

DIPLOMA IN PHARMACY - FIRST YEAR

S. No.	Name of Subject	Cred its	Total Marks
1	Pharmaceutics (T)	5	100
2	Pharmaceutical Chemistry (T)	5	100
3	Pharmacognosy (T)	5	100
4	Human Anatomy and Physiology (T)	5	100
5	Social Pharmacy (T)	5	100
6	Pharmaceutics (P+Tu)	5	100
7	Pharmaceutical Chemistry (P+Tu)	5	100
8	Pharmacognosy (P+Tu)	5	100
9	Human Anatomy and Physiology (P+Tu)	5	100
10	Social Pharmacy (Tu)	2	100
Total		47	

Subject Name: PHARMACEUTICS

Scope: This course is designed to impart basic knowledge on the art and science of formulating and dispensing of different dosage forms.

Objectives: Upon completion of the course, the student shall be able to understand

- The formulation aspects of different dosage forms
- The evaluation of pharmaceutical dosage forms the importance of good manufacturing practices.

Unit I

- History of profession of Pharmacy in India in relation to Pharmacy education, industry and associations.
- Pharmacy as a career
- Pharmacopoeia: Introduction to IP, BP, USP, NF and extra pharmacopoeia. Salient features of Indian Pharmacopoeia

Unit II

Prescription: Definition, significance, parts and handling of prescription.

Posology: Definition, factors affecting dose selection. Calculation of doses for infants & children based on age, body weight and body surface area

Unit III

Tablets – coated and uncoated

Capsules - hard and soft gelatin capsules

Liquid oral preparations- solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution

Topical preparations - ointments, creams, pastes, gels, liniments and lotions Suppositories and pessaries

Nasal preparations

Powders and granules - Insufflations, dusting powders, effervescent powders and effervescent granules

Sterile formulations – Injectables, eye drops and eye ointments

Pharmaceutical Aerosols: Definition, types of aerosol systems, propellants, containers and valves

Immunological products: Definition, classification of sera, vaccines, toxoids and storage conditions

Quality assurance: Definition and concept of quality control, quality assurance, good manufacturing practice (GMP), calibration and validation

Packaging materials: Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials

Pharmaceutical aids: Organoleptics and preservatives: Definition, types with examples and uses

Novel drug delivery systems: Introduction, Classification with examples

Practical

Formulation of the following dosage forms

- Liquid orals: Simple syrup, Piperazine citrate elixir, Aqueous Iodine solution, Strong Iodine solution
- Emulsion: Castor oil emulsion, Cod liver oil emulsion
- Suspension: Calamine lotion, Magnesium hydroxide mixture
- Ointments: Simple ointment base, Sulphur ointment
- Dry powder: Effervescent powder, Dusting powder,
- Sterile Injections: Calcium gluconate Injection
- Capsules: Indomethacin capsules, Tetracycline capsules

Demonstration for tablet manufacturing including all types of coated tablets

Demonstration of methods for evaluation of all types of above formulations as per IP

Recommended Books

1. History of Pharmacy in India by Dr. Harikishan Singh
2. Indian Pharmacopoeia, Govt. of India Publication
3. A Text book of Pharmaceuticals Formulation by B.M. Mithal, Vallabh Prakashan.
4. Bentleys' Text book of Pharmaceutics, 8th Edition, editor E.A. Rawlins, published by Elsevier Int.,
5. The Theory and Practice of Industrial Pharmacy. Leon Lachman, Herbert Lieberman and Joseph Kanig, Editors, Lea and Febiger, Philadelphia. Latest edition Verghese publishing House

Subject Name: PHARMACEUTICAL CHEMISTRY

Scope: This course is designed to impart basic knowledge on the chemistry of drugs and pharmaceuticals. The course gives knowledge of chemical structure, storage conditions and medicinal uses of organic and inorganic chemicals and quality control aspects of pharmaceuticals.

Objectives: Upon completion of the course, the student shall be able to understand

- the various impurities in pharmaceuticals and tests to identify them
- the chemical nature and medicinal uses of drug substances
- the storage conditions of pharmaceuticals
- the quantitative and qualitative analysis of official compounds

Unit I

Introduction to Pharmaceutical chemistry: Scope and objectives

Sources and types of errors: Accuracy, precision, significant figures.

