Course - D.Pharmacy

DIPLOMA IN PHARMACY (PART- I and PART- II)

1. Minimum qualification for admission to Diploma in Pharmacy Part-I course

Minimum qualification for admission to Diploma in Pharmacy Part-I course —A pass in any of the following examinations with Physics, Chemistry and Biology or Mathematics.

(1) Intermediate examination in Science;
(2) The first year of the three year degree course in Science,
(3) 10+2 examination (academic stream) in Science;
(4) Predegree examination;
(5) Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examination.

Provided that there shall be reservation of seats for Scheduled Caste and Scheduled Tribes candidates in accordance with the instructions issued by the Central Govt. /State Govts./Union Territory Admns. as the case

may be from time to time]

2. Duration of the course

The duration of the course shall be for two academic years with each academic year spread over a period of not less than one hundred and eighty working days in addition to 500 hours practical training spread over a period of not less than 3 months.

3. Course of study

The course of study for Diploma in Pharmacy Part I and Diploma in Pharmacy Part II shall include the subjects as given in the Tables I & II below. The number of hour devoted to each subject for its teaching in Theory and Practical, shall not be less than that noted against it in columns 2 and 3 of the Tables below.

TABLE –I
Diploma in Pharmacy (Part- I)

Subject	No. of Hours of Theory	No. of Hour of Practical
Pharmaceutics I	75	100
Pharmaceutical Chemistry I	75	75
Pharmacognosy	75	75
Biochemistry & Clinical Pathology	50	75
Human Anatomy & Physiology	75	50
Health Education & Community Pharmacy	50	—
	400 +	375 = 775

TABLE –II
Diploma in Pharmacy (Part –II)

Subject	No. of hours of Theory	No. of hours of Practical
Pharmaceutics II	75	100
Pharmaceutical Chemistry II	100	75
Pharmacology & Toxicology	75	50
Pharmaceutical Jurisprudence	50	—
Drug Store and Business Management	75	—
Hospital and Clinical Pharmacy	75	50
	450	+275 = 725

4. Syllabus for each subject

The syllabi for each subject of study in the said Tables shall be as specified in Appendix A to these regulations.

5. Approval of the authority conducting the course of study

The course of regular academic study prescribed under regulation 7 shall be conducted in an institution, approved by the Pharmacy Council of India under sub-section (1) of Section 12 of the Pharmacy Act, 1948.

Provided that the Pharmacy Council of India shall not approve any institution under this regulation unless it provides adquate arrangements for teaching in regard to building accommodation, equipment and teaching staff

as specified in Appendix B to these regulations.

6. 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) or Diploma in Pharmacy (Part II), 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 Table III and IV below: -

TABLE --III
DIPLOMA IN PHARMACY (PART-I) EXAMINATION

SUBJECTS	THEORY			PRACTICAL		
	Final Exam	Sessionals*	Total	Final Exam	Sessionals*	Total
Pharmaceutics 1	80	20	100	80	20	100
Pharmaceutical Chemistry 1	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Bio Chemistry & 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

MAXIMUM MARKS		1100

*** Internal assessment.**

TABLE IV
DIPLOMA IN PHARMACY (PART-II) EXAMINATION

SUBJECTS	THEORY			PRACTICAL		
	Final Exam	Sessionals*	Total	Final Exam	Sessionals*	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 and Clinical Pharmacy	80	20	100	80	20	100
			600			400

MAXIMUM MARKS		1000

*** Internal assessment.**

7. Eligibility for appearing at the Diploma in Pharmacy Part I 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 I course, in proof of his /her having regularly and satisfactorily undergo the course of study by attending not less than **75 % of the classes** held both in theory and in practical separately each subject shall be eligible for appearing at the Diploma in Pharmacy (Part I) examination.

8. Eligibility for appearing at the Diploma in Pharmacy 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.

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9. Mode of examinations:

(1) Each theory and practical examination in the subjects mentioned in Table III & IV shall be of three hours duration.
(2) A Candidate who fails in theory or practical examination of a subject shall re-appear both in theory and practical of the same subject.
(3) Practical examination shall also consist of a Viva Voce (Oral) examination.

10. Award of Sessional marks and maintenance of records

(1) A regular record of both theory and practical class work and examinations conducted in an institution imparting training for diploma in Pharmacy Part-I and diploma in Pharmacy Part II courses, shall be maintained for each student in the institution and 20 marks for each theory and 20 marks for each practical subject shall be allotted as sessional.

