



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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School of Pharmacy

Diploma in Pharmacy

Syllabus(ER91)

**PROGRAMME : D.PHARMACY
CURRICULUM**

First Year										
S. NO	Course Type	Course code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	101T	Pharmaceutics -I	3	0	0	3	20	80	3
2	Theory	102T	Pharmaceutical Chemistry-I	3	0	0	3	20	80	5
3	Theory	103T	Pharmacognosy	3	0	0	3	20	80	6
4	Theory	104T	Biochemistry & Clinical Pathology	2	0	0	2	20	80	8
5	Theory	105T	Human Anatomy and Physiology	3	0	0	3	20	80	9
6	Theory	106T	Health Education & Community Pharmacy	2	0	0	2	20	80	10
7	Practical	107P	Pharmaceutics –I	0	0	4	2	20	80	11
8	Practical	108P	Pharmaceutical Chemistry-I	0	0	3	1	20	80	11
9	Practical	109P	Pharmacognosy	0	0	3	1	20	80	12
10	Practical	110P	Biochemistry & Clinical Pathology	0	0	3	1	20	80	12
11	Practical	111P	Human Anatomy and Physiology	0	0	2	1	20	80	12
Total Credits for First Year 1 -22										
Total Marks for First Year 1 -1100										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION, ESE – END SEMESTER EXAMINATION

CURRICULUM

Second Year										
S. NO	Course Type	Course code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	201T	Pharmaceutics -I I	3	0	0	3	20	80	13
2	Theory	202T	Pharmaceutical Chemistry-II	4	0	0	4	20	80	14
3	Theory	203T	Pharmacology & Toxicology	3	0	0	3	20	80	16
4	Theory	204T	Pharmaceutical Jurisprudence	2	0	0	2	20	80	18
5	Theory	205T	Drug store and Business Management	3	0	0	3	20	80	19
6	Theory	206T	Hospital & Clinical Pharmacy	2	0	0	2	20	80	20
7	Practical	207P	Pharmaceutics –II	0	0	4	2	20	80	21
8	Practical	208P	Pharmaceutical Chemistry-II	0	0	3	1	20	80	22
9	Practical	209P	Pharmacology & Toxicology	0	0	2	1	20	80	22
10	Practical	210P	Hospital & Clinical Pharmacy	0	0	2	1	20	80	22
Total Credits for Second Year 1 -22										
Total Marks for Second Year 1 -1000										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION, ESE – END SEMESTER EXAMINATION

101T	PHARMACEUTICS- I	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content

Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarization with new drug delivery systems. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

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.

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.
Size reduction, objectives, and factors affecting size reduction, methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

Size separation-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

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.

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.

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

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.

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

Sterilization-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process. Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and 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.

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 de.. in an elementary manner).

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

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

Books recommended:(Latest editions)

1. Remington's Pharmaceutical
2. Indian Pharmacopoeia
3. Tutorial Pharmacy by Cooper Gunns

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

102T	PHARMACEUTICAL CHEMISTRY-I	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content

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

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

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

Gastrointestinal agents-

Acidifying agents- Dilute Hydrochloric acid.

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

Protective and Adsorbents- Bismuth sub carbonate and Kaolin.

Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

Topical Agents-

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

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.

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

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

Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

Respiratory stimulants- Ammonium carbonate.

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

Antidotes- Sodium nitrite.

Major Intra and Extra cellular electrolytes-

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

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.

Combination of oral electrolyte powders and solutions.

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

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.

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.

Identification tests for cations and anions as per Indian Pharmacopoeia.

Books recommended:(Latest editions)

1. Indian Pharmacopoeia
2. Text Book of Pharmaceutical Inorganic Chemistry by V.N.Rajasekaran
3. Text Book of Pharmaceutical Inorganic Chemistry by Gundu Rao

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks (question

103T	PHARMACOGNOSY	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

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

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content

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) **Antileprotics**- Chaulmoogra oil.
- (k) **Antidiabetics**- Pterocarpus, Gymnema sylvestre.
- (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.

Pharmaceutical aids-Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia, Tragacanth, sodium Alginate, Agar, Guar gum, Gelatin.

