

Rajiv Gandhi Proudyogiki Vishwavidalaya, Bhopal (M.P.)

B. PHARMA-III SEMESTER

PHARMACEUTICS –III (PHARMACEUTICAL ENGINEERING -I)-PY 301

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

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.

Corrosion and its Prevention –

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

Industrial Hazards and Safety measures-

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

Fluid Flow-

Fluid statics, Manometers, Types of flow, Reynold's 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

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.

Automated Process Control Systems:

Process variables, Temperature, Pressure, Flow, Level and Vacuum and their measurements. Elements of computer aided manufacturing (CAM).

LIST OF PRACTICALS

1. Determine the corrosion rate of different materials
2. Determine the corrosion rate of the metal in different environments
3. Calibrate a venturimeter and interpret the energy losses graphically.
4. Determine the rate of heat transfer using different materials.
5. Calculate the humidity at different places using dry bulb and wet bulb temperature method.
6. Determine the overall heat transfer coefficient of the given condenser
7. Determine the water vapour permeability across the given packaging material.
8. Determine the nature of flow of fluid and Reynolds Number by using Reynolds apparatus.
9. Determine the rate of flow of the given fluid by orifice meter.
10. Determine the rate of flow of the given fluid by venturimeter
11. Determine the pressure difference by simple and differential manometers.
12. Correlate flow factors and Reynolds Number using given pipe line assembly.
13. Determine the enlargement losses contraction losses and friction losses in a fluid flowing through a pipe.
14. Calculate the coefficient of discharge at orifice using orifice meter.

Books Recommended:

1. J.F. Richardson and J.M. Coulson: Chemical Engineering
2. Walter L. Badger and J.T. Banchero: Introduction to Chemical Engineering
3. Perry: Handbook of Chemical Engineering
4. Lauer & Heckmann: Chemical Engineering Techniques
5. Peters: Elementary Chemical Engineering
6. S.J. Carter: Tutorial Pharmacy
7. N.D. Bhatt: Elementary Engineering Drawing.
8. McCabe W.L. and Smith J.C. Unit Operation of Chemical Engineering Mc Graw Hill International Book Co., London.
9. Cooper and Gunn's Tutorial Pharmacy, CBS Publishers, New Delhi

ANATOMY PHYSIOLOGY & HEALTH EDUCATION- II (PY-302)

1. Digestive system –

Gross anatomy and histology of the gastrointestinal system, Functions of its different parts

Oral cavity, Oesophagus, Stomach, Pancreas, liver, gall bladder, small intestine, large intestine.

Various gastrointestinal secretions, its regulation and their role in the absorption and digestion of food.

Overview of Disorders of digestive system, dental, caries' disease, periodontal cirrhosis, hepatitis, gallstones, anorexia, peptic ulcers, appendicitis, gastrointestinal tumors.

2. Central Nervous System

Neurohumoral transmission in the CNS

Organization of nervous systems. Histology and physiology of neurons.

Structure and function of brain and spinal cord, specialized function of cranial and spinal nerves. Reflex action, Neurotransmitter in brain, Electroencephalogram.

Overview: CNS Disorder. Parkinson's, cerebral palsy, poliomyelitis multiple sclerosis, epilepsy, dyslexia, Trigeminal neuralgia, headache, Reyes syndrome, Alzheimer's Disease, Neuritis, Sciatica.

3. The sensory, motor and integrative systems.

4. Autonomic Nervous system

Structure and physiology of Autonomic nervous system (Sympathetic and parasympathetic).

Visceral autonomic reflexes, control by higher centers

5. Urinary System

Structure and functions of the kidney and urinary tract Physiology of urine formation, acid-base balance.

Overview of Disorder of urinary system, Gout, cystitis, nephrosis Renal failure, glomerulonephritis, Urinary tract infection.

6. Endocrine system

Endocrine glands, chemistry of hormones, mechanism of hormonal action, control of hormonal secretion (Feed back mechanism) Anatomy and physiology of Pituitary, thyroid, Parathyroid, Adrenals, Pancreas, ovaries, testes, thymus, Pineal, 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.

