

## Syllabus for Diploma in Pharmacy (Part II)

### 2.1 PHARMACEUTICS – II Theory (75 hours)

#### 1. Dispensing Pharmacy :

- (i) Prescriptions – Reading and understanding of prescription; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
- (ii) Incompatibilities in Prescriptions – Study of various types of incompatibilities – physical, chemical and therapeutic.
- (iii) Posology – Dose and Dosage of drugs, Factors influencing dose, Calculations of doses on the basis of age, sex and surface area. Veterinary doses.

#### 2. Dispensed Medications

**Note:** A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures. Special labeling requirements and storage conditions should be high – lighted.

- (i) Powders – Types of powders – Advantages and disadvantages of powders, Granules, Cachets and Tablet triturates. Preparation of different types of powder encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.
- (ii) Liquid oral Dosage Forms :
  - (a) Monophasic – Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, cp;piramts amd f;avpirs, with examples.

Review of the following monophasic liquids with details of formulation and practical methods.

- (b) Biphasic Liquid Dosage Forms :
  - (i) Suspensions (elementary study) - Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvants used like thickening agents, wetting agents, their necessity and quantity to be incorporated. Suspensions of precipitate forming liquids like tinctures, their preparations and stability. Suspensions produced by chemical reaction. An introduction to flocculated non – flocculated suspension system.
  - (ii) Emulsions – Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agents. Instabilities in emulsions. Preservation of emulsions.
  - (iii) Semi - Solid Dosage Forms :

- (a) Ointments – Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes;
  - (i) Trituration (ii) Fusion (iii) Chemical reaction (iv) Emulsification
- (b) Pastes – Difference between ointments and pastes, bases of pastes, Preparation of pastes and their preservation.
- (c) Jellies – An introduction to the different types of jellies and their preparation.
- (d) An elementary study of poultice.
- (e) Suppositories and pessaries – Their relative merits and demerits, types of suppositories, suppository bases, classification, properties, preparation and packing of suppositories. Use of suppository for drug absorption.

**(iv) Dental and Cosmetic Preparations**

Introduction to Dentrifices, Fancial cosmetics, Deodorants, antiperspirants Shampoos, and Hair

**(v) Sterile Dosage Forms :**

- (a) Parenteral dosage forms – definitions, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvants, processing, personnel facilities and quality control. Preparation of Intravebous fluids and admixtures – Total parenteral nutrition, Dialysis fluids.
- (b) Sterility testing, Particulate matter monitoring – Faculty seal packaging.
- (c) Ophthalmic Products – Study of essential characteristics of different ophthalmic preparations. Formulations additives, special precautions in handling and storage of ophthalmic products.

**PRACTICAL (100 hours)**

Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsions, lotions, liniments, E.N.T. preparations, ointments, suppositories, powders, incompatible prescriptions etc. Book recommended : (Latest editions)

- 1 Indian Pharmacopoeia.
- 2 Britiesh Pharmacopoeia.
- 3 National Formularies (N.F.I., B.N.F.)
- 4 Remington’s Pharmaceutical Sciences.
- 5 Martindale Extra Pharmacopoeia.

## 2.2 PHARMACEUTICAL CHEMISTRY II Theory (100 hours)

1 Introduction to the nomenclature of organic chemical systems with particular reference to heterocyclic system containing up to 3 rings.

2 The chemistry of following Pharmaceutical organic compounds, covering their nomenclature, chemical structure uses and the important Physical and Chemical properties Chemical structure of only those compounds marked with

The stability and storage conditions and the different type of Pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants – Proflavine, “Benzal – koniumchloride, Cetrinide, Chlorocresol”, Chloroxylenol, Formaldehyde solutions Hexachlorophene, Liquified phenol, Nitrofurantoin.

Sulfonamides – Sulfadiazine, Sulfaguanidine.

Phthalylsulfathiazole, Succinylsulfathiazole, Sulfadimethoxine, Sulfamethoxyipyridazine, Sulfamethoxazole, Co-trimoxazole, Sulfacetamide.

Antileprotic Drugs – Clofazimine, Thiambutosine, Dapsone, Solapson.