Miscellaneous- Liquorice, Garlic, picrorhiza, Dipsacaceae, Linseed, shatavari, shankhpushpi, pyrethrum, Tobacco.

Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwolfia, Digitalis, senna.

Study of source, preparation and identification of fibers used in sutures and surgical dressings- cotton, silk, wool and regenerated fibers.

Gross anatomical studies of-senna, Datura, cinnamon, cinchona, fennel, clove, Ginger, Nuxvomica & ipecacuanha.

Books recommended:(Latest editions)

1. Text book of Pharmacognosy by wallis
2. Text book of Pharmacognosy by kokate

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

104T	BIOCHEMISTRY AND CLINICAL PATHOLOGY	L	T	P	Credits	Total Marks
		2	0	0	2	100

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shall able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content

Introduction to biochemistry. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.

Carbohydrates: Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.

Lipids: Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.

Vitamins: Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes.

Enzymes: Brief concept of enzymatic action. factors affecting it.

Therapeutics: Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

Books recommended:(Latest editions)

1. Text book of Biochemistry by T.Sathyanarayana
2. Text book of Biochemistry by Ramarao

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

105T	HUMAN ANATOMY AND PHYSIOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Course Objectives: Upon completion of this course the student should be able to

- Explain the gross morphology, structure, and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

Course Content

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

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. 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.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

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.

Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas

Reproductive system: Physiology and Anatomy of Reproductive system.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

106T	HEALTH EDUCATION AND COMMUNITY PHARMACY	L	T	P	Credits	Total Marks
		2	0	0	2	100

Concept of health: Definition of physical health, mental health, social health, spiritual health determinants

of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.

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.

First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.

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.

Fundamental principles of microbiology: Classification of microbes, isolation, staining techniques of organisms of common diseases.

Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections- chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.

Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection

Arthropod borne infections-plague, Malaria, filariases. **Surface infection-**Rabies, Trachoma, Tetanus, Leprosy. **Sexually transmitted diseases-**Syphilis, Gonorrhoea, AIDS

Non-communicable diseases: causative agents, prevention, care and control.

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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

80 Marks

107P	PHARMACEUTICS-I	L	T	P	Credits	Total Marks
		0	0	4	2	100

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 2
11. Ophthalmic preparations 2
12. Preparations involving aseptic techniques 2

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : Synopsis

10 Marks

PART B : Experiments (major and Minor)

60 Marks

PART C: Viva voce & Record

10 Marks

108P	PHARMACEUTICAL CHEMISTRY-I	L	T	P	Credits	Total Marks
		0	0	3	1	100

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).

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : Synopsis

10 Marks

PART B : Experiments (major and Minor)

60 Marks

PART C: Viva voce & Record

10 Marks

109P	PHARMACOGNOSY	L	T	P	Credits	Total Marks
		0	0	3	1	100

1. Identification of drugs by morphological characters. Physical and chemical tests for evaluation of drugs wherever applicable.
2. Gross anatomical studies(t.s.)of the following drugs :Senna, Datura, cinnamon, cinchona, coriander, fennel , clove, Ginger, Nux-vomica, Ipecacuanha.
3. Identification of fibers and surgical dressing.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : Synopsis

10 Marks

PART B : Experiments (major and Minor)

60 Marks

PART C : Viva voce & Record

10 Marks

110P	BIOCHEMISTRY & CLINICAL PATHOLOGY	L	T	P	Credits	Total Marks
		0	0	3	1	100

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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : Synopsis

10 Marks

PART B : Experiments (major and Minor)

60 Marks

PART C : Viva voce & Record

10 Marks

111P	HUMAN ANATOMY &PHYSIOLOGY	L	T	P	Credits	Total Marks
		0	0	2	1	100

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs: Digestive system Respiratory system Ear
Cardiovascular system Urinary system
Reproductive system 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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : Synopsis

10 Marks

PART B : Experiments (major and Minor)

60 Marks

PART C : Viva voce & Record

10 Marks

SECOND YEAR

201T	PHARMACEUTICS- II	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

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

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content

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.

Incompatibilities in prescriptions- study of various types of incompatibilities-physical, chemical and therapeutic.

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 highlighted).

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.

