & melting point.
5. To synthesize P-Nitroacetanilide from acetanilide and reports its % yield & melting point.
6. To synthesize Methyl orange from sulphanilic acid and reports its % yield & melting point.
7. To synthesize benzoyl acetone from ethyl acetate and report its % yield, m.p.
8. To synthesize sod. Benzene sulphonate from benzene and report its % yield, m. p. To synthesize fluorescein from resorcinol and report its % yield, m. p. and Rf value.
9. To synthesize phenylhydroxylamine from nitrobenzene and report its % yield, m. p.
10. To synthesize succinic anhydride from succinic acid and reports its % yield & melting point.
11. To synthesize dibenzal acetone from benzaldehyde and reports its % yield & melting point.

BOOKS RECOMMENDED:

1. Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/ Longman, London.
2. Furniss B S, Hannaford A J, Smith P W G and Tathell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
3. Pharmacopoeia of India, Ministry of Health, Govt. of India.
4. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.

5. Delgado J N and Remers W A R, Eds., Wilson And Gisworld's Text book of Organic Medicinal and Pharmaceutical Chemistry, J.Lippincott Co., Philadelphia.
6. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
7. Singh Harkishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.

PHARMACEUTICAL ANALYSIS-II

THEORY

Subject code -602T

Hours – (03/week)

- 1.** Basic concepts in spectroscopy - Introduction : Electromagnetic radiation and interaction with matter, electronic spectra, wavelength, wave number, frequency, absorbance, transmittance, photometers, spectrophotometers
- 2. UV-Visible absorption spectroscopy:** electronic transitions and UV spectra, Chromophore , Auxochromes , Bathochromic and Hypsochromic shifts, hyperchromism and Hypsochromic, Beer-Lamberts law (Definition, derivation of mathematical expression, limitations), Applications of Beer's law to single component analysis, multicomponent analysis (calibration graph, standard absorptivity value, single standardization, effect of solvents, Instrumentation, applications
- 3. Infrared spectrophotometry:** Regions, requirements for I.R. absorption, Vibrational and rotational transitions , types of molecular vibrations, Vibrational, sample preparation frequency, factors influencing Vibrational frequencies, Vibrational modes, Instrumentation , application.
- 4. Nuclear Magnetic Resonance Spectroscopy:** Fundamental Principles and Theory, Instrumentation, solvents, chemical shift, and factors affecting chemical shift, spin-spin coupling, coupling constant, and factors influencing the value of coupling constant, spin-spin decoupling, applications
- 5. Mass Spectroscopy:** Basic principles and instrumentation, ion formation and types, fragmentation processes and fragmentation pattern, Chemical ionization mass spectroscopy (CIMS), Field Ionization Mass Spectrometry (FIMS), ionization MS (MALDI-MS), applications in Pharmacy.
- 6. Flame Emission Spectroscopy and Atomic Absorption Spectroscopy:** Principle, instrumentation, interferences and applications in Pharmacy.
- 7. Fluorimetry and phosphometry :** The theoretical aspects, basic instrumentation, Fundamentals and applications
- 8. Electron Spin Resonance Spectroscopy:** Theory and principle, Instrumentation, Difference between NMR and ESR and application

PRACTICALS RECOMMENDED

1. To study basic analytical techniques with emphasis on spectrophotometric techniques
2. To determine maximum optical density/absorbance wavelength range of given sample in solution (**selection of complementary filter**) and establish Beer's and Lambert law by Colorimeter
3. To estimate concentration ($\mu\text{g/ml}$) of unknown sample in given solution by Colorimeter (**single standard point method**)
4. To estimate concentration ($\mu\text{g/ml}$) of unknown sample in given solution by Colorimeter (**multiple standard point method or calibration curve method**)
5. To determine maximum absorbance wavelength (λ_{max}) of given drug sample and establish Beer's and Lambert law using UV-Visible Spectrophotometer
6. To estimate concentration ($\mu\text{g/ml}$) of unknown sample in given solution by UV-Visible Spectrophotometer. (**single standard point method**)
7. To estimate concentration ($\mu\text{g/ml}$) of unknown sample in given solution by Colorimeter (**multiple standard point method or calibration curve method**)
8. To find out amount of drug (Paracetamol, Metformin hydrochloride, frusimide etc) in given pharmaceutical dosage form as per of official pharmacopoeia. (**Assay as per IP**)
9. To calibrate flame photometer and estimate concentration ($\mu\text{g/ml}$) of Sodium (Na) in given artificial biological fluid (urine) / mixture by flame photometer.
10. To calibrate flame photometer and estimate concentration ($\mu\text{g/ml}$) of potassium (K) in given artificial biological fluid (urine) / mixture by flame photometer.
11. To study and demonstrate of IR spectrophotometer.
12. To prepare KBr disc of given drug for IR spectral analysis.
13. To perform IR spectroscopy of given drug and interpret it. (**solid sampling technique**)
14. To perform IR spectroscopy of given sample and interpret it. (**liquid sampling technique**)
15. To perform IR spectroscopy of given drug and interpret it. (**ATR technique**)
16. To interpret the structure of simple organic compound using UV, IR, NMR, and Mass spectroscopy

BOOKS RECOMMENDED

1. Connors, K.A. A Textbook of Pharmaceutical Analysis. Wiley Interscience.
2. Joffery Vogel's Textbook of Quantitative Chemical Analysis.
3. Silverstein, R.M. and Webster, F.X. Spectrometric identification of organic compounds 6th Ed. John Wiley.
4. Pharmacopoeia of India, Ministry of Health, Govt of India.
5. Becket A.H. and Stenlake J.B. Practical Pharmaceutical Chemistry Vol. I and II, The Athlone Press of the University of London.
6. Chatten L.G. A text book of Pharmaceutical Chemistry Vol. I & II Marcel, Dekker, New York.
7. Willard H.H. and Merrit L. Jr and Dean J.A., Instrumental methods of analysis Van Nostrand Reinhold, New York.
8. Obonson J.W.R. Undergraduate Instrumental Analysis, Marcel Dekker Inc, New York, 1970.
9. Parikh V.H. Absorption Spectroscopy of Organic Molecules Addison-Wesley Publishing Co., London 1974.
10. Skoog V, Principles of Instrumental Analysis, Holler-Neimen

**PHARMACEUTICS-X
(Dosage form design-II)**

THEORY

Subject code -603T

Hours – (03/week)

1. Pilot plant techniques: Introduction, theory and techniques

2. Stabilization and stability; testing protocols for various pharmaceutical products, determination of expiry date and overage calculations, factors affecting physical and chemical stability.

3. Microencapsulation: Types of microcapsules, importance on microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.

4. Performance evaluation methods

a. In-vitro dissolution studies for solid dosage forms; methods, interpretation of dissolution data.

b. In-vivo methods of evaluation and statistical treatment.

c. Classification Scheme (BCS)

5. Novel Drug Delivery Systems:

Basic concept, merits and demerits, design, development, production & evaluation of following delivery systems- sustained & controlled release dosage forms (with special reference to tablets, capsules and oral liquids), nanoparticles, liposomes, resealed erythrocytes, microspheres, microcapsules, fast dissolving dosage forms.

6. Pharmaceutical Aerosols:

Definitions, propellants, general formulation, manufacturing evaluation, packaging methods and pharmaceutical applications.

