

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,  
NANDED**



**Teaching & Examination Scheme  
for Four Year B. Pharmacy Program  
&  
Course Content for First Year B. Pharmacy  
to  
Affiliated Colleges**

*Credit Based Semester Pattern with CGPA Evaluation  
w.e.f.: 2014-2015*



# Swami Ramanand Teerth Marathwada University, Nanded

## Teaching and Examination Scheme for B. Pharmacy (w.e.f. 2014-2015)

### I<sup>st</sup> Semester

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH11	Pharmaceutical Practice	04	03	03	40	10	50	50	100
BPH12	Organic Chemistry-I	04	03	03	40	10	50	50	100
BPH13	Human Anatomy & Physiology-I	03	02	03	40	10	50	50	100
BPH14	Introduction to Pharmacognosy	03	02	03	40	10	50	50	100
BPH15	Introduction to Biochemistry	02	02	--	--	10	10	50	60
BPH16	Modern Pharmaceutical Business	02	02	--	-	10	10	50	60
BPH17	Remedial Maths*	02	02	--	--	--	--	50*	50
BPH18	Remedial Biology*	03	02	03	40	10	50	50*	100
	<b>Total</b>	<b>20</b> <b>/21</b>	<b>16</b>	<b>12</b> <b>/15</b>	<b>160</b> <b>/200</b>	<b>70</b> <b>/80</b>	<b>220</b> <b>/250</b>	<b>350</b>	<b>570</b> <b>/620</b>

\*Home Examination and for eligibility; student has to appear for R. Maths/R. Biology or both as the case may be

### II<sup>nd</sup> Semester

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH21	Inorganic Pharmaceuticals	04	03	03	40	10	50	50	100
BPH22	Physiologic Biochemistry	03	02	03	40	10	50	50	100
BPH23	Human Anatomy & Physiology-II	03	02	03	40	10	50	50	100
BPH24	Organic Chemistry-II	04	03	03	40	10	50	50	100
BPH25	Study of Crude Drugs	03	02	03	40	10	50	50	100
BPH26	Financial Management for Pharmacist	02	02	--	--	10	10	50	60
BPH27	Introduction to Hospital Pharmacy	02	02	--	--	10	10	50	60
	<b>Total</b>	<b>21</b>	<b>16</b>	<b>15</b>	<b>200</b>	<b>70</b>	<b>270</b>	<b>350</b>	<b>620</b>



**Swami Ramanand Teerth Marathwada University, Nanded**  
**Teaching and Examination Scheme for B. Pharmacy (w.e.f. 2014-2015)**

**III<sup>rd</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH31	Physical Chemistry	03	02	03	40	10	50	50	100
BPH32	Pharmaceutical Microbiology	03	02	03	40	10	50	50	100
BPH33	Organic Chemistry-III	04	03	03	40	10	50	50	100
BPH34	Clinical Biochemistry	03	02	03	40	10	50	50	100
BPH35	Introduction to Pharmaceutical Analysis	03	02	03	40	10	50	50	100
BPH36	Plant Genetics & Tissue Culture	03	02	03	40	10	50	50	100
BPH37	Introduction to Unit Operations	02	02	--	--	10	10	50	60
BPH38	Causes of Disease & Prevention	02	02	-	--	10	10	50	60
	<b>Total</b>	<b>23</b>	<b>17</b>	<b>18</b>	<b>240</b>	<b>80</b>	<b>320</b>	<b>400</b>	<b>720</b>

**IV<sup>th</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH41	Physical Pharmaceutics	03	02	03	40	10	50	50	100
BPH42	Sterilization & Disinfectants	03	02	03	40	10	50	50	100
BPH43	Classical Analytical Techniques	03	02	03	40	10	50	50	100
BPH44	Organic Chemistry-IV	03	02	03	40	10	50	50	100
BPH45	Fundamentals of Pharmacology	03	02	03	40	10	50	50	100
BPH46	Pathophysiology of Diseases	02	02	--	--	10	10	50	60
BPH47	Unit Operations in Pharmaceutical Technology	02	02	--	--	10	10	50	60
BPH48	Calculus & Biostatistics	02	02	--	--	10	10	50	60
BPH49	Computer Application	01	--	03	--	--	--	50*	Grade
	<b>Total</b>	<b>22</b>	<b>16</b>	<b>18</b>	<b>200</b>	<b>80</b>	<b>280</b>	<b>400</b>	<b>680</b>

\* Home examination



**Swami Ramanand Teerth Marathwada University, Nanded**  
**Teaching and Examination Scheme for B. Pharmacy (w.e.f. 2014-2015)**

**V<sup>th</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH51	Pharmaceutical Technology-I (DFD-I)	03	02	03	40	10	50	50	100
BPH52	Pharmaceutical Technology-II (DFM-I)	03	02	03	40	10	50	50	100
BPH53	Medicinal Chemistry-I	03	02	03	40	10	50	50	100
BPH54	Neuropharmacology	03	02	03	40	10	50	50	100
BPH55	Physico-electro Analytical Techniques	03	02	03	40	10	50	50	100
BPH56	Phytochemical Approaches of Natural Products	03	02	03	40	10	50	50	100
BPH57	Immunology	02	02	--	--	10	10	50	60
BPH58	Pharmacology of Hormones	02	02	--	--	10	10	50	60
	<b>Total</b>	<b>22</b>	<b>16</b>	<b>18</b>	<b>240</b>	<b>80</b>	<b>320</b>	<b>400</b>	<b>720</b>

**VI<sup>th</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester Max. Marks (TH)	Total Marks
					Lab. Work for Pr	Sessional	Total		
BPH61	Pharmaceutical Technology-I (DFD-II)	03	02	03	40	10	50	50	100
BPH62	Pharmaceutical Technology-II (DFM-II)	03	02	03	40	10	50	50	100
BPH63	Medicinal Chemistry-II	03	02	03	40	10	50	50	100
BPH64	Chemotherapy of Anti-infective & Neoplastic Diseases	03	02	03	40	10	50	50	100
BPH65	Separation Techniques	03	02	03	40	10	50	50	100
BPH66	Chemistry of Natural Products	03	02	03	40	10	50	50	100
BPH67	Biotechnology of Pharmaceutical Products	02	02	--	--	10	10	50	60
BPH68	Laws Governing Trade & Commerce of Pharmaceuticals	02	02	--	--	10	10	50	60
	<b>Total</b>	<b>22</b>	<b>16</b>	<b>18</b>	<b>240</b>	<b>80</b>	<b>320</b>	<b>400</b>	<b>720</b>



**Swami Ramanand Teerth Marathwada University, Nanded**  
**Teaching and Examination Scheme for B. Pharmacy (w.e.f. 2014-2015)**

**VII<sup>th</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester	Total Marks
					Lab. Work for Pr	Sessional	Total	Max. Marks (TH)	
BPH71	Cosmetic Technology	03	02	03	40	10	50	50	100
BPH72	Medicinal Chemistry-III	04	03	03	40	10	50	50	100
BPH73	Biopharmaceutics	03	02	03	40	10	50	50	100
BPH74	Spectro-analytical Techniques	03	02	03	40	10	50	50	100
BPH75	Herbal Technology	03	02	03	40	10	50	50	100
BPH76	Modern Pharmaceutics	02	02	--	--	10	10	50	60
BPH77	Pharmaceutical Management	02	02	--	--	10	10	50	60
BPH78	Autacoids & Immunomodulators	02	02	-	--	10	10	50	60
	<b>Total</b>	<b>22</b>	<b>17</b>	<b>15</b>	<b>200</b>	<b>80</b>	<b>280</b>	<b>400</b>	<b>680</b>

**VIII<sup>th</sup> Semester**

Subject Code	Subject	Credits	Contact Hours		Examination Scheme				
			TH	PR	Internal			Semester	
					Lab. Work for Pr	Sessional	Total	Max. Marks (TH)	Total Marks
BPH81	NDDS and Targeted DDS	03	02	03	40	10	50	50	100
BPH82	Medicinal Chemistry-IV	03	02	03	40	10	50	50	100
BPH83	Pharmacokinetics & its Clinical Application	03	02	03	40	10	50	50	100
BPH84	Potentials of Herbal Based Industries	02	02	03	40	10	50	50	100
BPH85	Molecular Spectroscopy	03	02	03	40	10	50	50	100
BPH86	Total Quality Management	03	03	--	--	10	10	50	60
BPH87	Clinical Pharmacy & Drug Interaction	03	03	--	--	10	10	50	60
BPH88	Environmental Study	01	--	Project	--	--	50*	#	Grade
BPH89	Library Assignment	01	--	Project	--	--	50*	--	Grade
	<b>Total</b>	<b>23</b>	<b>16</b>	<b>15</b>	<b>240</b>	<b>70</b>	<b>270</b>	<b>350</b>	<b>620</b>

\*Home Examination/Evaluation, # as per common philosophy of university for all faculty



# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

**Subject** : Pharmaceutical Practice  
**Subject Code/Paper No** : BPH11  
**Credits** : 04 (03T+01Pr.)

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### **Scope:**

Pharmaceutics is the most diverse of the subjects areas in pharmacy it encompasses many subject areas which are all associated with step to which a drug is subjected towards end of its development i.e. discovery or synthesis, isolation and purification, testing or advantages, pharmacological effects and absence from serious toxicological properties.