Anti – tubercular Drugs – Isoniazid “PAS” Streptomycin, Rifampicin, Ethambutol, Thiacetazone, Ethionamide, Cycloserine, Pyrazinamide.

Antiamoebic and Anthelminthic Drugs – Emetine, Metronidazole, Halogenated hydroxyquinolines, diloxanid furoate, Paramomycin Piperazine, Mebendazole, D.E.C.

Antibiotics – Benzyl Penicillin, Phenoxy methyl Penicillin, Benzathine Penicillin, Ampicillin, Cloxacillin, Carbenicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine Cephalothin, Grisofulvin, Chloramphenicol.

Antifungal agents – Undecylenic acid, Tolnaftate, Nystatin Amphotericin, Flucanazole.

Antimalarial Drugs – Chloroquine Amodiaquine, Primaquine Proguanil, Pyrimethamine, Quinine, Trimethoprim.

Tranquilizers – Chlorpromazine, Prochlorperazine, Trifluoperazine, Thioridazine, Haloperidol.

Triperidol, Oxypertine, Chlordiazepoxide, Diazepam, Lorazepam, Meprobamate.

Hypnotics – Phenobarbitone, Butobarbitone, Cyclobarbitone, Nitrazepam, Glutethimide, Methyprylon, Paraldehyde, Triclofos sodium.

General Anaesthetics – Halothane, Cyclopropane, Diethyl ether, Methohexital Sodium, Thiopental Sodium, Troc;prpetju;eme.

Antidepressant Drugs – Amitriptyline, Nortriptyline, Imipramine, Phenelzine, Tranylcypromine

Analeptics – Theophylline, Caffeine, coramine, Dextroamphetamine.

Adrenergic drugs – Adrenaline, Noradrenaline, Isoprenaline, Phenylephrine, Salbutamol, Terbutaline, Ephedrine, Pseudoephedrine.

Adrenergic Antagonist – Tolazline, Propranolol, Practolol.

Cholinergic Drugs – Neostigmine, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine.

Cholinergic Antagonists – Atropine, Hyoscine, Homatropine, Propantheline, Benztropine, Tropicamide, Biperiden.

Diuretic Drugs – Furosemide, Chlorothiazide, Hydrochlorothiazide, Benzthiazide, Urea, Mannitol. Ethacrynic Acid.

Cardiovascular Drugs – Ethyl nitrite, Glyceryl trinitrate, Alpha methyl dopa, Guanethidine, Clofibrate. Quinidine.

Hypoglycemic Agents – Insulin, Chlorpropamide, Tolbutamide, Glibenclamide, Phenformin, Metformin.

Histamine and Anti histaminic Agents- Histamine, Diphenhydramine, Promethazine, Cyproheptadine, Mepyramine, Pheniramine, Chlorphemiramine.

Analgesics and Anti – pyretics – Morphine, Pethidine, Codeine, Methadone, Aspirin, Paracetamol, Analgin, Dextropropoxyphene, Pentazocine.

Non – steroidal Anti – inflammatory Agents – Indomethacin, Phenylbutazone, Oxyphenbutazone, Ibuprofen, Antithyroids – Thyroxine, Methimazole, Methylthiouracil, Propylthiouracil.

Diagnostic Agents- Iopanoic Acid. Propyliodone, Sulfobromophthalein.

Sodium indigotindisulfonate, Indigo carmine, Evans blue, Congo Red, Fluorescein Sodium.

Anticonvulsants, Cardiac glycosides, Antiarrhythmic antihypertensives & vitamins.

Steroidal Drugs – Actinomycins, Azathioprine, Busulfan, Chlorambucil, Cisplatin cyclophosphamide, Daunorubicin hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

**Books Recommended :** (Latest editions)

1. Pharmacopoeia of India
2. British Pharmaceutical Codex.
3. Martindale the extra pharmacopoeia

**PRACTICAL** (75 hours)

1. Systematic qualitative testing of organic drugs involving solubility determination. Melting point and boiling point, detection of elements and functional groups (10 compounds).
2. Official identification test for certain groups of drugs included in the I.P. like barbiturates, sulfonamides, phenothiazine. Antibiotics etc. (8 compounds).
3. Preparation of three simple organic preparations.