PRACTICALS RECOMMENDED

1. To carry out an exercise to demonstrate the principle and working of some equipments used in Dosage form design.
2. To Perform preformulation study of given excipient and design a suitable dosage form.
3. To perform the compatibility study of drug excipient.
4. To prepare the calibration curve of paracetamol.
5. To prepare, evaluate and submit paracetamol tablet.
6. To perform in-vitro dissolution study of marketed product. (Paracetamol).
7. To perform film coating on formulated tablets.
8. To prepare and submit sodium alginate beads of Paracetamol.
9. To perform formulation and evaluation of matrix tablet.
10. To perform formulation and evaluation of Fast dissolving tablet.
11. To perform in-vitro bioequivalence study of two marketed brands of Paracetamol.
12. To perform solubility analysis of given API.
13. To prepare microcapsules of aspirin in ethyl cellulose by emulsion solvent evaporation method.

BOOKS RECOMMENDED

1. Ansel, H.C. Introduction to Pharmaceutical Dosage Forms. K.M. Verghese & Co. Mumbai.
2. Aulton, M.E. Pharmaceutics: The Science of Dosage Form Design ELBS.
3. Avis, K.E., Lachman, L & Liberman, H.A., Pharmaceutical Dosage forms: Paraenteral medications Vols. 1 & 2 Marcel Dekker, N.Y.
4. Juliano, R.L. Drug Delivery Systems Oxford University Press, Oxford.
5. Pharmaceutical Dosage Forms & Drug Delivery systems Lea & Febiger, Philadelphia.
6. Lieberman, H.A. Lachman, L & Schwartz, J.B. Pharmaceutical Dosage Forms. Tablets Vols. 1-3, Marcel Dekker.
7. Robinson, J.R. & Lea Vincet Controlled Drug Delivery: Fundamentals & Applications, Marcel Dekker.
8. Lachman, L., Lieberman, H.A. & Kanig, J.L, The Theory & and Practice of Industrial Pharmacy. Lea and Febiger, Philadelphia.
9. Loftus B.T. & Nash Robert Pharmaceutical Process Validation Marcel Dekker.

PHARMACOLOGY –II

THEORY

Subject code -604

Hours – (03/week)

1. Pharmacology of Central nervous system.

- a. Neurohumoral transmission in the CNS.
- b. General anaesthetics.
- c. Alcohol and disulfiram.
- d. Sedatives, hypnotics, anti-anxiety agents and centrally acting muscle relaxants.
- e. Psychopharmacological agents (antipsychotics), drugs used in affective disorders and hallucinogens.
- f. Anti-epileptic drugs.
- g. Anti-parkinsonism drugs.
- h. Analgesics, antipyretics, anti-inflammatory and anti-gout drugs.
- i. Narcotic analgesics and antagonists .
- j. C.N.S. stimulants.
- k. Drug abuse.

2. Drugs Acting on Respiratory System

Anti-asthmatic drugs, Anti-tussives, Mucolytics, Expectorants, Respiratory Stimulants.

3. Diuretics & anti-diuretics

4. Drugs acting on GIT

Antacids and Antiulcer drugs, Laxatives and antidiarrhoeal Agents, Emetics and antiemetics, anti motility agent.

5. Endocrine pharmacology

- (a) Hypothalamic and pituitary hormones.
- (b) Thyroid and anti-thyroid drugs, parathormone, calcitonin and vitamin D.
- (c) Insulin, oral hypoglycemic agents and glucagons.
- (d) ACTH and corticosteroids.

- (e) Androgens and anabolic steroids.
- (f) Estrogens, progestogens and oral contraceptives.
- (g) Drugs acting on uterus.

PRACTICALS RECOMMENDED

1. To find out the locomotor activity of given drug in rats by using actophotometer.
2. To find out the muscle relaxant activity of given drug in rats by using rotarod apparatus.
3. To find out the memory enhancer effect of given drug in rats by using rectangular plus maze apparatus.
4. To find out the antianxiety effect of given drug in rats by using elevated plus maze apparatus.
5. To find out the analgesic effect of given drug in mice by using Eddy's hot plate apparatus.
6. To find out the analgesic effect of given drug in mice by using tail flick method.
7. To find out the analgesic effect in acetic acid induced writhing in rats.
8. To find out the amnesic (loss of memory) effect of given drug by using passive avoidance step-down task paradigm in mice.
9. To find out the catatonia effect of phenothiazine drug in rats.
10. To find out the antiparkinsonian effect of given drug in rats.
11. To find out the antidepressant effect in mice by swimming method.
12. To find out the anti-inflammatory effect of given drug against carageenan induced paw oedema.
13. To record the concentration response curve (CRC) and calculate PD₂ value of 5-HT by using rat fundus preparation.
14. To record the concentration response curve (CRC) and calculate PD₂ value of oxytocin by using rat uterus preparation.
15. To record the concentration response curve (CRC) and calculate PD₂ value of papaverine by using rat ileum preparation.

BOOKS RECOMMENDED:

1. Ghosh, MN; Fundamentals of Experimental Pharmacology, Scientific Book Agency, Calcutta.
2. Grover J.K., Experiments in Pharmacy & Pharmacology, CBS Publishers, New Delhi.
3. Kulkarni S.K., Hand Book of Experimental Pharmacology, Vallabh Prakashan, Delhi.
4. Barar FSK : Text Book of Pharmacology, Interprint, New Delhi.
5. Goodman & Gilman, The Pharmacological basis of Therapeutics, Editors:-JG Hardman, Le Limbird, PB Molinoss, RW Ruddon & AG Gil, Pergamon Press.
6. Katzung, B.G. Basic & Clinical Pharmacology, Prentice Hall, International.
7. Laurence, DR & Bannet PN; Clinical Pharmacology, Churchill Livingstone.
8. Rang MP, Date MM, Riter JM, Pharmacology Churchill Livingstone.
9. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New

- Delhi.
10. Satoskar & Bhandarkar; Pharmacology & Pharmacotherapeutics, Popular Prakashan Pvt. Ltd., Bombay.
 11. Craig, C.R. and Stitzel, R.R., Modern Pharmacology, Little Brown and Co., 1994.

PHARMACEUTICS-XI

(Hospital & Community Pharmacy)

THEORY

Subject code -605 T

Hours – (03/week)

- 1. Organization and structure:** Organization of a hospital, organization & personnel of hospital pharmacy, duties and responsibilities of a hospital pharmacist, pharmacy procedural manual, Budget preparation and Implementation, Pharmacy and Therapeutic Committee, Hospital Formulary and its contents, preparation and revision of hospital formulary.
- 2. Drugs store Management and inventory control:**
 - (a) Organization of drugs store, Types of materials stocked, storage conditions
 - (b) Purchase and inventory control principles, purchase procedures, purchase order, procurement and stocking.
 - (c) Quality control of drugs in hospitals.
- 3. Drug distribution systems in hospitals:**
 - a) Dispensing of drugs to out-patients.
 - b) Dispensing of drugs to in-patients.
 - c) Dispensing of controlled drugs.
 - d) Pre-packaging and labeling.
 - e) Drug charges and charging policy.
 - f) Central Sterile Supply Unit and their Management.
 - g) Surgical supplies and health accessories
- 4. Hospital formulary:** Format and appearance of the formulary, distribution of the formulary, keeping the formulary current use of non formulary drugs, the legal basis of the formulary system, anti substitution laws and formulary, Preparation of the formulary, formulary Vs. drug catalogue or list, selection of guiding for admission or deletion of drug, contains, prescription writing, format, size, loose leaf Vs bound publication, formulary drug listing service preparation, categorizing and indexing, sample pharmacologic index, text, specialty formulary.
- 5. Nuclear pharmacy:** Introduction to Radio-pharmaceuticals, radio-active half life, Units of radio-activity Production of radio-pharmaceuticals, methods of isotopic tagging, preparation of radio-isotopes in laboratory using radiation dosimetry, radio-isotope generators, permissible radiation dose level, radiation hazards and their prevention, specifications for radio-active laboratory.
- 6. Retail and wholesale drugs store:** Organization and structure of retail and whole sale drug store, types of drug stores and design, maintenance of drug store, dispensing of proprietary products, maintenance of records of retail and wholesale

7. **Records and Reports:** Prescription filling, drug profile, patient medication profile, annual report
8. **Patient counseling and Patient Compliance:** Role of pharmacist in community health care and education.
9. **Drugs Information Services:** Sources of Information on drugs, disease, treatment schedules, procurement of information, computerized services (e.g. MEDLINE, MEDLAR etc.), retrieval of information, medication error, safe use of medicine, drug Information center, pharmacist as a information specialist.
10. **Use of computer in hospital:** Terminology, program criteria, managing computer system, development of ASHP technical assistant bulletin on hospital drug distribution and control, impact of the computer in dispensing time, model computer regulations.