7. Reproductive system

Structure and function of male reproductive system testes, ductus epididymis vas deferens, ejaculatory duct, urethra, seminal vesicles, prostate, gland, bulbourethral, glands, penis, Hormones of male system and their regulation. Spermatogenesis, semen Structure and function of female reproductive system, ovaries, uterine tubes, Vagina, Vulva, mammary glands, Endocrine relations' Menstrual and ovarian cycles Oogenesis, coitus, Fertilization, pregnancy – its maintenance and parturition.

Overview of Disorders of Reproductive systems: - Sexually transmitted diseases

Gonorrhea, Syphilis, Genital herpes, Trichomoniasis, Prostatitis impotence, infertility, Menstrual, abnormalities (Amenorrhea, dysmenorrhea) Ovarian cysts, endometriosis, cervical cancer, prostate cancer, breast cancer.

8. Sense Organ

Basic anatomy, Physiology of eye (Vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors).

List of Practicals:

1. To study human digestive system with help of chart and models and study histology of salivary glands, esophagus, stomach, Pancreas, liver, small intestine, large intestine.
2. To study human urinary system with help of chart and models study histology of nephron, urinary bladder, Ureter

3. To study male and female reproductive system with help of chart and models and study histology of testes, ductus, epididymis, ovary, uterus, mammary glands.
4. To study brain and spinal cord with help of chart and models and study histology of cerebrum, cerebellum, spinal cord
5. To study structure and physiology of special senses
6. To study structure and physiology of Eye
7. To study structure and physiology of Ear
8. To study structure and physiology of Skin
9. To study structure and physiology of Taste buds
10. To study structure and physiology of Nose
11. To perform urine analysis for physiological (normal) constituent present in urine sample
12. To study pathological (abnormal) constituent in the urine sample.
13. To perform quantitative test for presence of glucose in urine sample

Books Recommended

1. Gerard J. Tortora and Nicholas P. Anagnostakos ; Principles of Anatomy and physiology. Harper and Row publishers, New York.
2. Sujit K. Chaudhuri: Concise Medical Physiology.
3. C.C. Chatterjee: Human Physiology.
4. Kathleen J.W., Wilson Ross and Wilson: Anatomy and Physiology in Health and Illness
5. Arthur C. Guyton: Textbook of Medical Physiology.
6. Cyril A. Keele, Erie Neil, Norman Joels and Samson Wrights: Applied Physiology
7. Chatterjee, C.C, **Human Physiology**, Medical allied agency, Calcutta.
8. Shalya, Subhas, **Human Physiology** CBS publisher Delhi.
9. Ross and Wilson, **Human anatomy and Physiology**, Churchill Livingstone London.
10. Chaurasia, B.D, **Human anatomy, Regional and applied.** , CBS publisher New Delhi

PHARMACEUTICAL CHEMISTRY IV (ORGANIC CHEMISTRY II) - PY-303

1. Photochemistry and Pericyclic reaction

Theory-energy transfer-characteristics of photoreactions – typical photoreaction. Electrocyclic reaction–sigmatropic rearrangement cycloaddition reactions. Neighboring group effect, Catalysis by transition metal complexes.

2. Heterocyclic Chemistry

Nomenclature of Heterocycles

Nomenclature (Hantzsch-Widman system) for monocyclic (three, four, five, six and large membered), fused and bridged heterocycles.

Aromatic and Non-aromatic Heterocycles

General chemical behaviour of aromatic heterocycles, classification (structural type), Heteroaromatic reactivity and tautomerism in aromatic heterocycles, Strain–bond angle and torsional strains and their consequences in small ring heterocycles

Synthesis, chemical reactivity and medicinal application of the following heterocycles

Three and four-membered heterocycles: aziridines and azetidines

Five membered hetero cycles: Furan, thiophen, pyrrole, pyrazole, oxazole, imidazole, triazole.

