

**JODHPUR NATIONAL UNIVERSITY
JODHPUR**

Faculty of Pharmaceutical Sciences

D.Pharm.

Session 2009-2010

TABLE-I Diploma in Pharmacy (Part-I)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-I	75	3	100	4
Pharmaceutical Chemistry-I	75	3	75	3
Pharmacognosy	75	3	75	3
Biochemistry & Clinical Pathology	50	2	75	3
Human Anatomy & Physiology	75	3	50	2
Health Education & community pharmacy	50	2		
	400	16	375	15

TABLE-II Diploma in Pharmacy (Part-II)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-II	75	3	100	4
Pharmaceutical Chemistry-II	100	4	75	3
Pharmacology & Toxicology	75	3	50	2
Pharmaceutical Jurisprudence	50	2	-	
Drug store and Business Management	75	3	-	
Hospital & Clinical Pharmacy	75	3	50	2
	450	18	275	11

PLAN AND SCHEME OF EXAMINATION FOR THE DIPLOMA IN PHARMACY
(Based on effective teaching for 180 working days in one academic session)

Table-III Diploma in pharmacy (part-I) Examination

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	Sessional	Total	Examination	Sessional	Total
Pharmaceutics-I	80	20	100	80	20	100
Pharmaceutical Chemistry-I	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Biochem. & Clinical Pathology	80	20	100	80	20	100
Human Anatomy & Physiology	80	20	100	80	20	100
Health Education & community pharmacy	80	20	100			
			600			500

TABLE-IV Diploma in Pharmacy (Part-II)

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	Sessional	Total	Examination	Sessional	Total
Pharmaceutics-II	80	20	100	80	20	100
Pharmaceutical Chemistry-II	80	20	100	80	20	100
Pharmacology & Toxicology	80	20	100	80	20	100
Pharmaceutical Jurisprudence	80	20	100			
Drug store and Business Management	80	20	100			
Hospital & Clinical Pharmacy	80	20	100	80	20	100
			600			400

Note: Each paper shall consist of six questions out of which five shall be attempted. Half of the total number of papers in each year will be set and assessed by external examiners and the remaining half will be set and assessed by the internal examiners. There shall be one external and one internal examiner for each practical Examination.

SYLLABUS

DIPLOMA IN PHARMACY (PART-I)

1.1 PHARMACEUTICS I

Theory (75 Hours)

1. Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarization with new drug delivery systems.
2. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.
3. Metrology- System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products. Use of alligation method in calculations. Isotonic solutions.
4. Packaging of pharmaceuticals- Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.
5. Size reduction, objectives, and factors affecting size reduction, methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.
6. Size separation-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

7. Mixing and Homogenization- Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, Planetary Mixer; Agitated Powder mixer; Triple Roller Mill; Propeller Mixer, Colloid Mill and Hand Homogeniser. Double cone mixer.

8. Clarification and Filtration-Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, Sintered filters, Filter candles, Metafilter.

9. Extraction and Galenicals- (a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts. (b) Introduction to Ayurvedic dosage forms.

10. Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.

11. Distillation- Simple distillation and Fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of purified water I.P. and water for Injection I.P. construction and working of the still used for the same.

12. Introduction to drying process- Study of Tray Dryers; Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.

13. Sterilization-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process.

- (i) Sterilization with moist heat,
- (ii) Dry heat sterilization,
- (iii) Sterilization by radiation,
- (iv) Sterilization by filtration and
- (v) Gaseous sterilization.

Aseptic techniques- Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

14. Processing of Tablets- Definition; different type of compressed tables and their properties. Processes involved in the production of tablets; Tablets excipients; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be deal in an elementary manner).

15. Processing of Capsules- Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.

16. Study of immunological products like sera, vaccines, toxoids & their preparations.

PRACTICAL (100 hours)

Preparation (minimum number stated against each of the following categories illustrating different techniques involved.

1. Aromatic waters	3
2. Solutions	4
3. Spirits	2
4. Tinctures	4
5. Extracts	2
6. Creams	2
7. Cosmetic preparations	3
8. Capsules	2
9. Tables	2
10. Preparations involving	2
11. Ophthalmic preparations	2
12. Preparations involving aseptic techniques	2

Books recommended: (Latest editions)

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

1.2 PHARMACEUTICAL CHEMISTRY-I

THEORY (75 Hours)

1. General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

(A) Acids, bases and buffers- Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

(B) Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

(C) Gastrointestinal agents-

(i) Acidifying agents- Dilute Hydrochloric acid.

(ii) Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.