**2.3 PHARMACOLOGY & TOXICOLOGY** Theory (75 hours)

1. Introduction to Pharmacology, scope of Pharmacology.
2. Routes of administration of drugs, their advantages and disadvantages.
3. Various processes of absorption of drugs and the factors affecting them, metabolism, distribution and excretion of drugs.
4. General mechanism of drug action and the factors which modify drug action.
5. Pharmacological classification of drugs. The discussion of drugs should emphasise the following aspect :
  - (i) Drugs acting on the Central Nervous System.
    - (a) General anaesthesia, adjunct to anaesthesia, intravenous anaesthetics.
    - (b) Analgesic antipyretics and non-steroidal anti-inflammatory drugs, Narcotic analgesics, Antirheumatic and antispasmodic remedies, sedatives and hypnotics Psychopharmacological agents, anti convulsants, analeptics.
    - (c) acting muscle relaxants and anti parkinsonism agents.
  - (ii) Local anaesthetics
  - (iii) Drug acting on autonomic nervous system.
    - (a) Cholinergic drug, Anticholinergic drugs, anti – cholinesterase drugs.
    - (b) Adrenergic drugs and adrenergic receptor blockers.
    - (c) Neurone blockers and ganglion blockers.
    - (d) Neuromuscular blockers, drugs used in myasthenia gravis.
  - (iv) Drugs acting on eye, mydriatics, drugs used in glaucoma.
  - (v) Drugs acting on respiratory system – Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

- (vi) Antacids, Physiological role of histamine and serotonin, Histamine and Antihistamines, Prostaglandins.
- (vii) Cardio Vascular drugs, cardiotonics antiarrhythmic agents, Antihypertensive agents, Peripheral Vasodilators and drugs used in arteriosclerosis.
- (viii) Drugs acting on the blood and blood forming organs Haematinics, Coagulants and anti – coagulants, Haemostatics, Blood substitutes and plasma expanders.
- (ix) Drugs affecting renal function – diuretics and antidiuretics.
- (x) Hormones and hormone antagonists- hypoglycemic agents, Antithyroid drugs, sex hormones and oral contraceptives, corticosteroids.
- (xi) Drugs acting on digestive system carminatives, digestants Bitters, Antacids and drugs used in Peptic ulcer, purgatives, and laxatives, Antidiarrhoeals, Emetics, Antimemetics, Anti-spasmodics.

Chemotherapy of microbial disease : Urinary antiseptics, sulphonamides, Penicillins, Streptomycin, tetracyclines and other antibiotics, Antitubercular agents, Antifungal agents, antiviral drugs, antileprotic drugs.

- 7. Chemotherapy of protozoal diseases. Anthelminthic drugs.
- 8. Chemotherapy of cancer.
- 9. Disinfectants and antiseptics.

A detailed study of the action of drugs on each organ is not necessary.

## PHARMACOLOGY

## PRACTICAL (50 hours)

The first six of the following experiments will be done by the students while the remaining will be demonstrated by the teacher.

1. Effect of  $K^+$ ,  $Ca^{++}$ , acetylcholine and adrenaline on frog's heart.
2. Effect of acetylcholine on rectus abdominis muscle of frog and guinea pig ileum.
3. Effect of spasmogens and relaxants on rabbits intestine.
4. Effect of local anaesthetics on rabbit's cornea.
5. Effect of mydriatics and miotics on rabbits eye.
6. to study the action of strychnine on frog.
7. Effect of digitalis on frog's heart.
8. Effect of hypnotics in mice.
9. Effect of convulsants and anticonvulsant in mice or rats.
10. Test for pyrogen.
11. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
12. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