Benzo-Fused Five-Membered Heterocycles: Benzimidazole, benzthiazole and benztriazole.

Six-Membered Heterocycles with One, Two or More Heteroatoms: Pyridine and Pyrimidine.

Fused heterocycles: Quinoline, isoquinoline, acridine, coumarins.

3. Organic Compounds with functional group containing nitrogen

Structure, nomenclature of nitro and cyano compounds.

Nitro compounds: Important methods of preparation, physical properties and chemical reactions.

Cyanides and isocyanides: preparation, physical properties and chemical reactions.

4. Structure, Nomenclature and reactivity of Sulphur containing compounds

List of Practicals:

1. Synthesis and Characterization of – Benzthiazole.
2. Synthesis and Characterization of Quinoline.
3. Synthesis and Characterization of Benzimidazole.
4. Synthesis and Characterization of triazoles.
5. Synthesis and Characterization of pyrimidines.
6. Synthesis and Characterization of acridines.
7. Synthesis and Characterization of coumarins.
8. Synthesis and Characterization of azipine.
9. Synthesis and Characterization of oxazole.
10. Synthesis and Characterization of picric acid.
11. Synthesis and Characterization of 3- nitro benzaldehyde.
12. Synthesis and Characterization of 2 – mercapto oxadiazole.
13. Synthesis and Characterization of thiazolidinedione.
14. To perform the reduction of aromatic nitro group 2- amino group (Nitro benzene to aniline, nitrobenzoic acid to amino benzoic acid, etc)

BOOKS RECOMMENDED:

1. The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
2. Heterocyclic Chemistry, J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
3. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical
4. Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Paudler, Wiley-Inter

Science.

5. Heterocyclic Chemistry Vol. 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer Verlag
6. An introduction to the Heterocyclic Compounds, R.M. Acheson, John Wiley
7. Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon
8. Natural Products: Chemistry and Biological Significance, J.Mann, R.S. Davidson, J.B.
9. Hobbs, D.V. Banthorpe and J.B. Harborne, Longman, Essex.
10. Organic Chemistry, Vol 2, I.L. Finar, ELBS.
11. Stereoselective Synthesis: A Practical Approach, M. Nogradi, VCH
12. Name Reactions in Heterocyclic Chemistry by J. J. Li. Wiley, 2005.
13. Molecular Photochemistry, N.J. Turro, W.A. Benjamin
14. Introductory Photochemistry, A. Cox and T. Camp, McGraw Hill
15. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson

PHARMACEUTICAL MICROBIOLOGY - PY 304

1. Introduction to the Science of Microbiology: Historical development, contribution of great scientists and scope of microbiology.
2. Microbiology Taxonomy- Classification of Bacteria and Viruses
3. Identification of Microbes:

- Working of different types of microscopes, electron microscopy, stains and types of staining techniques.
- Structure and Morphology of bacteria and viruses.
- Nutritional requirements, Cultivation and isolation of bacteria and viruses.

4. Microbial genetics and variation.

5. Control of microbes by physical and chemical methods

- a. Disinfection: factors influencing disinfection, dynamics of disinfection.
- b. Disinfectants and antiseptics, and their evaluation
- c. Sterilization: Different methods, Validation of sterilization methods and equipments.

6. Sterility testing of pharmaceutical products.

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

8. 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, Gonorrhoea and AIDS.

Microbial assay of antibiotics and vitamins.

Food spoilage and Preservation of food.

Sewage and Sewage disposal: Industrial Sewage, Sewage treatment methods, BOD, COD etc.

LIST OF PRACTICALS

(All practicals are compulsory)

1. Study the motility of the given sample of microorganism by hanging drop technique.
2. Identify the given sample of organism by simple staining technique
3. Identify the given sample of organism by Gram staining technique
4. Identify the given sample of organism by negative staining.