(2) There shall be atleast two periodic sessional examinations during each academic year .The highest aggregate of any two performances shall form the basis of calculating sessional marks.

(3) The sessional marks in practicals shall be allotted on the following basis:-
(i) Actual performance in the sessional examination 10marks
(ii) Day to day assessment in the practical class work 10marks.

11. Minimum marks for passing the examination

A student shall not be declared to have passed Diploma in Pharmacy examination unless he /she secures at least 40% marks in each of the subject separately in the theory examinations, including sessional marks and at least 40% marks in each of the practical examinations including sessional marks. The candidates securing 60% marks or above in aggregate in all subjects in a single attempt at the Diploma in Pharmacy (Part I) or Diploma in Pharmacy (Part II) examinations shall be declared to have passed in first class the Diploma in Pharmacy (Part I) or Diploma in Pharmacy (Part-II) examinations, as the case may be. Candidates securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he/she passes in all the subjects in a single attempt.

12. Eligibility for promotion to Diploma in Pharmacy (Part-II)

All candidates who have appeared for all the subjects and passed the Diploma in Pharmacy Part I examination are eligible for promotion to the Diploma in Pharmacy Part II class. However, failure in more than two subject shall debar him/ from promotion to the Diploma in Pharmacy Part II class.

13. Improvement of sessional marks**:**

Candidates who wish to improve sessional marks can do so, by appearing in two additional sessional examinations during the next academic year. The average score of the two examination shall be the basis for

improved sessional marks in theory .The sessional of practicals shall be improved by appearing in additional practical examinations. Marks awarded to a candidate for day to day assessment in the practical class can not be improved unless he /she attends a regular course of study again.

14. Approval of examinations:

The examinations mentioned in regulations 10 to 13 and 15 shall be held by an authority herein after referred to as the Examining Authority in a State , which shall be approved by the Pharmacy Council of India under sub section (2) of section 12 of the Pharmacy Act, 1948. Such approval shall be granted only if the Examining Authority concerned fulfills the conditions as specified in Appendix C to these regulations.

15. Certificate of passing examination for Diploma in Pharmacy (Part II)

Certificate to having passed the examination for the Diploma in Pharmacy Part II shall be granted by the Examining Authority to a successful student.

Diploma in Pharmacy (Part –III)
(Practical Training)

16. Period and other conditions for Practical Training

(1) After having appeared in **Part –II** examination for the Diploma in Pharmacy, conducted by Board/University or other approved Examining Body or any other course accepted as being equivalent by the Pharmacy Council of India, a candidate shall be eligible to undergo practical training in one or more of the following institutions namely:

- Hospitals/Dispensaries run by Central/State Governments/Municipal Corporation/Central Government Health Scheme and Employees State Insurance Scheme.
- A Pharmacy, Chemist and Druggist licensed under the Drugs and Cosmetics Rules, 1945 made under the Drugs and Cosmetics Act, 1940 (23 of 1940)
- Drugs manufacturing Unit licensed under the Drugs and Cosmetics Act, 1940 & rules made thereunder.

(2) The institutions referred in sub–regulation (1) shall be eligible to impart training subject to the condition that number of student pharmacists that may be taken in any hospital, pharmacy, chemist and druggist and drugs manufacturing unit licensed under the Drugs and Cosmetics Rules, 1945 made under the Drugs and Cosmetics Act, 1940 shall not exceed two where there is one registered pharmacist engaged in the work in which the student pharmacist is undergoing practical training, where there is more than one registered pharmacist similarly engaged, the number shall not exceed one for each additional such registered pharmacist.

(3) Hospital and Dispensary other than those specified in sub–regulation (1) for the purpose of giving practical training shall have to be recognised by Pharmacy Council of India on fulfilling the conditions specified in Appendix –D to these regulations.

(4) In the course of practical training, the trainee shall have exposure to

(i) Working knowledge of keeping of records required by various Acts concerning the profession of Pharmacy, and

(ii) Practical experience in: –

- the manipulation of pharmaceutical appartus in common use.
- the reading, translation and copying of prescription including checking of doses;
- the dispensing of prescription illustrating the commoner methods of administering medicaments; and
- the storage of drugs and medical prepartions.