Impurities in Pharmaceuticals: Source and effect of impurities in pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.

Unit II

Volumetric analysis: Fundamentals of volumetric analysis, Acid-base titration, Non- aqueous titration, precipitation titration, complexometric titration, redox titration Gravimetric analysis: Principle and method.

Unit IV

Inorganic Pharmaceuticals: Pharmaceutical formulations, storage conditions and uses of

- Haematinics: Ferrous sulphate, Ferrous gluconate
- Antacids: Aluminium hydroxide gel, Magnesium hydroxide
- Anti microbial agents: Hydrogen peroxide, Boric acid, Bleaching powder
- Dental products: Calcium carbonate, Sodium fluoride
- Medicinal gases: Carbon dioxide, nitrous oxide, oxygen

Unit IV

Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings

Unit V

Drugs acting on Central Nervous System

- **Anaesthetics:** Thiopental sodium*, Ketamine hydrochloride*.
- **Sedatives and Hypnotics:** Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital*,
Antipsychotics: Chlorpromazine hydrochloride*, Haloperidol*, Droperidol, Risperidone*, Sulperide*
- **Anticonvulsants:** Phenytoin*, Ethosuximide, Carbamazepine*, Clonazepam, Primidone, Valproic acid*, Gabapentin*
- **Anti-depressants:** Amitriptyline hydrochloride*, Imipramine hydrochloride*, Fluoxetine*.

Unit VI

Drugs acting on Autonomic Nervous System

- **Sympathomimetic agents:** Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine, Dopamine, Terbutaline, Salmeterol, Salbutamol, Albuterol, Naphazoline, Tetrahydrozoline, Oxymetazoline. Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexadrine. Agents with mixed mechanism: Ephedrine, Metaraminol.
- **Adrenergic Antagonists:** Alpha adrenergic blockers: Tolazoline, Phentolamine, Phenoxybenzamine, Prazosin, Doxazosin. Beta adrenergic blockers: Propranolol, Practolol, Acebutolol, Atenolol, Esmolol, Metoprolol, Labetolol and Carvedilol
- **Cholinergic drugs and related agents:** Direct acting agents: Acetylcholine, Carbachol, Bethanechol, Methacholine and Pilocarpine. Cholinesterase inhibitors: Neostigmine, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambinonium chloride, Pralidoxime chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.
- **Cholinergic Blocking agents:** Solanaceous alkaloids and analogues: Atropine sulphate, Homatropine hydrogen bromide, Ipratropium bromide. Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clindinium bromide, Dicyclomine hydrochloride, Procyclidine hydrochloride
- Tridihex ethylchloride, Isopropamide iodide, and Ethopropazine hydrochloride

Unit VII

Drugs acting on Cardiovascular System

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Verapamil, Diltiazem hydrochloride, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, amiodarone and Sotalol.

Anti-hypertensive Agents: Propranolol, timolol, Captopril, Lisinopril, Enalapril, Benzapril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride, Clonidine hydrochloride. Reserpine, Hydralazine hydrochloride, Nifedipine,

Antianginal agents: isosorbide dinitrate, amyl nitrite

Diuretics: acetazolamide, frusemide, bumetanide, chlorthiazide, benzthiazide, xipmide, spiranolactone

Hypoglycemic agents: insulin and its preparations, metformin, tolbutamide, glibenclamide, glipizide, Glimepiride, pioglitazone, ripaglinide

Analgesic and anti-inflammatory agents: Morphine analogues, Narcotic antagonists; Nonsteroidal anti-inflammatory agents (NSAIDs) aspirin, diclofenac, ibuprofen, piroxicam, celecoxib, mefenamic acid, paracetamol

Unit VII

Anti-infective agents

Antifungal agents: Amphotericin-B and Griseofulvin, Econazole nitrate, Miconazole, Ketoconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate.

Urinary tract anti-infective agents: Nalidixic Acid, Cinoxacin, Norfloxacin, Ciprofloxacin, Ofloxacin, Lomefloxacin, Sparfloxacin.