5. Identify the bacteria by performing IMViC test.
6. Prepare various types of culture media (Nutrient broth, nutrient agar, fluid thioglycolate media etc)
7. Prepare subculture of the given sample of microorganism by aseptic transfer technique.
8. Evaluate the given sample of disinfectant by R.W. Coefficient test.
9. Determine the sterility of the given sample by filtration method.
10. Determine the sterility of the given sample by direct inoculation method.
11. Evaluate the given sample of an antibiotic microbiologically by filter paper disc method.
12. Evaluate the given sample of an antibiotic microbiologically by cup plate method.
13. Assay the given sample of vitamin microbiologically.

.Books Recommended

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
3. Gilbert S.Banker and Christopher T. Rhodes: Modern Pharmaceutics.
4. Remington's Pharmaceutical Sciences.
5. Pelczar and Reid: Microbiology.
6. Dawson and Mirne: Immunological and Blood products.
7. Rose: Industrial Microbiology.
8. Prescott and Dunn: Industrial Microbiology.
9. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
10. Cooper and Gunn's: Tutorial Pharmacy
11. Pepler: Microbial Technology.
12. I.P., B.P., U.S.P.- latest editions
13. Edward: Fundamentals of Microbiology
14. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi

PHARMACOGNOSY-II (Theory) -PY 305

1. General methods of, isolations classification chemical properties and chemical tests and systematic pharmacognostical studies of

a) Glycosides, and drugs belongs to this class: Liquorice, Ginseng, Dioscorea, Sarasaparilla, Senega, Digitalis, Squill, Rhubarb, Cascara, Aloe, Senna, Psorelea, Gentian, Saffron, Chirata, Quassia, Thevetia, Mustard, Picrorrhiza

b) Volatile oils and drugs belongs to this class: Dill, Fennel, Coriander, Caraway, Cassia bark, Cinnamon bark, Clove, Nutmeg, Cardamom, Musk, Palmrosa, Gaultheria, Valerian, Black Pepper, Lemon grass, Sandal wood Orange peel, Henna.

2. Enzymes, Biological sources, preparation, properties, identification tests and uses of Diastase, Papain, Pepsin, Trypsin and Pancreatin.

3. Plant bitters and Sweetners.

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. 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.

LIST OF PRACTICALS:

1. Morphological identification of Senna pod, Squill Aloe, Senega
2. Morphological identification of Satavari, Guduchi, Apamarga Gokharu
3. Morphological identification of Nagarmotha, Neem, Garlic, Methi seed
4. Morphological identification of Nutmeg, Cardamom fruits and seeds.
5. Morphological and Microscopical identification of Senna leaf.
6. Morphological and Microscopical identification of Liquorice.
7. Morphological and Microscopical identification of Rhubarb.
8. Morphological and Microscopical identification of Dill & Fennel.
9. Morphological and Microscopical identification of Caraway & Coriander.
10. Morphological and Microscopical identification of Cinnamon bark & clove.
11. Identify the given mixture/sample of powder drug by morphological, microscopical & chemical evaluation of senna cinnamon Rhubarb Coriander.
12. General studies of marketed formulations.

Books Recommended:

1. C.K. Kokate, Gokhale and Purohit, A Text Book of Pharmacognosy, Nirali Prakashan, Pune
2. S.S. Handa and V.K. Kapoor, Pharmacognosy, Vallabh Prakash, Delhi
3. G.E. Trease and W.C. Evans, Pharmacognosy (India Reprint J. P. Publication, Delhi)
4. T.E. Wallis, Text Book of Pharmacognosy, C.B.S. Publication, Delhi
5. V.E. Tylor, L.R. Brady & J.E. Robbers, Lea & Febiger Philadelphia, U.S.A.
6. C.K. Atal and B.M. Kapoor, Cultivation & Utilization of Aromatic Plants, Council of Scientific Industrial Research (CSIR) New Delhi
7. Medicinal Plant Glycosides – Sim, Toronto
8. C.S. Shah & J.S. Quadry, A Text Book of Pharmacognosy