### 2.4 PHARMACEUTICAL JURISPRUDENCE Theory (50 hours)

1. Origin and nature of pharmaceutical legislation in India, its scope and objective. Evolution of the "Concept of Pharmacy" as an integral part of the Health Care System.
2. Principles and significance of Professional Ethics. Critical study of the code of Pharmaceutical Ethics drafted by Pharmacy Council in India.
3. Pharmacy Act, 1948 – The general study of the Pharmacy Act with special reference to Education Regulations, working of State and Central Councils, constitution of these councils and functions, Registration procedures under the Act.
4. The drugs and cosmetics Act, 1940- General study of the drugs and cosmetics Act and the rules thereunder. Definitions and salient features related to retail and wholesale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licences under the rule. Facilities to be provided for running a Pharmacy effectively. General study of the schedules with special reference of schedules C, C1, F, G, J, H, P, and X and salient features of labeling and storage condition of drugs.
5. The drugs and magic remedies (Objectionable Advertisement) Act. 1954 – General study of the Act, Objectives, Special reference to be laid on Advertisements. Magic remedies and objectionable and permitted advertisements – disease which cannot be claimed to be cured.
6. Narcotic Drugs and Psychotropic Substances Act, 1985 – A brief study of the act with special reference to its objectives, offences and punishments.
7. Brief introduction to the study of the following acts.
  1. Latest Drugs (Price control) order in force.
  2. Poisons Act 1919 (as amended to date)
  3. Medicinal and Toiled Preparations (Excise Duties) Act, 1971 (as amended to date)
  4. Medical Termination of Pharmacy Act. 1971 (as amended to date)

#### **BOOKS RECOMMENDED** (Latest edition)

Bare – Acts of the said laws published by the Government.

## 2.5 DRUG STORE AND BUSINESS MANAGEMENT Theory (75 hours)

### Part – 1 Commerce (50 hours)

1. Introduction – Trade, Industry and Commerce, Functions and subdivision of commerce, Introduction to Elements of Economics and Management.
2. Forms of Business Organisations.
3. Channels of Distribution.
4. Drugs House Management – Selection of Site, Space lay – out and legal requirements.  
Importance and objectives of Purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto.  
Codification, handling of drug stores and other hospital supplies.
5. Inventory control – objects and importance, modern techniques like ABC, VED analysis, the lead time, Inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal.
6. Sales promotion, Market research Salesmanship, qualities of a salesman, Advertising and Window Display.
7. Recruitment, training evaluation and compensation of the pharmacist.
8. Banking and Finance Service and functions of bank, finance.

### Part II Accountancy (25 hours)

1. Introduction to the accounting concepts and conventions. Double entry Book keeping, Different kinds of accounts.
2. Cash Book.
3. General Ledger and Trial Balance.
4. Profit and Loss Account and Balance Sheet.
5. Simple technique of analyzing financial statements.

### Introduction to Budgeting

**Books Recommended** (Latest edition  
**Remington's Pharmaceutical Sciences.**

## 2.6

## HOSPITAL AND CLINICAL PHARMACY Theory (75 hours)

### Part – I : Hospital Pharmacy :

1. Hospital Definition, Function, Classifications based on various criteria, organization, Management and Health delivery system in India.
2. Hospital Pharmacy
  - (a) Definition
  - (b) Functions and objectives of Hospital Pharmaceutical Services.
  - (c) Location, Layout, Flow chart of material and men.
  - (d) Personnel and facilities requirements including equipments based on individual and basic needs.
  - (e) Requirements and abilities required for Hospital pharmacists.
3. Drug Distribution system in Hospital
  - (a) Out – patient services
  - (b) In – patient services (a) Types of Services (b) Detailed discussion of unit dose system, floor ward stock system.
4. Manufacturing
  - (a) Economical considerations estimation of demand.
  - (b) Sterile manufactures – large and small volume parenterals. Facilities, requirements layout production planning man power requirements.



- (c) Non-sterile manufacture – Liquid orals externals bulk concentrates.
- (d) Procurement of stores and testing of raw materials.
- 5. Nomenclature and uses of surgical instruments and Hospital Equipments and health Accessories.
- 6. P.T.C. (Pharmacy Therapeutic Committee). Hospital Formulary system and their organization. Functioning, composition.
- 7. Drug Information service and Drug information Bulletin.
- 8. Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply e.g. I.V. sets B.G. sets, Ryals tubes, Catheters, Syringes etc.
- 9. Application of computer in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital and retail pharmacy establishments.