PRACTICALS RECOMMENDED

1. To operate the various sterilization equipments
2. To sterilize surgical dressings, sheets, towels and gowns.
3. To sterilize rubber gloves.
4. To sterilize syringes, needles, glasswares and surgical instruments.
5. To Prepare Water for Injection I.P.
6. To Prepare normal saline solution for injection I.P.
7. To Prepare Dextrose solution I.P. for injection.
8. To Prepare compound sodium chloride solution I.P.
9. To Prepare compound sodium lactate injection I.P.
10. To prepare intravenous infusions of Mannitol and Sodium bicarbonate.
11. To perform hydrolytic resistance test on glass containers used for transfusions.
12. To evaluate the plastic transfusion bottles used for large volume parenterals.
13. To evaluate the absorbent cotton wool for identification, test for neps and fluorescence test.
14. To determine the sinking time and water holding capacity of absorbent cotton wool.
15. To determine loss on drying and sulphated ash of absorbent cotton wool.
16. To determine number of threads per 10cm and weight per unit area of absorbent cotton ribbon gauze.
17. To study use of computer for preparing patient profiles.

BOOKS RECOMMENDED:

1. Merchant and Quadry, text book of hospital pharmacy-(B S shah prakashan)
2. Hassan, Hospital pharmacy(Lee and Febiger)
3. Parmar N S Health education and community pharmacy

FORENSIC PHARMACY

THEORY

Subject code -606T

Hours – (03/week)

1. Pharmacy an Introduction: Origin, development, scope, objectives and nature of pharmaceutical

legislation in India. Evolution of the “Concept of Pharmacy” as an integral part of the health care system.

2. Pharmaceutical education: A brief review.

3. Pharmacy Act, 1948: The general study of the Pharmacy Act with special reference to Pharmacy Council of India, Education Regulations, working of State and Central Councils, constitutions and functions of these councils, registration procedures under the Act.

4. The Drugs and Cosmetics Act, 1940 & Rules 1945: General study of the Drugs and Cosmetics Act and the Rules there under. Definitions and salient features related to retail and wholesale distribution of drugs. The powers of inspectors, the sampling procedures and the procedure and formalities in obtaining licences under the rule. Facilities to be provided for running a Pharmacy effectively. General study of the schedules with special reference to schedules C, C1, F, G, J, H, P and X and salient features of labeling and storage conditions of drugs.

5. AICTE Act, 1987: A brief study.

6. An elaborate study of the following: (as amended to date)

(a) Medicinal and Toilet Preparations (Excise Duties) Act, 1955

(b) Poisons Act 1919

(c) Patents Act 1970

7. Narcotic Drugs and Psychotropic Substances Act, 1985: A brief study of the Act with special reference to its objectives, offences and punishment.

8. A brief study of the following with special reference to the main provisions: (as amended to date)

(a) Medical Termination of Pregnancy Act, 1970 & Rules 1975

(b) Prevention of Cruelty to Animals Act, 1960

9. The Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954: General study of the Act, objectives, special reference to be laid on advertisements, magic remedies and objectionable and permitted advertisement and diseases which cannot be claimed to be cured.

10. Drugs & Pharmaceutical Industry – A brief review.

11. Principles and significance of professional ethics. Critical study of the code of pharmaceutical ethics drafted by Pharmacy Council of India.

BOOKS RECOMMENDED:

___ B.M. Mittal – Textbook of Forensic Pharmacy Vallabh Prakashan, 10th Ed., 1999.

___ Jain, N.K. A Textbook of Forensic Pharmacy. Vallabh Prakashan, New Delhi.

B.PHARM. SEMESTER-VII PHARMACEUTICAL ANALYSIS -III

THEORY

Subject code -701T

Hours – (03/week)

1. Chromatography: fundamentals of the following techniques with relevant examples of pharmaceutical and/or natural products TLC, HPTLC, HPLC, GLC, paper chromatography and column chromatography

2. Electrochemistry:-the electric cell, electrode potential, half cells, sign convention, Nernst equation, the salt bridge, activity series, standard potential, reference electrode, indicator electrode, measurement of relative voltage of half-cells and calculation of std potential.
3. Theoretical consideration, fundamentals, principle and application following techniques: Potentiometry, Conductometry, Coulometric Titration, Polarography and Amperometric titration.
4. Estimation studies of important gases – Oxygen, Nitrogen and Carbon dioxide and Determination of water by Karl-Fisher titration. Kjeldahl method of nitrogen estimation
5. X-ray diffraction: Introduction, generation of X-rays, X- ray diffraction, Bragg's law, X-ray crystallography, X-ray powder diffraction, and applications.
6. Theoretical consideration, fundamentals, principle and application following techniques: Refractometry, Polarimetry, Nephelometry

PRACTICALS RECOMMENDED

Experiments of "Paper Chromatography"

1. To Perform Paper chromatography for Separation of amino acids in given mixture. (Ascending descending and Radial or circular technique).
2. To perform two-dimensional paper chromatography for Separation of amino acids in given mixture.
3. To Separate and identify of sugars by ascending /descending paper chromatography).

Experiments of "Thin Layer Chromatography"

4. To Perform thin layer chromatography (TLC) for Separation of amino acids in given mixture. (Ascending technique).
5. To perform two-dimensional thin layer chromatography for Separation of amino acids in given mixture.
6. To Separate and identify of sugars by ascending thin layer chromatography.

Experiments of "Column Chromatography"

7. To perform column chromatography for Separation of compounds in given mixture.

Experiments of "pH Metry"

Determination of end point by titration

8. To determine the exact equivalence point and normality of 0.1N HCl by titrating with 0.1N NaOH using pH meter.
9. To estimate the amount of drug present in the given tablets by pH meter.

Experiments of "Potentiometry"

Determination of end point by Potentiometry titration

10. To determine the exact equivalence point and normality of 0.1N HCl by titrating with 0.1N NaOH potentiometrically using potentiometer.

(Other titrations etc.)

11. To estimate the amount of sulphadiazine present in the given tablets by Potentiometry using potentiometer.
12. To determine acid-base dissociation constant using potentiometer/ pH meter.

Experiments of "Conductometry"

13. To Measure of conductivity by conductivity meter.
Determination of end point by conductometric titration
14. To determine the exact normality of given approximately 0.1N HCl acid by titrating against 0.1N NaOH, by using conductivity meter.
(Other titrations etc.)
Experiments of "Moisture Content"
15. To determine the moisture content in the given sample (citric acid) by Karl Fischer titration.
16. To determine the moisture content in the given sample by IR moisture balance.
Experiments of "Alcohol Content"
17. To determine the content in liquid galenicals.
Experiments of "Polarimetry"
18. To find out specific rotation of given optical active substance.
19. To investigate by half time, the order of reaction of mutarotation of glucose using 5% and 10 % solutions.
20. To estimate concentration of sugar in given sample using polarimeter. (saccharimetry)

BOOKS RECOMMENDED

1. Beckett, A.H. & Stenlake, J.B. Practical Pharmaceutical Chemistry. Athlone Press, London.
2. Pharmacopoeia of India, Ministry of Health, Govt of India.
3. kaur H., instrumental methods of chemical analysis II edition 2003, Pragati prakashan meerut.
4. Skoog V, Principles of Instrumental Analysis, Holler-Neimen
5. Varma, R.M. Analytical Chemistry, Theory & Practice. 3rd edition CBS Publishers & Distributors, New Delhi.

