

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – I, Semester – I

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	BPH-101M BPH-101B	Remedial Mathematics or Remedial Biology	3	-	15	05	20	80	100
2.	BPH -102	Pharmaceutical Analysis-I	3	-	15	05	20	80	100
3.	BPH-103	Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	3	-	15	05	20	80	100
4.	BPH-104	Pharmaceutics-I (Dispensing & General Pharmacy)	3	-	15	05	20	80	100
5.	BPH-105	Anatomy & Physiology -I	3	-	15	05	20	80	100
6.	BPH-106	Professional Communication & Writing Skills-I	3	-	15	05	20	80	100

Day to Day Evaluation

Practical									
S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
7.	BPH-101P	Remedial Biology	-	4	-	-	-	-	-
8.	BPH-102P	Pharmaceutical Analysis-I	-	4	-	-	20	80	100
9.	BPH-103P	Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	-	4	-	-	20	80	100
10.	BPH-104P	Pharmaceutics-I (Dispensing & General Pharmacy)	-	4	-	-	20	80	100
11.	BPH-105P	Anatomy & Physiology -I	-	4	-	-	20	80	100
			18	20	-	-	200	800	1000

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – I, Semester – II

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	BPH-201	Pharmaceutics-II (Physical Pharmacy-I)	3	-	15	05	20	80	100
2.	BPH-202	Pharmaceutical Chemistry-II (Basic Organic Chemistry)	3	-	15	05	20	80	100
3.	BPH-203	Anatomy & Physiology -II	3	-	15	05	20	80	100
4.	BPH-204	Computer Fundamentals	3	-	15	05	20	80	100
5.	BPH-205	Pharmaceutical Mathematics & Biostatistics	3	-	15	05	20	80	100

Practical

Day to Day Evaluation

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
6.	BPH-201P	Pharmaceutics-II (Physical Pharmacy-I)	-	4	-	-	20	80	100
7.	BPH-202P	Pharmaceutical Chemistry-II (Basic Organic Chemistry)	-	4	-	-	20	80	100
8.	BPH-204P	Computer Fundamentals	-	4	-	-	20	80	100
			15	12	-	-	160	640	800

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – II, Semester – III

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	BPH-301	Pharmaceutics-III (Physical Pharmacy-II)	3	-	15	05	20	80	100
2.	BPH-302	Pharmaceutics-IV (Unit Operation-I)	3	-	15	05	20	80	100
3.	BPH-303	Pharmacognosy-I	3	-	15	05	20	80	100
4.	BPH-304	Pharmaceutical Chemistry-III (Advanced Organic Chemistry)	3	-	15	05	20	80	100
5.	BPH-305	Anatomy & Physiology -III	3	-	15	05	20	80	100

## Practical

## Day to Day Evaluation

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
6.	BPH-301P	Pharmaceutics-III (Physical Pharmacy-II)	-	4	-	-	20	80	100
7.	BPH-302P	Pharmaceutics-IV (Unit Operations-II)	-	4	-	-	20	80	100
8.	BPH-303P	Pharmacognosy-I	-	4	-	-	20	80	100
9.	BPH-304P	Pharmaceutical Chemistry-III (Advanced Organic Chemistry)	-	4	-	-	20	80	100
			18	16	-	-	180	720	900

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – II, Semester – IV

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	BPH-401	Pharmaceutics-V (Unit Operation-II)	3	-	15	05	20	80	100
2.	BPH-402	Pharmaceutical Microbiology	3	-	15	05	20	80	100
3.	BPH-403	Pharmacognosy-II	3	-	15	05	20	80	100
4.	BPH-404	Pharmaceutical Analysis-II	3	-	15	05	20	80	100
5.	BPH-405	Anatomy & Physiology -IV	3	-	15	05	20	80	100
6.	BPH-406	Pharmaceutical Jurisprudence	3	-	15	05	20	80	100

Practical

Day to Day Evaluation

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
7.	BPH-401P	Pharmaceutics-V (Unit Operation-II)	-	4	-	-	20	80	100
8.	BPH-402P	Pharmaceutical Microbiology	-	4	-	-	20	80	100
9.	BPH-403P	Pharmacognosy-II	-	4	-	-	20	80	100
10.	BPH-404P	Pharmaceutical Analysis-II	-	4	-	-	20	80	100
			18	16	-	-	180	820	1000

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – III, Semester – V

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
		<b>Theory</b>							
1.	BPH-501	Pharmaceutical Chemistry-IV (Biochemistry)	3	-	15	05	20	80	100
2.	BPH-502	Pharmaceutics-VI (Pharmaceutical Technology-I)	3	-	15	05	20	80	100
3.	BPH-503	Pharmacology-I	3	-	15	05	20	80	100
4.	BPH-504	Pharmaceutical Chemistry-IV (Medicinal Chemistry-I)	3	-	15	05	20	80	100
5.	BPH-505	Pharmacognosy-III	3	-	15	05	20	80	100

**Practical**

**Day to Day Evaluation**

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
		<b>Theory</b>							
6.	BPH-501P	Pharmaceutical Chemistry-IV (Biochemistry)	-	4	-	-	20	80	100
7.	BPH-502P	Pharmaceutics-VI (Pharmaceutical Technology-I)	-	4	-	-	20	80	100
8.	BPH-503P	Pharmacology-I	-	4	-	-	20	80	100
9.	BPH-504P	Pharmaceutical Chemistry-IV (Medicinal Chemistry-I)	-	4	-	-	20	80	100
10.	BPH-505P	Pharmacognosy-III	15	20	-	-	20	80	100
							200	800	1000

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.

# STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – III, Semester – VI

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
1.	BPH-601	Pharmaceutics – VII (Pharmaceutical Technology-II)	3	-	15	05	20	80	100
2.	BPH-602	Pharmacology – II	3	-	15	05	20	80	100
3.	BPH-603	Pharmaceutical Chemistry – VI (Medicinal Chemistry – II)	3	-	15	05	20	80	100
4.	BPH-604	Pharmacognosy-IV	3	-	15	05	20	80	100
5.	BPH-605	Pharmaceutics-VII (Hospital & Community Pharmacy)	3	-	15	05	20	80	100

Practical

Day to Day Evaluation

S. No.	Course Code	Subject Name  Theory	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
6.	BPH-601P	Pharmaceutics – VII (Pharmaceutical Technology-II)	-	4	-	-	20	80	100
7.	BPH-602P	Pharmacology – II	-	4	-	-	20	80	100
8.	BPH-603P	Pharmaceutical Chemistry – VI (Medicinal Chemistry – II)	-	4	-	-	20	80	100
9.	BPH-604P	Pharmacognosy-IV	-	4	-	-	20	80	100
10.	BPH-605P	Pharmaceutics-VII (Hospital & Community Pharmacy)	-	4	-	-	20	80	100
			15	20	-	-	200	800	1000

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.

## STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – IV, Semester – VII

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
		<b>Theory</b>							
1.	BPH-701	Pharmaceutical Analysis-III	3	-	15	05	20	80	100
2.	BPH-702	Pharmaceutics - IX (Biopharmaceutics & Pharmacokinetics)	3	-	15	05	20	80	100
3.	BPH-703	Pharmacology-III	3	-	15	05	20	80	100
4.	BPH-704	Pharmaceutical Chemistry-VII (Medicinal Chemistry-III)	3	-	15	05	20	80	100
5.	BPH-705	Environmental Sciences	3	-	15	05	20	80	100

Practical

Day to Day Evaluation

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
		<b>Theory</b>							
6.	BPH-701P	Pharmaceutical Analysis-III	-	4	-	-	20	80	100
7.	BPH-702P	Pharmaceutics - IX (Biopharmaceutics & Pharmacokinetics)	-	4	-	-	20	80	100
8.	BPH-703P	Pharmacology-III	-	4	-	-	20	80	100
9.	BPH-706P	Industrial Training	-	-	-	-	-	-	100
			15	12	-	-	160	640	900

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.

## STUDY AND EVALUATION SCHEME

Effective from Session: 2011-12

Course; B.Pharm

Year – IV, Semester – VIII

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
		<b>Theory</b>							
1.	BPH-801	Pharmaceutical Biotechnology	3	-	15	05	20	80	100
2.	BPH-802	Pharmaceutical Chemistry-VIII (Chemistry of Natural Products)	3	-	15	05	20	80	100
3.	BPH-803	Pharmaceutical Industrial Management	3	-	15	05	20	80	100

4.	BPH-804	Professional communication & Writing skills -II	3	-	15	05	20	80	100
5.	BPH-805	Pharmaceutics-IX (Pharmaceutical Technology-III)	3	-	15	05	20	80	100

**Practical**

**Day to Day Evaluation**

S. No.	Course Code	Subject Name	Period (Hours)		Sessional			Exam	Subject Total
			L	P	CT	TA	Total	ESE	
6.	BPH-802P	Pharmaceutical Chemistry-VIII (Chemistry of Natural Products)	-	4	15	05	20	80	100
			15	04	-	-	120	480	600

TA-Teacher Assessment

ESE-End Semester Examination

CT-Cumulative Test

**NOTE:** Duration in Theory & Practical of ESE shall be 3 (three) hours & 4 (four) hours respectively.



## SEMESTER – I

### **BPH – 101 M**

#### **REMEDIAL MATHEMATICS**

##### **Unit – I**

**Algebra:** Determinants, properties of determinants, solution of simultaneous equations by Cramer's rule, matrices, properties of matrices, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. [08]

##### **Unit – II**

**Measures of Central value:** Objectives and pre-requisites of an ideal measure, mean, mode and median. [05]

##### **Unit – III**

**Trigonometry:** Measurement of angle, T-ratio, addition, subtraction and transformation formulae, T-ratio of multiple, submultiple, allied and certain angles, application of logarithms in pharmaceutical computations. [08]

##### **Unit – IV**

**Analytical Plain Geometry:** Certain co-ordinates, distance between two points, area of triangles locus of a point, straight line, slope and intercept form, double intercept form normal (perpendicular form), slope – point and two point form, general equation of first degree. [07]

##### **Unit – V**

**Calculus: Differential:** Limits and functions, definition of differential coefficient differentiation of standard functions, including functions, including function of a function (chain rule).  
**Integral:** Integration as inverse of differentiation indefinite integrals of standard form, integration by parts. [12]

#### **BOOKS RECOMMENDED**

1. A textbook of Mathematics for XI-XII Students, NCERT Publication Vol. I-IV.
2. Loney, S.L “Plane Trigonometry” AITBS Publishers.
3. Loney, S.L “The elements of coordinate geometry” AITBS Publishrs.
4. Gupta S.P. Statistical Methods, Sultan Chand and Co., New Delhi.
5. Narayan Shanti, Integral calculus , Sultan Chand & Co.
6. Prasad Gorakh Text book on differential calculus, Pothishala Pvt. Ltd., Allahabad.
7. Narayan Shanti, Differential calculus , Shyamlal Charitable Trust, New Delhi.
8. Prasad Gorakh Text book on integral calculus , Pothishala Pvt. Ltd., Allahabad.

### **BPH – 101 B**

#### **REMEDIAL BIOLOGY**

##### **Unit – I**

General survey of Animal Kingdom, Structure and life history of parasites as illustrated by amoeba, trypanosoma, plasmodium, taenia, and ascaris, [08]

##### **Unit – II**

General structure and life history of insects like mosquito, house fly and silk worm. [08]

##### **Unit – III**

Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed, modification of stems and roots. [08]

##### **Unit – IV**

**Plant cell:** Its structure and non living inclusions, mitosis and meiosis, different types of plant tissues and their functions. Basic concept of molecular biology (DNA, RNA). [08]

## Unit – V

Methods of classification of plants

**Plant taxonomy:** Study of following families with special reference to medicinally important plants – Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Labiatae. [08]

### PROJECT WORK :

**Preparation of herbarium sheets.**

### **BOOKS RECOMMENDED**

1. Dutta A.C. “ Botany for Degree students” Oxford.
2. Marshall & Williams “Text Book of Zoology” CBS Publishers & Distributors, Delhi.
3. Fahn “Plant Anatomy” Aditya Books Private Limited, New Delhi.
4. Weiz, Paul B “Laboratory Manual in Science of Biology” Mc Graw-hill book company.