(5) The practical training shall be not less than five hundred hours spread over a period of not less than three months, provided that not less than two hundred and fifty hours are devoted to actual dispensing of prescriptions.

17. Procedure to be followed prior to commencing of the training

(1) The head of an academic training institution, on application, shall supply in triplicate 'Practical Trainning Contract Form for qualification as a Pharmacist' (hereinafter referred to as the Contract Form) to candidate eligible to under take the said practical training. The Contract Form shall be as specified in *Appendix –E* to these regulations.

- The Head of an academic training institution shall fill section I of the Contract Form. The trainee shall fill Section II of the said Contract Form and the Head of the institution agreeing to impart the training (hereinafter referred to as the Apprentice Master) shall fill Section III of the said Contract From.
- It shall be the responsibility of the trainee to ensure that one copy (hereinafter referred to as the first copy of the Contract Form) so filled is submitted to the Head of the academic training institution and the other two copies (hereinafter referred to as the Second copy and the third copy) shall be filed with the Apprentice Master (if he so desires) or with the trainee pending completion of the training.

18. Certificate of passing Diploma in Pharmacy Part –III

On satisfactory completion of the apprentice period, the Apprentice Master shall fill SECTION IV of the second copy and third copy of the Contract Form and cause it to be sent to the head of the academic training institution who shall suitably enter in the first copy of the entries from the second copy and third copy and shall fill SECTION V of the three copies of Contract Form and thereafter hand over both the second copy and third copy to the trainee.
This, if completed in all respects, shall be regarded as a certificate of having successfully completed the course of Diploma in Pharmacy (Part-III).

19. Certificate of Diploma in Pharmacy

A certificate of Diploma in Pharmacy shall be granted by the Examining Authority to a successful candidate on producing certificate of having passed the Diploma in Pharmacy Part I and Part II and satisfactory completion of practical training for Diploma in Pharmacy (Part –III).

20. Miscellaneous

No course of training in pharmacy shall be considered for approval under regulation 18 unless it satisfies all the conditions prescribed under these regulations.

21. Repeal and Savings

1. The Education Regulations, 1981 (hereinafter referred to as the said regulations) published by the Pharmacy Council of India vide No 14-55/79 Pt. I/PCI/4235-4650 dt. 8th July 1981 is hereby repealed.
2. Notwithstanding such repeal,

- anything done or any action taken under the said regulations shall be deemed to have been done or taken under the corresponding provision of these regulations.
- a person who was admitted as a student under the said regulation to the course of training for Diploma in Pharmacy and who had not passed the examination at the commencement of these regulations shall be required to pass the examination in accordance with the provision of the said regulation as if these regulations had not come into force:

Provided however, the Examining Authority in a particular State may fix a date after which the examinations under the said Regulations shall not be conducted.

Admission - Syllabus

SYLLABUS

APPENDIX-A	
1.1	Pharmaceutics I
1.2	Pharmaceutical Chemistry I
1.3	Pharmacognosy
1.4	Biochemistry and Clinical Pathology
1.5	Human Anatomy & Physiology
1.6	Health Education & Community Pharmacy
2.1	Pharmaceutics II
2.2	Pharmaceutical Chemistry II
2.3	Pharmacology and Toxicology
2.4	Pharmaceutical Jurisprudence
2.5	Drug Store & Business management
2.6	Hospital and Clinical Pharmacy

APPENDIX –ASYLLABUS
DIPLOMA IN PHARMACY (PART –I)
PHARMACEUTICS –I
Theory (75 hours)

1. Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarisation with new drug delivery systems.

2. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

3. Metrology–Systems of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustments of products. Use of alligation method in calculations, Isotonic solutions.

4. Packing of Pharmaceuticals–Desirable features of a container–types of containers. Study of glass and plastics as materials for containers and rubber as material for closures-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 Enegy Mill and Disintegrator.

6. Size separation–Size separation by sifting. Official Standard for powders. Sedimentation methods of size separation. Construction and working of cyclone separator.

7. Mixing and Homogenisation–Liquid mixing and powder mixing, Mixing of semisolids, Study of Silverson Mixer–Homogeniser, 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–Applications in the preparation of tinctures and extracts.
(b) Introduction to Ayurvedic dosage forms.