PHARMACEUTICAL CHEMISTRY-IX (Medicinal Chemistry-III)

THEORY

Subject code -702T

Hours – (04/week)

Classification with structures, (mode of action, uses, structure activity relationship and Synthetic procedures of the following classes in the asterisk only)

1. Chemotherapy:

Antibacterial agent: Sulphonamides-Sulphamethoxazole*, Sulphadiazine*, Sulphacetamide*, and nalidixic acid*

Antiseptics & Disinfectants– Chlorhexidine*, Chlorxylenol*, Benzalkonium chloride* Triclosan*, Hexachlorophene*, Cetylpyridium chloride*

Antibiotics-Penicillins*, Semi-synthetic penicillins*, streptomycin*, Tetracyclines*, Cephalosporins*, Chloramphenicol*, Fluroquinolones* Amikacin, amoxicillin, sulbactan, azithromycin, azetreonan, cefaclor, cefadroxil, cefazolin, cefdinir, cefixime, cefoperazone, cefotaxime, cefpirome, cefpodoxime proxetil, ceftazidime, ceftizoxime, ceftriaxone sodium, cefuroxime, clarithromycin, clindamycin, lomefloxacin, demeclocycline, doxycycline, gatifloxacin, ciprofloxacin, kanamycin, levofloxacin, lincomycin, linezolid, meropenam, minocycline, nalidixic acid, netilmycin, nitrofurantoin, norfloxacin, ofloxacin,

oxytetracycline, pefloxacin, piperacillin, roxithromycin, sisomicin, sparfloxacin, suttamicillin, tobramycin, vancomycin

Antimycobacterial Agents:

Anti-tubercular drugs: Isoniazid*, rifampicin*, pyrazinamide*, ethambutol*, streptomycin*, ethionamide*, thiacetazone*, PAS*. Capreomycin, prothionamide, sodium aminosalicylate

Anti-leprotics : Clofazimine*, Dapsone* Rifampicin

Antifungal agents: Amphotericin-B*, Flucytosine*, ketoconazole*, itraconazole, fluconazole, voriconazole*, griseofulvin, clotrimazole*, tolnaftate*, naftifine*, nystatin* terbinafine

2. Antiprotozoal drugs:

Antimalarials: Quinine*, chloroquine*, amodiaquine*, quinacrine*, primaquine*, pyrimethamine*, proguanil*, artemisinin*, artemether*, Arteether, artesunate, bulaquine, mefloquine, mepacrine

Antiamoebics: Metronidazole*, Tinidazole*, Diloxanide*, Di-iodohydroxy quinoline*, emetine*. Chloroquine, ornidazole, secnidazole, dehydroemetine, sodium antimone gluconate

Anthelmintics- Thiabendazole*, albendazole, benzimidazole*, mebendazole*, diethylcarbamazine*, praziquantel*, pyrantel pamoate, niclosamide, levamisol. ivermectin, tetramisole,

Antifilarial drugs-Ivermectin*

Antilishmanic drugs.

3. **Antiviral agents** anti-HIV agents: Vidarabine*, acyclovir*, cidofovir*, famciclovir*, foscarnet*, ganciclovir*, idoxuridine*, amantadine*, zanamivir*, adefovir*, interferons*, lamivudine*, zidovudine*, didanosine*, stavudine*, nevirapine*, saquinavir*, Zalcitabine*, HIV protease inhibitors*.
4. **Antineoplastic agents:** Cisplatin*, busulphan*, cyclophosphamide*, chlorambucil*, melphalan*, carmustine*, altretamine*, thiotepa*, dacarbazine*, procarbazine*, cisplatin*, methotrexate*, 6-mercaptopurine*, cytarabine*, 5-fluorouracil*, vinblastine*, vincristine*, paclitaxel*, dactinomycin*, etoposide*, L-asparaginase hydroxyurea*, tamoxifen*, Amifostine, Bicalutamide, Bleomycin, carboplatin, doxorubicin, docetaxol, ethinyl oestradiol, etoposide, flutamide, formestane, formestrol, goserelin, hydroxyl urea, ifosfamide, interferon, L-asparaginase, m leucovorin, leuprilide acetate, lomustine, megestrol, MESNA preparations, mitozantrone, mustine-HCl, paclitaxel, tamoxifen, thioguanin, topotecan, letrozole
5. **Immunomodulators:** Cyclosporine*, tacrolimus*, mycophenolate mofetil*, azathioprine*
6. Anti-ageing agent.

PRACTICALS RECOMMENDED

1. To synthesize 7-hydroxy-4-methylcoumarin from resorcinol and report its % yield and m.p.
2. To synthesize benzil from benzoin and report its % yield, m. p. and Rf value.
3. To synthesize benzilic acid from benzil and report its % yield, m. p. and Rf value.
4. To synthesize phenytoin from benzoin and report its % yield, m. p. and Rf value.
5. To synthesize Dichloramine-T from toluene-p-sulphonamide and report its % yield and m. p.

6. To synthesize sodium p-toluenesulphonate from toluene and report its % yield, m.p. and Rf value.
7. To synthesize anthranilic acid from phthalic anhydride and report its % yield, m. p. and Rf value.
8. To synthesize anthraquinone from anthracene and report its % yield, m. p. and Rf value.
9. To synthesize anthrone from anthraquinone and report its % yield, m. p. and Rf value.
10. To synthesize phenytoin from benzoin and report its % yield, m. p. and Rf value.
11. To synthesize anisole from phenol and report its % yield, b. p. and Rf value.
12. To synthesize p-aminoazobenzene from aniline and report its % yield, m. p. and Rf value.
13. To synthesize methylene blue from dimethylaniline and report its % yield, m. p. and Rf value.

BOOKS RECOMMENDED:

1. Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/ Longman, London.
2. Furniss B S, Hannaford A J, Smith P W G and Tathell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
3. Pharmacopoeia of India, Ministry of Health, Govt. of India.
4. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
5. Delgado J N and Remers W A R, Eds., Wilson And Gisworld's Text book of Organic Medicinal and Pharmaceutical Chemistry, J. LippincottCo., Philadelphia.
6. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
7. Singh Harkishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.

BIOPHARMACEUTICS AND PHARMACOKINETICS

PHARMACEUTICS XII

THEORY

Subject code - 703

Hours – (04/week)

1. Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development.

2. Biopharmaceutics :

1. Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis)
2. Factors influencing absorption- Physicochemical, physiological and pharmaceutical.
3. Drug distribution in the body, Volume of distribution, plasma protein binding.
4. Biotransformation and factors affecting biotransformation of drugs.
5. Clearance concept, Mechanism of renal clearance, clearance ratio, determination of renal clearance and factors affecting renal clearance. Renal Function (RF), Dosage adjustment in patients with renal failure. Extraction ratio, hepatic clearance, biliary excretion, Extra hepatic circulation.