## **BPH – 102**

### **PHARMACEUTICAL ANALYSIS-I**

#### **Unit-I:**

Significance of quantitative analysis in quality control different techniques of analysis, preliminaries and definitions, precision and accuracy. Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards. [06]

#### **Unit-II:**

##### **Acid Base Titrations:**

Acid base concepts, role of solvent, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Henderson-Hasselbach equation, buffer solution, neutralization curves, acid base indicators, theory of indicators, choice of indicators, mixed indicators. [10]

#### **Unit-III:**

##### **Oxidation reduction Titrations:**

Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation reduction curves, iodimetry and iodometry. [10]

#### **Unit-IV:**

##### **Precipitation Titrations:**

Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of precipitate. Gaylussac method, Mohr’s method, Volhard’s method and Fajan’s method. [06]

#### **Unit-V:**

##### **Gravimetric Analysis:**

Solubility products, the colloidal state, supersaturation, co-precipitation, post-precipitation, digestion, washing of the precipitate, filtration, filter papers and crucibles, Ignition, specific examples like barium as barium sulphate & Calcium as calcium oxide, organic precipitants. [08]

## **BPH-102P**

### **PHARMACEUTICAL ANALYSIS - I**

#### **PRACTICAL**

The students should be introduced to the main analytical tools through demonstration. They should have a clear understanding of a typical analytical balance, the requirements of a good balance, weights,

care & use of balance, methods of weighing, and errors in weighing. The students should also be acquainted with the general apparatus requiring various analytical procedures.

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

#### **BOOKS RECOMMENDED:**

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

#### **BPH – 103**

### **PHARMACEUTICAL CHEMISTRY-I (INORGANIC PHARMACEUTICAL CHEMISTRY)**

#### **Unit-I**

A. Sources of impurities & their control, limit test for iron, arsenic, lead, heavy metals, chloride & sulphate.

B. An outline of methods of preparation, uses, sources of impurities, tests of purity and identification and special tests, if any, of the following classes of inorganic pharmaceuticals included in **Indian Pharmacopoeia**:

**Gases and Vapours** : Inhalants (Oxygen), Anaesthetics (Nitrous oxide)

**Topical Agents**: Protective (Calamine, talc, kaolin), astringents (Zinc oxide, Zinc Sulphate) and anti infectives (Boric Acid, Hydrogen peroxide, Iodine, Potassium permanganate, Silver nitrate).

**Dental Products** : Dentrifices- anti-caries agents (Sodium fluoride).

[08]

#### **Unit-II:**

**Gastrointestinal Agents** : Acidifying agents (Dilute Hydrochloric acid), antacids(Bismuth subcarbonate, Aluminium hydroxide, Calcium carbonate, Magnesium hydroxide, Magnesium oxide{ light and heavy }, Magnesium carbonate{ light and heavy}), cathartics (disodium hydrogen phosphate, Magnesium sulphate), protective and adsorbents( Activated Charcoal, Light Kaolin, Aluminium

sulphate)

**Miscellaneous Agents:** Expectorants (Ammonium chloride, Potassium Iodide). [08]

**Unit-III :**

**Major intra and extra- cellular electrolytes :** Physiological ions, Electrolytes used for replacement therapy, acid-base balance & combination therapy (Calcium chloride, Calcium gluconate, Calcium lactate, Sodium dihydrogen phosphate, sodium acetate, sodium bicarbonate, sodium chloride, potassium chloride, magnesium chloride). Cationic and anionic components of inorganic drugs useful for systemic effects. [08]

**Unit-IV:**

**Essential and Trace Elements:** Transition elements and their compounds of pharmaceutical importance. Iron and haematinics (Ferrous fumarate, Ferrous gluconate, Ferrous sulphate, Ferric Ammonium citrate), mineral supplements (Cu, Zn, Mn, S, I).

**Co-ordination compounds and complexation-** study of such compounds used in therapy including poison antidotes (Calcium folinate, Sodium thiosulphate). [08]

**Unit-V:**

**Inorganic Radio-Pharmaceuticals:** Nuclear radio pharmaceuticals, nomenclature, methods of obtaining, standards and units of activity, measurement of activity, clinical application and dosage, hazards and precautions. [08]

**BPH-103P**

**PHARMACEUTICAL CHEMISTRY-I  
(INORGANIC PHARMACEUTICAL CHEMISTRY) LAB**

List of Experiments

1. To perform limit test of chloride, sulphate, Iron, Heavy metal and arsenic in the given sample.
2. Salt analysis
3. Preparation of following compounds:-
  - Boric acid
  - Magnesium sulphate
  - Heavy magnesium carbonate
  - Calcium Carbonate
  - Alum
  - Zinc sulphate

**BOOKS RECOMMENDED:**

1. Block, J.H. Roche, E, Soine, T and Wilson, C., "Inorganic, Medicinal & Pharmaceutical Chemistry", Lea & Febiger.
2. Discher, C.A., et.al Modern Inorganic Pharmaceutical Chemistry, waveland press.
3. Pharmacopoeia of India, 1996 edition.
4. Atherden L.M., Bentley and Drivers' "Text Book of Pharmaceutical Chemistry", Oxford University Press, London.

**BPH – 104**

**PHARMACEUTICS- I  
(DISPENSING AND GENERAL PHARMACY)**

**Unit-I:**

**History of Pharmacy:** Origin & development of pharmacy, scope of pharmacy, introduction to pharmacopoeias with special reference to I.P, B.P., U.S.P, & International Pharmacopoeia. [04]

**Pharmaceutical Additives:** Coloring, flavoring & sweetening agents, cosolvents, preservatives, surfactants & their applications, antioxidants, stabilizers. [03]

**Unit-II:**

**Pharmaceutical Incompatibilities :** Physical and Chemical Incompatibilities: Types and methods to overcome these Inorganic incompatibilities including incompatibilities of metals and their salts, nonmetals, acids and alkalis. [06]

**Unit-III:**

**Pharmaceutical calculations:** Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes, percentage solutions, alligation, alcohol dilution, proof spirit. [10]

**Unit-IV:**

**Extraction & Galenicals:** Extraction processes, study of infusion, decoction, digestion, percolation, maceration & their modifications, applications in the preparation of tinctures & extracts. Factors affecting selection of extraction processes. [07]

**Unit-V**

**Introduction to Pharmaceutical Dosage Forms:** A brief theory of : Tablets, Capsules, Emulsion, suspension, Solutions, mixtures, spirits, aromatic waters, glycerins, paints, syrups, elixirs, mouth washes, mucilages, lotions, liniments, pastes, inhalations and powders. [10]

**BPH-104P**

**PHARMACEUTICS-I  
(DISPENSING & GENERAL PHARMACY)**

I – Preparation of Pharmaceutical dosage forms (involving the use of calculations in metrology) as official in IP, BP, USP/NF (at least 15 preparations).

II. Experiments covering various physical and chemical incompatibilities.

**BOOKS RECOMMENDED:**

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

**Unit –I**

- a. Introduction to human body & organisation of human body.
- b. Functional & structural characteristics of cell.
- c. Anatomy and Physiology of cell membrane & various transport mechanisms across the cell.
- d. Structural & functional characteristics of tissues- epithelial, connective, muscle and nerve. [08]

**Unit-II:**

**Skeletal system:**

- a. Structure, composition & functions of skeleton. Classification of joints, types of movements of joints.
- b. Joint disorders: Arthritis & Gout [08]

**Unit-III:**

- a. Anatomy & physiology of skeletal & smooth muscle, neurotransmission, physiology of skeletal muscle contraction, energy metabolism, types of muscle contraction, muscle tone.
- b. Disorder of Muscular System: Spasticity, Tetany, Fatigue & Myasthenia gravis. [08]

**Unit-IV:**

**Haemopoietic system:**

- a. Composition & function of blood & its elements, erythropoiesis, blood groups & blood coagulation.
- b. Blood Disorder: Anaemia, its types. [08]

**Unit-V : Lymphatic system:** Composition, formation and circulation of lymphs, lymph node spleen. [08]

**PRACTICAL**

1. Study of human skeleton.
2. Microscopic study of different tissues.
3. Estimation of haemoglobin in blood, Determination of bleeding time, clotting time, R.B.C, Count, Total leucocyte count, D.L.C. and E.S.R.
4. Recording of body temperature, pulse rate and blood pressure,

**BOOKS RECOMMENDED:**

1. Ranade VG, "Text Book of Practical Physiology", Pune Vidyarthi Griha Prakashan, Pune.
2. Difore S.H. "Atlas of Normal Histology" – Lea & Febiger Philadelphia.
3. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Guyton AC, Hall JE., "Text book of Medical Physiology", WB Saunders Company.
5. Chatterjee C.C. "Human Physiology", Medical Allied Agency, Calcutta.
6. Ross & Wilson "Anatomy & Physiology in Health & Illness", Churchill Livingstone.
7. Tortora GJ, & Anagnodokos NP "Principles of Anatomy & Physiology", Harper & Row Publishers, New Delhi.
8. Parmar N.S. "Health Education & Community Pharmacy" CBS Publishers, Delhi.
9. Shalya Subhash "Human Physiology" CBS Publishers & Distributors.
10. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.

**BPH – 106**

**PROFESSIONAL COMMUNICATION & WRITING SKILLS – I**

**Unit-I:**

English Grammar

Parts of speech, Articles, Preposition, Tenses, Active-Passive voice, Direct- Indirect, speech. [12]

**Unit-II:**

Letter writing, Precis and Essay writing, Comprehension, Speed reading, scanning & swimming. [08]

**Unit-III:**

Working on accent neutralisation, pauses, stresses, non words, voice modulation, eye contact for small & large groups. [08]

**Unit-IV:**

Presentation techniques, - Tips.

Importance of non-verbal communication, debates, Role plays. [06]

**UNIT-V:**

Personality types., Decision making, Motivation, Attitude , Thinking [06]

**BOOKS RECOMMENDED**

1. Wren P.C and Martin H., “High School Grammar and Composition”, S. Chand & Co.
2. Robbins, S “Organisational Behaviour”

## SEMESTER – II

**BPH – 201**

### **PHARMACEUTICS-II (PHYSICAL PHARMACY-I)**

#### **Unit-I:**

1. **States of matter:** change in the state of matter, latent heats and vapor pressure, sublimation critical point, Eutectic mixtures, gases, relative humidity, liquid complexes, liquid crystals, glassy state, solids-crystalline, amorphous and polymorphism.
2. **Solutions :** Ideal and real solutions, solutions of gases in liquids, colligative properties. [08]

#### **Unit-II:**

3. **Kinetics and Drug Stability:** General considerations & concepts, Degradative pathways, half life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating. [08]

#### **Unit-III:**

4. **Thermodynamics :** Fundamentals, first, second, third and zeroth law, Joule-Thompson's effect, absolute temperature scale.
5. **Thermo chemistry :** Definition & conventions, heat of reaction, heat of formation, heat of solution, heat of neutralisation, heat of combustion, Hess law of constant summation, Bomb calorimeter, bond energies, Kirchoffs equation. [08]

#### **Unit-IV:**

6. **Electro chemistry :** Faraday's Laws of Electrolysis, Electrolytic conductance & its measurement, molar & equivalent conductivity, its variation with dilution. Kohlrausch law, Arrhenius theory, degree of ionisation & Ostwald dilution law. Transport number & migration of ion, Hittorffs theoretical device, theory of strong electrolytes (Debye Huckle theory). [08]

#### **Unit-V:**

7. **Phase equilibria:** Phase, component, degree of freedom, phase rule (excluding derivation). Cooling curves & Phase diagrams for one & two component system involving eutectics, congruent & incongruent melting point (examples-water, sulphur, KI-H<sub>2</sub>O, NaCl-H<sub>2</sub>O system). Distribution law & application to solvent extraction. [08]

**BPH-201P**

### **PHARMACEUTICS-II (PHYSICAL PHARMACY-I)**

#### **PRACTICALS**

1. Determination refractive index of given liquids.
2. Determination of specific rotation of sucrose at various concentrations and determine the intrinsic rotation.
3. Determination of rate constant of simple reaction.
4. Determination of cell constant, verify Ostwald dilution law and perform conductometric titrations.
5. Determination of surface tension.
6. Determination of partition co-efficient.
7. Determination of solubility.

#### **BOOKS RECOMMENDED:**

1. Pali S.R., and Prabartak, S.K.D.E., Practical Physical Chemistry, Haltone Limited, Calcutta.
2. Shoemaker, D.P. Garland, C.W., Experiments of Physical Chemistry, MC Graw Hill Book Co.
3. Bahl B.S., Tuli G.D. & Bahl Arun, Essential of Physical Chemistry, S. Chand & Co.



4. Negi A.S. & Anand S.C. "Textbook of Physical Chemistry" Wiley Eastern Ltd.
5. Glasstone S. & Lewis D, Elements of Physical Chemistry, Macmillan Education.
6. Atkins P & Paula, J.D. "Atkins Physical Chemistry" Oxford University Press.