10. Heat processes 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 processes–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 micro–organisms. 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. Application of sterilization processes 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 types of compressed tablets 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; film coating, enteric coating and microencapsulation (Tablet coating may be dealt in an elementary manner.)

15. Processing of Capsules–Hard and soft gelatin capsules; different sizes 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.	**Tablets**	**2**
10.	**Preparations involving sterilization**	**2**
11.	**Ophthalmic preparations**	**2**
12.	**Preparations**	**2**

	involving aseptic techniques	

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, Calcium hydroxide, Sodium hydroxide and official buffers.

(B) Antioxidants–Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium metabisulphite, Sodium thiosulphate, Nitrogen and Sodium Nitrite.

(C) Gastrointestinal agents--

(i) Acidifying agents, Dilute hydrochloric acid.

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

(iii) Protectives and Adsorbents –Bismuth subcarbonate and Kaolin.

(iv) Saline Cathartics –Sodium potassium tartrate and Magnesium sulphate.

(D) Topical Agents-

(i) Protectives-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 Floride, Stannous Flouride, Calcium carbonate, Sodium metaphosphate, Dicalcium 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 tartarate.

(I) Antidotes-Sodium nitrate.

2. Major Intra and Extracellular 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 injection, 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 Sulfate 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, sulphate, 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.

a. Acid-Base titrations (atleast 3)

b. Redox titrations (One each of Permanganometry and iodimetry)

c. Precipitation titrations (atleast 2)

d. Complexometric titrations (Calcium and Magnesium)

Book recommended (Latest editions)

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 of 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 applications 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, Rhuburb, 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) Antihypertensives-Rauwolfia.
(g) Antitussives-Vasaka, Tolu balsam, Tulsi.
(h) Antirheumatics-Guggul, Colchicum.
(i) Antitumour-Vinca.
(j) Antileprotics-Chaulmoogra Oil.
(k) Antidiabetics -Pterocarpus, Gymnema, Sylvestro.
(l) Diuretics–Gokhru, Punarrnava.
(m) Antidysentrics-Ipecacuanha.
(n) Antiseptics and disinfectants Benzoin, Myrrh. Nim, curcuma.
(o) Antimalarials–Cinchona.
(p) Oxytocics-Ergot.
(q) Vitamines-Shark liver Oil and Amla.
(r) Enzymes-Papaya, Diastase, Yeast.
(s) Perfumes and flavouring agents –Peppermint Oil, Lemon Oil, Orange Oil, Lemon grass Oil, Sandalwood.
(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, Dioscorea, Linseed, Shatavari, Shankhapusphi, Pyrethrum, Tobacco.

6. Collection and preparation of crude drug for the market as exemplified by Ergot, opium, Rauwolfia, Digitalis, Senna.

7. Study of source, preparation and identification of fibres used in sutures and surgical dressings—cotton, silk, wool and regenerated fibre.

8. Gross anatomical studies of Senna, Datura, Cinnamon, Cinchona, Fennel, Clove, Ginger, Nux vomica & Ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drug 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, Nuxvomica, Ipecacuanha.
4. Identification of fibres and surgical dressings.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

Theory (50 hours)

1. Introduction to biochemistry.
2. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.
3. Brief chemistry and role of Carbohydrates, Classification, qualitative tests, Diseases related to carbohydrate metabolism.
4. Brief chemistry and role of Lipids, Classification, qualitative tests. Diseases related to lipids metabolism.
5. Brief chemistry and role of Vitamins and Coenzymes.
6. Role of minerals and water in life processes.
7. Enzymes : Brief concept of enzymic action. Factors affecting it. Therapeutic and pharmaceutical importance.
8. Brief concept of normal and abnormal metabolism of proteins, carbohydrates and lipids.
9. 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 and 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.
2. Definition of various terms used in Anatomy
3. Structure of cell, function of its components with special reference to mitochondria and microsomes.
4. Elementary tissues of the body. i.e epithelial tissue, muscular tissue, connective tissue and nervous tissue.
5. Structure and function of skeleton. Classification of joints and their function, Joint disorder.
6. Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood.
7. Name and functions of lymph glands.
8. Structure and functions of various parts of the heart. Arterial and venous systems with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.
9. Various parts of respiratory system and their functions. Physiology of respiration.
10. Various parts of urinary system and their functions, structure and functions of kidney. Physiology of Urine formation. Pathophysiology of renal diseases and oedema.
11. Structure of skeletal muscle. Physiology of muscle contraction, Names, position, attachments and functions of various skeletal muscles. Physiology of neuromuscular junction.
12. Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and Physiology of autonomic nervous system.
13. Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.
14. Digestive system; names of the various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.
15. Endocrine glands and Hormones. Locations of the glands, their hormones and functions. Pituitary, thyroid, Adrenal and Pancreas.
16. Reproductive system -Physiology and Anatomy of Reproductive system.