3. Pharmacokinetics:

1. Introduction to pharmacokinetics, significance of plasma drug concentration measurement.
2. Concept of Compartment models-Definition and Scope.
3. Compartment kinetics- one compartment open models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravenous (i. v.) and extra vascular route.
4. Pharmacokinetics of drug absorption – Zero order and first order absorption rate constant using Wagner– Nelson method and Curve fitting (method of Residuals).
5. Urinary excretion data, Determination of K_E from Urinary excretion data by rate of excretion method and Sigma-minus method.
6. Non-linear pharmacokinetics with special reference to one compartment model after I.V. drug administration, Michaelis Menten Equation, detection of non-linearity (Saturation mechanism).
7. Non-Compartmental concept of mean residence time (MRT)

4. Bioavailability and bioequivalence:

1. Measures of bioavailability, C_{max} , T_{max} and area under the curve (AUC).
2. Design of single dose bioequivalence study and relevant statistics.
3. Review of regulatory requirements for conduct of bioequivalent studies.
4. In vivo-In Vitro correlation (IVIVC)

PRACTICALS RECOMMENDED

1. To Study various equipment generally used in Biopharmaceutics and pharmacokinetics.
2. To evaluate various pharmacokinetic parameters for given data.
3. To prepare tablet using different binders and compare D.T., Hardness, Friability and dissolution profile of prepared tablet.
4. To prepare tablet using different hardness and compare D.T., Hardness, weight variation, Friability and dissolution profile of prepared tablet.
5. To perform in vitro bioequivalence study of two different brands of paracetamol tablet.
6. To study the absorption of ascorbic acid through buccal cavity. (Limcee)
7. To determine the urinary excretion rate of ascorbic acid through urinary excretion data analysis.
8. To study the effect of protein-drug binding on the in-vitro release of drug.
9. To determine the partition coefficient of iodine in carbon tetra chloride and water.
10. To study the diffusion of salicylic acid ointment and methyl salicylate ointment through agar plate.

BOOKS RECOMMENDED:

1. Notari, R.E. Biopharmaceutics & Pharmacokinetics- An Introduction. Marcel Dekker.
2. Rowland, M. and Tozer, T.N. Clinical Pharmacokinetics. Lea & Febiger, N.Y.
3. Gibaldi, M. & Perrier, D. Pharmacokinetics. Marcel Dekker Inc. N.Y.
4. Gibaldi, M. Biopharmaceutics and Clinical Pharmacokinetics. Lea & Febiger, Philadelphia.
5. Pecile, A & Rescigno, A. Pharmacokinetics. Plenum Press, N.Y.
6. Remington's The Science & Practice of Pharmacy. Mack Publishing Co., Pennsylvania.

7. Shargel, L. and Yu, A. Applied Biopharmaceutics and Pharmacokinetics. Appleton & large, Norwalk.
8. Wagner, J.G. Fundamentals of Clinical Pharmacokinetics. Drug Intelligence Publications, Hamilton.
9. Wagner, J.G. Pharmacokinetics for Pharmaceutical Scientists. Technomic Publishing, A.G. Basel, Switzerland.
10. Winter, M.E. Basic Clinical Pharmacokinetics. Applied Therapeutics, Inc., San Fransisco.
11. Welling, P.G. & Tse. Francis L.S. Pharmacokinetics, Marcel Dekker, NY.
12. Madan, P.L. Biopharmaceutics & Pharmacokinetics.
13. Venkateswarm, V. Fundamentals of Biopharmaceutics and Pharmacoknitics, Paras Publishing.
14. Brahmankar and Jaiswal, Biopharmaceutics and Pharmacokinetics; A treatise, Vallabh Prakashan

PHARMACEUTICS-XIII (Cosmetology)

Subject code -704T

Hours – (03/week)

1. Origin and development of cosmetic Sciences and technology.
2. Structure and physiology of skin.
3. Definition and general formulation, manufacturing process and evaluation of following preparations....
Creams, Lotions, Face powder, Lip sticks, Mouth washes, Shaving preparations, Shampoos, Baby toiletries, Antiperspirants, Deodorants, Nail Licquers, Tooth powders, hair preparations, herbal cosmetics, eye makeup preparations..
4. Packaging of Cosmetics.
5. Evaluation of Cosmetics.
6. Clinical safety testing: Clinical safety testing and protocols for Irritation, sensitization, photo-irritation, photo-allergy, and ocular irritation.
7. Regulatory requirements: Manufacturing and sale of cosmetics

PRACTICALS RECOMMENDED

1. To prepare, evaluate and submit 20 gm cold cream.
2. To prepare, evaluate and submit 20 gm cleansing cream.
3. To prepare, evaluate and submit 20 gm foundation cream.
4. To prepare, evaluate and submit 20 gm shaving cream.
5. To prepare, evaluate and submit 20 gm vanishing cream.
6. To prepare, evaluate and submit 20 gm face pack.
7. To prepare, evaluate and submit 20 ml liquid shampoo.
8. To prepare, evaluate and submit 20 ml anti dandruff shampoo.
9. To prepare, evaluate and submit 20 ml hair colorants
10. To prepare, evaluate and submit 20 gm sun screen lotion.
11. To prepare, evaluate and submit 20 ml after shave lotion.
12. To prepare, evaluate and submit 20 gm tooth paste.

13. To prepare, evaluate and submit 20 ml mouth wash.
14. To prepare, evaluate and submit 20 gm tooth powder.
15. To prepare, evaluate and submit 20 gm face powder.
16. To prepare, evaluate and submit lipstick.
17. To prepare, evaluate and submit herbal preparation

BOOKS RECOMMENDED

1. Poucher's Cosmeticology.
2. R.L. Juliano, Drug Delivery Systems, Oxford University Press, Oxford.
3. Harrys Cosmetology
4. Balsam and Sagarin, Cosmetics: Science and Technology.
5. Thomssen E.G. Modern Cosmetics, Universal Publishing Corporation.
6. Mittal B.M. & Saha R.N.-a handbook of cosmetics, Vallabh Prakashan.
7. Sagarin & Balsam, M.S. Cosmetic Science & Technology. Vol. 1-3 2nd ed. John Wiley.
8. Jellinek, J.S. Formulation and Function of Cosmetics. John Wiley & Sons.
9. Kac Chensney, J.C. Packaging of Cosmetics and Toiletries. Newness Butter Worth London.
10. Thomssen, S.G. Modern Cosmetics Universal Publishing Corp., Mumbai.

PHARMACOLOGY –III

THEORY

Subject code -705

Hours – (04/week)

- 1. Pharmacology of CVS:** Cardiac glycosides, Antihypertensive drugs, Antianginal drugs, Antiarrhythmics, Antihyperlipidemics, Therapy of Shock.
- 2. Drugs Acting on Hemopoietic System:** Haematinics, Vit. K & anticoagulants, Fibrinolytics & antiplatelet drugs, Plasma Volume expanders.
- 3. Chemotherapy:** General principles of chemotherapy. Sulphonamides, quinolones, penicillins, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol and macrolides. Anti-malarial, Antiamoebics, Antileishmaniasis, Antitrypanosoma, Anthelmintics, Antifungal and Antiviral & Drugs used for the treatment of AIDS. Chemotherapy of tuberculosis and leprosy, Urinary antiseptics. Chemotherapy for Cancer.
- 4. Bioassays:** General principles and methods of bioassays. Official methods of bioassay of Insulin, Oxytocin, d-tubocurarine, Heparin, Digitalis, Adrenaline & Acetyl Choline.

PRACTICALS RECOMMENDED

1. To study the various methods of bleeding technique.
2. To carry out the blood serum testing of the given sample.
3. To perform bioassay of histamine by three point method using guinea pig ileum preparation.