### **Objective:**

To acquaint the students of pharmaceutical sciences with basic knowledge of Pharmaceutics, its concepts, dosage forms and novel drug delivery systems and current pharmaceutical practices.

### Course Content (Theory)

- 1) Introduction to Pharmaceutics, history and its scope. (2hrs)
- 2) Introduction to Pharmacopoeias and other compendia. (4hrs)  
Brief history and development of Indian Pharmacopeia, USP & NF, BP, BPC
- 3) Introduction to pharmaceutical dosage form and Novel drug delivery systems. (7hrs)  
Need of Drug and Dosage forms, Classification, formulation methods of mixture and syrup & elixirs.  
Definition: Emulsion, suspension, solution, glycerides, aromatic waters, linctuses, spirits & infusion paints, lotions, liniments, mouth wash, creams, pastes, ointments, inhalation & lozenges. (7hrs)
- 4) Alternative systems of medicine (3hrs)  
Ayurveda, Homeopathy, Unani, Siddha system of medicines.
- 5) Pharmaceutical Excipients (Additives) (5hrs)  
Brief description of Pharmaceutical Additives or excipients used in pharmaceutical industry.
- 6) Basic of Preformulation studies (4hrs)  
Introduction to different fundamental and derived properties of drug molecules and excipients.
- 7) Pharmaceutical Incompatibilities (2hrs)  
Physical, chemical, biological & therapeutic incompatibility.
- 8) Pharmaceutical Packaging (3hrs)  
Objectives of Packaging, designs, various container and closure designs, advantages and disadvantages.
- 9) Pharmaceutical Calculations (4hrs)  
Normality, Molality, Molarity, percentage calculations, % W/V, V/V & W/W, Alcohol dilutions, Isotonicity and Calculation related to drug dosage.
- 10) Brief overview of Pharmaceutical Industry (3hrs)  
Indian Pharmaceutical industry and current scenario.

## REFERENCE BOOKS

1. L. V. Al en Jr., N. G. Popovich and H. C. Ansel “Ansel’s Pharmaceutical Dosage Forms and Drug Delivery Systems “,8 th Edition Lippincots Wil iams and Wilkin, Indian Education Distributed by B. I. Publications Pvt. Ltd, 2005
2. P. J. Sinko, “Martin’s Physical Pharmacy and Pharmaceutical Science” 5 th Edition, Lippincots Wil iams and Wilkin, Indian Edn, Distributed by B. I. Publications Pvt. Ltd,2006
3. M. E. Aulton “Pharmaceutics- The Science of Dosage Form Design” Churchill Livingstone, London, 2002. 4.
4. “Remington- The Science and Practice of Pharmacy “, Vol. I and II, 21 st Edn. Lippincots Wil iams and Wilkin, Indian Edn. Distributed by B. I. Publications Pvt. Ltd.,2005
5. M. L Shrof “Principles of Pharmacy Part I and I”8 th Edn. Five star Enterprises, Calcuta. 6.
6. E. A. Rowling “Bentleys Textbook of Pharmaceutics” 8 th Edn. Bail iere Tindal, London, Indian Edn. Published by All India Traveler Book Sel er Delhi, 1992.
7. P. C. Dandiya, R. K. Khat and N. K. Gurbani “The Pharmacist Year Book 1993, 1 st Edn. CBS Publishers and Distributors, Delhi 1993.
8. G. Sonnedecker “Kremers and Urdang’s History of Pharmacy” 4 th Edn Lippincots Company, USA, 1976.
9. James Swarbick “Current concepts in Pharmaceutical Sciences: Dosage form design and bioavailability” Lea and Febiger, Philadelphia, 1973.
10. Harkishan Singh “Pharmacopoeias and Formularies” Vol. I Val abh Prakashan, Delhi 1994.
11. S. J. Carter “Cooper and Gunn’s Tutorial Pharmacy” 6th Edn. CBS Publishers and Distributors, Delhi, 1986.
12. M. J. Stocklosa, H. C. Ansel, ”Pharmaceutical Calculations” 8th Edition, Indian Edition by K.M. Varghese Company, Mumbai 1986.
13. A textbook of Pharmaceutical and Clinical Calculations by Mansoor A Khan, Indra K. Reddy, CRC Press, Boca Raton, Londaon New York, Washington, D.C.
14. Pharmaceutical Packaging Handbook by Edward Bauer

### Course Content (Practical/Lab Work)

1. Laboratory Standard Operating Procedures (SOPs)  
**At least 2 prescriptions from each of the following classes of products should be compounded & dispensed.**
2. Emulsion
3. Suspensions
4. Ointments
5. Syrups
6. Elixirs
7. Solutions
8. Glycerites
9. Linctus
10. Aromatic waters
11. Pharmaceutical calculations.

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 L, 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.
10. Jain N.K., Modern Dispensing Pharmacy, 2nd Ed.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

**Subject** : Organic Chemistry-I  
**Subject Code/Paper No** : BPH12  
**Credits** : 04 (03T+01Pr.)

**Learning objectives:** During completion of following concepts of theory topics & laboratory experiments, learner should be able to understand the applicability in pharmaceuticals.

### **A] Knowledge:**

1. Relevance & significance of Organic Chemistry to Pharmaceutical Sciences.
2. Basic principles and concepts of organic chemistry (Includes organic reagents, reaction types and mechanisms etc).
3. Basic functional groups & IUPAC nomenclature of organic compounds.
4. Stereo chemical concepts/ basics such as isomerism & apply this knowledge for the study of structure property in relation to organic compounds
5. Different reagents and its role in organic reactions.
6. Different reaction intermediates & their role in reaction mechanism.
7. How addition & elimination reactions are performed with respect to alkenes and alkynes
9. Meaning and basics of "Aromaticity" & different chemical properties, reaction involved in the formation of aromatic compounds

### **B] Skill:**

1. Correct use of various equipments & safety measures in Pharmaceutical Chemistry laboratory.
2. Calibration of thermometer in technically correct way & explain the simple laboratory techniques.
3. How to synthesize different organic compounds along with principle, type of reaction, reaction mechanism and calculation involved.
4. Basics of stereochemistry and making/ preparation of stereo chemical models by using current methods (PPT/ 3D models etc)

## Course Content (Theory)

- 1. Introduction: (2 hrs)**  
Organic compounds their sources, classification with their definition and examples. Important branches of chemistry in relation to organic chemistry (such as need of green chemistry along with introduction to twelve principles)
- 2. Basic principles and concepts of organic chemistry: (5 hrs)**  
Atomic and molecular orbitals, electronic configuration, molecular orbital theory, hybridization, Types of chemical bond, electro negativity, bond length and bond energy, dipole moment, polarity of bonds, polarity of molecules.
- 3. Reaction mechanism: (4 hrs)**
  - Organic reagents and their types, types of solvents (electrophiles and nucleophiles), non-ionic and ionic solutes.
  - Organic reaction & their types, various reaction mechanism, Heterolysis and homolysis of bond.

- 4. Reaction intermediates:** (4 hrs.)  
Definition, Generation and stability of carbocation, carbanion, carbenes, nitrene and free radicals
- 5. Factors affecting electron availability:** (4 hrs.)  
Acidity and basicity, Inductive effect, resonance effect, hyperconjugation, steric effect, Tautomerisms, application of these factors on acidity and basicity
- 6. Stereochemistry:** (3 hrs.)  
Definition and importance of Stereochemistry, Isomers, types, enantiomerism, diastereomerism, meso-compounds, optical isomerism & optical activity, geometric isomerism, constitution, configuration & conformation
- 7. Alkanes:** (2 hrs)  
Definition, nomenclature, properties and reactions of alkanes, mechanism and kinetics of halogenations
- 8. Alkenes and alkynes:** (6 hrs.)  
Definition, classification, preparation and reactions, E1 & E2 mechanism and stereochemistry, Saytzeff and Hoffman rules, Addition Reaction of Alkenes-Mechanism, regioselectivity (Markonikov & anti markonikov) in addition of hydrogen, halogen, hydrogen halide, halohydrin formation, oxymercuration-demercuration, hydroboration-oxidation, hydroxylation, and ozonolysis. Chemical identification using bromine, KMnO<sub>4</sub> in CCl<sub>4</sub> reaction  
**Conjugated Dienes**–Structure, electrophilic addition of dienes: 1, 2 & 1, 4- addition, Diels-Alder reaction  
**Alkynes:** General methods of preparation and reactions.
- 9. Benzene & Aromaticity** (6 hrs.)  
*Concepts of aromaticity*  
Arene, classification, difference between aromatic & aliphatic compounds, evidences for kekule formula, resonance in benzene derivatives, Huckel's rule, orbital picture of benzene, stability of benzene ring ,  
*Preparation and reactions*  
methods of preparations, mechanism of electrophilic aromatic substitution like alogenations, nitration, sulphonation and Friedel craft reaction, benzene does not undergo addition reaction, reactivity in electrophilic aromatic substitution,  
*Theory of reactivity*  
Orientation in electrophilic aromatic substitution by taking example as aniline, phenol, chlorobenzene and nitrobenzene, electron donating and withdrawing group, activating and deactivating groups

#### Text Books:

1. Morrison and Boyd, Organic Chemistry, Prentice Hall of India (P.)Ltd.

#### Reference Books:

1. Pine, Organic chemistry, McGraw Hill international.
2. Jerry March, Advance Organic Chemistry (Reaction, Mechanism & Structure), Willey Eastern Ltd.
3. Sachin Kumar Ghosh, General Organic Chemistry, New central book agency, Calcutta.
4. E.L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill Publishing company Ltd., New Delhi.
5. R.O.C. Norman, Principles of Organic Chemistry, Chapman and Hill.
6. Peter Sykes, A Guidebook Reaction Mechanism in Organic Chemistry, Longman group Ltd.