PRACTICAL (50 hours)

1. Study of the human skeleton.
2. Study with the help of charts and models of the following systems and organs:

(a) Digestive system.
(b) Respiratory system.
(c) Cardiovascular system.
(d) Urinary system.
(e) Reproductive system.
(f) Nervous system.
(g) Eye.
(h) Ear.

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 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, indicators 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, disease induced due to deficiency of proteins, Vitamins and minerals –treatment and prevention.

3. Demography and family planning—Demography cycle, fertility, family planning, contraceptive methods, behavioural methods, natural family planning method, chemical method, 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 –Sources 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, modes of transmission and prevention.

(a) Respiratory infections—Chicken pox, measles. Influenza, diphtheria, whooping cough and tuberculosis.
(b) Intestinal infections: Poliomyelitis. Hepatitis. Cholera. Typhoid, Food poisoning, Hookworm infection.
(c) Arthropod borne infections –plague, Malaria, Filariasis.
(d) Surface infections –Rabies, Trachoma, Tetanus, Leprosy.
(e) Sexually transmitted diseases ---Syphilis. Gonorrhoea. AIDS.

8. Non –communicable diseases –Causative agents, prevention, care and control; Cancer, Diabetes, Blindness, Cardiovascular diseases.

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, disinfection procedures, for faeces, urine, sputum, room linen, dead –bodies, instruments.

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 labelling 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 powders 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, colourants and flavours, 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 mucus membranes.
Mixtures and concentrates	Gargles
Syrups	Mouth washes Throat –paints Douches
Elixirs	Ear Drops Nasal drops & Sprays Liniments Lotions.

(b) Biphasic Liquid Dosage Forms:

(i) Suspension (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 suppositories for drug absorption.

(iv) Dental and Cosmetic Preparations:

Introduction to Dentrifices, Facial cosmetics, Deodorants, Antiperspirants, Shampoos, Hair dressing and Hair removers.

1. (v) Sterile Dosage Forms:
2. (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 Intravenous fluids and admixtures –Total parenteral nutrition, Dialysis fluids.
3. (b) Sterility testing, Particulate matter monitoring –Faulty seal packaging.
4. (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, emulsions, lotions, 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.F)
4. Remington's Pharmaceutical Sciences.
5. Martindale Extra Pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTY 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 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, * Benzalkoniumchloride, Cetrimide, Chlorocresol*, Chloroxylene, Formaldehyde solution, Hexachlorophene, Liquified phenol, Nitrofurantoin.Sulfonamides-Sulfadiazine, Sulfaguanidine*, Phthalysulfathiazole, Succinylsulfathiazole, Sulfadimethoxine, Sulfamethoxypridazine, Sulfamethoxazole, co-trimoxazole, Sulfacetamide*.Antileprotic Drugs –Clofazimine, Thiambutosine, Dapsone*, Solapsone.Anti-tubercular Drugs –Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, Cycloserine, Pyrazinamide*.Antiamoebic and Anthelmintic Drugs- Emetine, Metronidazole*, Halogenated hydroxyquinolines, diloxanidefuroate, Paramomycin 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 –Undecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.Antimalarial Drugs –Chloroquine*, Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.Tranquilizers –Chlorpromazine*, Prochlorperazine, TrifluoPerazine, Thiothixene, Haloperidol*, Triperidol, Oxypertine, Chlordiazepoxide, Diazepam*, Lorazepam, Meprobamate.Hypnotics—Phenobarbitone*, Butobarbitone, Cyclobarbitone, Nitrazepam, Glutethimide*, Methyprylone, Paraldehyde, Triclofos sodium.General Anaesthetics –Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopental sodium, Trichloroethyelene.Antidepressant Drugs—Amitriptyline, Nortryptyline, Imipramine *, Phenelzine, Tranylcypromine.Analeptics –Theophylline, Caffeine*, Coramine*, Dextroamphetamine.Adrenergic Drugs –Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine Salbutamol, Terbutaline, Ephedrine *, Pseudoephedrine.Adrenergic Antagoinst –Tolazoline, Propranolol*, Practolol.Cholinergic Drugs –Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*.Cholinergic Antagonists –Atropine*, Hysocine, Homatropine, Propantheline*, Benztrophine, Tropicamide, Biperiden.*Diuretic Drugs –Furosemide*, Chlorothiazide, Hydrochlorothaizide*, 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.Coagulants and Anti –Coagulants –Heparin, Thrombin, Menadione*, Bishydroxycoumarin, Warfarin Sodium.Local Anaesthetics –Lignocaine*, Procaine*, Benzocaine.Histamine and Anti–histaminic Agents-Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine, Pheniramine, Chlorpheniramine*.Analgesics and Anti-pyretics–Morphin, Pethidine*, Codeine, Methadone, Aspirin*, Paracetamol*, Analgin, Dextropropoxyphene, Pentazocine.Non-steroidal anti-inflammatory Agents –Indomethacin*, phenylbutazone*, Oxyphenbutazone, Ibuprofen, Thyroxine and 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 –Betamethazone, Cortisone, Hydrocortisone, prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.Anti-Neoplastic Drugs –Actinomycins, Azathioprine, Busulphan, Chlorambucil, Cisplatin cyclophosphamide, Daunorubicin hydrochloride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended :(Latest editions)