(iii) Protective and Adsorbents- Bismuth sub carbonate and Kaolin.

(iv) Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

(D) Topical Agents-

(i) Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.

(ii) Antimicrobials and Astringents- Hydrogen peroxide*, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone-iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury yellow, Mercuric oxide, Ammoniated mercury.

- (iii) Sulphur and its compounds- Sublimed sulphur, Precipitated sulphur, Selenium sulphide.
- (iv) Astringents- Alum and Zinc Sulphate.

(E) Dental Products- Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Di-calcium phosphate, Strontium chloride, Zinc chloride.

(F) Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

(G) Respiratory stimulants- Ammonium carbonate.

(H) Expectorants and Emetics- Ammonium chloride*, Potassium iodide, Antimony potassium tartrate.

(I) Antidotes- Sodium nitrite.

2. Major Intra and Extra cellular electrolytes-

(A) Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations.

(B) Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection.

(C) Combination of oral electrolyte powders and solutions.

3. Inorganic official compounds of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.

4. Radio pharmaceuticals and contrast media- Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media-Barium sulfate.

5. Quality control of Drugs and pharmaceuticals-Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.

6. Identification tests for cations and anions as per Indian Pharmacopoeia.

PRACTICAL (75 hours)

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.
2. Limit test for chloride, Sulfate, Arsenic, Iron and Heavy metals.
3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds marked with (*) under theory.
 - i. Acid-Base titrations(at least 3)
 - ii. Redox titrations (one each of permanganometry and iodimetry).
 - iii. Precipitation titrations (at least 2)
 - iv. Complexometric titration (Calcium and Magnesium).

Books recommended (Latest editions)

1. Indian pharmacopoeia.

1.3 PHARMACOGNOSY

THEORY (75 Hours)

1. Definition, history and scope of Pharmacognosy including indigenous system of medicine.
2. Various systems of classification of drugs and natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.
4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.
 - (a) **Laxatives**- Aloes, Rhubarb, Castor oil, Ispaghula, Senna.
 - (b) **Cardiotonics**- Digitalis, Arjuna.
 - (c) **Carminatives & G.I. regulators**- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper, Asafoetida, Nutmeg, Cinnamon, Clove.
 - (d) **Astringents**- Catechu.
 - (e) **Drugs acting on nervous system**- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux-vomica.
 - (f) **Antihypertensive**- Rauwolfia.
 - (g) **Antitussives**- Vasaka, Tolu balsam, Tulsi.
 - (h) **Antirheumatics**- Guggal, Colchicum.
 - (i) **Antitumour**- Vinca.
 - (j) **Antileptotics**- Chaulmoogra oil.
 - (k) **Antidiabetics**- Pterocarpus, Gymnema sylvestro.
 - (l) **Diuretics**- Gokhru, Punarnava.
 - (m) **Antidysenterics**- Ipecacuanha.
 - (n) **Antiseptics and disinfectants**- Benzoin, Myrrh, Neem, Curcuma.
 - (o) **Antimalarials**- Cinchona.
 - (p) **Oxytocics**- Ergot.
 - (q) **Vitamins**- Shark liver oil and Amla.
 - (r) **Enzymes**- Papaya, Diastase, Yeast.
 - (s) **Perfumes and flavoring agents**- Peppermint oil, Lemon oil, Orange oil, Lemon grass oil, Sandal wood.
 - (t) **Pharmaceutical aids**-Honey, Arachis oil, Starch, Kaolin, Pectin, Olive oil. Lanolin, Beeswax, Acacia, Tragacanth, Sodium Alginate, Agar, Guar gum, Gelatin.
 - (u) **Miscellaneous**- Liquorice, Garlic, Picrorhiza, Dirscorea, Linseed, Shatavari, Shankpushpi, Pyrethrum, Tobacco.
6. Collection and preparation of crude drugs for the market as exemplified by Ergot, Opium, Rauwolfia, Digitalis, Senna.

7. Study of source, preparation and identification of fibers used in sutures and surgical dressings-cotton ,silk, wool and regenerated fibers.
8. Gross anatomical studies of- Senna , Datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nux-vomica & Ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drugs by morphological characters.
2. Physical and chemical tests for evaluation of drugs wherever applicable.
3. Gross anatomical studies (t.s.)of the following drugs: Senna, Datura, Cinnamon, Cinchona, Coriander, Fennel , Clove, Ginger, Nux-vomica, Ipecacuanha.
4. Identification of fibers and surgical dressing.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

THEORY (50 Hours)

1. Introduction to biochemistry.
2. Protein: Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.
3. Carbohydrates: Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.
4. Lipids: Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.
5. Vitamins: Brief chemistry and role of vitamins and coenzymes.
6. Role of minerals and water in life processes.
7. Enzymes: Classification, brief concept of enzymatic action. Factors affecting it.
8. Introduction to pathology of blood and urine.
 - (a) Lymphocytes and platelets, their role in health and disease.
 - (b) Erythrocytes-Abnormal cells and their significance.
 - (c) Abnormal constituents of urine and their significance in diseases.