Anti-tubercular Agents: INH, Ethionamide, ethambutol, Pyrazinamide, Para amino salicylic acid, Rifampicin

Antiviral agents: Amantadine hydrochloride, Idoxuridine, Acyclovir, Gancyclovir, Foscarnet, Zidovudine, Lamivudine, Ribavirin

Antimalarials: Quinine sulphate, Chloroquine phosphate, Primaquine phosphate, Quinacrine hydrochloride, Mefloquine, Cycloguanil, proguanil, Pyrimethamine Sulfonamides: History and

development, mechanism of action sulfanilamide, sulfadiazine, sulfamethoxazole, sulfacetamide, mefenide acetate and cotrimoxazole

Antibiotics: Penicillin G, ampicillin, amoxicillin, cloxacillin, clavulanic acid, cephalosporins, streptomycin, neomycin, tetracycline, doxycycline, minocycline, erythromycin, azithromycin, chloramphenicol, clindamycin.

Anti-neoplastic agents: Meclorothamine, Cyclophosphamide, Busulfan, Thiotepea, Mercaptopurine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate, Azathioprine, Dactinomycin, Daunorubicin hydrochloride, Doxorubicin hydrochloride, Etoposide, Vinblastin sulphate, Vincristin sulphate, Cisplatin, Mitotane and bromostanolone propionate.

Practical

1 Limit tests

- Limit test for chlorides
- Limit test for sulphate
- Limit test for Iron
- Limit test for heavy metals

2 Identification tests for Anions and cations as per IP

3 Fundamentals of volumetric analysis

Preparation of standard solution and standardization of Sodium hydroxide, ceric ammonium sulfate, potassium permanganate

4 Assay of the following compounds

- Ferrous sulphate- by redox titration
- Calcium gluconate-by complexometry
- Sodium chloride-by Modified Volhard's method
- Ascorbic acid by cerimetry
- Metronidazole by Non Aqueous Titration
- Ibuprofen by alkalimetry

5 Fundamentals of preparative organic chemistry

Determination of Melting point and boiling point of organic compounds

6 Preparation of organic compounds.

- Acetanilide from aniline
- Aspirin from salicylic acid

7 Identification and test for purity of pharmaceuticals

Aspirin, caffeine, paracetamol, sulfanilamide

Subject Name: PHARMACOGNOSY

Scope: This course is designed to impart knowledge of medicinal uses of various naturally occurring drugs. It also emphasizes the study of evaluation of crude drugs, alternative system of medicine nutraceuticals and herbal cosmetics.

Objectives: Upon the completion of the course, the student shall be able to

- Identify the important crude drugs of natural origin
- Know the herbs used as nutraceuticals and cosmeceuticals
- Understand the principles of alternative system of medicines
- Understand the importance of quality control of drugs of natural origin

- 1 Definition, history, present status and scope of Pharmacognosy
- 2 **Classification of drugs:**
 - Alphabetical
 - Taxonomical
 - Morphological
 - Pharmacological
 - Chemical
 - Chemo-taxonomical
- 3 **Quality control of crude drugs:**
 - Different methods of adulteration of crude drugs
 - Evaluation of crude drugs
- 4 Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
- 5 Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.

Laxatives	- Aloe, Castor oil, Ispaghula, Senna
Cardiotonics	- Digitalis, Arjuna
Carminatives and G.I. regulators	- Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
Astringents	- Myrobalan, Black Catechu
Drugs acting on nervous system	- Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca
Anti-hypertensive	- Rauwolfia
Anti-tussives	- Tolu Balsam
Anti-rheumatics	- Colchicum seed
Anti-tumor	- Vinca, Podophyllum
Anti-leprotics	- Chaulmoogra oil
Antidiabetics	- Pterocarpus, Gymnema
Diuretics	- Gokhru, Punarnava
Anti-dysentrics	- Ipecacuanha
Antiseptics and disinfectants	- Benzoin, Myrrh, Neem, Turmeric
Antimalarials	- Cinchona, Artemisia
Oxytocics	- Ergot
Vitamins	- Cod liver oil, Shark liver oil
Enzymes	- Papaya, Diastase, Pancreatin,
Yeast Pharmaceutical Aids	- Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatin
Miscellaneous	- Squill, Galls, Pale catechu, Aswagandha, Vasaka, Tulsi, Guggul

- 6 **Plant fibers used as surgical dressings:** Cotton, silk, wool and regenerated fibers
Sutures – Surgical Catgut and Ligatures
- 7 **a. Basic principles involved in the alternative system of medicine like:** Ayurveda, Sidha, Unani and Homeopathy
b. Method of preparation of Ayurvedic formulations in like: Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma
- 8 Role of medicinal and aromatic plants in national economy and their export potential
- 9 **Herbs as health food:**
Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibers, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic
- 10 **Herbal cosmetics:**
Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of : Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil

