

PHARMACEUTICS – III (PHARMACEUTICAL ENGINEERING - I)

(BPH – 301)

Unit operations and processes, Material and energy balances, Dimensionless equations: formulas and groups.

UNIT - I

Pilot Plant Scale Up Techniques-

Concepts of pilot plant, scale up techniques in pharmaceutical industries.

Materials of Pharmaceutical Plant Construction-

Factors affecting the material selection for pharmaceutical plants, Physical: Chemical; Mechanical properties and use of the important materials of construction with special reference to Ferrous metals, Copper, Aluminum, Nickel, Glass, Plastics and their alloys, Heat and Corrosion resistant alloys.

Industrial Hazards and Safety measures-

Mechanical, Chemical, Electrical, Fire and Dust Hazards, Safety requirements, Legal requirements, Industrial dermatitis.

UNIT - II

Fluid Flow-

Fluid statics, Manometers, Types of flow, Reynolds Number and its significance, Concept of boundary layers, Bernoulli's theorem and its applications, Measurement of flow of – fluids, Valves.

Material Handling Systems-

Liquid handling: Different types of pumps.

Solid handling : Conveyors.

UNIT -III

Heat Transfer-

Heat transfer mechanisms, Heat transfer by conduction, Fourier's law, Natural and forced convection, Surface and overall heat transfer coefficients, Heat transfer by radiation, Heaters and heat exchangers.

Humidity, Air- Conditioning and Refrigeration

Basic concepts and definitions of various terms, Psychometric charts, Wet bulb theory, Measurement of humidity, Application of humidity measurement, air-conditioning and refrigeration in Pharmacy.

UNIT -IV

Corrosion and its Prevention –

General considerations of corrosion, Types of Corrosion, Methods of reducing Corrosion, Simple mathematical problems.

UNIT-V

Automated Process Control Systems:

Process variables, Temperature, Pressure, Flow, Level and Vacuum and their measurements.

Suggested Readings/ Books:

- Sinko PJ."Martin's Physical pharmacy & Pharmaceutical sciences", 5th edition, 2006, B.I. Publications Pvt Ltd, New Delhi. Carter SJ.
- "Cooper & Gunn's Tutorial Pharmacy", 6th edition, 200, CBS Publishers & Distributors, New Delhi. Remington's The Science & Practice of Pharmacy Mack Publishing Co. Easton,
- PA Gaud and Gupta " Practical Physical Pharmacy", I edition, reprint 2008, CBS Publisher and Distributor, New Delhi
- Subhramanyam CVS. "Textbook of Physical Pharmaceutics", 2nd edition , 2007, Vallabh Prakashan, New Delhi.
- S.J. Carter: Tutorial Pharmacy

List of Experiments

- Determine the pressure difference by simple and differential manometers.
- Determine the nature of flow of fluid and Reynolds Number by using Reynolds Apparatus.
- Determine the rate of flow of the given fluid by orifice meter.
- Determine the rate of flow of the given fluid by venturimeter.
- Determine the rate of heat transfer using different materials.
- Calculate the humidity at different places using dry bulb and wet bulb temperature method.
- Determine the corrosion rate of different materials
- Determine the corrosion rate of the metal in different environments.

PHARMACOGNOSY-II (BPH - 302)

UNIT - I

1) General Study of following.

- a) Pest and Pest Management, natural pest control agents.
- b) Plant hormones and their applications.
- c) Polyploidy, Mutation and hybridization with reference to medicinal plants.
- d) Poly Houses/ Green Houses for cultivation.

UNIT - II

- 2) Resins:** Study of Drugs Containing Resins and Resin Combination like Podophyllum, Cannabis, Capsicum, Myrrh, Asafoetida, Balsam of Tolu, Balsam of Peru, Benzoin, Turmeric, Ginger.
Tannins: Study of tannins and tannin containing drugs like Black catechu, Gall and Arjuna.

UNIT - III

- 3) Systematic Study of Crude Drugs:** Including synonyms, biological / geographical sources, identification, chemical constituents, chemical tests, uses, adulteration and evaluation of glycosidal and alkaloidal drugs of following groups:

a) Alkaloidal drugs:

Indole alkaloidal drugs: especially Ergot, Nux-vomica, Rauwolfia, Catharanthus.