**BPH – 202**

**PHARMACEUTICAL CHEMISTRY-II  
(BASIC ORGANIC CHEMISTRY)**

**Unit-I:**

**Structure and Properties:** Atomic Structure, atomic orbital, molecular orbital, hybridization, sigma & Pi bond, covalent, electrovalent and co-ordinate bond, inductive effect, resonance, Classification & Nomenclature of organic compounds. [08]

**Unit-II:**

Isomerism, geometrical isomerism, Stereochemistry including optical activity, stereoisomerism, specification of configuration and conformational analysis. [08]

**Unit-III:**

Important methods of preparation, reactions with special reference to mechanism of the following classes of compounds: Alkanes, alkenes, alkynes & dienes, free radical substitution reaction, alkyl halides, Alcohols. [08]

**Unit-IV:**

Aromatic Compounds, aromatic character, structure of benzene, orientation of aromatic substitution, arenes, amines (aliphatic & aromatic), phenols, aryl halides. [08]

**Unit-V:**

Aldehydes and ketones (aliphatic & aromatic), carboxylic acids & their derivatives, di & tricarboxylic acids, hydroxy acids. Organometallic Compounds- Grignard reagent, organolithium compounds, their preparation & synthetic application. [08]

**BPH-202P**

**PHARMACEUTICAL CHEMISTRY –II  
(BASIC ORGANIC CHEMISTRY)**

**PRACTICALS:**

*Introduction of various laboratory techniques including :*

- a. Calibration of thermometer
- b. Determination of melting point
- c. Determination of boiling point
- d. Determination of mixed melting point.
- e. Distillation
- f. Crystallization

Purification of solvents like Benzene, chloroform, acetone and preparation of absolut alcohol.

Identification of elements and functional groups in given sample

Synthesis of compounds involving benzylation, acetylation, bromination, reduction & oxidation.

Synthesis of following compounds

Picric acid

Aniline

Acetanilide

Aspirin  
Hippuric acid  
P-Bromo acetanilide  
Iodoform  
Oxalic Acid

**BOOKS RECOMMENDED:**

1. Mann, F.G, & Saunders, B.C., Practical Organic Chemistry, ELBS/ Longman.
2. Vogel A.I., Textbook of Practical Organic Chemistry, ELBS/Longman.
3. Morrison, R.T., and Boyd R.N., Organic Chemistry, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Finar, I.L., Organic Chemistry, Vol. I & II, ELBS/Longman.
5. Jain, M.K. Organic Chemistry, Sohan Lal Nagin Chand & Co. 60 B, Bunglaw Road, Delhi.
6. Hendrikson, Organic Chemistry.

**BPH – 203**

**ANATOMY & PHYSIOLOGY-II**

**Unit-I:**

**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. [10]

**Unit –II:**

**Autonomic Nervous System :** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission the A.N.S. [10]

**Unit-III:**

**Sense Organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell), and skin (superficial receptors). [06]

**Unit-IV:**

**First Aid:** Emergency treatment of shock, snake bites, burns, poisoning, fractures and resuscitation methods. [06]

**Unit-V:**

**Communicable Diseases:** Brief outline, their causative agents, modes of transmission and prevention (Chicken pox, measles, influenza, diphtheria, whooping cough, tuberculosis, poliomyelities, helminthiasis, malaria, filariasis, rabies, trachoma, tetanus, leprosy). [08]

**BOOKS RECOMMENDED:**

1. Ranade VG, Text Book of Practical Physiology, Pune Vidyarthi Griha Prakashan, Pune.
2. Difore SH, "Atlas of Normal Histology" Lea & Febiger Philadelphia.
3. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
5. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
6. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.
7. Tortora GJ, & Anagnodokos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.
8. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
9. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.

10. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.

**BPH – 204**

## **COMPUTER FUNDAMENTALS**

### **Unit- I: Computer Fundamentals:**

Definition and Overview of Computer, Computer classification, Computer Organization, Computer code. Input Devices Out put devices, Storage devices. Computer Software, Types of software.

Overview of Computer Networks, LAN, MAN, WAN, Internet, Intranet, network topology.

Internetworking: Bridges, Repeaters and Routers. [10]

### **Unit-II: Operating System:**

A brief introduction to operation systems, functions and study of windows as an operating system.

Introduction to MS-OFFICE- word Document creation, Editing, formatting table handling, mail merge, Excel, Editing, working Retrieval, Important functions, short cut keys used in EXCEL. [08]

### **Unit-III: Problem Solving :**

Concept of algorithm and flow charting, Programming : Variables and constants, Control statement, DO, IF, GOTO. Arrays, Function formatting, files handling. Application of programming to solve problem (i) largest number of given set of numbers (ii) roots of equation (iii) handling in built functions (iv) find mean, mode, and standard deviation of given data in a file (v) correlation and regression (vi) fitting a straight line to given data (vii) matrices handling (viii) difference of data (ix) integration (Trapezoidal rule). [08]

### **Unit-IV:**

MS-Power point 2007-Job Profile, Elements of Power point , ways of delivering Presentation, concept of Four P's (Planning , Preparation, Practice and Presentation) ways of handling presentations e.g. creating, saving slides show controls, Adding formatting, animation and multimedia effects. Database system concepts, Data models schema and instance , Database language, Introduction to MS-Access 2007, main components of Access tables, Queries, Reports, Forms table handling, working on Query and use of database. [07]

### **Unit –V: Networking & Internet:**

Computer networks, characteristics of networking technology, components of network.

Internet – Basic terms, software and hardware requirement for internet, process of internetworking, internet tools, Email- components and working, study of pharmaceutical web sites and search engines, searching through pharmaceutical data bases, study of patent websites. [07]

**BPH-204P**

**COMPUTER FUNDAMENTALS**

**PRACTICAL**

SIMPLE EXERCISES BASED ON THEORY

**BOOKS RECOMMENDED:**

V. Rajaraman–Fundamentals of Computers, Prentice-Hall of India Pvt. Ltd.

**BPH – 205**

**PHARMACEUTICAL MATHEMATICS & BIOSTATISTICS**

**Unit-I**

1. Method of collective data
2. Diagrammatic representation of data (Pie, Histogram, Bar, Circular diagram)
3. Classification and Tabulation of data.
4. Sampling-Types of sampling, Merits and limitations of sampling, Sampling errors and non sampling errors. [08]

**Unit-II- Measure of central tendency for discrete and continuous data.**

1. Mean, Types of means.
  2. Median
  3. Mode
- Measure of dispersion
1. Quartile deviation
  2. Mean deviation
  3. Standard error of Mean (SEM) [08]

**Unit-III .**

1. Skewness and Kurtosis
2. Correlation and regression analysis
3. Method of least square in straight line [08]

**Unit-IV-Statistical Inferences- Confidence (feucidial ) limit.**

1. Test- Hypothesis- t-test, z-test,  $\chi^2$  –test, F- test ( variance ratio)
2. Analysis of variances- one way and two way classification, Nonlin (ANOVA) [08]

**Unit-V-**

1. Theory of Probability- Simple Probability, Addition Probability, Multiplication Probability
2. Binomial distribution- Fit of Binomial
3. Poisson distribution- Fit of Poisson
4. Normal distribution –Fit of Normal [08]

**BOOKS RECOMMENDED**

1. A textbook of Mathematics for XI-XII Students, NCERT Publication Vol. I-IV.
2. Gupta S.P. Statistical Methods, Sultan Chand and Co., New Delhi.
3. Greval B.S., Higher Engineering Mathematics, Khanna Publication, New Delhi.
4. Boltan’s Pharmaceutical Statistics, Practical and Clinical Application, Marcel Dekker, N.Y.
5. Khan, Khanum, ” Biostatistics for Pharmacy”.

## SEMESTER-III

BPH – 301

### PHARMACEUTICS – III (PHYSICAL PHARMACY-II)

#### Unit-I:

1. **Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
2. **Complexation :** Classification of complexes, methods of preparation and analysis, applications. [08]

#### Unit-II:

3. **Micromeritics and Powder Rheology :** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties. [08]

#### Unit-III:

4. **Surface and Interfacial Phenomenon :** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid- gas and solid-liquid interfaces. [08]

#### Unit-IV:

5. **Viscosity and Rheology:** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers. [08]

#### Unit-V:

6. **Dispersion Systems:** Colloidal Dispersions: Definition, types, properties of colloids, protective colloids, application of colloids in pharmacy.  
Suspensions and Emulsions: Basic principles, sedimentation properties, aging of emulsions & suspensions, wetting of particles, Ostwald drop ripening concept, effect of flocculation, Brownian moments. [08]

BPH – 301 P

### PHARMACEUTICS – III (PHYSICAL PHARMACY-II)

#### PRACTICAL

1. Determination of particle size, Particle size distribution and surface area using various methods of particle size analysis.
2. Determination of derived properties of powders like density, porosity, compressibility, angle of repose etc.
3. Determination of surface/ interfacial tension, HLB value and critical micellar concentration of surfactants.
4. Study of rheological properties of various types of systems using different Viscometers.

5. Studies of different types of colloids and their properties.
6. Preparation of various types of suspensions and determination of their sedimentation parameters.
7. Preparation and stability studies of emulsions.
8. Studies of different types of complexes and determination of their stability constants.
12. Preparation of pharmaceutical buffers and determination of buffer capacity.
13. Experiments involving tonicity adjustments.

**BOOKS RECOMMENDED :**

1. Martin A, Bustamante P. & Chun A.H.C- Physical Pharmacy, Lea & Febiger, Philadelphia.
2. Shotten E & Ridgaway K, Physical Pharmaceutics, Oxford University Press, London.

**BPH-302**

**PHARMACEUTICS-IV  
(UNIT OPERATIONS-I)**

**Unit-I:**

1. **Unit Operations:** Introduction, basic laws.
2. **Fluid Flow:** Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic situations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. [07]

**Unit-II:**

3. **Material of Construction:** General study of composition, corrosion, resistance, Properties and applications of the materials of construction with special reference to stainless steel and glass.
4. **Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter. Factors affecting filtration, Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters. [10]

**Unit-III:**

5. **Crystallization:** Characteristics of crystals like-purity, size, shape, geometry, habit, forms size and factors affecting them, Solubility curves and calculation of yields. Material and heat balances around Swenson Walker Crystallizer. Supersaturation theory and its limitations, Nucleation mechanisms, crystal growth, Study of various types of Crystallizer, Tanks, agitated batch, Swenson Walker, Single vacuum, circulating magma and Krystal crystallizer, Caking of crystals and its prevention. [08]

**UNIT – IV**

6. **Humidification And Dehumidification:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations.
7. **Water systems** – Raw water, soft water, purified water, water for injection, quality requirement and treatment of water. [08]

**Unit-V**

8. **Mixing:** Theory of mixing, solid-solid, solid-liquid & liquid-liquid mixing equipments.
9. **Industrial Hazards and Safety Precautions:** Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatitis, safety record. [07]

## **BPH-302P**

### **PHARMACEUTICS-IV (UNIT OPERATIONS-I)**

#### **PRACTICAL**

Experiments based on Theory.

#### **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. Gavhane, K.A. "Unit Operation-II", Nirali Prakashan.
5. Sambhamurthi Pharmaceutical Engineering, New Age Publishers

## **BPH – 303**

### **PHARMACOGNOSY – I**

#### **Unit-I:**

Definition, history, scope & development of Pharmacognosy. [02]

1. **Source of Drug:** Biological, mineral and Marine pharmacognosy.
2. **Classification of Drugs:** Alphabetical, Morphological, taxonomical, chemical & pharmacological. [03]

#### **Unit-II:**

3. **Chemotaxonomical classification** [03]
  4. **Fibres :** Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestos. [03]
- Pharmaceutical aids:-** Study of Pharmaceutical aids like Talc, Diatomite, Kaolin, Bentonite, Fullers earth, Gelatin and Natural colors. [02]

#### **Unit-III:**

4. **Cultivation, Collection, Processing & Storage of crude drugs:**
  1. Factors influencing cultivation of medicinal plants, Type of Soils & fertilizers of common use. [02]
  2. Pest Management & natural pest control agents. [02]
  3. Plant hormones and their applications. [01]
  4. Polyploidy, Mutation & hybridization with reference to medicinal plants. [02]

#### **Unit-IV:**

5. **Quality Control of crude drugs:** Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation including Quantitative microscopy. WHO guidelines for standardization of medicinal plants. [08]

#### **Unit-V:**

6. **Systematic pharmacognostic study of following:**
  - a) Carbohydrates & derived products: Agar, Guar gum, acacia, Honey, Isabgol, pectin, starch, sterculia & tragacanth. [06]
  - b) Lipids–Beeswax, castor oil, Cocabutter, hydnocarpus oil, Codliver oil, sharkliver oil, Linseed oil, Lard & Suet. [06]

**BPH-303P****PHARMACOGNOSY - I****PRACTICAL :**

1. Microscopical Measurements of cell & cell contents Starchgrains, Calciumoxalate Crystals & Phloem Fibres.
2. Determination of leaf Constants such as Stomatal index, Stomatal numbers, Veinlet numbers, Vein termination number and palisade ratio.
3. Identification of crude drugs belonging to carbohydrates & lipids.

**BOOKS RECOMMENDED:**

1. Trease, G.E. & Evans, W.C., "Pharmacognosy" Bailliere 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, Scientechnica- Bristol.
6. Kokate, C.K. Pharmacognosy, Nirali Prakashan, Pune.
7. Schewer PJ, "Marine Natural products", Academic press, London.