7. I.L.Finar, Organic Chemistry, Vol. I: The Fundamental Principles, ELBS Publications.
8. Bahl & Bahl, Advanced Organic Chemistry, S Chand Publication.
9. Organic Chemistry by John Mc Murry, Fifth Edition, Brooks/Cole Thomson Learning.

### Course Content (Practical/Lab Work)

1. Study of laboratory safety measures, hazards in laboratory and first aid. [01]
2. Study of various laboratory glass wares, equipments and techniques used in the organic chemistry laboratory including miscellaneous (all test paper such as litmus, pH, starch iodide, turmeric, congo red etc.) [01]
3. Determination of Melting point and boiling point of given organic sample. (Study theory and techniques) [01]
4. To perform the recrystallization of the given organic compound.(Study theory of recrystallization, selection of solvent) [01]
5. To build the structure of organic compounds (stereo isomers studied in theory; covering examples of each category) by using stereo models (By use of video/PPT/3D images is highly expected) [02]
6. Preparation, Crystallization and determination of physical constants, covering following types of reactions (at least 7 compounds to be synthesized). [07]
  - a. Acetylation:
    - i. Acetanilide
    - ii. Aspirin
  - b. Benzoylation:
    - i. Benzanilide
    - ii. Phenyl benzoate
  - c. Bromination:
    - i. p-bromo acetanilide
  - d. Nitration:
    - i. p-nitro acetanilide
  - e. Reduction : m-nitro aniline
  - f. Diazotization reaction:
    - i. 1-Phenylazo-2-naphthol
  - g. Oxidation:
    - i. Benzil from benzoin
  - h. Preparation of Fumaric acid

#### **Recommended Reference Books:**

1. Mann, F. G. and Saunders, B. C. Practical Organic Chemistry, Orient Longman Ltd., New Delhi.
2. Donald L. Pavia, Gary M. Camp man, Georage S. Kriz. Introduction to Organic laboratory Techniques – a Contemporary Approach by, C.B.S. College Publishing, USA.
3. Brian Furniss, Antony Hannaford, Peter Smith, Austrin Vogel's Text Book of Practical Organic Chemistry , ELBS Publication, Singapore.
4. Shriner and Fuson, The Systematic Identification of Organic Compounds, Wiley.
5. Raj K Bansal, Laboratory Manual of Organic Chemistry, New Age International Publishers. New Delhi.
6. K.S. Jain, P.B. Miniyar, T.S. Chitre, Experimental Pharmaceutical Organic Chemistry, A benchtop Manual, Carrier Publication, Nashik.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

**Subject** : Human Anatomy & Physiology-I  
**Subject Code/Paper No** : BPH13  
**Credits** : 03 (02T+01Pr.)

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### **Course Objective:**

The objective of course is to review structural basis and the fundamental principles & knowledge with special emphasis on physiological functions of the human body organ systems. This will help students in design and fabrication of drug and delivery system for manipulation in otherwise physiological function of the body.

### Course Content (Theory)

- 1) Introduction to Human Body :- (01 Hrs)**  
Introduction to principle systems, internal environment, homeostasis & communication
- 2) The Cell and Tissue :- (03 Hrs)**  
Structure & functions of cell, cell membrane and cell organelles, transport of material across cell membrane., types of tissue & their sub types, occurrence & characteristics of tissue & their subtypes, functions
- 3) Blood :- (04 Hrs)**  
Composition & functions of blood, blood elements, production and their functions, blood group and its significance, blood coagulation, coagulation factors, factors influencing blood coagulation.
- 4) Cardio Vascular System :- (07 Hrs)**  
Anatomical review of the cardiovascular system, Heart - position and structure, function, blood flow, blood supply to heart, conducting systems of heart, Blood circulation, cardiac cycle, cardiac output, control of heart rate and stroke volume, E.C.G; Blood pressure, factors regulating blood pressure, baroreceptor and other cardiovascular reflexes.
- 5) Lymph Vessels and Lymph Node :- (01 Hrs)**  
Structural and functional study of lymph vessels and lymph nodes
- 6) Digestive System :- (05 Hrs)**  
Anatomical review of digestive system; composition and function of saliva, gastric juice, digestion in mouth, stomach & intestine., Physiology of absorption and fate of food stuff in G.I. tract; regulation of gastrointestinal tone and motility; mechanism of secretion of various digestive juice
- 7) Respiratory System :- (03 Hrs)**  
Anatomical & functional study of organs of respiratory system, physiology of respiration; transport of gases, lung volume and lung capacities, control of respiration

### Course Content (Practical/Lab Work)

1. Introduction to microscope.
2. Microscopic study of permanent slides of epithelial, connective and nervous tissue.
3. Determination of bleeding time of own blood and its significance
4. Determination of clotting time of owns blood and its significance.
5. Detection of blood group and its significance.
6. Estimation of Haemoglobin and oxygen carrying capacity.
7. Estimation of Red blood cell count.

8. To determine W.B.C. Count.
9. To determine differential white blood cell count.
10. Estimation of E.S.R.
11. Estimation of packed cell value and its significance.
12. Calculation of blood indices and its significance.
13. Determination of specific gravity of blood and its significance.

**Text Book:-**

- 1) Ross and Wilson - Anatomy and Physiology in Health and illness by K.J. W. Wilson and Anne Waugh. 8<sup>th</sup> edition. 1996., Churchill Livingstone, London.

**Reference Books:**

- 1) Chatterjee C.C. - Human Physiology (Vol. I & II), 1998 (Reprint), Medical Allied Agency, Calcutta.
- 2) Guyton - Text book of Medical Physiology 9<sup>th</sup> edition, 1998, Harcourt Brace and Company, Asia PTE LTD.
- 3) Tortora - Principles of Anatomy and Physiology, 8<sup>th</sup> edition, 1996, Harper Collins College Publishers.
- 4) Gray's Anatomy: By P.L. Williams, R. Warwick et.al. 37<sup>th</sup> edition, 1992, ELBS, London.
- 5) Vijaya D. Joshi: Prep. Manual for undergraduate, Physiology: 1999 (Reprint), B.I. Churchill Livingstone.
- 6) James E. Crouch: Functional Human Anatomy: 2<sup>nd</sup> edition, 1972, Williams & Wilkins.
- 7) Chaudhary : Concise Medical Physiology : 2<sup>nd</sup> edition,1993,New central Book Agency (P) Ltd., Calcutta
- 8) Samson Wrights, Applied Physiology By: Cyril A. Keele, Eric Neil et.al: 13<sup>th</sup> edition 1996, Oxford University Press, Mumbai.
- 9) Cunningham's Text book of Anatomy: Edited by G.J. Romanes: 12<sup>th</sup> edition 1981, Oxford University Press, Mumbai.
- 10) S. Chaudhry & A. Chaudhry: Human Anatomy and Physiology, Ist edition 1996, S Vikas & Company, Jalandhar.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

**Subject** : Introduction to Pharmacognosy  
**Subject Code/Paper No** : BPH14  
**Credits** : 03 (02T+01Pr.)

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### **Course Objective:**

The objective of the course is to study with sufficient knowledge of classical botany associated with taxonomic systems of medicinal plants. The course also envisages sufficient knowledge about general methods of cultivation, collection, and prevention of adulteration, storage and uses of crude drugs.

### Course Content (Theory)

#### **UNIT-I**

1. Significance of medicinal plants in pharmacy. Introductions, historical development, present status and future scope of Pharmacognosy. **02 hr**
2. Introduction to alternative systems of medicine- Ayurveda, Siddha, Unani, Homeopathy, Naturopathy. **01 hr**
3. Sources of crude drugs and their classification based on alphabetical, morphological, taxonomical, chemical and pharmacological methods, organized and unorganized drugs. **02 hr**

#### **UNIT-II**

1. General characteristics of Leaves, Flower, Bark, Wood, Seed, Fruit, Root. **03 hr**
2. Study of distinguishing characters of following families and their important medicinal plant-Apocynaceae, Solanaceae, Leguminosae, Papaveraceae, Rutaceae, Umbelliferae and Liliaceae. **05 hr**

#### **UNIT-III**

1. **Quality control of crude drugs :** **04 hr**  
Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation, WHO guidelines for quality control of crude drugs.