Isoquinoline alkaloidal drugs: including Ipecac, Opium, Curare.

Tropane alkaloidal drugs: Stramonium, Hyoscyamus, Datura, Belladonna, Duboisia etc.

Quinoline alkaloidal drugs: including Cinchona.

Pyridine alkaloidal drugs: especially Areca, Lobelia, Nicotiana.

Imidazole alkaloidal drugs: including Pilocarpus.

Quinazoline alkaloidal drugs: including Vasaka.

Steroidal alkaloidal drugs: especially Ashwagandha, Kurchi, Veratrum, Solanum.

Proto-alkaloidal drugs: Ephedra, Colchicum etc.

Terpenoid alkaloidal drugs: including Aconite.

- b) Enzymes,** Biological sources, preparation, properties, identification tests and uses of Diastase, Papain, Pepsin, Trypsin and Pancreatin.

UNIT - IV

- 4)** Biological Source, identification characters chemical constituents and therapeutics uses of traditional drugs like: Kantkari, Satavari, Guduchi, Punarnava, Chitrak, Apamarga, Gokhru, Shankhpushpi, Adusa, Brahmi, Methi, Garlic Nagarmotha, Neem, Shilajit Kapur kachari, Acorus.

5) UNIT - V

- 6)** The holistic concept of drug administration in Ayurvedic and Traditional system of medicine. Introduction to preparations like Asava, Arishta, Tailas, Churnas, Lepas, Lehyas and Bhasmas and their evaluation schemes.

PHARMACOGNOSY II PRACTICALS

1. Perform macroscopic examination (Morphology and Organoleptic) of at least fifteen crude drugs mentioned in theory.
2. Perform microscopic studies of seven-selected crude drugs and their powders mentioned under the category of Alkaloids in theory and their chemical tests,
3. Perform identification test of some resin containing drugs at least three drugs (Capsicum, Myrrh, Balsam of Tolu, Benzoin, Asafoetida, Turmeric, Ginger).
4. Perform chemical tests to identify phytoconstituents present in unknown drug sample.
5. Determination of Leaf Constants.

PHARMACOGNOSY REFERENCE BOOKS

1. Evans WC. Trease and Evans Pharmacognosy. 15th ed. Philadelphia:Elsevier Science Ltd;2002.
2. Kokate CK, Purohit AR, Gokhale SB. Pharmacognosy. 45th ed. Pune:Nirali Prakashan;2010.
3. Shah BS, Qadry JS. Pharmacognosy. 12th ed. Ahmedabad:BS Shah Prakashan;2005.
4. Wallis TE. Textbook of pharmacognosy. 5th ed. London:JA Churchill Limited;1985.
5. Biren SN, Seth AK. Textbook of pharmacognosy and phytochemistry. 1st ed. New Delhi: A Division of Read Elsevier India Private Ltd; 2010.
6. Yoganarsimhan SN. Cultivation of medicinal & aromatic crops. 1st ed. Bangalore:Interline Publishing Private Ltd;2000.
7. The Wealth of India. A dictionary of Indian raw materials and industrial products (All Volumes). New Delhi:NISCAIR, CSIR; 2000.
8. Kokate CK. Practical Pharmacognosy. 4th ed. New Delhi:Vallabh Prakashan;1994.
9. Khandelwal KR. Practical pharmacognosy techniques and experiments. 16th ed. Pune;Nirali Prakashan;2006.
10. Iyengar MA, Nayak SGK. Anatomy of crude drugs. 8th ed. Manipal:Manipal Power Press; 2001.

PHARMACEUTICAL CHEMISTRY IV-(ORGANIC CHEMISTRY - II)

(BPH - 303)

Unit-I

Nomenclature of heterocyclic compounds: Trivial names, Systematic (Hantzsch-Widman) nomenclature of monocyclic compounds, Naming of fused ring systems (bicyclic and tricyclic systems).