**BPH – 304****PHARMACEUTICAL CHEMISTRY – III  
(ADVANCED ORGANIC CHEMISTRY)****Unit-I :**

$\alpha$ ,  $\beta$ - Unsaturated carbonyl compounds.

Compounds containing active methylene group and their synthetic importance- Acetoacetic ester and malonic ester.

Polynuclear hydrocarbons-Naphthalene, anthracene and phenanthrene. [08]

**Unit - II:**

Heterocyclic Compound – Nomenclature, Chemistry, preparation, properties and pharmaceutical importance of pyrrole, furan, thiophene, pyridine, pyrimidine, imidazole, pyrazole, thiazole, benzimidazole, indole, phenothiazines. [08]

**Unit-III:**

Name reactions – Definition, reaction mechanism and synthetic application of Merwin-Pondorff Verley reduction, Oppeneaur oxidation, Bechmann rearrangement, Mannich reaction, Diel's Alder reaction, Michel reaction, Reformatsky reaction, Knoevanegal reaction, Benzoin condensation. [08]

**Unit-IV:**

Classification, structure, reactions, structure elucidation, identification of:

**a) Carbohydrates**

i) Monosaccharides – Glucose and fructose.

ii) Disaccharides – Sucrose, lactose and maltose.

iii) Polysaccharides – Starch. [08]

**Unit-V:**

Classification, identification, general methods of preparation and reactions of amino acids and proteins.

Chemistry & identification of oils, fats and waxes. Polymers and polymerisation. [08]



**BPH – 304P**

**PHARMACEUTICAL CHEMISTRY – III  
(ADVANCED ORGANIC CHEMISTRY)**

**PRACTICAL**

1. Identification of organic compounds with derivatization.
2. Synthesis of Organic Compounds involving two steps.
3. Workshop on molecular modelling of some organic molecules.

**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 Tatehell A R, Vogel's Textbook of Practical Organic Chemistry, The ELBS/ Longman, London.
3. Morrison, T.R. and Boyd, R.N., Organic Chemistry, Prentice Hall of India, Private Limited, New Delhi.
4. Finar, I.L., Organic Chemistry Vol. I & II, ELBS/Longman.
5. Jain, M.K. and Sharma S.C, Organic Chemistry, Shoban Lal Nagin Chand & Co., Delhi.

**BPH – 305**

**ANATOMY & PHYSIOLOGY-III**

**Unit I:**

**Digestive system**– Parts of digestive system, their structure and functions. Various gastrointestinal secretions & their role in digestion of food. [08]

**Unit II:**

Pathology of disorders related to digestive system Peptic Ulcer, Ulcerative colitis, Crohns disease, Zollinger- Ellison syndrome, Amoebiasis, Hepatitis, Cirrhosis of liver, pancreatitis. [06]

**Unit-III:**

**Urinary System:** Anatomy & physiology of Kidney, Physiology of urine formation, acid- base balance, pathophysiology of renal failure, glomerulonephritis, Urinary tract infection. [08]

**Unit-IV:**

**Reproductive system**– Male & female reproductive system. Menstruation, Pathophysiology of sexually transmitted diseases (AIDS, Gonorrhoea & siphylis), spermatogenesis, oogenesis, pregnancy. [08]

**Unit-V:**

**Endocrine system**– Anatomy & Physiology of pituitary, thyroid, parathyroid, adrenal, pancreas, control of hormone secretion, pathophysiology of hypo & hyper secretion of endocrine glands & their disorders e.g. – Diabetes mellitus. [10]

**BOOKS RECOMMENDED:**

1. Ranade VG, Text Book of Practical Physiology, Pune Vidyarthi Griha Prakashan, Pune.
2. Difore SH, "Atlas of Normal Histology" Lea & Febiger Philadelphia.
3. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.

4. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
5. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
6. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.
7. Tortora GJ, & Anagnodokos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.
8. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
9. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
10. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.

## SEMESTER IV

**BPH – 401**

### **PHARMACEUTICS – V (UNIT OPERATIONS – II)**

**Unit-I:**

**Stoichiometry :** Unit processes material and energy balances, molecular units, mole fraction, tie substance, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation. [08]

**Unit-II:**

**Evaporation:** Basic concepts of phase equilibria, factor affecting evaporation, evaporator, film evaporators, single effect and multiple evaporator. [08]

**Unit-III:**

**Distillation :** Raoult' s law , Phase Diagrams , volatility, simple steam and flash distillations , principles of rectifications, McCabe thiele method for the calculations of number of theoretical plates, Azeotropic and extractive distillation. [08]

**Unit –IV:**

**Drying:** Moisture content and mechanism of drying , rate of drying and time of drying calculations, classification and type of dryers , dryers used in pharmaceutical industries – Tray dryer, Fluidised bed dryer, spray dryer and special drying methods. [08]

**Unit-V:**

**Size Reduction:** Definition, factors affecting size reduction, principles, laws & factors affecting energy requirements, different methods of size reduction, study of hammer mill, ball mill, fluid energy mill & disintegrator, various methods & equipments employed for size separation e.g. sieving, sedimentation, cyclone separator, elutriation methods.

**Automated Process Control Systems:** Process variables, temperature, pressure, flow level and vacuum and their measurements. Elements automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM). [08]

**BPH-401P**

### **PHARMACEUTICS – V (UNIT OPERATIONS – II)**

**PRACTICALS:**

Experiments Based on Theory

**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.

**BPH – 402****PHARMACEUTICAL MICROBIOLOGY****Unit-I :**

1. Introduction to the scope of microbiology.
2. Structure of bacterial cell.
3. Classification of microbes and their taxonomy: Bacteria and viruses. [08]

**Unit-II:**

4. Identification of Microbes : Stains and types of staining techniques, electron microscopy.
5. Nutrition, cultivation & isolation of bacteria & viruses. [08]

**Unit-III :**

8. Control of microbes by physical and chemical methods.
9. Disinfection, factors influencing disinfectants, dynamics of disinfection, disinfectants and antiseptics and their evaluation.
10. Sterilization, different methods, validation of sterilization methods & equipments. [08]

**Unit-IV :**

11. Sterility testing as per I.P.
12. Preservative efficacy
13. Personnel Microbiology
14. Application of Micro-organism in Bio-conversions in Pharmaceutical Industry. [08]

**Unit-V :**

15. Aseptic techniques and clean area classification
16. Principle & Method of Microbiological assays of Pharmacopoeia with special reference to Microbial assays of antibiotics, vitamin B12.
17. Method of preparation of Official sera & vaccines. Serological & diagnostic tests. [08]

**BPH – 402P****PHARMACEUTICAL MICROBIOLOGY****PRACTICAL**

Experiments devised to prepare various types of culture media, sub-culturing of common aerobic and anaerobic bacteria, fungus and yeast, various staining methods, various methods of isolation and identification of microbes, sterilization techniques and their validation, validation of sterilization techniques, evaluation of antiseptics and disinfectants, testing the sterility of pharmaceutical products as per I.P. requirements, microbial assay of antibiotics and vitamins.

**SUGGESTED PRACTICALS**

1. Preparation of various types of culture media
2. Subculturing of common bacteria, fungi, yeast.
3. Isolation of bacteria.
4. Identification and staining of bacteria
  - Simple staining
  - Gram staining
  - Acid fast staining

- Negative staining
  - Hanging drop preparation
5. Evaluation of disinfectants and antiseptics.
    - Phenol coefficient test, minimum inhibitory concentration.
  6. Study of sterilization methods & equipments
    - Dry heat
    - Moist heat
  7. Test for sterility of pharmaceutical products as per IP
  8. Microbial assay of antibiotics as per IP.

#### **BOOKS RECOMMENDED:**

1. Aneja K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture & Mushroom Cultivation, Vishwa Prakashan.
2. Gunasekaran P, Lab Manual of Microbiology, New Age Publishers.
3. Davis, Dulbetco, Eisen Microbiology.
4. Stanier R.Y., Ingraham, J.L., Wheelis M.L. & Painter P.R. General Microbiology, Macmillan Press Limited.
5. Hugo and Russell, Pharmaceutical Microbiology, Black Well Scientific Publication, Oxford.
6. Prescott L.M., Harley J.P. & Klien D.A. Microbiology, McGraw Hill.
7. Sykes, Disinfection and Sterilization.
8. Pelczar & Reid, Microbiology, Tata Mc Graw Hill, Delhi.
9. Virella G. Microbiology and Infectious Diseases, William & Wilkins.
10. Ananthanarayan R & Paniker CKJ, Textbook of Microbiology, Orient Longman.

#### **BPH – 403**

#### **PHAMACOGNOSY – II**

##### **Unit-I:**

**1. Resins** :Study of drugs containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Shellac, Asafoetida, Balsam of tolu, Balsam of peru, Benzoin, Turmeric, Ginger. [07]

##### **Unit-II:**

**2. General methods of obtaining volatile oils from plants, Study of volatile oils from:** Mentha, Lemon peel, Orange peel, Lemon grass, Citronella, Spearmint, Nutmeg, Eucalyptus, Chenopodium, Valerian, Musk, Palmarosa, Gaultheria, Cinnamon, Sandalwood, Jatamansi. [07]

##### **Unit-III:**

**3. Volatile oils** Coriander, Cumin, Caraway, Dill, Clove, Fennel, Cardamon, Black pepper.  
**4. Utilization of aromatic plants & desired products with special reference to Sandalwood oil, Mentha oil, Lemon grass oil, Vetiver oil, Geranium oil & Eucalyptus oil in nations economy.** [08]

##### **Unit-IV:**

**5. Phytochemical Screening:** An introduction to active constituents of drugs : Their isolation, classification and properties with Qualitative chemical tests of the followings – Alkaloids, Saponins, Cardenolides and bufadienolides, flavanoids and Leucoanthocyanidine, cynogenetic

glycosides.

[10]

**Unit-V:**

6. **Tannins:** Study of tannins & tannin containing drugs like Gambir (Pale Catechu), Black Catechu, Gall and Myrobalans (Harde, Baheda, Arjuna & Ashoka).

7. General methods of screening of natural products for following biological activity:

(a) Anti-inflammatory (b) Hypoglycaemic (c) Antibacterial (d) Antifertility [08]

**BPH-403P**

**PHARMACOGNOSY - II**

***PRACTICALS***

Experiments based on theory.

**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.
4. Kokate C.K. et al "Pharmacognosy" Nirali Prakashan, Pune.
5. Atal C.K. & Kapur BM, "Cultivation & utilization of Medicinal plant, RRL, Jammu.
6. Harborne J B, Phytochemical method, Chapman & Hall International Edition, London.

**BPH – 404**

**PHARMACEUTICAL ANALYSIS- II**

**Unit-I :**

Theoretical considerations and application in drug analysis and quality control by the following analytical techniques:

**1. Non-aqueous titrations**

**2. Complexometric titration.**

[08]

**Unit-II: Miscellaneous methods of analysis :**

3. Diazotization titrations, Kjeldahl method of Nitrogen estimation, Karl- Fischer titration. Radioassays. [06]

**Unit-III:**

**4. Potentiometry:** General principles, instrumentation and applications.

**5. Conductometry:** General Principles, instrumentation and applications.

**6. Polarography:** General Principles, instrumentation and applications

**7. Amperometric Titrations:** General principles, instrumentation and applications. [10]

**Unit-IV:**

**8.** Principle, instrumentation and pharmaceutical applications. Paper Chromatography, column chromatography, TLC & Ion exchange chromatography. [08]

**Unit-V:**

9. Basic Principles, Instrumentation and Applications of GC & HPLC.

[08]

## **BPH-404P**

### **PHARMACEUTICAL ANALYSIS - II**

#### **PRACTICAL**

Experiments based on Theory.

#### **BOOKS RECOMMENDED:**

1. Beckett, A H and Stenlake, J.B, Practical Phamaceutical Chemistry, Vol, I and II, The Athlone Press of the University of London.
2. Pharmacopoeia of India, published by The Controller of Publications, Delhi.
3. British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
4. Mendham J, Denny RC, Barnes, J.D. Thomas M.J.K. "Vogel's Text Book of Quantitative chemical" Pearson Education Asia.
5. Connors KA, A Textbook of Pharmaceutical Analysis, Wiley Intescience, New York.