#### **UNIT-IV**

1. **Cultivation, collection and processing of crude drugs:** **04 hr**  
Introduction and advantages, factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation, hybridization with reference to medicinal plants.

#### **UNIT-V**

1. **An introduction to phyto constituents of crude drugs:** **05 hr**  
Introduction, properties, classification, general method of isolation and identification of Alkaloids, Glycosides, Tannins, Resins, Flavonoids, Volatile oil, Fixed oil, Carbohydrates, Enzymes.

### **TEXT BOOK:**

- 1) C.K. Kokate, A.P. Purohit, S.B. Gokhale; Pharmacognosy; Nirali Prakashan, Pune

### **REFERENCE BOOKS:**

1. Trease and Evans; Pharmacognosy, ELBS, London.
2. T.E.Wallis; Text book of Pharmacognosy; CBS Publishers & distributors, Delhi.

3. V.E.Tyler, L.R. Brady, J.E. Robbers; Pharmacognosy; Lea and Febiger, Bombay.
4. J.B. Harborne: Phytochemical Methods, Chapman and Halls, London
5. P.C. Vasishta; Taxonomy of Angiosperms; R.Chand & Company, New Delhi.
6. A.C. Dutta, Class book of Botany, Oxford University Press, Calcutta.
7. Ashok Bendre, A. Text Book of Practical Botany, Vol.I & II , Rastogi Publications, Meerut.
8. M.K Gupta; Pharmaceutical Biology and Introductory Pharmacognosy; Pragati Prakashan, Meerut.

### Course Content (Practical/Lab Work)

1. Introduction to various Instruments and equipments used in Pharmacognosy Laboratory. **(01 practical)**
2. To understand the techniques of section cutting, staining, mounting and microchemical agents. **(02 practical)**
3. Study of morphological characteristics of medicinal plant from families mentioned in theory. **(03 practical)**
4. Evaluation of crude drugs with reference to
  - a) Ash Value and Sulphated Ash value.
  - b) Alcohol and water soluble extractive value.
  - c) Loss on Drying. **(03 Practical)**
5. To determine various leaf constants
  - a) Stomatal number and stomatal index.
  - b) Vein islet number and vein termination number
  - c) Palisade ratio **(03 practical)**

### **REFERENCE BOOKS:**

1. K.R. Khandelwal, Practical Pharmacognosy, Nirali Prakashan, Pune.
2. C.K. Kokate , Practical Pharmacognosy, Vallabh Prakashan, Delhi.
3. M.A. Iyngar, Pharmacognosy of Powdered crude drugs, Manipal.
4. Ashok Bendre, A Text book Practical Botany, Vo. I & II Rastogi Publications, Meerut

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, 1st Semester

**Subject** : Introduction to Biochemistry  
**Subject Code/Paper No** : BPH15  
**Credits** : 02 (02T)

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### Course Content (Theory)

#### **Course Objective:-**

The course objective is an introduction to the principles of biochemistry at conceptual level. The course deals with chemical constituents of life - carbohydrates, lipids, proteins and amino acids, nucleic acids and enzymes.

- 1) Introduction.** (02 hrs)  
Nature and aims of Biochemistry, contribution of Biochemistry towards Medicine
- 2) Carbohydrates :-** (05 hrs)  
Definition, functions of carbohydrates, Classification, Straight chain and ring structure and biological importance of common carbohydrates like Glucose, Fructose, Ribose, Lactose, maltose, Sucrose, Starch, Glycogen, Cellulose, Heparin, Hyaluronic acid.
- 3) Lipids :-** (06 hrs)  
Definition, Biological importance of lipids, Classification; Structure of triglycerides, Selected properties of fats -Hydrolysis, Saponification number, Iodine number, Acid number, Rancidity; Structure and significance of phospholipids and essential fatty acid, Cholesterol - Structure, significance.
- 4) Amino acids :-** (06 hrs)  
Classification, structures, Essential and non essential amino acids;  
Proteins- Classification, Biological importance, Structure of Protein; Selected reactions of Amino acids and proteins along with colour reactions
- 5) Nucleic Acid :-** (05 hrs)  
Bases, Sugar, Nucleosides, nucleotides, nucleic acid; Structure of DNA, Functions of DNA as carrier of genetic information, Role in protein biosynthesis

#### **Text Books:**

- 1) Dr. A.C. Deb: Fundamentals of Bio-chemistry, 6<sup>th</sup> edition, 1997 (Reprint), New Central Book Agency (P) Ltd., Calcutta.

#### **Reference Books:**

- 1) A.V.S.S. Rama Rao: A. Text of Bio-chemistry, 7th edition, 1997 (Reprint), UBS Publishers and Distributors Ltd., Delhi.
- 2) R.K. Murray, D.K. Granner, P.A. Mayers: Harpers Bio-chemistry, 24<sup>th</sup> edition 1996, Prentice - Hall International, INC, Calcutta.
- 3) Dr. A.C. Deb: Concepts of Bio-chemistry, 1st edition, 1999, Books and allied (P) Ltd., Calcutta.
- 4) S. Ramakrishnan, K.G. Prasannan: Text book of Medical Bio-chemistry, 1991, Orient Longman.
- 5) R.L. Nath, A Text book of Medical Bio-chemistry, 1996, New Age International Publishers, Delhi.
- 6) P.C. Champe, R.A. Harvey: Lippincott's illustrated Reviews, Bio-Chemistry: 2<sup>nd</sup> edition, 1994, J.B.Lippincott Company, Philadelphia.



- 7) Lehninger, Nelson, Cox: Principles of Bio-chemistry, 2<sup>nd</sup> edition, 1993, CBS Publishers and Distributors, Delhi.
- 8) Lubert Stryer: Bio-Chemistry, 4th edi, 1995, W.H.Freemen & Company, New York.
- 9) Geoffrey L.Zubay: Bio-chemistry, 4th edition, 1998, W.C.B., McGraw -Hill, Boston.
- 10) M.F. Laker: Clinical Bio-chemistry, 1996, W.B. Saunders Company Ltd., London.
- 11) Victor L. Davidson, Donald Sittman: Bio-chemistry 3<sup>rd</sup> edition 1994, Harwal Publishing, London.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

Subject	: Modern Pharmaceutical Business
Subject Code/Paper No	: BPH16
Credits	: 02 (02T)

### Course Objectives:

The course is designed to impart basic techniques of management which are often employed in running or managing the business enterprises. Students are expected to acquire requisite skills for modern pharmaceutical businesses so that, entrepreneurship desire is further strengthened.

### Course Content (Theory)

- 1) Introduction to pharmaceutical trade & commerce,** business, Profession, their features, objectives, branches of commerce, trade, aids to trade, Industry, Classification of industry. Introduction to management, its features, importance, principles and functions.  
**Regulatory requirements for starting a drug store:** Planning of a new establishment, location and selection, layout design and its importance, Conditions of license for establishing a drug store, Documents required for retail & wholesale drug store, & its renewal as per law. (5 hrs)
- 2) Forms of Business organizations:** Conventional business organizations their merits and demerits. Emergence of joint stock company, its classifications, features, advantages and disadvantages. (6 hrs.)
- 3) Channels of Distribution:**  
Meaning of distribution, methods of selling, choice of a channel, types of channels of distribution, example of wholesale and retail with their characteristic and services rendered. Modern trends in retailing, Chain stores, departmental stores, mail order business, medical shoppe, super markets and malls (3-4 hrs)
- 4) Purchase and sales management:** Objective and importance of purchasing, purchasing procedure, Selection of suppliers, Tenders, Codification, pricing of materials.  
**Sales:** Objective of sales promotion, Techniques of sales promotion, Salesmanship, Qualities of salesman, advertising, Advantages & Disadvantages, Parts of advertisement, Advertisement in Pharmaceutical Industry, Window display, Market research, Methods of market research, Advantages of market research. (5 hrs)
- 5) Inventory control:**  
Objectives & importance, techniques of inventory control like capital ABC, VED analysis, lead time, inventory carrying cost, safety stock minimum and maximum stock levels, EOQ, scrap and surplus disposal. (3-4 hrs)
- 6) Personnel Management:**  
Recruitment, Selection, Training, Evaluation & compensation of a pharmacist (2 hrs.)

### REFERENCE BOOKS:

1. R.M. Mehata, Drug Store and Business Management, Vallabh Prakashan, Delhi
2. Mohammed Ali, Jyoti Gupta, Drug Store and Business Management CBS Publishers and Distributors, New Delhi
3. Dr. Mahesh D. Burande, Principles and Practice of Drug Store Administration. , Nirali Prakashan, Pune.
4. Dr. Mohan Singhal, Dr. Jai Dev , Drug Store and Business Management, S.Vikas and Company, Jalandhar.