PRACTICAL (75 Hours)

1. Detection and identification of proteins. amino acids, carbohydrates and lipids.
2. Analysis of normal and abnormal constituents of Blood and Urine (Glucose, urea, creatine, creatinine, cholesterol, alkaline phosphatase, acid phosphatase, Bilirubin, SGPT, SGOT, Calcium, Diastase, Lipase).
3. Examination of sputum and faeces (microscopic & staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes, withdrawal of blood samples.

1.5 HUMAN ANATOMY AND PHYSIOLOGY

THEORY(75 Hours)

1. **Scope of Anatomy and physiology.** Definition of various terms used in Anatomy.
2. Structure of cell, function of its components with special reference to mitochondria and microsomes.

3. **Elementary tissues:** Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.
4. **Skeletal System:** Structure and function of Skeleton. Classification of joints and their function. Joint disorders.
5. **Cardiovascular System:** Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood.
6. Name and functions of lymph glands.
7. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.
8. **Respiratory system:** Various parts of respiratory system and their functions, physiology of respiration.
9. **Urinary System:** Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.
10. **Muscular System:** Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.
11. **Central Nervous System:** Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.
12. **Sensory Organs:** Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.
13. **Digestive System:** names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.
14. **Endocrine System:** Endocrine glands and Hormones. Location of glands, their hormones and functions. Pituitary, thyroid. Adrenal and pancreas.
15. **Reproductive system:** Physiology and Anatomy of Reproductive system.

PRACTICALS (50 hours)

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:

(a) Digestive system	(b)Respiratory system	(c)Ear
(d) Cardiovascular system	(e) Urinary system	
(f) Reproductive system	(g)Eye	
3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

1.6 HEALTH EDUCATION AND COMMUNITY PHARMACY

THEORY (50 hours)

- 1. Concept of health:** Definition of physical health, mental health, social health, spiritual health determinants of health, indicator of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.
- 2. Nutrition and health:** Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.
- 3. Demography and family planning:** Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.
- 4. First aid:** Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.
- 5. Environment and health:** Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases.
- 6. Fundamental principles of microbiology:** Classification of microbes, isolation, staining techniques of organisms of common diseases.
- 7. Communicable diseases:** Causative agents, mode of transmission and prevention.
 - (a) Respiratory infections-chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.
 - (b) Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.
 - (c) Arthropod borne infections-plague, Malaria, filariases.
 - (d) Surface infection-Rabies, Trachoma, Tetanus, Leprosy.
 - (e) Sexually transmitted diseases-Syphilis, Gonorrhoea, AIDS.
- 8. Non-communicable diseases:** causative agents, prevention, care and control.
- 9. Epidemiology:** Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments.

2.1 PHARMACEUTICS II

THEORY (75 Hours)

1. Dispensing Pharmacy:

- I. **Prescriptions**-Reading and understanding of prescriptions; 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, surface area and veterinary doses.

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-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates. Preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a 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, colorants and flavors, with examples.

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

Liquids for internal administration.	Liquids for external administration or used on mucous membranes
Mixtures and concentrates,	Gargles
Syrups	Mouth washes
Elixirs	Throat-paints
	Douches
	Ear Drops
	Nasal drops
	Sprays
	Liniments
	Lotions.

(b) Biphasic Liquid Dosage Forms:

- I. **Suspensions** (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant 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 agent. 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**: Differences 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. An elementary study of poultice.

(d) **Suppositories and pessaries**-Their relative merits and demerits, types of suppositories, suppository bases , classification, properties. preparation and packing of suppositories. Use of suppositories of drug absorption.

(iv) **Dental and cosmetic preparations**: Introduction to Dentifrices, facial cosmetics, Deodorants. Anti-perspirants, shampoo, Hair dressings and Hair removers.

(v) **Sterile Dosage forms**:

(a) **Parenteral dosage forms**-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and personnel, Facilities and quality control. Preparation of Intravenous 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.

Formulation: 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, emulsion, solutions, liniments, E.N.T. preparations. Ointments, suppositories, powders, incompatible prescriptions etc.