4. To perform the bioassay of chlorpheniramine applying histamine as agonist by using guinea pig ileum preparation.
5. To perform bioassay of acetylcholine by four point method using rat ileum preparation.
6. To perform bioassay of acetylcholine by cumulative method using rat ileum preparation.
7. To perform bioassay of atropine employing acetylcholine as agonist by using rat ileum preparation.
8. To perform bioassay of phenylephrine by graphical method using rat vasdeferens preparation.
9. To perform bioassay of prazocin employing phenylephrine as agonist by using rat vasdeferens preparation.
10. To calculate pA2 value for atropine employing acetylcholine as agonist by using rat ileum preparation.
11. To calculate pA2 value for pheniramine employing histamine as agonist by using guinea pig ileum preparation.
12. To calculate pA2 value for prazocin employing phenylephrine as agonist by using rat vasdeferens preparation.
13. To calculate pA2 value for barium chloride employing papaverine as agonist by using rat ileum preparation.
14. To find out the diuretic effect of given drug in rats & estimate amount of sodium & potassium ions present in urine.
15. To find out the diuretic effect of given drug in rats & estimate amount of sodium & potassium ions present in urine.

BOOKS RECOMENDED

1. Goyal R.K. – Practicals in pharmacology (1994-95) 1st Edn. M/s. B.S. Shah Prakashan, Ahmedabad
2. Sheth U.K. etal – Selected topics in experimental pharmacology (1972) 1st Edn. The Kothari Book Depot, Mumbai.
3. Kulkarni S.K. – Handbook of experimental pharmacology(1993) 2nd Edn. Vallabh Prakashan, New Delhi.
4. Ghoosh M.N. – Essentials of experimental pharmacology scientific book agency, Culcutta, 1984.
5. Rang. H.P., Dale M.M., etal –Pharmacology(1995) 3rd Edn. Churchil livingstone,USA.
6. Satoskar R.S. , etal – Pharmacology and pharmacotherapeutics (1999) 16th Edn. Popular Prakashan, Mumbai.
7. Harvel, R.A., Champe P. C. etal, Pharmacology (1997) 2nd edition, Lippincott- Raven Company, Philadelphia, New Yor.
8. Craig C. R. Stitzel, R. E.-Modern Pharmacology (1994) 4th edition. Little Browth and Company, U.S.A.

9. Goodman and Gilman's –The Pharmacological Basis of Therapeutics (1996) 9th edition. Pergamon Press, Singapore.
10. Seth S. D., Text Book of Pharmacology, B. I. Churchill, 1997

PROFESSIONAL TRAINING & PROJECT

Subject code -706A

Hours – (03/week)

Every candidate shall be required to work for at least four weeks in a Pharmaceutical Industry after the Semester- IV of the course of study. The candidate may undergo practical training in parts, each constituting not less than two weeks. Candidate shall undergo professional training in a training center (Pharmaceutical Manufacturing Unit /Analytical Laboratory / Bulk Drug Manufacturing Unit / Hospital Pharmacy) allotted by Training officer of the institute.

Candidate shall prepare and submit two copies of training report in prescribed format printed or type written in bound form. One copy is to be submitted to the research board and one copy to be retained by the candidate for his / her own reference. The report shall contain the certificate of training from the head of the respective training center and shall be duly accepted and certified by the Dean, faculty.

Marks for professional training shall be awarded on the basis of training report, interview and viva voce by a board consisting of training in-charge and one examiner (appointed by the Dean, faculty) and the Dean, faculty or his nominee who shall be the chairman of the board.

Subject code -706B

Before the end of Semester VI (B.Pharm Part-III), for each candidate, a project supervisor shall be appointed by the Dean, faculty. The candidate shall choose a project topic in consultation with the supervisor. A synopsis on the project topic should be prepared in the prescribed format and submitted to the respective head for approval. Candidate shall carry out literature survey on the approved topic during semester VII & VIII (B.Pharm Part-IV) under the guidance of the supervisor. Candidate shall prepare and submit three copies of project report in prescribed format in bound form. Two copies are to be submitted to the research board and one copy to be retained by the candidate for his/her own reference. The project report should contain a copy of approved synopsis and certificate from the supervisor, certifying that the work has been undertaken and written under his/her supervision and meets the requirements of the course, countersigned and duly forwarded by the chairman of the research board. Marks for project shall be awarded on the basis of project report, seminar and viva voce by a board consisting of supervisor, one examiner (appointed by the research board) and the chairman of research board or his nominee who shall be the chairman of the board.

B. Pharm. Semester- VIII
PHARMACEUTICAL CHEMISTRY X
(Medicinal Chemistry-IV)

THEORY

Subject code -801T

Hours – (03/week)

- 1. Cardiovascular agents:** Alprostadil, atropine sulphate, calcium dobesilate, diosmin/flavonoids, nimodipine
Antianginal & vasodilators-Glyceryl tri nitrate, amyl nitrate, isosorbide dinitrite.
Antiarrhythmics: Quinidine*, di-isopyramide*, procainamide*, moxiletine*, amiodarone*, flecainide*, Adenosine, diltiazem, atenolol, esmolol, lignocaine, metoprolol, Phenytoin, propafenone, Propranolol, sotalol, verpamil
Antihypertensives: Reserpine*, guanethidine*, diazoxide*, hydralazine*, minoxidil*, methyl dopa*, prazosin*, clonidine*, pargyline*, propranolol* sotalol, metoprolol, phenoxybenzamine*, atenolol*, captopril*, enalapril*, lisinopril*, nifedipine*, amlodipine*, diltiazem*, verapamil*, benazepril, lisinopril, nifedipine, benidipine, bisoprolol, candesartan, carvedilol, celiprolol, fosinopril, amiloride, hydrchlorthiazide, Indapamide, irbesartan, labetal, lacilipine, tercanidipine, losartan, ramipril, nitrendipine, , nebilol, perindopril, sodium nitroprusside, telmisartan etc.
Anticoagulants : Warfarin*, Phenindione*, Abcixionab, accnocoumarol, ardeparin, aspirin, clopidogrel, dipyridamol, ticlopidine, dalteparin, enoxaparin, gensparin, nitroparin calcium, parnaparium, reviparin, streptokinase, urokinase, alteplase
Antihyperlipidemics: Statins*, Ezetimibe*, Niacin*, Clofibrate*
Cardiotonics: Digoxine, Amrinone*.
Plasma expanders
- 2. Diuretics:** Mannitol*, furesamide*, bumetanide*, ethacrynic acid*, chlorthiazide*, hydrochlorthiazide*, chlorthalidone, acetazolamide*, amiloride, triamterene*, spironlactone*.
- 3. Vitamins:** Classification, general chemistry and structural formulae of Vitamins included in I.P., Detailed chemistry of Vit. A*, Vit.D*, Vit.B₁*, B₂*, and Vit. C* D-alpha-tocopherol, methylcobalmine, Phytomenadione, Pyridoxine (Vit.B₆), Nicotinamide (Vit.B₃) Sodium pantothenate (Vit.B₅), cyanocobalmine (Vit.B₁₂), biotin, folic acid, PABA.
- 4. Steroids and related drugs:** Introduction, Classification, Nomenclature & Stereochemistry, SAR and use.
(A) Androgens and Anabolic steroids – Testosterone*, Stanazolol*.
(B) Estrogens and Progestational agents – Progesterone*, Estradiol*and synthetic agents.
(C) Adrenocorticoids – Cortisone*, Hydrocortisone* Prednisolone*, Dexamethasone*, Betamethasone.
(D) Oral contraceptives
Beclomethasone, clobetasol propionate, desonide, fluocinolone, fleticarsone, halicinonide, mometasone, prednicarbate, triamcinolone, clobetarone, fludrocortisone
- 5. Diagnostic agents:** Iodohippurate*, Diatrizoate*, Iothalamate*, Metrizamide*, Iopanoic acid Propyliodone*, Aminohippuric acid*, Iodate*, Rosebengal*, Fluorescein*,Chlormerodin*, Metyrapone*, Evansblue* iohexol, gadodiamide, iopromide, , gadopentetic acid dimeglumine salt, diatrizoic acid