5. S.H. Merchant, Dr. J.S. Quadry, A textbook of retail pharmacy management, B.S. Shah Publication, Ahemadabad
6. Ashok K. Gupta, Handbook of drug store and business management, CBS, publishers & distributors, Delhi

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

Subject : Remedial Maths  
Subject Code/Paper No : BPH17  
Credits : 02 (02T)

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### Course Content (Theory)

- 1) **Algebra:** (03hrs)  
Laws of indices, Logarithms, Permutations and Combinations, Quadratic equation
- 2) **Co-ordinate Geometry:** (04hrs)  
Distance Formula, Locus, and Equations of straight line in different forms. Circle.
- 3) **Trigonometry:** (07hrs)  
Measurement of angles, Simple relations connecting the complementary and supplementary angles, negative angles, Sum and difference of two angles; Sine and cosine for multiple and half angles
- 4) **Calculus:**
  - (a) **Differentiation:** (07hrs)  
Function, Limit, differentiation; Rules for differentiation of sum, difference, product and quotient of functions; Differentiation of implicit, trigonometric, composite and parametric functions
  - (b) **Integration:** (04hrs)  
Integration as inverse of differentiation; Indefinite integration of some standard functions, formal evaluation for definite integrates

### **Reference Books:**

1. A Textbook of Mathematics for XI and XII, NCERT, New Delhi.
2. Calculus and Analytic Geometry”, Thomas and Finney, Pearson Education Limited.
3. Engineering Mathematics By H.K. Das

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, Ist Semester

**Subject** : Remedial Biology  
**Subject Code/Paper No** : BPH18  
**Credits** : 03 (02T+01Pr)

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The objective of the course is to provide eligibility for the students who did not have biology at 10+2 level.

### **Course Objective:**

The course envisages studying the elementary biological science which includes study of general botany and zoology, which find further application in pharmaceutical sciences

### Course Content (Theory)

- 1. Diversity in Organisms: (03hrs)**
  - 1.1 Introduction,
  - 1.2 Diversity in living organisms,
  - 1.3 Systematic taxonomy, Taxonomical hierarchy and biological nomenclature,
  - 1.4 Five kingdom system of classification,
  - 1.5 Lichens and Viruses.
- 2. Kingdom Plantae: (03hrs)**
  - 2.1 Salient features of major plant groups: Algae, Bryophyta, Pteridophyta, Gymnosperms, and Angiosperms.
  - 2.2 Botanical gardens and Herbaria: Meaning, Importance and list of gardens and herbaria in India.
  - 2.3 Taxonomic Key
  - 2.4 Plant life cycle
- 3. Mendel's Laws of Inheritance: (02hrs)**
  - 3.1 Introduction - Gregor Mendel - Mendel's Experiments on Sweet Pea-Terminology Used - monohybrid and Dihybrid Ratio.
  - 3.2 Law of Dominance- Monohybrid Ratio - Law of Segregation - Dihybrid Ratio - Law of Independent Assortment.
  - 3.3 Test Cross or Back Cross - The Concept of 'Factor' & its present Position.
- 4. Genes : (02hrs)**
  - 4.1 Introduction - Packaging of Hereditary Material - The Structure of DNA, Replication of DNA in Eukaryotes- Replication of Prokaryotic Chromosome - Plasmids - RNA : The Structure and Classes (Types)- The Genetic Code - The Central theme of Protein synthesis.
- 5. Plant Water relations and Mineral Nutrient (02hrs)**
  - 5.1 Source of water and physical process involved in absorption of water
  - 5.2 Absorption and movement of water
  - 5.3 Transpiration and translocation of food
  - 5.4 Mineral nutrient
- 6 Plant Growth and Development: (02hrs)**
  - 6.1 Seed germination
  - 6.2 Characteristics of growth
  - 6.3 Phases of growth
  - 6.4 Growth regulators
  - 6.5 Photoperiodism and Photomorphogenesis and Vernalization
- 7 Kingdom Animalia: (05hrs)**
  - 7.1 Criteria for animal classification

- 7.2 Salient features of non-cordates  
 7.3 Silent features of Cordates  
 7.4 Zoological parks and museums in India
- 8 Human Evolution :** (02hrs)  
 8.1 Introduction and Brief Account of Human Ancestry- Palaeontological evidences –  
 8.2 Brief Account of Evolutionary Stages.
- 9 Sex Determination and Sex Linkage :** (01hrs)  
 8.1 Introduction- Sex Determination in Human Being- Sex linkage - Sex linkage in Man with Respect to Colour-blindness.
- 10 Human Diseases and Their Control :** (02hrs)  
 10.1 Introduction - Hepatitis, AIDS, Leprosy & Cancer.
- 11 Community Health Services and Measures :** (01hr)  
 11.1 Introduction, Blood Bank & Addiction.

**Text Book:**

1. State Government, Text book of Biology-XI & XII, Maharashtra state Board of secondary and higher secondary education, Pune.

**Reference Books:**

1. S.D. Bhagwat , H.D. Sane, A.B. Dandekar, A.D. Marathe & Mrs. C.P. Soman, A text book of Biology , Narendra Prakashan, Pune.
2. P.G. Pataskar, Y.B. Mutkekar Biology, Phadke Prakashan, Kolhapur.
3. M. K Gupta, Pharmaceutical Biology and Introductory Pharmacognosy, Pragati Prakashan, Meerut.

**Course Content (Practical/Lab Work)**

- 1) To study the parts of compound microscope (01 Practical )
- 2) To study and describe two locally available flowering plants from the families. (01 Practical)
- 3) To study histological structure of stomata in upper and lower surface of leaf (01 Practical)
- 4) To test the presence of sugar & starch from suitable plant and animal material. (01 practical)
- 5) To study different modifications of root, stem and leaf (01 practical)
- 6) To study and identify different types of Inflorescence. (01 practical)
- 7) To study of tissues and diversity in shapes and sizes of plant and animal cells- Palisade cells, Guard cells, Parenchyma, Collenchyma, Sclerenchyma, xylem, Phloem, Squamous epithelium, muscle fibres, through temporary and Permanent slides. (02 practical)
- 8) To study external morphology of earthworm, Cockroach and frog through models. (01 practical)
- 9) Separation of plant pigments by paper chromatography 01 practical)
- 10) Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms. (01 practical)
- 11) To study and identify stages of gamete development i.e T.S of testies and T.S of ovary through permanent slides (01 practical)

**Text Book:**

1. Practical Biological, Navneet publication, Mumbai

**Reference Books:**

1. Ashok Bendre, A text book of practical botany, Vol-I, & II, Rastogi Publications, Meerut.
2. K R Khandelwal, Practical Pharmacognosy, Nirali Prakashan, Pune
3. S R Kale and R R Kale, Practical Human Anatomy and Physiology, Nirali Prakashan, Pune

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**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,  
NANDED**



**Teaching & Examination Scheme  
for Four Year B. Pharmacy Program  
&  
Course Content for First Year B. Pharmacy  
to  
Affiliated Colleges**

*Credit Based Semester Pattern with CGPA Evaluation  
w.e.f.: 2014-2015*



# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Inorganic Pharmaceuticals  
**Subject Code/Paper No** : BPH21  
**Credits** : 04 (03T+01Pr.)

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### Course Content

#### **Objectives:**

The course is designed to study the principles of inorganic chemistry and its scope in pharmacy. This course explains inorganic pharmaceuticals, essential elements and inorganic compound which are used as pharmaceutical aid and diagnostic agents. More emphasis is given on methods of preparation, properties and therapeutic potential of inorganic pharmaceuticals. It also reviews on qualitative inorganic analysis and quality control of inorganic pharmaceuticals e.g., Limit test and Monograph.

- 1) Introduction to Pharmaceutical Inorganic Chemistry, significance of the subject (01)
- 2) Impurities in pharmaceuticals: (04)  
Concept of purity, sources of impurity & their control, limit test, limit test for chloride, sulphate, lead, Iron, arsenic.
- 3) Pharmacopoeia: (02)  
Various Pharmacopoeias, Monograph, IP monograph of Sodium bi carbonate and boric acid
- 4) Nuclear Chemistry and Radio pharmaceuticals: (05)  
Nuclear Composition, stability of isotope, nuclear reaction, dosimetry, fission and fusion, measurement of radioactivity, modes of decay, half life period, artificial radioactivity. Radiopharmaceuticals, application of Radiopharmaceuticals in medicines & Pharmacy, Iodine-31, Phosphorus-32, Iron-59; radiopaque contrast media, barium sulphate, quality control of radiopharmaceuticals

#### **Outline the methods of preparation, Chemistry, chemical properties, mode of action, & uses of the following--**

- a) Water: (02)  
Properties of water, types of water, purification of water, water as the universal pharmaceutical Vehicle, official preparations of water.
- b) Major intra and extra cellular electrolytes ions: (05)  
Extra and intracellular electrolytes & ions such as chloride, bicarbonate, sodium, potassium, calcium, their physiological role, and uses, electrolytes used for replacement therapy, physiological acid base balance, electrolytes used in acid base therapy, electrolyte combination therapy, sodium chloride, potassium chloride.
- c) Essential and trace elements: (04)  
Essential & non-essential elements, iron, copper, Zinc, sulphur and Iodine, their biochemical role, deficiency symptoms and use; Ferrous sulphate, ferrous gluconate, potassium iodide
- d) Gastrointestinal agents: (04)  
Definition, Classification, Antacids, Acidifying agents, protective and adsorbents, saline cathartics; Magnesium sulphate, Sodium bicarbonate, Aluminium hydroxide, Bismuth sub carbonate, Kaolin, Hydrochloric acid.
- e) Topical agents: (04)  
Protective, Antimicrobials & astringents; Talc, Zinc oxide, Hydrogen peroxide, potassium permanganate, Iodine, Sulphur, boric acid, Alum.
- f) Dental products : (02)  
Anticaries agents, dentifrices, sodium fluoride, stannous fluoride, pumice, zinc chloride, calcium carbonate.