Books recommended: (Latest editions)

1. Indian Pharmacopoeia.
2. British pharmacopoeia.
3. National formularies(N.F.I.,B.N.P)
4. Remington's pharmaceutical sciences.
5. Martindale's Extra pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTRY II

THEORY (100 hours)

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic 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 asterisk (*). The stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants- Proflavine*,

Sulphonamides- Phthalylsulfathiazole, Methoxazole, Co-trimoxazole, Sulfacetamide*

Antileprotic Drugs- Clofazimine, Thiambutosine, Dapsone*, Solapone,

Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, Cycloserine, Pyrazinamide*.

Antimoebic and Anthelmintic Drugs- Emetine, Metronidazole, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin, Piperazine*, Mebendazole, D.E.C.*

Antibiotics- Benzyl penicillin*, Phenoxy methyl penicillin*, Benzathine penicillin, Ampicillin*, Cloxacillin, Carbenicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

Antifungal agents- Udecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.

Antimalarial Drugs- Chloroquine*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.

Tranquilizers- Chlorpromazine*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperidol*, Triperiodol, Oxypertine, Chlordizepoxide, Diazepam*, Lorazepam, Meprobamate.

Hypnotics- Phenobarbitone*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide*, Methypylon, Paraldehyde, Triclofosodium.

General Anaesthetics- Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopecal sodium, Trichloroethylene.

Antidepressant Drugs- Amitriptyline, Nortriptyline, Imperamine*, Phepelzine, Tranlycypromine.

Analeptics- Theophylline, Caffeine*, Coramine*, Dextro-amphetamine.

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

Adrenergic antagonist- Tolazoline, 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- Ethylnitrite*, Glyceryl trinitrate, Alpha methyl dopa, Guanethidine, Clofibrate, Quinidine.

Hypoglycemic Agents- Insulin, chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin.

Coagulants and Anti coagulants- Heparin, Thrombin, Menadione*, Bisphydroxycoumarin, Warfarin sodium.

Local Anaesthetics- Lignocaine*, Procaine*, Benzocaine,

Histamine and anti Histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine*, Pheniramine, Chlorpheniramine*,

Analgesics and Anti-pyretics-Morphine, Pethidine, Codeine, Mathadone, Aspirin*, Paracetamol, Analgin, Dextropropoxphene, Pentazocine.

Non-steriodal anti-inflammatory agents- Indomethacin*, Phenylbutazone*, Oxyphenbutazone, Ibuprofen.

Thyroxine and Antithyroids-Thyroxine*, Methimazole, Methyl thiouracil, Propylthiouracil.

Diagnostic Agents- Lopanoic Acid, Propyliodone, Sulfobromophthalein-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium.

Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins.

Steroidal Drugs- Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

Anti-Neoplastic Drugs- Actinomycin, Azathioprie, Busulphan, chloramubucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended: (Latest editions)

1. Pharmacopoeia of India.
2. British Pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

PRACTICAL (75 hours)

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

2.3PHARMACOLOGY & TOXICOLOGY

THEORY (75 hours)

Introduction to pharmacology, scope of pharmacology.

Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

General mechanism of drugs action and their factors which modify drugs action. Pharmacological classification of drugs. The discussion of drugs should emphasise the following aspects:

Drugs acting on the central Nervous system:

General anaesthetics, adjunction to anaesthesia, intravenous anaesthetics.

Analgesic antipyretics and non-steroidal

Anti-inflammatory drugs, Narcotic analgesics.

Antirheumatic and anti-gout remedies.

Sedatives and Hypnotics, psychopharmacological agents, anticonvulsants, analeptics.

Centrally acting muscle relaxants and antiparkinsonism agents.

Local anaesthetics.

Drugs acting on autonomic nervous system.

Cholinergic drugs, Anticholinergic drugs, anticholinesterase drugs.

Adrenergic drugs and adrenergic receptor blockers.

Neurone blockers and ganglion blockers.

Neuromuscular blockers, used in myasthenia gravis.

Drugs acting on eye: Mydriatics, drugs used in glaucoma.

Drugs acting on respiratory system

Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

Autocoids: physiological role of histamine and serotonin, Histamine and Antihistamines, prostaglandins.

Cardio vascular drugs

Cardiotonics, Antiarrhythmic agents, Anti-anginal agents, Antihypertensive agents, peripheral Vasodilators and drugs used in atherosclerosis.

Drugs acting on the blood and blood forming organs. Haematinics, coagulants and anticoagulants, Haemostatic, Blood substitutes and plasma expanders.

Drugs affecting renal function- Diuretics and anti-diuretics.