PRACTICALS RECOMMENDED

1. To synthesize sulphanilamide from acetanilide and report it's % yield, m.p. and Rf value.
2. To synthesize paracetamol from Nitrobenzene and report it's % yield, m.p. and Rf value.
3. To synthesize eosine from phthalic anhydride and report it's % yield, m.p. and Rf value.
4. To synthesize sulphanilic acid from aniline and report it's % yield, m.p. and Rf value
5. To synthesize m-Nitroaniline from Nitrobenzene and report it's % yield, m.p. and Rf value.
6. To synthesize benzidine from Nitrobenzene and report it's % yield, m.p. and Rf value
7. To synthesize acetanilide from acetophenone and report it's % yield, m.p. and Rf value.
8. To synthesize acetophenone from benzene and report it's % yield, b. p. and Rf value.
9. To synthesize phenolphthalein from phenol and report it's % yield, m. p. and Rf value.
10. To synthesize p-nitroaniline from acetanilide and report it's % yield, m. p. and Rf value.
11. To synthesize isatin from anthranilic acid and report it's % yield, m. p. and Rf value.
12. To synthesize quinoline from aniline and report it's % yield, m. p. and Rf value.

BOOKS RECOMMENDED:

1. Mann P G & Saunders B C, Practical Organic Chemistry, ELBS/ Longman, London.
2. Furniss B S, Hannaford A J, Smith P W G and Tathell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
3. Pharmacopoeia of India, Ministry of Health, Govt. of India.
4. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
5. Delgado J N and Remers W A R, Eds., Wilson And Gisworld's Text book of Organic Medicinal and Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia.
6. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
7. Singh Harkishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi

Pharmaceutics-XIV (Biotechnology) THEORY

Subject code -802T

Hours – (03/week)

1. **Bacterial genetics:** Introduction, basic principles of molecular biology, extra chromosomal genetic elements, genotypic and phenotypic variations, mutation, transmission of genetic material, genetic mechanisms of drug resistance in bacteria, transposable genetic elements and bacterial genetics applications.
2. **Enzyme technology:** Production of amyloglucosidase, glucose-isomerase, amylase, cellulose, takadiastase, trypsin, streptokinase and urokinase. Techniques of immobilization, and their applications in the industry, Kinetics of immobilized enzymes.
3. **Plant and Animal tissue culture:** Introduction, culture media, application in pharmaceutical industry.
4. **Bioinformatics, Genomics and Proteomics:** their introduction

5. **Fermentation technology:** Introduction, development of industrial fermentation processes, fermentors, downstream processing and industrial processing. production of lactic acid, alcohol, penicillin and vitamin B12, Acetic Acid.
6. Production of Monoclonal Ab's. and their diagnostic/ therapeutic application
7. Recombinant DNA technology and its application.
8. Radioimmunoassay's, ELISA, PCR, Gel Electrophoresis & its application.

PRACTICALS RECOMMENDED

1. To learn laboratory manners, general laboratory techniques and handling & care of equipments, chemicals and glass ware.
2. To learn the construction and working of Gel Electrophoresis Units
3. To perform the Test for Sterility I.P. of given pharmaceutical product (e.g., SWFI) using Membrane Filtration Assembly
4. To utilize Membrane Filtration Assembly/Membrane Filter Holder with Funnel to filter-sterilize the given solution and to perform the test for sterility I.P. for filtrate.
5. To utilize autoclavable Syringe Filter for filter-sterilization of given solution and to perform the test of sterility I.P. for filtrate.
6. To perform sub-culturing of given microbial culture in nutrient broth/nutrient agar medium for maintenance of culture.
7. To perform the total aerobic viable count of given sample of pharmaceutical product as per I.P.
8. To perform simple and multiple streaking on nutrient agar for isolation of pure culture from a given mixed culture of bacterium.
9. To perform simple streaking/spread plate technique/pour plate technique to isolate (probable) antibiotic resistant mutants from a wild population of given bacterial culture
10. To perform Replica Plate/ Gradient Plate technique to isolate (probable) antibiotic resistant mutants from a wild population of given bacterial culture
11. To perform Microbiological Assay of given Antibiotic as per I.P.
12. To perform Test for Specific Microorganism I.P. to detect the presence/ absence of *E. coli* in given sample (drainage water).
13. To detect the presence /absence of Anaerobic Microorganisms from a mixed culture.

PHARMACOGNOSY-IV

THEORY

Subject code -803T

Hours – (03/week)

1. Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, Substituents, adulterants, uses, diagnostic macroscopic & microscopic features & specific chemical tests and their role in national economy (if any) of following alkaloid containing drugs.
Tobacco, Areca, Lobelia, Belladonna*, Hyoscyamus, Datura*, Coca, Withania, Cinchona*, Ipecac, Opium*, Ergot, Rauwolfia, Catharanthus, Nux-vomica, Pilocarpus, Veratrum Kurchi, Ephedra, Colchicum, Solanum, Coffee, Tea, Vasaka, Taxol*.

{*- These plants should be given special emphasis on utilization and desired products.}

2. Biological sources, preparation, Identification tests and uses of following enzymes Diastase, Papain, Penicillinase, Hyalluronidase, Streptokinase, Trypsin, Pancreatin.
3. Plant Bitters, Sweeteners & plant laxatives.
4. Historical development of plant tissue culture, type of culture, Nutritional requirement, growth & their maintenance. Application of plant tissue culture in Pharmacognosy.
5. General principles of formation of primary and secondary plant metabolites, Biogenesis of medicinally important alkaloids, glycosides, carbohydrates, lipids, volatile oils, and steroids etc.
6. Study of natural allergens, hallucinogens and antitumor drugs.

PRACTICAL RECOMMENDED

1. To Study the morphology of given crude drugs (Tobacco, areca, Belladonna)
2. To Study the morphology of given crude drugs (Ipecac, Opium Poppy, Tea)
3. To study the Pharmacognostical evaluation of given crude (Datura)
4. To study the Pharmacognostical evaluation of given crude (Vasaka)
5. To study the Pharmacognostical evaluation of given crude (Vinca)
6. To study the Pharmacognostical evaluation of given crude (Nux Vomica)
7. To study the Pharmacognostical evaluation of given crude (Kurchi)
8. To study the Pharmacognostical evaluation of given crude (Rauwolfia)
9. To study the Pharmacognostical evaluation of given crude (Ephedra)
10. To study the Pharmacognostical evaluation of given crude (Withania)
11. To Extract Calcium citrate from Lemon juice.
12. To extract Caffeine from Tea.
13. To extract Piperine from Black Pepper.
14. To extract Tannic acid from Myrobalan.
15. To extract Lawsone from Henna.
16. To extract Strychnine and Brucine from Nux Vomica.
17. To extract Nicotine Picrate from Tobacco Leaves.
18. To perform the Phytochemical screening of given powder mixture containing Alkaloids

BOOKS RECOMMENDED:

1. Kokate, C.K. Practical Pharmacognosy, Vallabh Prakashan, Delhi.
2. Wallis T.E. Analytical Microscopy, J&A Churchill Ltd, London.
3. Ganborg & Wetter, Plant Tissue Culture Methods, National Research Council of Canada, Saskatchewan.
4. Clarke ECG, Isolation & Identification of drugs. The Pharmaceutical Press, London.
5. Trease, G.E. & Evans, W.C. "Pharmacognosy" Bailliere Tindall East Bourne, U.K.
6. Tyler V.E. et al Pharmacognosy, Lea & Febiger Philadelphia.
7. Wallis T.E. Text book of Pharmacognosy" J&A Churchill Ltd. London.
8. Kokate, C.K. et al Pharmacognosy" Nirali Prakashan, Pune.
9. Atal & Kapur, Cultivation & Utilization of Medicinal Plants, RRL, Jammu.