- g) Expectorants, Emetics & Antitussive,: (01)  
Ammonium chloride, Potassium iodide
- h) Antidotes: (01)  
Cyanide poisoning Sodium nitrite, Sodium thiosulphate.
- i) Inorganic gases used in pharmacy: (01)  
Oxygen, carbon dioxide and Nitrous oxide

#### Reference Books:

- 1) J.H. block, E.B. Roche, T.O. Soine, C.O. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia.
- 2) A.H. Beckett & J.B. Stanlake, Practical Pharmaceutical Chemistry, Part I & II
- 3) Bently and Drivers, Text Book of Pharmaceutical Chemistry.
- 4) Remington's Pharmaceutical Sciences,
- 5) Indian Pharmacopoeia 2010
- 6) J.D. Lee, Concise Inorganic Chemistry, ELBS Publication
- 7) Alexive V.N., Qualitative Chemical Semi micro Analysis, CBS Publication
- 8) Vogel's Qualitative Inorganic Analysis, Orient Longman

### Course Content (Practical/Lab Work)

#### Objectives:-

The course is designed with an objective to learn all theoretical concepts of pharmaceutical inorganic chemistry practically by students and to understand the concepts evidently. With this consideration, practicals based on topics have been included in theory course.

- Teachers are expected to develop interest about the subject in students.
- Teachers are expected to explain principle and objective of each experiment to the students.
- Teachers are expected to explain scope and applications of experiments in pharmaceutical industry and related area.
- Teachers are expected to develop practical skills like reagents preparations chemical calculations in the students.
- Teachers are expected to ensure improvement of practical skill in the students.

- 1) **Introduction to Pharmaceutical Inorganic Chemistry laboratory** (01)  
(Study requirement of Inorganic Chemistry Practical, Cleaning and Drying of glassware, various grades of chemicals, care in handling the hazardous chemicals, safety measures, use and care of balance)
- 2) **Preparation of Inorganic Compounds:** (02)  
Copper Sulphate, Boric acid, Alum
- 3) **Qualitative Analysis of cations and anions, inorganic mixtures** (04)
- 4) **Limit test for chloride, sulphate, iron, arsenic on the given sample.** (03)
- 5) **Indian Pharmacopoeia Monographs** (02)

#### Recommended Books:

1. J.H. Block, E.B. Roche, T.O. Soine, C.O. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia.
2. Bently and Drivers, Text Book of Pharmaceutical Chemistry.
3. Indian Pharmacopoeia 2010
4. A.H. Beckett & J.B. Stanlake, Practical P'ceutical Chemistry, Part I & II
5. Alexive V.N., Qualitative Chemical Semi-micro Analysis, CBS Publication
6. J.S. Qadry, A Text Book of Inorganic Pharmaceutical and Medicinal Chemistry, B.S. Shah Prakashan.
7. Vogel's Qualitative Inorganic Analysis, Orient Longman



# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Physiologic Biochemistry  
**Subject Code/Paper No** : BPH22  
**Credits** : 03 (02T+01Pr.)

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### Course Content (Theory)

#### **Course Objective:**

The course covers biochemical aspects of enzymes, vitamins along with cellular environment homeostasis. The course focuses on how molecular basis of life operates integrated behaviour of the complete body.

- 1) Enzymes:** (08 hrs)  
Introduction, Chemical nature and properties, Nomenclature and classification; Enzyme specificity, Mechanism of enzyme action, factors affecting enzyme activity; Enzyme inhibition, application & clinical uses
- 2) Vitamins and coenzymes (excluding structure) :-** (10 hrs)  
Classification of vitamins, fat soluble and water soluble vitamins  
Source, Biochemical function, deficiency state of Vit A, D, E, K, C, B complex group, Co-enzyme activity; Co-enzyme like NAD, NADP, FMN, FAD, ATP, UDP, Biotin, Tetrahydrofolic acid - and functions; Co-enzyme forms of vit. B<sub>1</sub>, B<sub>6</sub> & B<sub>12</sub>
- 3) Homeostasis of Cellular Environment :-** (06 hrs)  
Concept, component involved and physiological mechanism of fluid balance, electrolyte balance, acid-base balance along with concept note on thermoregulation.

#### **Text Books:**

- 1) Dr. A.C. Deb: Fundamentals of Bio-chemistry, 6<sup>th</sup> edition, 1997 (Reprint), New Central Book Agency (P) Ltd., Calcutta.

#### **Reference Books:**

- 1) A.V.S.S. Rama Rao: A. Text of Bio-chemistry, 7th edition, 1997 (Reprint), UBS Publishers and Distributors Ltd., Delhi.
- 2) R.K. Murray, D.K. Granner, P.A. Mayers: Harpers Bio-chemistry, 24<sup>th</sup> edition 1996, Prentice - Hall International, INC, Calcutta.
- 3) Dr. A.C. Deb: Concepts of Bio-chemistry, 1st edition, 1999, Books and allied (P) Ltd., Calcutta.
- 4) Ramakrishnan, K.G. Prasannan: Text book of Medical Bio-chemistry, 1991, Orient Longman.
- 5) R.L. Nath,: A Text book of Medical Bio-chemistry, 1996, New Age International Publishers, Delhi.
- 6) P.C. Champe, R.A. Harvey: Lippincott's illustrated Reviews, Bio-Chemistry: 2<sup>nd</sup> edition, 1994, J.B.Lippincott Company, Philadelphia.
- 7) Lehninger, Nelson, Cox: Principles of Bio-chemistry, 2<sup>nd</sup> edition, 1993, CBS Publishers and Distributors, Delhi.
- 8) Lubert Stryer: Bio-Chemistry, 4th edi, 1995, W.H.Freeman & Company, New York.
- 9) Geoffrey L.Zubay: Bio-chemistry, 4th edition, 1998, W.C.B., McGraw -Hill, Boston.
- 10) M.F. Laker: Clinical Bio-chemistry, 1996, W.B. Saunders Company Ltd., London.
- 11) Victor L. Davidson, Donald Sittman: Bio-chemistry 3<sup>rd</sup> edition 1994, Harwal Publishing, London.

### **Course Content (Practical/Lab Work)**

- 1) Preparation of standard buffer and measurement of their pH, Care and use of pH meter. (02 Practicals)
- 2) Qualitative test for carbohydrates identification of unknown sample (03 Practicals)
- 3) Qualitative test for proteins and amino acids Identification of unknown sample (03 Practicals)
- 4) Qualitative test for lipids (01 Practical)
- 5) Estimation of Blood Cholesterol (01 Practical)
- 6) Estimation of Glucose in Urine by Benedict's methods (01 Practicals)
- 7) Determination of Sap value, acid value, iodine value of lipid (03 Practicals)

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Human Anatomy & Physiology-II  
**Subject Code/Paper No** : BPH23  
**Credits** : 03 (02T+01Pr.)

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### Course Objective:

The objective of course is to review structural basis and the fundamental principles & knowledge with special emphasis on physiological functions of the human body organ systems. This will help students in design and fabrication of drug and delivery system for manipulation in otherwise physiological function of the body.

### Course Content (Theory)

- 1) Nervous System :- (08 Hrs)**  
Structure of neurone, Basic parts of C.N.S. - their structure and functions; Physiology of nerve impulses, physiology of pain, electroencephalograph; peripheral nervous system- parasympathetic and sympathetic nervous system, with outflow and functions, neurotransmitters.
- 2) Endocrine System :- (05 Hrs)**  
General concepts of the endocrine system, endocrine glands, importance, physiology and hormones of pituitary, thyroid, parathyroid, adrenal, pancreas, testes, ovary and prostate gland
- 3) Reproductive System :- (06 Hrs)**  
Anatomical and physiological consideration of male and female reproductive system; physiology of menstrual cycle, fertilisation, pregnancy, sterility in females; spermatogenesis, male puberty, abnormal spermatogenesis; family planning - principles underlying the various family planning methods.
- 4) Urinary System :- (02 Hrs)**  
Components of urinary system - its structure & functions, mechanism of urine formation
- 5) Special Senses : - (03 Hrs.)**  
Parts and structure of Ear, Eye, and physiology of hearing and sight; structure and functions of organs of smell and taste including physiology of smell and taste; structure and functions of skin, physiology of touch

### Course Content (Practical/Lab Work)

- 1) Detection of Heart rate, Pulse rate & body temperature with its significance.
- 2) Recording of blood pressure by palpatory and auscultatory method.
- 3) Urine Analysis: Test for normal constituents of urine & analysis of urine for abnormal constituents.
- 4) Microscopic study of permanent slides of smooth and skeletal muscle, stomach, intestine, liver, kidney, skin, pancreas, testes, ovaries, cerebellum, cerebrum, spinal cord.
- 5) Study of Axial and Appendicular skeleton **(02 Practicals)**
- 6) Introduction to ECG- demonstration through Data acquisition system / Theoretical Concept.
- 7) Interpretation of data obtained through Data acquisition system or available data and correlate electrical events with mechanical activity of ECG.
- 8) Introduction to EMG- demonstration through Data acquisition system / Theoretical Concept.