Unit-II

Chemistry, preparation, properties and pharmaceutical applications of following Monocyclic rings:-

- i. 3-membered with one hetero atom: Aziridine
- ii. 4-membered with one hetero atom: Azetidine
- iii. 5-membered with one hetero atom: Pyrrole, Thiophene, Furan
- iv. 6-membered with one hetero atom: Pyridine, Pyran

Unit-III

Chemistry, preparation, properties and pharmaceutical applications of following Monocyclic rings:

- i. 5-membered with two or more hetero atoms: Imidazole, Pyrazole, Oxazole, Isoxazole, Thiazole, Isothiazole, Triazole, Tetrazole, Oxadiazole, Thiadiazole.
- ii. 6-membered with two or more hetero atoms: Pyrimidine

Unit-IV

Chemistry, preparation, properties and pharmaceutical applications of following Bicyclic rings:-

- i. 5-membered with one hetero atom: Indole
- ii. 5-membered with two or more heteroatoms: Benzimidazole, Benzopyrazole, Benzoxazole, Benzothiazole, Benzofuran
- iii. 6-membered with one hetero atom: Quinoline, Isoquinoline, Coumarin
- iv. 6-membered with two or more hetero atoms: Purine, Quinazoline Tricyclic rings: Acridine

Unit-V

Molecular Rearrangement Reactions:-

Pericyclic Reactions: Electrocyclic, Cycloaddition and Sigmatropic reactions (Cope rearrangement.) Benzoin condensation reaction, Reformatsky reactions, Beckmann rearrangement, Michael addition, Mannich reaction, Oppenauer oxidation, Claisen condensation, Knoevenagel condensation, Diels - Alder reaction and their applications.

RECOMMENDED BOOKS:

1. Organic Chemistry by R.T. Morrison and R.N.Boyd.(Prentice Hall of India, NewDelhi)
2. Advanced Organic Chemistry by B.S.Bahl and Arun Bahl.(S.Chand, New Delhi)
3. Bentley and Driver's Text Book of Pharmaceutical Chemistry.(Oxford UniversityPress, New Delhi)
4. Organic Chemistry – Reactions and Reagents by O. P.Agarwal.
5. Organic Chemistry by I.L. Finar Vol. I & Vol. II.(Longman, Singapore)
6. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scietific Technical
7. Heterocyclic Chemistry, Raj K Bansal, New age publication

PRACTICAL 3 hours/ week (A minimum of 10 experiments shall be conducted)

1. Preparation of organic compounds and their derivatives, crystallization and determination of their melting points.
2. Estimation of organic compounds using functional groups.
3. Experiments. on analysis of organic compounds containing two functional groups.

Pharmaceutical Microbiology

BPH - 304

Unit-I

1. **Introduction to microbiology;** Classification of microbes and their taxonomy, bacteria, viruses (DNA, RNA and retroviruses).

Unit-II

2. Nutrition, cultivation, isolation and identification of bacteria, viruses, protozoa and fungi.

Unit-III

3. Infection and factors influencing infection, immunity, Primary and Secondary defensive mechanism of body, Microbial resistance, Interferon.

Unit-IV

4. **Sterilization:** Different methods, evaluation of sterilization methods, sterility testing of pharmaceutical products as per I.P. and B.P. requirements. Sources of contamination and methods of prevention.

Unit-V

5. **Microbial diseases:** Brief outline of communicable diseases. Their causative agents, Mode of transmission and prevention – Chicken pox, Measles, influenza, Diphtheria, Whooping, cough, Tuberculosis, Poliomyelitis, Hepatitis, Cholera, Typhoid, Food poisoning, Helminthiasis, Malaria, Filariasis, Rabies, Trachoma, Tetanus, Syphilis, Syphilis, Gonorrhoea and AIDS. Microbial assay of antibiotics and vitamins.

LIST OF PRACTICALS

1. Preparation of various types of culture media.
2. Study the motility of the given sample of microorganism by hanging drop technique
3. Identify the given sample of organism by simple staining technique
4. Identify the given sample of organism by Gram staining technique
5. Identify the given sample of organism by negative staining
6. Evaluate the given sample of disinfectant by R.W. Coefficient test
7. Determine the sterility of the given sample by filtration method
8. Determine the sterility of the given sample by direct inoculation method
9. Prepare subculture of the given sample of microorganism by aseptic transfer technique