## **BPH – 405**

### **ANATOMY & PHYSIOLOGY-IV**

#### **Unit-I:**

**Respiratory System** – Anatomy & function of respiratory structures, Mechanism of respiration, regulation of respiration, pathophysiology of Asthma, Pneumonia, Bronchitis, Emphysema, Tuberculosis. [08]

#### **Unit-II:**

**Cardiovascular System**– Functional Anatomy of heart, conducting system of heart, cardiac cycle, ECG (Electro cardiogram). Pathophysiology of hypertension, Angina, CHF, myocardial infarction, cardiac arrhythmias, Ischemic heart disease, Arteriosclerosis. [10]

#### **Unit-III:**

**Cell injury & Adaptation**– Courses of cell injury, pathogenesis & morphology of cell injury.

**Cellular Adaptation**– Atropy, hypertropy, aplasia, metaplasia, & dysplasia, intracellular accumulation & pathophysiology of Neoplasm. [08]

#### **Unit IV:**

Basic mechanisms involved in the process of inflammation and repair Alterations in vascular permeability and blood flow, migration of WBC's , mediators of inflammation. Brief outline of the process of repair [08]

#### **Unit-V:**

**Pathophysiology of following disorder** – Hypersensitivity, allergic conditions, epilepsy, Parkinson & Alzheimer's disease, cataract, glaucoma. [06]

#### **BOOKS RECOMMENDED:**

1. Ranade VG, Text Book of Practical Physiology, Pune Vidyarthi Griha Prakashan, Pune.
2. Difore SH, "Atlas of Normal Histology" Lea & Febiger Philadelphia.
3. Chaurasia B.D, Human Anatomy, Regional & Applied Part I, II & III, CBS Publishers & Distributors, New Delhi.
4. Guyton AC, Hall JE., Text book of Medical Physiology, WB Saunders Company.
5. Chatterjee C.C. Human Physiology, Medical Allied Agency, Calcutta.
6. Ross & Wilson, Anatomy & Physiology in Health & Illness, Churchill Livingstone.

7. Tortora GJ, & Anagnodokos NP, Principles of Anatomy & Physiology, Harper & Rave Publishers, New Delhi.
8. Parmar N.S., Health Education & Community Pharmacy CBS Publishers, Delhi.
9. Shalya Subhash, Human Physiology, CBS Publishers & Distributors.
10. Keele, C.A., Niel, E and Joels N, Samson Wright's Applied Physiology, Oxford University Press.

## **BPH-406**

### **PHARMACEUTICAL JURISPRUDENCE & ETHICS**

#### **Unit-1: Introduction**

1. **Pharmaceutical Legislations** – A brief review.
2. **Pharmaceutical Education** – A brief review.
3. **Pharmaceutical Ethics** [06]

#### **Unit-II: An elaborate study of the following:**

4. Pharmacy Act 1948
5. Drugs and Cosmetics Act 1940 and Rules 1945 [14]

#### **Unit-III :**

6. Medicinal & Toilet preparations (Excise duties Act 1955)
7. Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.
8. Drugs Price Control Order 1995. [08]

#### **Unit-IV: A brief study of the following with special reference to the main provisions.**

9. Poisons Act 1919
10. Drugs and Magic remedies (Objectionable Advertisements) Act 1954.
11. Medical termination of Pregnancy Act 1970 & Rules 1975.
12. Prevention of Cruelty to Animals Act 1961. [07]

#### **Unit-V :**

13. States Shops & Establishments Act & Rules.
14. A.I.C.T.E. Act 1987
15. Patents Act 1970
16. Weight and Measures Act [05]

**Note:** The teaching of all the above Acts should cover the latest amendments.

### **BOOKS RECOMMENDED**

1. B.M., Mittal, Textbook of Forensic Pharmacy, National Book Centre, Dr. Sundari Mohan Avenue, Calcutta.
2. Relevant Acts & Rules Published by the Govt. of India.
3. N.K. Jain, A Textbook of Forensic Pharmacy, Vallabh Prakashan, N. Delhi.
4. Singh, Harkishan "History of Pharmacy in India- Vol.-I, II & III" Vallabh Prakashan.



## SEMESTER -V

BPH – 501

### PHARMACEUTICAL CHEMISTRY – IV (BIOCHEMISTRY)

#### Unit-I:

**Enzymes:** Nomenclature, enzymes-kinetics and mechanism of action, mechanism of inhibition of enzymes and isoenzymes in chemical diagnosis.

**Co-enzymes:** Vitamins as co-enzymes and their significance. Metals as co-enzymes and their significance. [08]

#### Unit-II:

**Carbohydrate metabolism:** Glycolysis, Gluconeogenesis and Glycogenolysis. Metabolism of galactose and galactosemia. Role of sugar nucleotides in biosynthesis and pentose phosphate pathway. The citric acid cycle, significance, reactions and energetics of the cycle. [08]

#### Unit-III:

**Lipid metabolism :** Oxidation of fatty acids-oxidation & energetics, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and unsaturated fatty acids., regulation of lipid metabolism, essential fatty acids.

**Biological Oxidation :** The respiratory chain, its role in energy capture & control, Energetics of oxidative phosphorylation, mechanism of oxidative phosphorylation. [08]

#### Unit-IV:

Biosynthesis of amino acids, catabolism of amino acids and conversion of amino acids to specialized products, biosynthesis of purine and pyrimidine.

Biosynthesis of Nucleic acid, DNA replication & repair Mechanism, Mutation- Physical, chemical, mutagenesis & carcinogenesis. [08]

#### Unit-V:

Genetic Code and Protein synthesis, components of protein synthesis, inhibition of protein synthesis. Regulation of gene expression. (Prokaryote and Eukaryote) [08]

BPH – 501P

### PHARMACEUTICAL CHEMISTRY – IV (BIOCHEMISTRY)

#### PRACTICAL

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.
2. Titration curve for amino acids.
3. Separation of amino acids by chromatography.
4. Separation of lipids by TLC.
5. Quantitative estimation of amino acids.
6. Determination of glucose by means of the enzyme glucose oxidase.
7. Enzymatic hydrolysis of glycogen by  $\alpha$  &  $\beta$  amylase.
8. Effects of temperature on the activity of alpha amylase.
9. Estimation of cholesterol in Blood.
10. Estimation of Glucose in blood & urine.

11. Estimation of Urea in blood.
12. Estimation of ketone bodies in blood.
13. Qualitative analysis of inorganic as well as organic constituents of Urine..

**BOOKS RECOMMENDED :**

1. Jayaraman J., Laboratory Manual in Biochemistry, Wiley Eastern Limited.
2. Plummer, David J., An Introduction to Practical Biochemistry, Mc Graw Hill, New Delhi.
3. Singh S.P., Practical Manual to Biochemistry, CBS Publisher, New Delhi.
4. "Harpers Review of Biochemistry" Lange Medical Publication.
5. Conn E.E. & Stumph P.K., Outline of Biochemistry, John Willery & sons, New York.
6. Nelson DL & Cox MM, Lehninger Principles of Biochemistry, Macmillan Worth Publishers.
7. Stryer L., Biochemistry, WH, Freeman & Company, San Francisco.
8. Harrow B. & Mazur A., Text book of Biochemistry, W.B. Saunders Co., Philadelphia.

**BPH – 502**

**PHARMACEUTICS – VI  
(PHARMACEUTICAL TECHNOLOGY -I)**

**Unit-I:**

**Preformulation studies:**

- a) Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant, Solubility, dissolution and organoleptic properties and their effect on formulation, stability and bioavailability.
- b) Study or chemical properties of drug like hydrolysis, oxidation – reduction recemization, polymerization and their influence on formulation and stability of product. [08]

**Unit-II:**

**Liquid Dosage Forms:** Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavours and others, Manufacturing packaging & evaluation of clear liquids, suspensions and emulsions. [08]

**Unit-III:**

**Semisolid Dosage Forms:**

Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection, General formulation of semisolids, clear gels & manufacturing procedure, evaluation and packaging. [08]

**Unit-IV:**

**Suppositories :** Ideal requirements, bases, manufacturing procedure, packaging and evaluation.

**Pharmaceutical Aerosols:** Definition, Propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications. [08]

**Unit-V:**

**Cosmetology and cosmetic Preparations:** Structure of skin, formulation of cold cream, vanishing cream, cleansing cream, all purpose cream, protective cream, antiperspirants, deodorant, face powder. Hair structure, Shampoos, Conditioner, Shaving and after shaving products, Dentrifice & Mouthwash, Lipstick, Nail lacquer. [08]

## **BPH – 502 P**

### **PHARMACEUTICS – VI (PHARMACEUTICAL TECHNOLOGY -I)**

#### **PRACTICAL**

1. Preparation of cold cream, vanishing cream, cleansing lotion and creams. Moisturising, Skin tonics, Hair creams, Hair Conditioners, Shampoos, Shaving creams and sticks. Tooth powder, Tooth pastes, After shave lotion and other cosmetic preparations.
2. Preparation, evaluation and packing of liquid orals like solutions, suspensions and emulsions, ointments, suppositories, eye drops, eye ointments etc.

#### **BOOKS RECOMMENDED**

1. Remington's Pharmaceutical Sciences, Vol. I & Vol. – II, Mack Publishing Co., U.S.A.
2. J.W. Cooper, & G. Gunn, Tutorial Pharmacy, Petman Books Ltd., London.
3. Lachman L., Lieberman H.A, Kanig J.L, Theory and Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia, U.S.A.
4. H.C. Ansel, Introduction to Pharmaceutical Dosage Forms, Lea & Febiger, Philadelphia, U.S.A.
- 5 R.L. Juliano, Drug Delivery Systems, Oxford University Press, Oxford.
6. Harrys Cosmetology
7. Balsam and Sagarin, Cosmetics: Science and Technology.
8. Thomssen E.G. Modern Cosmetics, Universal Publishing Corporation.
9. Mittal B.M. & Saha R.N.-a handbook of cosmetics, Vallabh Prakashan.

## **BPH – 503**

### **PHARMACOLOGY – I**

#### **Unit-I:**

**General Pharmacology** – Introduction to pharmacology, routes of administration, mechanism of action, concept of receptors, combined effect of drugs, factors modifying drug action, tolerance & dependence. [07]

#### **Unit-II:**

Absorption, Distribution. Metabolism & Excretion of drugs, Adverse drug reactions & treatment of poisoning. ADME drug interactions, Bioassay/Biological standardization. Discovery & development of new drugs. [07]

#### **Unit-III:**

##### **Pharmacology of ANS-**

Parasympathomimetics, Parasympatholytics, Sympathomimetics, adrenergic receptor & neuron blocking agents, ganglionic stimulants & blocking agents. organophosphorous & atropine poisoning. [08]

#### **Unit-IV:**

**Pharmacology of CNS:** General Anaesthetics, Sedatives hypnotics, Anti-anxiety agents, Psychopharmacological agents (antipsychotics), antidepressants, Antiepileptic drugs. Anti-parkinsonism drugs, Narcotic Analgesics & antagonists, Treatment of poisoning with particular reference to barbiturates, opioids. Alcohols & disulfiram. [10]

**Unit-V:**

**1. Drugs acting on PNS**

Local anesthetics

Skeletal muscle Relaxants Peripherally and centrally acting muscle Relaxants [08]

**BPH – 503P**

**PHARMACOLOGY-I**

**PRACTICAL**

1. Use of computer simulated CDs or Video cassettes for pharmacology practical where possible.
2. Preparation of different solutions for experiments. Drug dilutions, use of molar and w/v solutions in experimental pharmacology. Common laboratory animals and anesthetics used in animal studies. Commonly used instruments in experimental pharmacology. Some common and standard techniques.
3. Study of different routes of administration of drugs in mice/rats. To study the effect of hepatomicrosomal enzyme inhibitors and Induction on the Pentobarbitone sleeping time in mice.
4. Recording of spontaneous motor activity, stereotype, analgesia, anticonvulsant activity, and anti-inflammatory activity & muscle relaxant activity of drug using simple experiment.

**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 F.S.K: Text Book of Pharmacology, Interpoint, New Delhi.
5. Goodman & Gilman, The Pharmacological basis of Therapeutics, Editors: J.G. Hardman, L.E. Limbird, P.B. Molinos, R.W. Ruddon and A.G. Gil, Pergamon press.
6. Katzung, B.G. Basic & Clinic Pharmacology, Prentice Hall, International..
7. Laurence, DR & bennet PN; clinical pharmacology, Churchill Livingstone.
8. Rang MP, Dale 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.