- 9) To observe and record Skeletal Muscle Tone and Clench Strength for right and left hand. or interpretation of available such data
- 10) Study of different family planning methods
- 11) Study of sense organ with the help of models/charts.

**Text Book:-**

- 1) Ross and Wilson - Anatomy and Physiology in Health and illness by K.J. W. Wilson and Anne Waugh. 8<sup>th</sup> edition. 1996., Churchill Livingstone, London.

**Reference Books:**

- 1) Chatterjee C.C. - Human Physiology (Vol. I & II), 1998 (Reprint), Medical Allied Agency, Calcutta.
- 2) Guyton - Text book of Medical Physiology 9<sup>th</sup> edition, 1998, Harcourt Brace and Company, Asia PTE LTD.
- 3) Tortora - Principles of Anatomy and Physiology, 8<sup>th</sup> edition, 1996, Harper Collins College Publishers.
- 4) Gray's Anatomy: By P.L. Williams, R. Warwick et.al. 37<sup>th</sup> edition, 1992, ELBS, London.
- 5) Vijaya D. Joshi: Prep. Manual for undergraduate, Physiology: 1999 (Reprint), B.I. Churchill Livingstone.
- 6) James E. Crouch: Functional Human Anatomy: 2<sup>nd</sup> edition, 1972, Williams & Wilkins.
- 7) Chaudhary : Concise Medical Physiology : 2<sup>nd</sup> edition,1993,New central Book Agency (P) Ltd., Calcutta
- 8) Samson Wrights, Applied Physiology By: Cyril A. Keele, Eric Neil et.al: 13<sup>th</sup> edition 1996, Oxford University Press, Mumbai.
- 9) Cunningham's Text book of Anatomy: Edited by G.J. Romanes: 12<sup>th</sup> edition 1981, Oxford University Press, Mumbai.
- 10) S. Chaudhry & A. Chaudhry: Human Anatomy and Physiology, Ist edition 1996, S Vikas & Company, Jalandhar.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Organic Chemistry-II  
**Subject Code/Paper No** : BPH24  
**Credits** : 04 (03T+01Pr.)

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### Course Content (Theory)

#### **Learning Object:**

During completion of following concepts of theory topics & laboratory experiments, learner should be able to understand the applicability in pharmaceuticals.

#### **Knowledge**

➤ Understanding of

- Basic chemistry,
- IUPAC Nomenclature, (including polyfunctional groups and priority)
- preparations
- and characteristics chemical reactions (Mechanism of specified reactions) of followings

Alcohol, Phenols, Alkyl & Aryl halides, Aldehydes and Ketones, Carboxylic Acids (Aliphatic and aromatic), Amines-Aliphatic & aromatic,  $\alpha$ ,  $\beta$ - Unsaturated carbonyl compounds Acetoacetic ester and malonic ester.

- Understanding of mechanism involving special reaction such as electrophilic, Nucleophilic, addition, substitution must be highlighted.

#### **Skill**

- 1) Explain and understand the principal behind various qualitative tests and analyze the given unknown organic compounds having different functional groups.
- 2) Explain and understand the principal, reaction mechanism and illustrate applications of every experiment.
- 3) Understand, explains and apply various laboratory techniques for the synthesis of organic compounds. Students should familiar with various techniques of Purification of the synthesized compound using precipitation or recrystallization.

#### **Definition, General structure, classification, physical properties, Nomenclature (including poly functional groups and priority) of followings**

**1. Alcohol:**

**(04 hrs.)**

methods of preparations, hydration of alkene, reduction of carbonyl compounds, Grignards reagents, reactions with alkali metals, Grignard reagents, esterification, oxidation, catalytic dehydrogenation, formation of alkyl halide, dehydration (mechanism), test to distinguish between primary, secondary & tertiary alcohol, oxidation test, action of hot reduced copper, Victor Meyer test, Lucas test .

**2. Phenols :**

**(03 Hrs)**

Definitions, classification, physical properties, acidity of phenol, effect of substituent in the acidity of phenol, methods of preparation, Dow process, Cumene, diazonium salt, alkali fusion of sulphonate, reactions like Fries rearrangement, Kolbe reaction, Reimer Tiemann reaction, ether formation, condensation with phthalic anhydride

**3. Alkyl halides:**

**(5 hrs)**

Methods of preparation, general reactions, kinetics, mechanism and stereochemistry of SN1, SN2 and SNi reactions, factors affecting nucleophilic substitution reactions, Substitution Vs Elimination . Chemical identification tests

- 4. Aryl halide: (03 hrs.)**  
Definition, physical properties, preparation, Sand Meyer reaction, halogenation, nucleophilic aromatic substitution (bimolecular displacement mechanism), elimination- addition reaction (mechanism), formation of Grignard reagent and substitution reaction
- 5. Aldehydes and Ketones: (6 hrs)**  
general methods of preparation, mechanism of nucleophilic addition and condensation reactions; Reaction with sodium bisulfide, HCN, R-MgX, ammonia and ammonia derivatives, Addition of Grignard Reagents and hydrides, MPV reduction (mechanism), Clemmersons reduction, Wolf Kishner reduction (mechanism) Aldol condensation (mechanism), Cannizzaro's reaction, Perkin reaction and Mannich reaction. Chemical analysis of aldehydes and ketones
- 6. Carboxylic Acids (Aliphatic and aromatic): (4 Hrs)**  
structure of carboxylic acids, physical properties, acidity of carboxylic acids, effect of substituent on the acidity of carboxylic acid, methods of preparations, reactions, salt formation, conversion into various derivatives, reduction to alcohol, halogenation of aliphatic acid, Hell Volhard Zelinsky reaction (mechanism).
- 7. Amines - Aliphatic & aromatic: (5 Hrs)**  
Basicity of amines, factors affecting basicity of amines, stereochemistry of amines, methods of preparations from nitrobenzene, chlorobenzene, ammonia, carboxylic acid, reductive amination, reduction of nitrile and amides, reaction, Hofmann elimination, Hingberg reaction, ring substitution in aromatic amines, reaction with nitrous acid, synthesis of sulphanilamide, preparation of diazonium salt and conversion of diazonium salt to phenol, fluoro and nitro derivatives, formation azo compounds, replacement by hydrogen, Sand Meyer reaction.
- 8.  $\alpha,\beta$ - Unsaturated carbonyl compounds (02hrs)**  
Electrophilic addition reaction, nucleophilic addition reaction, Michael addition (mechanism)
- 9. Acetoacetic ester and malonic ester (02hrs)**  
Carbanion in Organic synthesis, malonic ester synthesis of Carboxylic acids, Acetoacetic ester synthesis of ketones, decarboxylation of beta keto & malonic acids
- 10. Miscellaneous (02hrs)**  
Thioesters, cyanides, anhydrides, amides ( at least two reactions from each)

#### Text Books:

1. Morrison and Boyd, Organic Chemistry, Prentice Hall of India (P.)Ltd.

#### Reference books:

- 1 Pine, Organic chemistry, McGraw Hill international.
- 2 Jerry March, Advance Organic Chemistry (Reaction, Mechanism & Structure), Willey Eastern Ltd.
- 3 Sachin Kumar Ghosh, General Organic Chemistry, New central book agency, Calcutta.
- 4 E.L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill Publishing company Ltd., New Delhi.
- 6 Peter Sykes, A Guidebook Reaction Mechanism in Organic Chemistry, Longman group Ltd.
- 7 I.L.Finar, Organic Chemistry, Vol. I: The Fundamental Principles, ELBS Publications.
- 8 Bahl & Bahl, Advanced Organic Chemistry, S Chand Publication.
- 9 Organic Chemistry by John Mc Murry, Fifth Edition, Brooks/Cole Thomson Learning.
- 10 Stuart Warren, Designing Organic Synthesis(John Wiley)
- 11 G.R.Chatwal, Reaction Mechanism and Reagents in Organic Chemistry, Himalaya publication.