Liquid oral Dosage forms:

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

Throat-paints

Elixirs

Douches

Ear Drops

Nasal drops

Sprays

Liniments

Lotions.

Biphasic Liquid Dosage Forms:

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.

Emulsions-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.

Semi-Solid Dosage Forms:

Ointments: Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes:

Trituration	fusion
chemical reaction	Emulsification.

Pastes: Differences between ointments and pastes, Bases of pastes, preparation of pastes and their preservation .

Jellies: An introduction to the different types of jellies and their preparation. An elementary study of poultice.

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.

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

Sterile Dosage forms:

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.

Sterility testing: particulate matter monitoring- Faculty seal packaging.

Ophthalmic products: study of essential characteristics of different ophthalmic preparations. Formulation: additives, special precautions in handling and storage of ophthalmic products.

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

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

202T	PHARMACEUTICAL CHEMISTY- II	L	T	P	Credits	Total Marks
		4	0	0	4	100

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*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlorophene, Nitrofurantoin.

Sulphonamides- Sulphadiazine, Sulphaguanidine, Phthalylsulphathiazole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxypyridazine, Cotrimoxazole, sulfacetamide*

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

Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide*.

Antimicrobial 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, Thiethixene, Haloperidol*, Triperidol, Oxypertine, Chlordiazepoxide, Diazepam*, Lorazepam, Meprobamate.

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

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

Antidepressant Drugs- Amitriptyline, Nortriptyline, Imipramine*, Pheipazine, Tranylcypromine.

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, Methadone, Aspirin*, Paracetamol, Analgin, Dextropropoxyphene, Pentazocine.

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

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

Diagnostic Agents- Loperamide, Propylthiouracil, Sulfobromophthalen-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, 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's Extra pharmacopoeia.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

80 Marks

203T	PHARMACOLOGY & TOXICOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content

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 emphasize the following aspects:

Drugs acting on the central Nervous system:

General anaesthetics- adjunct 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 anti parkinsonism agents. Local anesthetics. 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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

204T	PHARMACEUTICAL JURISPRUDENCE	L	T	P	Credits	Total Marks
		2	0	0	2	100

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

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

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content

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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

205T	DRUG STORE AND BUSINESS MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Content

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)

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

206T	HOSPITAL & CLINICAL PHARMACY	L	T	P	Credits	Total Marks
		3	0	0	3	100

Scope: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

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

1. know various drug distribution methods in a hospital
2. appreciate the pharmacy stores management and inventory control
3. monitor drug therapy of patient through medication chart review and clinical review
4. obtain medication history interview and counsel the patients
5. identify drug related problems
6. detect and assess adverse drug reactions
7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. know pharmaceutical care services
9. do patient counseling in community pharmacy;
10. appreciate the concept of Rational drug therapy

Course Content

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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Each question carry 16 marks answer any five out of eight
(question may contain subdivisions)

Exam Duration: 3 Hrs.

80 Marks

207P	PHARMACEUTIS – II	L	T	P	Credits	Total Marks
		0	0	4	2	100

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.

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

PART A : Synopsis

PART B : Experiments (major and Minor)

Exam Duration: 3 Hrs.

10 Marks

60 Marks

PART C: Viva voce & Record**10 Marks**

208P	PHARMACEUTICAL CHEMISTRY – II	L	T	P	Credits	Total Marks
		0	0	3	1	100

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.

END EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 80****Exam Duration: 3 Hrs.****PART A : Synopsis****10 Marks****PART B : Experiments (major and Minor)****60 Marks****PART C: Viva voce & Record****10 Marks**

209P	PHARMACOLOGY & TOXICOLOGY	L	T	P	Credits	Total Marks
		0	0	2	1	100

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.

END EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 80****Exam Duration: 3 Hrs.****PART A : Synopsis****10 Marks****PART B : Experiments (major and Minor)****60 Marks****PART C: Viva voce & Record****10 Marks**

210P	HOSPITAL & CLINICAL PHARMACY	L	T	P	Credits	Total Marks
		0	0	2	1	100

END EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 80****Exam Duration: 3 Hrs.****PART A : Synopsis****10 Marks****PART B : Experiments (major and Minor)****60 Marks****PART C: Viva voce & Record****10 Marks**



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SCHOOL OF PHARMACY

Diploma in Pharmacy

Syllabus (ER 2021)

**PROGRAMME : D.PHARMACY
CURRICULUM**

S. NO	Course Type	Course code	Course Title	L	T	P	Marks		Page No.
							CAE	ESE	
1	Theory	ER-20-11T	Pharmaceutics	3	1	0	20	80	5
2	Theory	ER-20-12T	Pharmaceutical Chemistry	3	1	0	20	80	7
3	Theory	ER-20-13T	Pharmacognosy	3	1	0	20	80	11
4	Theory	ER-20-14T	Human Anatomy and Physiology	3	1	0	20	80	13
5	Theory	ER-20-15T	Social Pharmacy	3	1	0	20	80	16
7	Practical	ER-20-11P	Pharmaceutics	0	0	3	20	80	18
8	Practical	ER-20-12P	Pharmaceutical Chemistry	0	0	3	20	80	20
9	Practical	ER-20-13P	Pharmacognosy	0	0	3	20	80	22
10	Practical	ER-20-14P	Human Anatomy and Physiology	0	0	3	20	80	23
11	Practical	ER-20-15P	Social Pharmacy	0	0	3	20	80	25

L - LECTURE HOURS, T - TUTORIAL HOURS, P - PRACTICAL HOURS

CAE - CONTINUOUS ASSESSMENT EXAMINATION, END - YEAR FINAL EXAMINATION

CURRICULUM

S. NO	Course Type	Course code	Course Title	L	T	P	Marks		Page No.
							CAE	ESE	
1	Theory	ER-20-21T	Pharmacology	3	1	0	20	80	28
2	Theory	ER-20-22T	Community Pharmacy & Management	3	1	0	20	80	32
3	Theory	ER-20-23T	Biochemistry & Clinical Pathology	3	1	0	20	80	34
4	Theory	ER-20-24T	Pharmacotherapeutics	3	1	0	20	80	37
5	Theory	ER-20-25T	Hospital & Clinical Pharmacy	3	1	0	20	80	39
6	Theory	ER-20-26T	Pharmacy Law & Ethics	3	1	0	20	80	42
7	Practical	ER-20-21P	Pharmacology	0	0	2	20	80	46
8	Practical	ER-20-22P	Community Pharmacy & Management	0	0	3	20	80	48
9	Practical	ER-20-23P	Pharmacology & Toxicology	0	0	2	20	80	50
10	Practical	ER-20-24P	Pharmacotherapeutics	0	0	1	20	80	51
11	Practical	ER-20-25P	Hospital & Clinical Pharmacy	0	0	1	20	80	52

L - LECTURE HOURS, T - TUTORIAL HOURS, P - PRACTICAL HOURS,

CAE - CONTINUOUS ASSESSMENT EXAMINATION, END - YEAR FINAL EXAMINATION

ER20-11T	PHARMACEUTICS	L	T	P	Total Marks
		3	1	0	100

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

Course Objectives: This course will discuss the following aspects of pharmaceutical dosage forms

1. Basic concepts, types and need
2. Advantages and disadvantages, methods of preparation/formulation
3. Packaging and labelling requirements
4. Basic quality control tests, concepts of quality assurance and good manufacturing practices

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe about the different dosage forms and their formulation aspects
2. Explain the advantages, disadvantages and quality control tests of different dosage forms
3. Discuss the importance of quality assurance & good manufacturing practices

Course Content

Chapter	Topics	Hours
1	- History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice, and various professional associations. - Pharmacy as a career - Pharmacopoeia: Introduction to IP, BP, USP, NF and Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia	7
2	Packaging materials: Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials	5
3	Pharmaceutical aids: Organoleptic (Colouring, flavouring, and sweetening) agents Preservatives: Definition, types with examples and uses	3
4	Unit operations: Definition, objectives/applications, principles, construction, and working of:	9
	Size reduction: hammer mill and ball mill	
	Size separation: Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves	