**BPH – 504**

**PHARMACEUTICAL CHEMISTRY -V  
(MEDICINAL CHEMISTRY -I)**

**Unit-I:**

**Basic Principles of Medicinal Chemistry:** Physicochemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action. Drug-receptor interaction including transduction mechanism, Concept of Prodrug. [08]

**Unit-II: Mode of action, uses, structure activity relationship of the following classes of drugs (Synthetic procedures of individually mentioned drugs only):**

**Drugs acting at Synaptic and neuro-effector junction sites:**

1. Cholinergic, Anticholinergic & Anticholinesterases-Neostigmine, Physostigmine, Methacholine, Pilocarpine, Atropine.
2. Adrenergic Drugs-Ephedrine, Isoproterenol, Amphetamine, Salbutamol, Terbutaline, Adrenaline. [08]

**Unit-III:**

**Drugs acting on the Central Nervous System:**

1. General Anaesthetics-Thiopental, Ketamine, Methohexital.
2. Local Anaesthetics-Lignocaine, Benzocaine, Bupivacaine.
3. Hypnotics and Sedatives-Phenobarbitone, Pentobarbitone, Alprazolam.
4. Opioid Analgesics-Pethidine, Methadone, Pentazocine. [08]

**Unit-IV:**

1. Anticonvulsants-Phenytoin, Carbamazepine, Ethosuximide, Valproic Acid.
2. CNS Stimulants-Caffeine, Nikethamide.
3. Antitussives- Caramiphen, Dextromethorphen.
4. Antiparkinsonism drugs- Carbidopa, Levodopa [08]

**Unit-V: Psychopharmacological Agents:**

1. Neuroleptics- Chlorpromazine, Haloperidol.
2. Antidepressants – Imipramine, Amitriptyline Fluoxetine, Phenelzine, Doxepine.
3. Antianxiety drugs- Diazepam, Chlordiazepoxide , Meprobamate
4. Neuromuscular Blocking Agents – Gallamine, Triethiodide , Mephensin, pancuronium [08]

**BPH-504 P**

**PHARMACEUTICAL CHEMISTRY -V  
(MEDICINAL CHEMISTRY -I)**

**PRACTICAL**

1. Synthesis of selected drugs from the course content involving two or more steps.
2. Establishing the Pharmacopoeial standards of the drugs synthesized.

**BOOKS RECOMMENDED :**

1. Pharmacopoeia of India, Ministry of Health, Govt. of India.
2. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
3. 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.
4. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
5. Singh Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
6. Nogrady T, Medicinal Chemistry – A Biochemical Approach, Oxford University Press, New York, Oxford.
7. Finar I L, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.
8. Hanch C, Comprehensive Medicinal Chemistry, Vol. IV, Quantitative Drug Design, Pergamon.

**BPH-505****PHARMACOGNOSY – III****Unit-I :**

(A) Study of the biological sources, cultivation, collection, Commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing.

**Glycosides:**

- |                             |   |   |      |
|-----------------------------|---|---|------|
| 1. Saponins                 | : | Liquorice, Ginseng, Dioscorea.            | [03] |
| 2. Cardioactive sterols     | : | Digitals, Squill, Stropanthus & Thevetia. | [03] |
| 3. Anthraquinone Cathartics | : | Aloe, Senna, Rhubarb & Cascara.           | [03] |

**Unit-II:**

**Others :** Psoralea, Ammi majus, Ammi visnaga, Gentian, Saffron, Chirata, Quassia and Andrographis paniculata. [04]

(B) Utilization and production of phytoconstituents such as calcium sennsoides, Diosgenin, Solasodine & Podophyllotoxins. [03]

**Unit- III:**

**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, Vach, Rasna. [07]

**Unit-IV:**

Punarnava, Chitrak, Apamarg, Gokhru, Shankhpushpi, Brahmi, Methi, Lehsun, Palash, Guggul, Gymnema, Shilajit, Tulsi and Neem. [08]

**Unit-V:**

Brief Introduction and principals 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. [09]

**BPH – 505P****PHARMACOGNOSY – III****PRACTICAL**

1. Identification of crude drugs listed in theory.
2. Microscopic study of some important glycoside containing drugs as outlined above, study if powdered drugs.
3. Standardization of some traditional drug formulations.

**BOOKS RECOMMENDED:**

1. Kokate , C.K “Prectical pharmacognosy” Vallabh prakashan, new Delhi.
2. Wallis T.E, Analytical Microscopy, J&A Churchill Limited, London.
3. Trease, G.E. & Evans, W.C., “Pharmacognosy” Bailleire tindall East bourne, U.K
4. Tyler V.E. et al “Pharmacognosy” Lea & febiger, Philadelphia.
5. wallis, T.E. text Book of Pharmacognosy, J.A. Churchill, Ltd,
6. Kokate, C.K. Pharmcognosy nirali prakashan, pune.
7. medicinal plants of india I&II , Indian Council of Medicinal Research, 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 plant, 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 Reserch, new Delhi.
12. Compendium of indian medicinal Plants I-IV, Rastogi 7 Malhotora
13. indian ayurvedic pharmacopoeia, Govt. of india.
14. Kokate CK, Gokahle AS, Gokahle SB, Cultivation of medicinal Plants, Nirali prakashan.

## SEMESTER – VI

**BPH – 601**

### PHARMACEUTICS-VII (PHARMACEUTICAL TECHNOLOGY - II)

#### Unit-I:

1. **Capsules:** Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsule, size of capsules, methods of capsule filling, soft gelatin capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsule, quality control, stability testing and storage of capsule dosage forms. [07]

#### Unit –II:

2. **Micro-encapsulation:** Types of microcapsule, importance of microencapsulation in pharmacy, microencapsulation by phase separation, co-acervation, multi-orifice, spray drying, spray congealing, polymerisation, complex, formulation, emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules. [08]

#### Unit-III :

3. **Tablets: (A)** Formulation of different types of tablets, granulation technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets.  
**(B) Coating of Tablets:** Types of coating, film forming materials, formulation of coating solution, equipments for coating process, evaluation of coated tablet. Stability kinetics and quality assurance. [09]

#### Unit-IV:

##### Parenteral Products:

4. Preformulation factors, routes of administration, water for injection, pyrogenicity, nonaqueous vehicles. Formulation details, containers and closures and their selection.  
Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and sealing of ampoules, vial, infusion fluids, lyophilization & preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products. along with examples of Ophthalmic, Nasal and Ear Products. [10]

#### Unit-V:

5. **Surgical Products:** Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc, bandages, adhesive type, protective cellulosic hemostasis, official dressings, absorbable and non absorbable sutures, ligatures and catguts. [06]

**BPH-602P**

### PHARMACEUTICS-VII (PHARMACEUTICAL TECHNOLOGY-II)

#### PRACTICAL

##### Experiments based on Theory

Experiments to illustrate preparation, stabilization & physical evaluation of pharmaceutical products like powders.

##### BOOKS RECOMMENDED:

1. Remington's Pharmaceutical Sciences, Vol. I & Vol. – II, Mack Publishing Co., U.S.A.
2. J.W. Cooper, & G. Gunn, Tutorial Pharmacy, Petman Books Ltd., London.
3. Lachman L., Lieberman H.A, Kanig J.L, Theory and Practice of Industrial Pharmacy, Lea & Febiger, Philadelphia, U.S.A.
4. H.C. Ansel, Introduction to Pharmaceutical Dosage Forms, Lea & Febiger, Philadelphia,



U.S.A.

5 R.L. Juliano, Drug Delivery Systems, Oxford University Press, Oxford.

6. Harrys Cosmetology

7. Balsam and Sagarin, Cosmetics: Science and Technology.

8. Thomssen E.G. Modern Cosmetics, Universal Publishing Corporation.

9. Mittal B.M. & Saha R.N.-a handbook of cosmetics, Vallabh Prakashan.

## **BPH – 602**

### **PHARMACOLOGY-II**

#### **Unit-I:**

**1. Pharmacology of CVS:** Cardiac glycosides, Antihypertensive drugs, Antianginal drugs, Antiarrhythmics, Antihyperlipidemics,

**2. Drugs Acting on Hemopoietic System:** Haematinics, Vit. K & anticoagulants, Fibrinolytics & antiplatelet drugs, Plasma Volume expanders. [09]

#### **Unit-II:**

3. Diuretics

4. NSAIDS, Anti gout drugs [08]

#### **Unit-III;**

**5. Drugs acting on Respiratory System:** Anti – asthmatic drugs, Anti-tussives and Expectorants, reparatory stimulants. [07]

#### **Unit-IV :**

**6. Drugs acting on GIT:** Antacids and Antiulcer drugs, Laxatives and antidiarrhoeal Agents, Emetics and antiemetics. [08]

#### **Unit-V :**

**7. Autocoids:** Histamine, 5HT and their antagonists, Prostaglandins, Thromboxane, Leukotrienes, Angiotensin and Bradykinin [08]

## **BPH-602P**

### **PHARMACOLOGY-II**

#### **PRACTICAL**

1. To record the dose response curve(DRC) of Acetylcholine using ileum of rat.
2. To study the parallel shift of DRC in presence of competitive antagonist on DRC of Ach using rat ileum.
3. To study effect of physostigmine on DRC of each on rat ileum.
4. To study the CRC of histamine on guinea pig ileum preparation & study the effect of antihistaminics.

#### **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 F.S.K: Text Book of Pharmacology, Interpoint, New Delhi.
5. Goodman & Gilman, The Pharmacological basis of Therapeutics, Editors: J.G. Hardman, L.E.

- Limbird, P.B. Molinos, R.W. Ruddon and A.G. Gil, Pergamon press.
6. Katzung, B.G. Basic & Clinic Pharmacology, Prentice Hall, International..
  7. Laurence, DR & bennet PN; clinical pharmacology, Churchill Livingstone.
  8. Rang MP, Dale 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.

### BPH-603

#### PHARMACEUTICAL CHEMISTRY-VI (MEDICINAL CHEMISTRY - II)

##### Unit-I-Drug Design

Basic concept of drug design, Introduction to Analogues based drug design, Structure based drug design, Introduction to QSAR & Computer aided drug design. [08]

##### Unit-II:

**Cardiovascular Agents:** Anti anginal and Vasodilators, Antiarrhythmics, antihypertensives, anticoagulants, antihyperlipidemics and cardio tonics – Nifedipine, Procainamide, Propranolol, Atenolol, Methylopa, Guanetidine, Captopril, Pentolamine, Clofibrate, Warfarin, Phendione, Heparin, Dixitoxin, Lovastatin. [10]

##### Unit- III:

1. **Antihistaminics-** Diphenhydramine, Mepramine, Promethazine, cetirizine,
2. **Antispasmodic & Antiulcer drugs :** Dicyclomine, Ranitidine, Famotidine, Omeprazole .
3. **NSAIDS & Analgesic, Antipyretic:** Aspirin, Paracetamol, .Mefenamic Acid, Ibuprofen, Diclofenace, Piroxicam, [08]

##### Unit- IV:

1. **Antineoplastics;** Chlorambucil, Thiotepa, Florouracil, Metahotrexate, Busulphan.
2. **Diagnostic Agents:** Iopanoic acid [06]

##### Unit – V:

1. **Diuretics** – Acetazolamide, Chlorthiazide, Frusemide, Triamtrene, Spironolactone
2. **Antibacterials** – Suphamethoxazole, Sulphadiazine, Sulphacetamide.
3. **Antiprotozoals:** Metranidazole, Tinidazole, Diloxanide [08]

### BPH-603P

#### PHARMACEUTICAL CHEMISTRY-VI (MEDICINAL CHEMISTRY - II)

##### PRACTICALS

1. Synthesis of selected drugs from the course content involving two or more steps.
2. Establishing the Pharmacopoeial standards of the drugs synthesized.

##### BOOKS RECOMMENDED :

1. Pharmacopoeia of India, Ministry of Health, Govt. of India.
2. Wolff ME, Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.
3. 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.
4. Foye W C, Principles of Medicinal Chemistry, Lea & Febiger, Philadelphia.
5. Singh Harkrishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
6. Nogrady T, Medicinal Chemistry – A Biochemical Approach, Oxford University Press, New York, Oxford.
7. Finar I L, Organic Chemistry, Vol. I & II, ELBS/ Longman, London.

#### **BPH – 604**

#### **PHARMACOGNOSY-IV**

##### **Unit-1:**

Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes adulterants, uses, diagnostic macroscopic & microscopic features & specific chemical tests of following alkaloid containing drugs.

- (A) **Pyridine-piperidine:** Tobacco, Areca & Lobelia.
- (B) **Tropane:** Belladonna, Hyoscyamus, Datura, Coca & Withania.
- (C) **Quinoline & Isoquinoline:** Cinchona, Ipecac & Opium.
- (D) **Indole:** Ergot, Rauwolfia, Catharanthus & Nux-vomica. [08]

##### **Unit-II:**

- (E) **Imidazole:** Pilocarpus.
- (F) **Steroidal:** Veratrum & Kurchi.
- (G) **Alkaloidal amine:** Ephedra & Colchicum.
- (H) **Glycoalkaloid:** Solanum.
- (I) **Purines:** Coffee & Tea
- (J) **Quinazoline:** Vasaka. [08]

##### **Unit-III:**

1. World wide trade in Medicinal plants & derived product. Tropane alkaloids containing drugs, Cinchona, Ipecac, Rauwolfia, Taxol. Diosgenin, Digitalis, Liquorice, Papain, Ginseng, Aloe, Valerian, & plant laxatives.
2. Introduction to HPTLC & its application in evaluation of herbal drugs. [08]

##### **Unit-IV**

1. **Biological sources, preparation, Identification tests and uses of following enzymes–** Diastase, papain, Penicillinase, Hyalluronidase.
2. Plant Bitters & Sweeteners. [08]

##### **Unit-V:**

Historical development of plant tissue culture, type of culture, Nutritional requirement, growth & their maintenance. Applications of plant tissue culture in pharmacognosy. [08]

#### **BPH – 604P**

#### **PHARMACOGNOSY-IV**

##### **PRACTICAL:**

1. Identification of crude drugs listed above.
2. Microscopic study of character of any 8 selected drugs given in theory in entire & powder form.
3. Chemical evaluation of powdered drugs & Enzymes.
4. Chromatographic studies of some herbal constituents.
5. Some experiments in plant tissue culture.