Practical

- 1 **Morphological Identification of drug:** Ispaghula, Senna, Coriander, Fennel, Cardamom, Ginger, Nutmeg Black Pepper, Cinnamon, Clove, Ephedra, Rauwolfia, Gokhru, Punarnava, Cinchona, Agar.
- 2 **Gross anatomical studies (Transverse Section) of the following drugs:** Senna, Datura, Cinnamon, Cinchona, Coriander, Fennel, Clove, Ginger, Nuxvomica, Ipecacuanha.
- 3 **Physical and chemical tests for evaluation of drugs** Asafoetida, Benzoin, Pale catechu, Black catechu, Castor oil, Acacia, Tragacanth, Agar, Guar gum, Gelatin.

Recommended Books

1. Text book of Pharmacognosy by C. K. Kokate, S. B. Gokhale, A.P. Purohith, Nirali Prakashan
2. Text book of Pharmacognosy by C.S. Shah and J. S. Quadry, CBS Publishers & Distributors Pvt. Ltd.
3. Text Book of Pharmacognosy by T. E. Wallis. CBS Publishers & Distributors Pvt. Ltd.
4. Study of crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal
5. Powder crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal
6. Anatomy of crude drugs by M. A. Iyengar, Manipal Press Ltd, Manipal

Subject Name: HUMAN ANATOMY AND PHYSIOLOGY

Scope: This course is designed to impart basic knowledge on the structure and functions of the human body. It helps in understanding both homeostasis mechanism and homeostatic imbalances of various systems of human body.

Objectives: Upon the completion of the course, the student shall be able to

- Understand the structure and functions of the various organs of the human body
- Understand the various homeostatic mechanisms and their imbalance
- Perform the haematological tests and also record the blood pressure, heart rate, pulse rate and respiratory volumes

1. **Scope of Anatomy and Physiology.** Definition of various terminology

2. **Structure of Cell:** components and its functions
3. **Tissues of the human body:** Epithelial, Connective, Muscular and Nervous tissues – their sub-types and characteristics.
4. a) **Osseous system :** structure and functions of bones of axial and appendicular skeleton
b) Classification, types and movements of joints, disorders of joints
5. **Haemopoetic system**
 - Composition and functions of blood
 - Process of Haemopoiesis
 - Characteristics and functions of RBC's, WBC's and platelets
 - Mechanism of Blood Clotting
 - Importance of Blood groups
6. **Lymphatic system**
 - Lymph and lymphatic system, composition, function and its formation.
 - Structure and functions of spleen and lymph node.
7. **Cardiovascular system**
 - Anatomy and Physiology of heart
 - Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
 - Cardiac cycle and Heart sounds, Basic knowledge of ECG
 - Blood pressure and its regulation
8. **Respiratory system**
 - Anatomy of respiratory organs and their functions.
 - Regulation of respiration.
 - Respiratory volumes and capacities (definition)
9. **Digestive system**
 - Anatomy and Physiology of GIT.
 - Anatomy and functions of accessory glands.
 - Physiology of digestion and absorption
10. **Skeletal muscles**
 - Histology
 - Physiology of muscle contraction
 - Disorder of skeletal muscles
11. **Nervous system**
 - Classification of nervous system
 - Anatomy and physiology of cerebrum, cerebellum, mid brain
 - Function of hypothalamus, medulla oblongata and basal ganglia
 - Spinal cord-structure and reflexes
 - Names and functions of cranial nerves.
 - Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS)
12. **Sense organs**
Anatomy and physiology of

- Eye,
- Ear,
- Skin
- Tongue and nose

13. Urinary system

- Anatomy and physiology of urinary system
- Physiology of urine formation
- Renin - angiotensin system
- Clearance tests and micturition.