	Mixing: Double cone blender, Turbine mixer, Tripleroller mill and Silverson mixer homogenizer Filtration: Theory of filtration, membrane filter and sintered glass filter Drying: working of fluidized bed dryer and process of freeze drying Extraction: Definition, Classification, method, and Applications	
5	Tablets —coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi-layered, etc.) Capsules —hard and soft gelatine capsules Liquid oral preparations —solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution Topical preparations —ointments, creams, pastes, gels, liniments and lotions, suppositories, and pessaries Nasal preparations, Ear preparations Powders and granules —Insufflations, dusting powders, effervescent powders, and effervescent granules Sterile formulations —Injectables, eye drops and eye ointments Immunological products: Sera, vaccines, toxoids, and their manufacturing methods.	8 4 6 8 2 3 6 4
6	Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants Quality control and quality assurance: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation	5
7	Novel drug delivery systems: Introduction, Classification with examples, advantages, and challenges	5

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-12T	PHARMACEUTICAL CHEMISTRY	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart basic knowledge on the chemical structure, storage conditions and medicinal uses of organic and inorganic chemical substances used as drugs and pharmaceuticals. Also, this course discusses the impurities, quality control aspects of chemical substances used in pharmaceuticals.

Course Objectives: This course will discuss the following aspects of the chemical substances used as drugs and pharmaceuticals for various disease conditions

1. Chemical classification, chemical name, chemical structure
2. Pharmacological uses, doses, stability and storage conditions
3. Different types of formulations/ dosage form available and their brand names
4. Impurity testing and basic quality control tests

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the chemical class, structure and chemical name of the commonly used drugs and pharmaceuticals of both organic and inorganic nature
2. Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs
3. Describe the quantitative and qualitative analysis, impurity testing of the chemical substances given in the official monographs
4. Identify the dosage form & the brand names of the drugs and pharmaceuticals popular in the marketplace

Chapter	Topic	Hours
1	Introduction to Pharmaceutical chemistry: Scope and objectives Sources and types of errors: Accuracy, precision, significant figures Impurities in Pharmaceuticals: Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.	8
2	Volumetric analysis: Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration Gravimetric analysis: Principle and method.	8

3	Inorganic Pharmaceuticals: Pharmaceutical formulations, market preparations, storage conditions and uses of ● Haematinics: Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron ● Gastro-intestinal Agents: Antacids: Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium carbonate, Acidifying agents, Adsorbents, Protectives, Cathartics ● Topical agents: Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate ● Dental products: Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouthwashes ● Medicinal gases: Carbon dioxide, nitrous oxide, Oxygen	7
4	Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings	2
Study of the following category of medicinal compounds with respect to classification, chemical name, chemical structure (compounds marked with *) uses, stability and storage conditions, different types of formulations and their popular brand names		
5	Drugs Acting on Central Nervous System ● Anaesthetics: Thiopental Sodium*, Ketamine Hydrochloride*, Propofol ● Sedatives and Hypnotics: Diazepam*, Alprazolam*, Nitrazepam, Phenobarbital* ● Antipsychotics: Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone ● Anticonvulsants: Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine ● Anti-Depressants: Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine	9
6	Drugs Acting on Autonomic Nervous System ● Sympathomimetic Agents: Direct Acting: Nor-Epinephrine*, Epinephrine, Phenylephrine,	9

	Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. Indirect Acting Agents: Hydroxyamphetamine, Pseudoephedrine. Agents With Mixed Mechanism: Ephedrine, Metaraminol ● Adrenergic Antagonists: Alpha Adrenergic Blockers: Tolazoline, Phentolamine ● Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol ● Cholinergic Drugs and Related Agents: Direct Acting Agents: Acetylcholine*, Carbachol, and Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiophate Iodide ● Cholinergic Blocking Agents: Atropine Sulphate*, Ipratropium Bromide Synthetic Cholinergic Blocking Agents: Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*	
7	Drugs Acting on Cardiovascular System ● Anti-Arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcainide Hydrochloride, Amiodarone and Sotalol ● Anti-Hypertensive Agents: Propranolol*, Captopril*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine, ● Antianginal Agents: Isosorbide Dinitrate	5
8	Diuretics: Acetazolamide, Furosemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone	2
9	Hypoglycemic Agents: Insulin and Its Preparations, Metformin*, Glibenclamide*, Glimepiride, Pioglitazone, Repaglinide, Gliflozins, Gliptins	3
10	Analgesic And Anti-Inflammatory Agents: Morphine Analogues, Narcotic Antagonists; Nonsteroidal Anti-Inflammatory Agents (NSAIDs) - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac	3
11	Anti-Infective Agents	8