1. Pharmocopoeia 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, Antibiotic 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 drugs 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 anaesthetics, adjunction to anaesthesia, intravenuous anasesthetics.(b) Analgesic antipyretics and non-steroidal anti –inflammatory drugs, Narcotic analgesics, Antirheumatic and antigout remedies, Sedatives and Hypnotics, Psychopharmacological agents, anti convulsants, analeptics.(c) Centrally 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 recepter blockers.(c) Neurones 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, Antianginal agents, Antihypertensive agents, Peripheral Vasodilators and drugs used in atherosclerosis.(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, Antiemetics, Anti-spasmodics.Chemotherapy of microbial disease ;Urinary antiseptics, Sulphonamides, Penicillins, Streptomycin, Tetracylines and other antibiotics, Antitubercular agents, Antifungal agents, antiviral drugs, antileprotic drugs.

6. Chemotherapy of protozoal diseases Anthelmintic drugs.
7. Chemotherapy of cancer.
8. 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 on spasmogens and relaxants on rabbits intestine.
4. Effect of local anaesthetics on rabbit 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 objectives. 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 of 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 labelling and storage condition of drugs.

5. The Drug and Magic Remedies (Objectionable Advertisement) Act, 1945-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 punishment.

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 Toilet Preparations (Excise Duties) Act, 1995 (as amended to date)

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

BOOKS RECOMMENDED (Latest edition)

Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

Theory (75 hours) Part –I Commerce (50 hours)

1. Introduction-Trade, Industry and Commerce, Functions and subdivision of Commerce, Introduction of Elements of Economics and Management.

2. Forms of Business Organisations.

3. Channels of Distribution.

4. 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, there to.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 the bank, Finance Planning and sources of 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 analysing financial statements.

Introduction to Budgetting.

Books Recommended (Latest edition)

1. Remington's Pharmaceutical Sciences.

2.6 HOSPITAL AND CLINICAL PHARMACY
Theory (75 hours)

Part –I :Hospital Pharmacy:

1. Hospitals Definition, Function, Classifications based on various criteria, organisation, 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 Hospitals:

(a) Out –patient services

(b) In-patient services –(a) types of services (b) detailed discussion of unit Dose system, Floor ward stock system, Satellite pharmacy services, Central sterile services, Bed Side Pharmacy.

4. Manufacturing:

(a) Economical considerations, estimation of demand.
(b) Sterile manufacture-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 organisation, 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 Practice –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, heavy metal poison, Narcotic drugs, Barbiturate, Organophosphours poisons.

9. Drug dependences, Drug abuse, addictive drugs and their treatment, complications.

10. Bio–availability of drugs, including factors affecting it.

Books recommended (Latest editions)

1. Remington’s Pharmaceutical Sciences.

2. Martindale The Extra Pharmacopoeia

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