Hormones and hormone antagonists- Hypoglycemic agents, Anti--thyroid drugs, sex hormones and oral contraceptives, corticosteroids.

Drugs acting on digestive system-carminatives, digest ants, Bitters, Antacids and drugs used in peptic ulcer, purgatives, and laxatives, Antidiarrhoeals, Emetics, Anti-emetics, Antispasmodics.

Chemotherapy of microbial diseases:

Urinary antiseptics, sulphonamides, penicillin, streptomycin, Tetracyclines and other antibiotics. Anti-tubercular agents, Antifungal agents, antiviral drugs, anti-leprotic drugs.

Chemotherapy of protozoal diseases, Anthelmintic drugs.

Chemotherapy of cancer.

Disinfectants and antiseptics.

PHARMACOLOGY

PRACTICAL (50 hours)

1. The first six of the following experiments will be done by the students while
2. the remaining will be demonstrated by the teacher.
3. Effect of potassium and calcium ions, acetylcholine and adrenaline on frog's heart.
4. Effect of acetyl choline on rectus abdomens muscle of frog and guinea pig ileum.
5. Effect of spasmogens and relaxants on rabbits intestine.
6. Effect of local anaesthetics on rabbit cornea.
7. Effect of mydriatics and miotics on rabbit's eye.
8. To study the action of strychnine on frog.
9. Effect of digitalis on frog's heart.
10. Effect of hypnotics in mice.
11. Effect of convulsants and anticonvulsant in mice or rats.
12. Test for pyrogens.
13. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
14. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

2.4 PHARMACEUTICAL JURISPRUDENCE

THEORY (50 hours)

Origin and nature of pharmaceutical legislation in India, its scope and objectives. Evolution of the "Concept of pharmacy" as an integral part of the Health care system.

Principles and significance of professional Ethics. Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India.

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.

The Drugs and Cosmetics Act,1940-General study of the Drugs and cosmetics Act and the Rules there under. Definitions and salient features related to retail and whole sale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

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 objections and permitted advertisements -diseases which cannot be claimed to be cured.

Narcotic Drugs and psychotropic substances Act,1985-A brief study of the act with special reference to its objectives, offences and punishment.

Brief introduction to the study of the following acts:

Latest Drugs (price control) order in force.

Poisons Act 1919(as amended to date)

Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date).

Medical Termination of Pregnancy Act, 1971(as amended to date).

Books recommended:(Latest editions)

Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

THEORY (75 hours)

Part I Commerce (50 hours)

Introduction-Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution.

Drug 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. 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.

Sales promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

Recruitment, training, evaluation and compensation of the pharmacist.

Banking and Finance-Service and functions of bank, Finance planning and sources of finance.

Part II Accountancy (25 hours)

Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet.

Simple techniques of analyzing financial statements. Introduction to Budgeting.

Books Recommended: (Latest editions)

2.6 HOSPITAL AND CLINICAL PHARMACY

THEORY (75 hours)

Part-I: Hospital Pharmacy:

Hospital-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India.

Hospital Pharmacy: Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men.

Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists. Drug Distribution system in Hospitals. Out-patient service, In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.

Manufacturing: Economical considerations, estimation of demand.

Sterile manufacture-Large and small volume parenterals, facilities, requirements, layout production planning , man-power requirements.

Non-sterile manufacture- Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials.

Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories. P.T.C.(pharmacy Therapeutic Committee),Hospital Formulary system and their organization, functioning, composition. Drug Information service and Drug Information Bulletin.

Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply eg. I.V.sets, B.G. sets, Ryals tubes, Catheters, Syringes etc.

Application of computers in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital retail pharmacy establishment.

Part II: Clinical Pharmacy:

Introduction to Clinical pharmacy practice- Definition, scope.

Modern dispensing aspects- Pharmacists and patient counseling and advice for the use of common drugs, medication history.

Common daily terminology used in the practice of Medicine.

Disease, manifestation and patho-physiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

Physiological parameters with their significance.

Drug Interactions: Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction.

Adverse Drug Reaction: Definition and significance. Drug-Induced diseases and Teratogenicity.

Drugs in Clinical Toxicity- Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons. Drug dependences, drug abuse, addictive drugs and their treatment, complications. Bio-availability of drugs, including factors affecting it.

Books Recommended:(Latest editions)

1. Remington's pharmaceutical sciences.
2. Testing of raw materials used in (1).
3. Evaluation of surgical dressings.
4. Sterilization of surgical instruments, glassware and other hospital supplies.
5. Handling and use of data processing equipments.