10. Stahl. E, Thin Layer Chromatography. A laboratory handbook, Springer Verlag, Berlin.
11. Henry TA. The Plant Alkaloids, McGraw Hill, New York.
12. Dixit, V.K., Vyas. S.P. Pharmaceutical Biotechnology, CBS Publication, ND.
13. Street H.E. Tissue Culture & Plant Science, Academic Press, London.
14. Kokate, C.K. Gokhale AS, Gokhale SB, Cultivation of Medicinal Plants, Nirali Prakashan.

PHARMACOLOGY-IV

Subject code -804

Hours – (03/week)

1. **Immunology:** immunosuppressant, immuno-enhancers and immuno- modulators.
2. **Pharmacogenetics, pharmacovigilance, Therapeutic drug monitoring, Patient compliance and drug allergy.**
3. **Development of new drugs:** Method of drug discovery, Pre clinical evaluation (animal studies), Clinical evaluation (Human studies), Phases of clinical trial (Phase I, II, III & IV), ICH & GCP guide lines.
4. **Toxicology:** Types of toxicity (acute, sub acute and chronic toxicity tests), Heavy metals, drugs like opoids, atropine, barbiturates, diazepam, alcohol, organo- phosphorus, General principles of treatment of acute poisoning,
5. **Geriatric pharmacology:** Drug therapy in geriatrics, Mechanism of altered drug effects in elderly, ADRs, Effect of age on drug disposition.
6. **Drug therapy in Pediatric patients:** Pharmacokinetic considerations and therapeutic monitoring, Drugs in antenatal period (during pregnancy), adverse drug reactions and toxicity, Drug therapy during lactation, Immunization.

BOOKS RECOMMENDED

1. Clinical Pharmacokinetics /3rd Edition/Rowland and Tibzer/Williams & Wilkins
2. Clinical Pharmacokinetics - Pocket Reference, 2nd Edition/Murphy/American Society of Health-System Pharmacists
3. Drug Interaction Facts/Facts and Comparisons/up-dated quarterly
4. Drug Facts and Comparisons/Covington, et al/Facts and Comparisons/updated monthly.
5. Pharmacology/4th Edition/H. Rang/Harcourt Health Sciences Group
6. Pharmacotherapy: A Physiologic Approach/3rd Edition/Appleton & Lange
7. Ouriey/lippincott Williams and Wilkins

INDUSTRIAL BUSSINESS MANAGEMENT INCLUDING MARKETING

THEORY

Subject code -805T

Hours – (03/week)

1. **Management:** Meaning, Process of management (planning, organizing, staffing, directing, coordinating and controlling -a preliminary idea of their concepts, processes and techniques), Functional areas of management: production management, marketing management, personnel management, financial management (their meaning and functions).

- 2. Production management:-** Production planning and control, production processes: mass, job and project; plant location and lay out.
- 3. Market research:** Meaning, process and types of market research.
- 4. Marketing management:-** Evolution of modern concept; market segmentation; concept of marketing mix; pricing, promotion; product life cycle strategies. Field sales management.
- 5. Industrial psychology-** Transactional analysis (Meaning, Ego status, types of transactions and life positions-a preliminary idea). Motivation-Maslow's Theory, Approaches and styles of leadership (Preliminary idea).
- 6. Personnel Management:-** Recruitment and selection of man power, wage and salary administration, retrenchment, lay off and discharge.

Books Recommended:

1. Tripathi P.C. and Reddy P.N.:Management; Tata Mc Graw Hill.
2. Shukla M.C.:Business organization and management;S.Chand and company.
3. Sherlakar S.A.:Business organization and management;Himalaya.
4. Filippo E.B.:Personnel management;McGraw Hill.
5. Kotler Philip:Marketing Management;prentice Hall of India
6. Rao and Narayan: Organizational Behaviour; Konark publishers.

QUALITY ASSURANCE

THEORY

Subject code 806T

Hours – (03/week)

1. Regulatory control, regulatory drug analysis, interpretation of analytical data.
2. Validation and calibration of equipments and instruments and Preparation of standard operating procedure (SOP) in pharmaceutical industries
3. Preparing protocols on various validation requirements.
4. Quality control testing of Herbals and screening of plant extracts as per WHO guidelines and Safety and legislation for herbal products.
5. Overview on Approval of New Drug: Investigational new drug (IND), general consideration of the new drug approval (NDA) and Abbreviated New Drug Application (ANDA).
6. Fundamental Aspects of quality assurance during the Product Development with emphasis of solid dosage form.
7. Introduction to Intellectual Property Rights (patents, Copy right, Trade marks, Industrial Design, Geographical indicator etc), Filing of patents according to Indian patent act and PCT route and Searching of Innovator's patent.
8. GMP, Quality audit, optimization and validation of manufacturing processes.
9. Introduction to ICH guidelines related to formulation development, animal studies, clinical trials, stability studies etc.

PRACTICAL RECOMMENDED

1. To validate the performance of laboratory autoclave for temperature parameter using bacterial test strips. (Bacillus steriothermophilus)
2. To perform process validation of manufacturing process related to solid dosage form.

3. To perform process validation of manufacturing process related to semi-solid dosage form.
4. To perform process validation of manufacturing process related to liquid dosage form.
5. To perform validation of various equipment related to manufacturing of solid dosage form.
6. To perform validation of various equipment related to manufacturing of liquid dosage form.
7. To perform the stability studies of solid dosage form as per ICH guidelines.
8. To perform the accelerated stability studies of solid dosage form as per ICH guidelines.
9. To prepare and standardize the ayurvedic churnaof Khayam as per WHO guidelines.
10. To prepare and standardize the ayurvedic churnaof Triphala as per WHO guidelines.
11. To prepare and standardize the ayurvedic churnaof Trikatu as per WHO guidelines.
12. To prepare and standardize the Asava and arista of Kujaj Arista as per WHO guidelines.
13. To prepare and standardize the Asava and arista of Vidangasava as per WHO guidelines.
14. To prepare and evaluate herbal cosmetics of aloe vera cream.
15. To prepare and evaluate herbal cosmetics of Heena hair dye.
16. To prepare and evaluate herbal cosmetics of neem face pack.
17. To prepare and design process protocol for solid dosage form.
18. To validate /calibrate of UV-Visible spectrophotometer (manually).
19. To prepare protocol and validate of high performance liquid chromatography (HPLC).
20. To calibrate minor instrument (pH meter, flame photometer, conductometer etc).
21. To develop analytical method development and its validation for estimation of pharmaceutical dosage form by spectrophotometric and chromatographic techniques.

BOOKS RECOMMENDED:

1. Guideline for Developing National Drug Policies- WHO Publication, 1998.
2. Quality Assurance of Pharmaceuticals- Compendia of Guidelines and Related Materials, Vol.- 1, WHO publication.
3. OPPI- Quality Assurance
4. Michael E. Swartz, Analytical method development & validation.
5. Banker, G. S. and Rhodes, C. T. "Modern Pharmaceutics", Marcel Dekker, inc, New York
6. website of Indian patent office (<http://www.ipindia.nic.in>)
7. ICH Guidelines
8. USFDA Guidelines (<http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/Guidances/default.htm>)