	● Antifungal Agents: Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride	
	● Urinary Tract Anti-Infective Agents: Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin, ● Anti-Tubercular Agents: INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid* ● Antiviral Agents: Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir ● Antimalarials: Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine, Artemisinin ● Sulfonamides: Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*	
12	Antibiotics: Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin, Tetracyclines: Doxycycline, Minocycline, Macrolides: Erythromycin, Azithromycin, Miscellaneous: Chloramphenicol* Clindamycin	8
13	Anti-Neoplastic Agents: Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate	3

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-13T	PHARMACOGNOSY	L	T	P	Total Marks
		3	1	0	100

Scope:

This course is designed to impart knowledge on the medicinal uses of various drugs of natural origin. Also, the course emphasizes the fundamental concepts in the evaluation of crude drugs, alternative systems of medicine, nutraceuticals and herbal cosmetics.

Course Objectives: This course will discuss the following aspects of drugs substances derived from natural resources.

1. Occurrence, distribution, isolation, identification tests of common phytoconstituents
2. Therapeutic activity and pharmaceutical applications of various natural drugs substances and phytoconstituents
3. Biological source, chemical constituents of selected crude drugs and their therapeutic efficacy in common diseases and ailments
4. Basic concepts in quality control of crude drugs and various systems of medicines
5. Applications of herbs in health foods and cosmetics

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Identify the important/common crude drugs of natural origin
2. Describe the uses of herbs in nutraceuticals and cosmeceuticals
3. Discuss the principles of alternative system of medicines
4. Describe the importance of quality control of drugs of natural origin

Chapter	Topic	Hours
1	Definition, history, present status and scope of Pharmacognosy	2
2	Classification of drugs: • Alphabetical • Taxonomical • Morphological • Pharmacological • Chemical • Chemo-taxonomical	4
3	Quality control of crude drugs: • Different methods of adulteration of crude drugs • Evaluation of crude drugs	6
4	Brief outline of occurrence, distribution, isolation, identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.	6

5	Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.	30
	Laxatives	Aloe, Castor oil, Ispaghula, Senna
	Cardiotonic	Digitalis, Arjuna
	Carminatives and G.I. regulators	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
	Astringents	Myrobalan, Black Catechu, Pale Catechu
	Drugs acting on nervous system	Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca
	Anti-hypertensive	Rauwolfia
	Anti-tussive	Vasaka, Tolu Balsam
	Anti-rheumatics	Colchicum seed
	Anti-tumour	Vinca, Podophyllum
	Antidiabetics	Pterocarpus, Gymnema
	Diuretics	Gokhru, Punarnava
	Anti-dysenteric	Ipecacuanha
	Antiseptics and disinfectants	Benzoin, Myrrh, Neem, Turmeric
	Antimalarials	Cinchona, Artemisia
	Oxytocic	Ergot
	Vitamins	Cod liver oil, Shark liver oil
	Enzymes	Papaya, Diastase, Pancreatin, Yeast
	Pharmaceutical Aids	Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatine
	Miscellaneous	Squill, Galls, Ashwagandha, Tulsi, Guggul
6	Plant fibres used as surgical dressings: Cotton, silk, wool and regenerated fibres Sutures – Surgical Catgut and Ligatures	3
7	• Basic principles involved in the traditional systems of medicine like: Ayurveda, Siddha, Unani and Homeopathy • Method of preparation of Ayurvedic formulations like: Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma	8
8	Role of medicinal and aromatic plants in national economy and their export potential	2

9	Herbs as health food: Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic	4
10	Introduction to herbal formulations	4
11	Herbal cosmetics: Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil	4
12	Phytochemical investigation of drugs	2

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-14T	HUMAN ANATOMY & PHYSIOLOGY	L	T	P	Total Marks
		3	1	0	100

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

Course Objectives: This course will discuss the following

1. Structure and function of the various organs, systems and organs of the human body
2. Homeostatic mechanisms and their imbalances in the human body
3. Various vital physiological parameters of the human body and their significances