14. Endocrine system (Hormones and their functions)

- Pituitary gland
- Adrenal gland
- Thyroid and parathyroid gland
- Pancreas and gonads

15. Reproductive system

- Anatomy of Male and female reproductive system
- Physiology of menstruation
- Spermatogenesis and Oogenesis
- Pregnancy and parturition

Practical

1. Study of compound microscope
2. General techniques for the collection of blood
3. Microscopic examination of Epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, connective tissue and Nervous tissue.
4. Study of Human Skeleton-Axial skeleton and appendicular skeleton
5. Study of appliances used in Haematological experiments
6. Determination of
 - a. Blood group
 - b. ESR
 - c. Haemoglobin content of blood
 - d. Bleeding time and Clotting time
7. Determination of WBC count of blood
8. Determination of RBC count of blood
9. Determination of Differential count of blood
10. Recording of Blood Pressure
11. Recording of Body temperature, Pulse rate and Heart rate
12. Study of various systems and organs with the help of chart, models and specimen
 - a) Cardiovascular system

- b) Respiratory system
- c) Digestive system
- d) Urinary system
- e) Endocrine system
- f) Reproductive system
- g) Nervous system
- h) Eye
- i) Ear
- j) Skin

Recommended Books:

1. Human Physiology by C. C. Chatterjee.
2. Human Anatomy and Physiology by S. Chaudhary and A. Chaudhary.
3. Derasari and Gandhi's elements of Human Anatomy, Physiology and Health Education.
4. S.R. Kale and R.R. Kale, Textbook of Practical Anatomy and Physiology.
5. Ross and Wilson Anatomy and Physiology in Health and illness.
6. Human Anatomy and Physiology by Tortora Gerard J.
7. Fundamentals of medical Physiology by K.Sambulingam and Prana Sambulingam.
8. Ranade V.G. Text book of Practical Physiology.
9. Goyal R.K., Natvar M.P. and Shah S.A., Practical Anatomy, Physiology and biochemistry, Experimental Physiology.

Subject Name: SOCIAL PHARMACY

Scope: This course is designed to impart basic knowledge on public health, safe use of medicines, smoking cessation, health promotion, immunisation, de-addiction, abuse and misuse of drugs.

Objectives: Upon completion of the course, the student shall be able to understand

- The disease preventive measures
- Health promotion and education
- The social responsibility of the pharmacist in public health

1. Introduction to Social Pharmacy

- Definition and Scope. Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacist in Public Health.
- Concept of Health-WHO Definition, various dimensions, determinants, and health indicators.
- National Health Policy

2. Preventive care

- Demography and Family Planning.
- Mother and child health, importance of breastfeeding, ill effects of weaning foods and bottle feeding

- Vaccines and immunizations
- Effect of Environment on Health– Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses
- Psychosocial Pharmacy: Drugs of misuse and abuse – psychotropics, narcotics, alcohol, tobacco and tobacco products. Social Impact of these habits on social health and productivity
- Personal hygiene and sanitation in reproductive age group
- Role of pharmacist in preventive care

3. Nutrition and Health

- Basics of nutrition – Macronutrients and Micronutrients
- Fibre diet– importance and sources (Plant and animal origin),
- Calorific and nutritive values of various foods
- Balanced diet, nutrition deficiency diseases, ill effects of junk foods
- Genetically modified foods – Definition, advantages, disadvantages
- Ill effects of artificial ripening, hybridization, use of pesticides, adulteration of foods.
- Nutrition/dietary recommendation for diabetes, blood pressure, Hyperlipidemia, arthritis, renal disease, liver disease.
- Artificial sweeteners, zero calorie concept, glycemic index of foods
- Dietary supplements, nutraceuticals, food supplements, – indications, benefits, Drug - Food Interactions

4. Health Promotion and Health education

Epidemiology of Communicable Diseases: Causative agents and Clinical presentations and Role of Pharmacist in educating the public in prevention of communicable diseases:

- Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis
- Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrhoeal diseases, typhoid, food poisoning, amebiasis, worm infestations
- Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya
- Surface infections – trachoma, tetanus, leprosy, STDs, HIV/AIDS

5 Introduction to health systems and National health programs in India. Basics of disaster management.

Recommended Books

1. Social Pharmacy – Innovation and development ed. Geoff Harding, Sarah Nettleton and Kevin Taylor. The Pharmaceutical Press.
2. Text Book of Community Pharmacy Practice. RPSGB Publication
3. Community Pharmacy Handbook- Jonathan Waterfield
4. S.Khurana, P Suresh and R Kalsi. Health Education & Community Pharmacy. S Vikas & Co
5. Social Pharmacy: Tayler,Geoffery. Pharmaceutical Press. London.