**BOOKS RECOMMENDED:**

1. Kokate, C.K. "Practical pharmacognosy" Vallabh prakashan, new Delhi.
2. Wallis T.E, Analytical Microscopy, J&A Churchill Limited, London.
3. Trease, G.E. & Evans, W.C., "Pharmacognosy" Bailleire tindall East bourne, U.K
4. Tyler V.E. et al "Pharmacognosy" Lea & febiger, Philadelphia.
5. Wallis, T.E. text Book of Pharmacognosy, J.A. Churchill, Ltd,
6. Kokate, C.K. Pharmcognosy nirali prakashan, pune.
7. Medicinal plants of india I&II, Indian Council of Medicinal Research, 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 plant, 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 Reserch, new Delhi.
12. Compendium of indian medicinal Plants I-IV, Rastogi 7 Malhotora
13. Indian ayurvedic pharmacopoeia, Govt. of india.

**BPH – 605**

**PHARMACEUTICS – VIII  
(HOSPITAL & COMMUNITY PHARMACY)**

**Unit-I**

1. Definition, scope of Hospital & community pharmacy  
Roles and responsibilities of Community pharmacist, code of Ethics.
2. Pharmacy Management
  - i) Selection of site, Space layout, and design
  - ii) Staff, Materials- coding, stocking
  - iii) Legal requirements
  - iv) Use of Computers & Drug information services.

[08]

**Unit-II**

**Prescription:**

3. Description and parts of a prescription, handling the prescription, reading the prescription, checking the written prescription, consulting the prescriber, other methods of receiving prescription, refusal to accept the prescription; compounding the prescription, pricing the prescription, delivering the prescription.
4. Inventory control in community pharmacy.  
Definition, various methods of Inventory Control.  
ABC, VED, EOQ, Lead time, safety stock

[08]

**Unit-III**

5. Pharmaceutical care  
Pharmaceutical care & patient compliance
6. Communication skills and Patient counseling  
Need for good communication, Key communication skills.  
Strategies to overcome barriers  
Patient information leaflets- content, design, & layouts, advisory labels [08]

#### **Unit-IV**

8. Health screening services  
Definition, importance, methods for screening  
Blood pressure/ blood sugar/ lung function And Cholesterol testing. [08]
9. OTC Medication- Definition, OTC medication list & Counseling

#### **Unit-V**

10. Health Education  
WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients.  
Role of Pharmacist in family planning, prevention of communicable diseases, Nutrition. [08]

#### **BPH – 605P**

### **PHARMACEUTICS – VIII (HOSPITAL & COMMUNITY PHARMACY)**

#### **PRACTICAL**

1. Categorization and storage of Pharmaceutical products bases on legal requirements of labeling and storage.
2. Project report on visit to the nearby Community for Counseling on the rational use of drugs and aspects of health care.
3. Prescription handling and identification of drug interactions, incompatibilities.
4. Health screening services and study of equipments for:-
  - Blood glucose determination (Glucometer)
  - Blood pressure (BP apparatus)
  - Lung function test (Peak flow meter)
5. Design of community pharmacy to incorporate all pharmaceutical care services (as per schedule N).
6. Study of OTC medications  
List & Available brands
7. Interpretation of various pathological report of blood and urine.

#### **BOOKS RECOMMENDED :**

1. Carter S.J. Cooper and Gunn's Dispensing for Pharmaceutical Students, CBS Publishers, Delhi.
2. Ansel H.C., Introduction to Pharmaceutical Dosage Forms, K.M. Varghese & Co., Bombay.
3. Aulton M.E. Pharmaceutics – The Science of Dosage Form Design, ELBS/ Churchill Livingstone.
4. Remington Pharmaceutical Sciences, Mack Publishing Co., Pennsylvania.
5. I.P., Govt of India Publication.
6. B.P., Her Majesty's Stationary Office, Cambridge.

7. Carter S.J., Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, Delhi.
8. Drugs & Cosmetics Act & Rules
9. Parmar N.S. Community Pharmacy & Health Education, CBS Publishers.
10. Parthasarathi G, Nyfort-Hansen K, Nahata MC, A textbook of Clinical Pharmacy practice- Essential concepts & skills, Orient Longman.

## SEMESTER – VII

**BPH – 701**

### PHARMACEUTICAL ANALYSIS -III

**Unit-I :**

**Ultraviolet and Visible Spectrophotometry:** Electronic, excitation, quantitative laws, deviation from Beer's law, graphical presentation of data. Chromophores photometric error, instrumentation, single and double beam spectrophotometer. [08]

**Unit-II :**

**Infra Red Spectrophotometry :**

Basic principles, Instrumentation & Pharmaceutical applications [08]

**Unit-III:**

**Colorimetric methods:** Chemistry of colorimetry, instrumentation, application (direct methods and indirect methods). Nephelometry & turbidimetry and densitometry.

**Fluorimetric Analysis :** Theory, quantitative description, experimental factors affecting fluorescence intensity, relationship of fluorescence to molecular structure, instrumentation, pharmaceutical applications. [08]

**Unit-IV:**

**Mass Spectrometry:** Instrumentation, Introduction to mass spectra, molecular ion peak, fragmentation peaks, mass spectra of some simple compounds.

**Flame Photometry:** Origin of spectra, atomization and ionization, instrumentation, background emission, interference, qualitative & quantitative applications in pharmaceutical analysis. [08]

**Unit-V:**

Atomic absorption spectroscopy: Basic principles, Instrumentation & Pharmaceutical applications [08]

**BPH – 701 P**

### PHARMACEUTICAL ANALYSIS -III

#### PRACTICAL

1. Assay of at least 10 official formulation containing single and more active ingredients using instrumental techniques.
2. Study of interpretation of a few spectra.

#### BOOKS RECOMMENDED:

1. Indian Pharmacopoeia
2. Becket A.H. and Stenlake J.B. Practical Pharmaceutical chemistry Vol. I & II, The Athlone Press of the University of London.
3. Chatten L.G. A textbook of Pharmaceutical chemistry Vol. I & II Marcel, Dekker, New York.
4. Willard H.H. and Merrit L. Jr. and Dean J.A., Instrumental methods of Analysis, Marcel, Dekker, Inc. New York, 1970.
5. Oboson J.W.R. Undergraduate Instrumental methods of Analysis, Marcel, Dekker, Inc, New York, 1970.

6. Parikh V.H. Absorption spectroscopy of organic molecules Addison-wesley publishing co. London 1974.
7. Silver stein R.M. & Webster FX, Spectrometric Identification of Organic Compounds, John Wiley & Sons.
8. Skoog V., Principles of Instrumental Analysis, Helter-Neiman.

**BPH – 702**

**PHARMACEUTICS –IX  
(BIOPHARMACEUTICS & PHARMACOKINETICS)**

**Unit-1:**

Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation, development and clinical setting.

**Biopharmaceutics :**

- (A) Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis).
- (B) Factors influencing absorption – Physicochemical, physiological and pharmaceutical.
- (C) Drug distribution in the body, plasma protein binding. [08]

**Unit-II:**

**Pharmacokinetics:**

- (A) Significance of plasma drug concentration measurement.
- (B) Compartment model and Non-compartment model. Definition and Scope.
- (C) Pharmacokinetics of drug absorption – zero order and first order absorption rate constant. Using Wagner–Nelson, Loo-Reigelman method. [08]

**Unit-III:**

**Pharmacokinetics:**

- (D) Volume of distribution and distribution coefficient.
- (E) Compartment kinetics – One compartment and Preliminary information of multicompartment models.
- (F) Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route. [08]

**Unit-IV:**

**Clinical Pharmacokinetics**

- (A) Definition and scope.
- (B) Dosage adjustment in patients with and without renal and hepatic failure.
- (C) Pharmacokinetic drug interactions and their significance in combination therapy. [08]

**Unit-V:**

**Bioavailability and Bioequivalence:**

- (A) Measures of bioavailability, C-max, and area under the curve (AUC).
- (B) Review of regulatory requirements for conduction of bioequivalent studies. [08]

**BPH – 702P**

**PHARMACEUTICS –IX  
(BIOPHARMACEUTICS & PHARMACOKINETICS)**

**PRACTICAL:**

EXPERIMENTS BASED ON THEORY



### **BOOKS RECOMMENDED :**

1. Notari, R.E, Biopharmaceutics and Pharmacokinetics – An introduction Marcel Dekker Inc. N.Y.
2. Rowland M, and Tozer T.N. Clinical Pharmacokinetics, Lea and Febriger, N.Y.
3. Wagner J.G. Fundamentals of Clinical Pharmacokinetics, Drugs Intelligence Publishers, Hamilton.
4. Wagner J.G. Pharmacokinetics for the Pharmaceutical Scientist, Technomic Publishing A.G.

### **BPH – 703**

#### **PHARMACOLOGY –III**

##### **Unit-I:**

##### **Pharmacology of Endocrine System**

Pituitary hormones, Thyroid hormones & Anti-thyroid Drugs, Parathormone, Calcitonin & Vitamin D, Insulin, oral hypoglycemic agents & glucagon. [08]

##### **Unit-II:**

ACTH & Cortico steroids, Androgens & anabolic steroids, Estrogens, Progesterone & Oral Contraceptives, Drugs acting on uterus. [08]

##### **Unit-III:**

**Chemotherapy:** General Principles of Chemotherapy, Sulfonamides, Cotrimoxazole, Quinolones, Antibiotics– Cephalosporins, Chloramphenicol, Tetracyclines, Macrolides, Vancomycin, Beta lactam antibiotics, Aminoglycoside antibiotics. [08]

##### **Unit-IV:**

Chemotherapy of Tuberculosis, Leprosy, Malaria, Fungal infections, Viral diseases, Introduction to Immunomodulators and Chemotherapy of Cancer. [08]

##### **Unit-V:**

**Miscellaneous:** Therapy of Shock, Treatment of Heavy metal Poisoning . [08]

### **BPH – 703P**

#### **PHARMACOLOGY –III**

### **PRACTICAL**

1. To calculate the pA<sub>2</sub> value of Atropine & chlorpheniramine.
2. Bioassay of Ach, histamine & oxytocin on suitable isolated preparations using matching assay, bracketing assay, three point assay & four point assay.
3. Bioassay of histamine and acetylcholine using matching and interpolation method on rat guinea pig . All experiments will be conducted using software wherever possible.

### **BOOKS RECOMMENDED :**

1. Ghosh M.N. 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 F.S.K : Text Book of Pharmacology, Interprint, New Delhi.

5. Goodman & Gilman, The Pharmacological basis of Therapeutics, Pergamon Press.
6. Editors :- J.G. Hardman, Le Limbird, PB Molinoss, RW Ruddon & AG Gil, Pergamon Press.
7. Katzung, B.G. Basic & Clinical Pharmacology, Prentice Hall, International.
8. Laurene, DR & Bennet PN; Clinical Pharmacology, Churchill Livingstone.
9. Rang MP, Dale MM, Riter JM, Pharmacology Churchill Livingstone.
10. Tripathi, K.D. Essentials of Medical Pharmacology, Jay Pee Publishers, New Delhi.
11. Satoskar & Bhandarkar : Pharmacology & Pharmacotherapeutics, Popular Prakashan Pvt. Ltd., Bombay.
12. Paul. L., Principles of Pharmacology, Chapman and Hall.

#### **BPH – 704**

### **PHARMACEUTICAL CHEMISTRY –VII (MEDICINAL CHEMISTRY - III)**

#### **Unit-I:**

Mode of action, uses, structure activity relationship of the following classes of drugs (Synthetic procedures of individually mentioned drugs only)

1. **Steroids and related drugs:** Introduction, Classification, nomenclature & stereochemistry.
2. **Androgens & Anabolic steroids-** Testosterone, stanozolol.
3. **Estrogen & Progestational agents-** Progesterone, Estradiol.
4. **Adrenocorticoids-** Prednisolone, Dexamethasone, Betamethasone. [08]

#### **Unit-II:**

1. **Antibiotics** – Penicillin, Semi synthetic penicillin, streptomycin, tetracycline, Cephalosporin, chloramphenicol, Floroquinolone,
2. **Antimycobacterial agents:** PAS, Ethambutol, Isoniazid, pyrazinamide and Dapsone.