Books Recommended

- 1) Microbiology, Pelzar & Reid
- 2) Pharmaceutical Microbiology, Malcolm and Harris
- 3) R.Anathanarayan and C. K.J. Panikar, Textbook of microbiology
- 4) S.S. Kori and M. A. Halkai, Pharmaceutical microbiology
- 5) W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications
- 6) Applied Microbiology for Pharmacy Biosciences by Vinita Kale and Kishore Bhusari, Himalaya Publishing House, Mumbai
- 7) Brock T D, Madigen M T Biology of Microorganism. Prentice Hall, New Jersey USA. Davis, Dulbetco, Eisen Microbiology
- 8) Hugo and Russel, Pharmaceutical Microbiology; Blackwell Scientific Publication
- 9) Practical Microbiology by R. S. Gaud and G. D. Gupta. 2nd Edition, Nirali Prakashan

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

BPH – 305

Unit-I

- 1. Central Nervous System:** Functions of different parts of brain and spinal cord.
Neurohumoral transmission in the central nervous system, reflex action, Cranial nerves and their functions.
Overview: CNS Disorder. Parkinson's, cerebral palsy, poliomyelitis multiple sclerosis, epilepsy, dyslexia, Trigeminal neuralgia, headache, Reyes syndrome, Alzheimer's disease, Neuritis, Sciatica.

Unit-II

- 2. Endocrine System:** Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, pancreas, testis and ovary; their hormones and functions.
Overview of Disorders of endocrine system:
Pituitary dwarfism, gigantism, acromegaly, diabetes, insipidus, cretinism, Myxedema, exophthalmic goiter, aldosteronism, Addison's disease, Cushing's syndrome, pheochromocytoma, Diabetes mellitus.

Unit-III

- 3. Reproductive System:** Anatomy of male & female reproductive system and their hormones, physiology of menstruation, coitus, infertilization, sex differentiation, spermatogenesis and oogenesis, pregnancy its maintenance and parturition.
Overview of Disorders of Reproductive systems: - Sexually transmitted diseases, Gonorrhoea, Syphilis, Genital herpes, Trichomoniasis, Prostatitis impotence, in fertility, Menstrual, abnormalities (Amenorrhoea, dysmenorrhoea) Ovarian cysts, endometriosis, Cervical cancer, prostate cancer, breast cancer.

Unit-IV

- 4. Urinary System:** Various parts, structures and functions of kidney and urinary tract, physiology of urine formation and acid-base balance.
Overview of Disorder of urinary system:- Gout, cystitis, nephrosis, Renal failure glomerulonephritis, Urinary tract infection.

Unit-V

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

BOOKS RECOMMENDED

1. Waugh, A. and Grant, A., Ross & Wilson Anatomy and Physiology in Health and Illness, Churchill Livingstone, New York.
2. Tortora, G.J. and Grabowski, S.R. Principles of Anatomy and Physiology, John Wiley & Sons, US.
3. Guyton, A.C. and Hall, J.E., Textbook of Medical Physiology, Harcour Pub. Asia PTE Ltd., Singapore.
4. Chourasia, B.D. Human Anatomy, CBS Publishers and Distributors, New Delhi.
5. Chatterjee, C.C., Human Physiology, Medical Allied Agency, Calcutta.
6. Murgesh, N. Basic Anatomy and Physiology, Sathya Publishers, Madurai.
7. Patel, N.M. and Goyal, R.K., Practical Anatomy and Physiology, B.S. Shah Prakashan Ahmedabad.
8. Kale, S. R., Kale, R.R., Practical Human Anatomy and Physiology, Nirali Prakashan

305P: ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION - II

1. Study and draw human central nervous system with the help of charts/models.
2. Study and draw human endocrine system with the help of charts/models.
3. Study and draw human reproductive system with the help of charts/models.
4. Study and draw human urinary system with the help of charts/models.
5. Study and draw human eye with the help of charts/models.
6. Study and draw human ear with the help of charts/models.
7. Study and draw human nose with the help of charts/models.
8. Study and draw human taste buds components with the help of charts/models.
9. Study and draw human skin components with the help of charts/models.
10. Determine the normal constituents of urine in the given sample of urine.
11. Determine the abnormal constituents of urine in the given sample of urine.
12. Study and draw the histological characteristics of urinogential organs with the help of permanent slides.
13. Study and draw the histological characteristics of endocrine glands with the help of permanent slides.