### **Part – II : clinical Pharmacy**

- 1. Introduction to Clinical pharmacy – Definition scope.
- 2. Modern dispensing aspects –Pharmacists and Patient counselling and advice for the use of common drugs, medication history.
- 3. Common daily terminology used in the Practice of Medicine.
- 4. Disease, manifestation and pathophysiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis Cardiovascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.
- 5. Physiological parameters with their significance.
- 6. Drug Interactions :
  - (a) Definition and introduction
  - (b) Mechanism of drug interaction.
  - (c) Drug - drug interaction with reference to analgesics, diuretics cardiovascular drugs, Gastro intestinal agents, vitamins and Hypoglycemic agents.
  - (d) Drug – food interaction.
- 7. Adverse Drug Reactions.
  - (a) Definition and significance.
  - (b) Drug – induced diseases and Teratogenicity.
- 8. Drugs in Clinical Toxicity – Introduction, general treatment of poisoning systematic antidotes. Treatment of insecticide poisoning, systematic antidotes, heavy metal poison, Narcotic drugs, Barbiturate, Organophosphorus poisons.
- 9. Drug dependence, Drug abuse, addictive drugs and their treatment, complications.
- 10. Bio – Availability of drugs, including factors affection it.

#### **Books recommended (latest editors)**

- 1. Remington's Pharmaceutical Sciences.
- 2. Martindale The Extra Pharmacopocia.

#### **PRACTICAL (50 HOURS)**

- 1. Preparation of transfusion fluids.
- 2. Testing of raw materials used in (1)
- 3. Evaluation of surgical dressings.
- 4. Sterilization of surgical instruments, glass ware and other hospital supplies.
- 5. Handling and use of data processing equipments.

#### **APPENDIX**

(See regulation 9)

### **CONDITIONS TO BE FULFILLED BY THE ACADEMIC TRAINING INSTITUTION**

Any authority in India applying to the Pharmacy Council of India for approval of courses of study for Pharmacists under sub-section (1) of section 12 of the Pharmacy Act, 1948 shall provide.

**(A) ACCOMMODATION**

Suitable and sufficient accommodation with adequate ventilation lighting and other hygienic conditions should be provided to the rooms for Principal/Head of the department, office, class room, library, staff, staff common room, students common room, museum, stores etc.

At least four laboratories specified below should be provided for :

1. Pharmaceutics Lab.
2. Pharm. Chemistry Lab
3. Physiology, Pharmacology and Pharmracognosy Lab.
4. Biochemistry Clinical Pathology, Hospital and Clinical Pharmacy Lab.

In addition to the laboratories balance room, aseptic room or cabinet, animal house, a machine room are also to be provided for

Floor area of the laboratory should not be less than 30 square feet per student required to work in the laboratory at any given time subject to a minimum of 500 square feet.

Laboratories should be fitted and constructed in a manner that these can be kept reasonably clean. Gas and water fittings, shelves, fume upboards be provided wherever necessary.

**EVALUATION PATTERN FOR DIPLOMA IN PHARMACY**

**1. EXAMINATIONS**

There shall be an examination for Diploma in Pharmacy (Part - I) to examine students of the first year course and an examination for Diploma in Pharmacy (Part - II) to examine students of the second year course. Each examination may be held twice every year. The first examination in a year shall be the annual examination and the second examination shall be supplementary examination of the Diploma in Pharmacy (Part - I) of Diploma in Pharmacy (Part - III), as the case may be. The examinations shall be of written and practical (including oral) nature, carrying maximum marks for each part of a subject, as indicated in Tables I and II.

**2. ELIGIBILITY FOR APPEARING AT THE DIPLOMA IN PHARMACY Part – I EXAMINATION**

Only such candidates who produce certificate from the Head of the Academic institution which he/she has undergone the Diploma in Pharmacy Part – I course, in proof of his/her having regularly and satisfactorily undergone the course of study by attending not less than 75% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at the Diploma in Pharmacy (Part I) examination.

**3. ELIGIBILITY FOR APPEARING AT THE DIPLOMA IN PHAMRACY PART – II EXAMINATION**

Only such candidates who produce certificate from the Head of the academic institution in which he/she has undergone the Diploma in Pharmacy part II course, in proof of his/her having regularly and satisfactorily undergone the Diploma in Pharmacy Part- II course by attending not less than 75% of the classes held both in theory and in practical separately in each subject shall be eligible for appearing at the Diploma in Pharmacy (Part - II) examination.