#### **Unit –III:**

1. **Anthelmintics** – Mebendazole
2. **Antimalarials:** Chloroquine, Primaquine, and Pyrimethamine
3. **Antiseptics/Disinfectants** – Benzalkonium, Nalidixic acid.
4. **Antifungals** – Nystatin, Clotrimazole [10]

#### **Unit-IV:**

1. **Anti-HIV agents** – Zidovudine, Zalcitabine, Saquinavir
2. **Anti-Virals** – Amantadine, Acyclovir, Lamivudine.
3. **Prostagladins** – Misoprostol, Carboprostol. [08]

#### **Unit-V:**

1. **Thyroid and Antithyroids** – Carbimazole, Levothyroxine, Propylthiouracil, Methimazole.
2. **Hypoglycemic Agents** – Chlorpropamide, Metformin, Tolbutamide, Glibenclamide, Phenformin. Insulin [08]

#### **BOOKS RECOMMENDED :**

1. Mann PG & Saunders BC, Practical Organic Chemistry, ELBC/Longman, London.
2. Pharmcaopoeia of India, Ministry of Health, Govt. of India.
3. Wolff ME. Ed. Burger's Medicinal Chemistry, John Wiley & Sons, New York.

4. Delgado, J.N. & Remers WAR, 10<sup>th</sup> Ed. Wilson & Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, Lippincott, William & Wilkins.
5. Foye WC, Principles of Medicinal Chemistry,
6. Singh Harkishan and Kapoor, V.K., Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
7. Nogrady T, Medicinal Chemistry, A Biochemical Approach, Oxford University Press, New York, Oxford.
8. Finar I.L., Organic Chemistry, Vol. I & II ELBS/Longman, London.
9. Hans C, Comprehensive Medicinal Chemistry, Vol. IV, Quantitative Drug Design, Pergamon Press, Oxford.

### **BPH-705:**

### **ENVIRONMENTAL SCIENCES**

#### **Unit 1: Environmental studies**

Definition, scope and importance  
Need for public awareness.  
Environment Protection Act.

#### **Unit 2: Ecosystems**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

#### **Unit 3: Biodiversity and its conservation**

- Introduction – Definition : genetic, species and ecosystem diversity.
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- India as a mega-diversity nation
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

#### **Unit 4:**

##### **Human Population and the Environment**

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.

#### **Unit 5 : Environmental Pollution**

Definition

• Cause, effects and control measures of :-

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards.

**BOOKS RECOMMENDED:**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
3. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574.
4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)

**BPH-706: Report on Industrial Training**

## SEMESTER –VIII

**BPH – 801**

### **PHARMACEUTICAL BIOTECHNOLOGY**

**Unit-I :**

**Immunology and Immunological preparations :** Properties, Antigen and haptens, immune system, Cellular, humoral immunity, immunological tolerance, antigen-antibody reactions and their applications, standardization and storage of BCG. [08]

**Unit-II:**

**Genetic Recombination:** Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications, development of hybridoma for monoclonal antibodies, study of drugs produced by biotechnology such as activase, humulin, Humatrope. [08]

**Unit-III:**

**Antibiotics:** Historical development of antibiotics, Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics fermenter, its design, control of different parameters. Isolation of mutants, factors affecting mutation. [08]

**Unit-IV:**

**Microbial Transformation:** Introduction, types of reactions mediated by microorganisms, Design of Bio-transformation process, selection of organisms, biotransformation processes and its improvements with special reference to steroids. [08]

**Unit-V:**

**Enzyme immobilization:** Techniques of immobilization of enzymes, factors affecting enzyme kinetics, study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodaranse, amylases and proteases Immobilization of Bacteria and plant cells. [08]

**BOOKS RECOMMENDED:**

1. Dixit, V.K., Vays, S.P. Pharmaceutical biotechnology, CBS Publication, ND
2. Prescott and Dunn`s Industrial microbiology, 4<sup>th</sup> edition,1987, CBS Publication and Distributors, Delhi
3. P.F. stanby & A.Ahhitar Principles of Fermentation Technology.
4. K. Kieslich Ed. Biotechnology Vol.69 Verleg chernie Switzerland 1984
5. P.F Stanbury & A.Whitaker & Hall S.J principles of fermentation, Adity Book private Limited, New Delhi.
6. Crueger W, & Crueger A , Biotechnology - A Textbook of industrial microbiology, Panima publishing corporation, Delhi.

**BPH – 802**

### **PHARMACEUTICAL CHEMISTRY-VIII (CHEMISTRY OF NATURAL PRODUCTS)**

**Unit-I:**

1. Chemical & Spectral approaches to simple molecules of natural origin. [08]

**Unit-II:**

2. General Technique to biosynthetic study and basic metabolic pathways. Brief introduction to biogenesis of secondary metabolites of Pharmaceuticals importance.
3. Chemistry, Biogenesis and pharmacological activity of medicinally important monoterpenes,

Sesquiterpenes, diterpenoids. [08]

**Unit-III :**

**4.** Chemistry, Isolation and extraction and Pharmacological activity of-

- i) Carotenoids – Beta carotenoids, alpha carotene, Vitamin A, Xanthophylls of medicinal important.
- ii) Glycosides – Digitixin, Digoxin, Hecogenin, Senosoid, Diosgenin and Sarasapogenin. [08]

**Unit IV:**

**5.** Chemistry, Isolation, Biogenesis and extraction and Pharmacological activity of

- iii) **Alkaloids** – Atropine & related compounds, quinine, reserpine, morphine, papaverine, ephedrine, ergot, and Vinca Alkaloids.

Medicinally important lignins, Quassanoids and Flavonoids. [08]

**Unit-V**

Natural Allergens and Photosensitizing agents and fungal toxins.

Herbal Cosmetics and their formulation. [08]

**BPH – 802P**

**PHARMACEUTICAL CHEMISTRY-VIII  
( CHEMISTRY Of NATURAL PRODUCTS)**

**PRACTICAL**

1. Laboratory experiments on Isolation, Separation, Purification of various groups of chemical constituents of Pharmaceutical significance.
2. Exercises on paper & thin layer chromatographic evaluations of herbal drug constituents.
3. Extraction of volatile oils & their chromatographic profiles.

**BOOKS RECOMMENDED:**

1. Brain, K.R., & Turner T.D., The Practical evaluation of Phytochemical, Wright, Bristol.
2. Sim, Medicinal Plant Alkaloid & Glycosides.
3. Kokate, C.K. “ Practical Pharmacoognosy” Vallabh Prakashan, New Delhi.
4. Stahl, E. Thin Layer Chromatography. A laboratory handbook, springer verlog, Berlin.
5. Harborne, J.B. Phytochemical Methods, Chapman & Hall, International Ed, London.
6. Indian Pharmacopoeia.
7. Finar, I.L. Organic Chemistry, Vol. I & II, ELBS/Longman, London.
8. O.P. Agarwal, “ Chemistry of Organic Natural Product” Vol. I & II, Goel Pub. House, Meerut.
9. Trease, G.E. & Evans, W.C., “ Pharmacognosy” Bailleire tindall east bourne, U.K.
10. Tyler V.E. etal “ Pharmacognosy” Lea & Febiger, Philadelphia.
11. Kokate, C.K. Pharmacognosy, Nirali Prakashan, Pune.
12. Pridham JB & Swain T. Biosynthetic pathway Higher Plants, Academic Press, New York.

**BPH-803**

## **PHARMACEUTICAL INDUSTRIAL MANAGEMENT**

### **Unit-I:**

- 1. Concept of Management:** Administrative Management (Planning, Organising Staffing Directing and Controlling). Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/ Morale) Principles of Management (Co-ordination, Communication, Motivation, Decision making, leadership, Innovation Creativity, Delegation of Authority / Responsibility. Record Keeping), Identification of key points to give maximum thrust for development and perfection. [08]

### **Unit-II:**

- 2. Economics :** Principles of economics with special reference to the Laws of demand and supply, demand schedule, demand curves labor welfare, inland and foreign trade, procedure of exporting and importing goods.
- 3. Accountancy :** Principles of Accountancy, Ledger posting and book entries preparation of trial balance, columns of a cash book, Bank reconciliation statement, profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques bills of exchange, promissory notes and bundles documentary bills. [08]

### **Unit-III:**

- 4. Pharmaceutical Marketing:** Functions, buying, selling, transportation, storage financed feedback information, wholesale, retail, department store, multiple shop and mail order business.
- 5. Salesmanship:** Principle of sales promotion, advertising, ethics of sales, detailing, Recruitment, training, evaluation, compensation to the pharmacist. [08]

### **6. Unit-IV: Market Research**

- 7. A) Measuring & Forecasting Market Demand -** Major concept in demand measurement, Estimating current demand Geo-demo-graphic analysis. Estimating industry sales, Market share and future demand.  
**B) Market segmentation & Market targeting.** [08]

### **Unit - V:**

- 8. Materials Management:** A brief exposure of basic principles of management major areas, scope, purchase, stores, inventory control and evaluation of materials management.
- 9. Production Management :** A brief exposure of the different aspects of Production Management– Visible and Invisible inputs, Methodology of Activities Performance Evaluation Technique Process– Flow, Process Know-how, Maintenance Management. [08]

### **BOOKS RECOMMENDED:**

1. Beri, Market Research-Tata Mc Graw Hill
2. Chary S.N., Production and operative management/Tat Mc. Graw Hill.
3. Datta A.K., Material Management/PHI.
4. Chadwick Leslie, The essence of management/PHI.
5. Massie L. Joseph Essentials of Mangement/PHI.
6. Barthwal RR, Industrial Economics-/New Age International.
7. Shreenivasan K.R., An Introduction to Industrial Management-/Vikas.
8. Daver Rustam S. Salesmanship & Publicity-Vikas.
9. Drug Store Mangement/Mohammad Ali, CBS Publishers.
10. Mukhopadhyay Sekhar, Pharmaceutical selling, Sterling Publishers.

11. Koontz H, Weihrich H, Essentials of Management, Tat Mc Graw Hill.

**BPH-804**

**PROFESSIONAL COMMUNICATION & WRITING SKILLS-II**

**Unit-I:**

1. Written skills:

- Proposal writings formats.
- Report writings
- Business letters
- Applications
- Covering letters.
- Curriculum Vitae Designing [08]

**Unit-II:**

2. Productivity, Time Management simulation exercise  
3. Leadership Skills.  
4. Team work 'BSC' – Boss, Subordinates & Colleagues [08]

**Unit-III**

5. Group Discussions (G.D)  
➤ Tips  
➤ GD [08]

**Unit-IV**

6. Corporate behaviour, corporate expectation, office etiquettes.  
7. Extempore [08]

**Unit-V**

8. Interview Tips:-  
➤ What student is supposed to do before the interview, during the interview, after the interview & on the day of interview.  
➤ Various questions that may be asked in an interview.  
➤ Model interview (Video-shooting & displaying optional)  
9. Exit Interview [08]

***BOOKS RECOMMENDED***

1. Wren P.C and Martin H., "High School Grammar and Composition", S. Chand & Co.  
2. Robbins, S "Organisational Behaviour"

**BPH – 805**

**PHARMACEUTICS-IX  
(PHARMACEUTICAL TECHNOLOGY-III)**

**UNIT-I:**

1. Theory of Sustained & controlled release drug delivery systems, General methods of preparation.  
2. Introduction to the basic principle & application of Transdermal drug delivery systems, Implants, Inserts, Osmotic pumps, Occuserts. [08]

Unit-II:

**Targeted drug delivery systems:** Concept & importance in therapeutics of targeting , Introduction & application of microparticles, nanoparticles, Liposomes, Neosomes, Resealed Erythrocytes. [08]



Unit-III:

**Pharmaceutical Legislation & Quality-I:** Rational & Regulatory requirements of good manufacturing practices, Good laboratory practices. Introduction to ISO. Requirements of Documentation, New drug approval & clinical trials. [08]

Unit-IV:

**Pharmaceutical Legislation & Quality-II:** Concept & protocol of quality control & quality assurance. Raw material, IP Quality control & finished product, Sampling criteria. Environmental concerns in Pharmaceutical manufacturing. [08]

Unit-V:

**Packaging of Pharmaceutical Products :** Packaging component types, specifications and methods of evaluation, stability aspects of packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing. [08]

**BOOKS RECOMMENDED:**

1. Willing, Tuckerman and Hitchings, Good Manufacturing Practices for Pharmaceuticals.
2. OPPI, Quality Assurance.
3. Loftus and Nash, Pharmaceutical Process Validation.
4. Indian Pharmacopeia.
5. United States Pharmacopoeia
6. British Pharmacopoeia
7. Garfield, Quality Assurance Principles for Analytical Laboratories.
8. Ross, Packaging of Pharmaceuticals.
9. Joseph D.O. Brien, Medical Device Packaging Handbook.
10. Griffin, Drug and cosmetic packaging.
11. Barail, Packaging engineering
12. Harburn, Quality Control of Packaging Materials in Pharmaceutical Industry.
13. Kac Chensney, Packaging of Cosmetics and Toiletries.