### Course Content (Practical/Lab Work)

1. Elemental detection (Emphasis must be given on principles of reaction) (Minimum two)
2. Introduction to identification of Organic compound having different functional groups by qualitative analysis (This should include functional groups taught in theory such as aldehydes, ketones, phenols, carboxylic acid, alcohols and amines etc). (Minimum Eight)
3. Estimation of Functional groups (Minimum Three)
  - a. Estimation of Phenolic OH Group.
  - b. Estimation of Amide Group.
  - c. Estimation of Aliphatic amine/aromatic amine Group.
  - d. Estimation of Ketone Group.

#### **Recommended Reference Books:**

1. Mann, F. G. and Saunders, B. C. Practical Organic Chemistry, Orient Longman Ltd., New Delhi.
2. Donald L. Pavia, Gary M. Camp man, Georage S. Kriz. Introduction to Organic laboratory Techniques – a Contemporary Approach by, C.B.S. College Publishing, USA.
3. Brian Furniss, Antony Hannaford, Peter Smith, Austrin Vogel's Text Book of Practical Organic Chemistry , ELBS Publication, Singapore.
4. Shriner and Fuson, The Systematic Identification of Organic Compounds, Wiley.
5. Raj K Bansal, Laboratory Manual of Organic Chemistry, New Age International Publishers. New Delhi.
6. K.S. Jain, P.B. Miniyar, T.S. Chitre, Experimental Pharmaceutical Organic Chemistry, A benchtop Manual, Carrier Publication, Nashik.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Study of Crude Drugs  
**Subject Code/Paper No** : BPH25  
**Credits** : 03 (02T+01Pr)

### Course Objective:

The objective of the course is to identify, understand and conform the crude drugs by applying the systematic and scientific knowledge.

### Course Content (Theory)

Systematic Pharmacognostic study of following categories of crude drugs (Emphasis shall be given on Synonym, Biological Source, Morphology, Chemical Constituents, Identification, Uses, and Adulterants of the drug)

1. **Carbohydrates:-** Agar, Gum Acacia, Isbgol, Tragacanth, Honey, Guar Gum, Pectin, Starch, Sterculia, Bael. **(06 hours)**
2. **Lipids:-** Bees Wax, Cod-liver oil, Shark liver oil, wool fat, Castor oil, Cocum butter, linseed oil, rice bran oil, lard, Hydnocarpus oil. **(05 hours)**
3. **Tannins:-** Gambir, Black Catechu, Myrobalan, Behera. **(02 hours)**
4. **Resins and resin combinations:-** Asafoetida, Benzoin, Myrrh, Turmeric, Tolu balsam, Peru Balsam, Ginger, Podophyllum, Jalap, Colophony, Guggul, Capsicum, Cannabis, Musk, Shellac. **(09 hours)**
5. **Natural Fibers:-** Cotton, Jute, Silk, Wool, Hemp. **(02 hours)**
6. **Mineral Drugs:-** Bentonite, Kaolin, Kishelguhr, Talc, Shilajeet. **(02 hours)**

### TEXT BOOK:

1. C.K. Kokate, A.P. Purohit, S.B. Gokhale; Pharmacognosy; Nirali Prakashan, Pune.

### REFERENCE BOOKS:

1. Trease and Evans; Pharmacognosy, ELBS, London.
2. T.E. Wallis; Text book of Pharmacognosy; CBS Publishers & distributors, Delhi.
3. V.E. Tyler, L.R. Brady, J.E. Robbers; Pharmacognosy; Lea and Febiger, Bombay.
4. P.C. Vasishta; Taxonomy of Angiosperms; R. Chand & Company, New Delhi.
5. The Ayurvedic Pharmacopoeia of India; Part-I, Vol.I, 1<sup>st</sup> edition, Govt. of India.
6. M.K Gupta; Pharmaceutical Biology and Introductory Pharmacognosy; Pragati Prakashan, Meerut.

### Course Content (Practical/Lab Work)

1. **Identification of following categories of crude drugs by Morphological characteristics and chemical test.**(At list 04 drugs in one Practical) **(10 Practical)**
  - a) Carbohydrates and derived products:-
  - b) Tannins
  - c) Resin and Resin combinations
  - d) Lipids
  - e) Fiber
  - f) Mineral Drugs

2. **Preparation of Herbarium sheets.** (01 Practical)
3. **Visit to medicinal plant Garden and submitting report of the same.** (01 Practical)

**REFERENCE BOOKS:**

1. K.R. Khandelwal, Practical Pharmacognosy, Nirali Prakashan, Pune.
2. C.K. Kokate, Practical Pharmacognosy, Vallabh Prakashan, Delhi.
3. Wallis T.E., Practical Pharmacognosy, J.A. Churchill Ltd., London.
4. M.A. Iyngar, Pharmacognosy of Powdered crude drugs, Manipal.
5. Rasheeduz zafar; Practical Pharmacognosy; CBS Publisher & distributors, Delhi.

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Financial Management for Pharmacist  
**Subject Code/Paper No** : BPH26  
**Credits** : 02 (02T)

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### **Course Objectives:**

The course is designed to impart techniques of financial management which are often employed in running or managing the business enterprises. Students are expected to acquaint with financial management and regulatory guidelines.

### Course Content (Theory)

#### **1) Banking & Finance**

Indian financial institutions, Development of banking, Types of banks, Functions of commercial banks, Managing capital & its sources (4 hrs)

**2) Introduction to accounting**, Objective of accounting, Limitations of accounting, Branches of accounting, Accounting concepts and conventions, Book keeping & Double entry book keeping, Types of accounts. Books of original entry, Journal, Cash Book, General ledger and Trial balance. Some exercises solved (10-12 hrs)

**3) Introduction to financial management**, Advantages of financial statement, Limitations of financial statement, Profit and Loss Account and Balance Sheet preparation of final statements, Simple ratio techniques of analyzing financial statements. (7 hrs)

#### **4) Introduction of Budgeting**

Budget, budgeting & budgetary control, Preparation of budget for small & large organizations (2 hrs)

**5) Introduction to computerized accounting-** Demo & Project/ Assignments (1 hrs)

### **REFERENCE BOOKS:**

1. Norman V Carroll, Financial Management for Pharmacist, Lea & Febiger Ltd., UK
2. R.M. Mehata, Drug Store and Business Management, Vallabh Prakashan, Delhi.
3. Mohammed Ali, Jyoti Gupta, Drug Store and Business Management, CBS Publishers and Distributors, New Delhi.
4. Dr. Mahesh D. Burande, Principles and Practice of Drug Store Administration, Nirali Prakashan, Pune.
5. Dr. Mohan Singhal, Dr. Jai Dev, Drug Store and Business Management, S. Vikas and Company, Jalandhar.
6. Dr. Ashok Narkar, Book -Keeping & Accountancy, Reliable publications, Mumbai
7. A.P Battase, Drug store & Business management, Unique Publications, Aurangabad
8. Finance & Profit- Guide for Non Financial managers, N.J. Yaraswy, vision book's
9. publication, 2 edition, 2009

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# Swami Ramanand Teerth Marathwada University, Nanded

## First Year B. Pharmacy, IInd Semester

**Subject** : Introduction to Hospital Pharmacy  
**Subject Code/Paper No** : BPH27  
**Credits** : 02 (02T)

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### **Objective:**

The objective of the course is to know the principle duties of hospital pharmacist in health care system. This course deals with the current role of hospital pharmacist in supply and distribution of medications in hospital. The course also explains the correlation between the hospital pharmacist, physician and other technical staff in hospital. It also envisages the hospital and its organizational structure.

### Course Content (Theory)

- 1) Hospital pharmacy and its organization (02 hrs)  
Definition, objective, location and layout, organization pattern
- 2) The hospital and its organization (04 hrs)  
Definition, classification, administrative organisation, functions of hospital administrator, clinical and supportive services in hospital.
- 3) Drug Distribution systems (05 hrs)  
Definition and types of patients, location and layout of OPD, Different drug distribution systems for inpatients (individual prescription order system, complete floor stock order system, unit dose system, non floor stock system)
- 4) First Aid and surgical dressing (02 hrs)
- 5) Health related government policies, Health Insurance (01 hrs)
- 6) Health & Hygiene (02 hrs)
- 7) Patient records and billing systems (01 hr)
- 8) Role of Pharmacist- Clinical, Community, Locum Pharmacist. Role of Pharmacist in antibiotic resistance, Role of Pharmacist in current communicable and non communicable diseases. (03 hrs)
- 9) Drug Side effects and adverse drug reactions (ADR). Patient counselling and OTC products. (02 hrs)
- 10) Biological products (Blood and blood products) (02 hrs)

### **Text Book:**

- 1) A text book of Hospital Pharmacy by Merchant and Quadry, B.S. Shah Prakashan, Ahmadabad.

### **Reference Books:**

1. Remington's Pharmaceutical Sciences by Alfonso R. Gennaro, 19<sup>th</sup> edition, Mack Publishing Company, Pennsylvania.
2. Hospital Pharmacy by William E. Hasson Jr., 5<sup>th</sup> edition.
3. Practical Hospital and Clinical Pharmacy (ER 1991) by Dr, A.R. Paradkar, S.B. Gokhale, Mrs. Bapat

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