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the various organs, systems of the human body
2. Discuss the anatomical features of the important human organs and tissues
3. Explain the homeostatic mechanisms regulating the normal physiology in the human system
4. Discuss the significance of various vital physiological parameters of the human body

Chapter	Topic	Hours
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1	Scope of Anatomy and Physiology Definition of various terminologies	2
2	Structure of Cell: Components and its functions	2
3	Tissues of the human body: Epithelial, Connective, Muscular and Nervous tissues – their sub-types and characteristics.	4
4	Osseous system: structure and functions of bones of axial and appendicular skeleton Classification, types and movements of joints, disorders of joints	3 3
5	Haemopoietic system - Composition and functions of blood - Process of Hemopoiesis - Characteristics and functions of RBCs, WBCs, and platelets - Mechanism of Blood Clotting - Importance of Blood groups	8
6	Lymphatic system - Lymph and lymphatic system, composition, function and its formation. - Structure and functions of spleen and lymph node.	3
7	Cardiovascular system - Anatomy and Physiology of heart - Blood vessels and circulation (Pulmonary, coronary and systemic circulation) - Cardiac cycle and Heart sounds, Basics of ECG - Blood pressure and its regulation	8
8	Respiratory system - Anatomy of respiratory organs and their functions. - Regulation, and Mechanism of respiration. - Respiratory volumes and capacities – definitions	4
9	Digestive system - Anatomy and Physiology of the GIT - Anatomy and functions of accessory glands - Physiology of digestion and absorption	8
10	Skeletal muscles - Histology - Physiology of muscle contraction - Disorder of skeletal muscles	2

11	Nervoussystem • Classification of nervous system • Anatomy and physiology of cerebrum, cerebellum, mid brain • Function of hypothalamus, medulla oblongata and basal ganglia • Spinal cord-structure and reflexes • Names and functions of cranial nerves. • Anatomy and physiology of sympathetic and parasympathetic nervous system (ANS)	8
12	Senseorgans-Anatomyandphysiology of • Eye • Ear • Skin • Tongue • Nose	6
13	Urinarysystem • Anatomy and physiology of urinary system • Physiology of urine formation • Renin - angiotensin system • Clearance tests and micturition	4
14	Endocrinesystem(Hormonesandtheirfunctions) • Pituitary gland • Adrenal gland • Thyroid and parathyroid gland • Pancreas and gonads	6
15	Reproductivesystem • Anatomy of male and female reproductive system • Physiology of menstruation • Spermatogenesis and Oogenesis • Pregnancy and parturition	4

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I.Long Answers(Answer6outof7)	=	6x5=30
II.Short Answers(Answer 10out of11)	=	10x3=30
III.VeryShortAnswers(AnswerALL)	=	20x1=20

ER20-15T	SOCIAL PHARMACY	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart basic knowledge on public health, epidemiology, preventive care and other social health related concepts. Also, to emphasize the roles of pharmacists in the public health programs.

Course Objectives: This course will discuss about basic concepts of

1. Public health and national health programs
2. Preventive healthcare
3. Food and nutrition related health issues
4. Health education & promotion
5. General roles and responsibilities of pharmacists in public health

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Discuss about roles of pharmacists in the various national health programs
2. Describe various sources of health hazards and disease preventive measures
3. Discuss the health care issues associated with food and nutritional substances
4. Describe the general roles and responsibilities of pharmacists in public health

Chapter	Topic	Hours
1	Introduction to Social Pharmacy • Definition and Scope. Social Pharmacy as a discipline and its scope in improving the public health. Role of Pharmacists in Public Health. (2) • Concept of Health- WHO Definition, various dimensions, determinants, and health indicators. (3) • National Health Policy – Indian perspective (1) • Public and Private Health System in India, National Health Mission (2) • Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals (1)	9
2	Preventive healthcare – Role of Pharmacists in the following • Demography and Family Planning (3) • Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding (2) • Overview of Vaccines, types of immunity and immunization (4)	18

	• Effect of Environment on Health – Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals (7) • Psychosocial Pharmacy: Drugs of misuse and abuse – psychotropics, narcotics, alcohol, tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviours (2)	
3	Nutrition and Health • Basics of nutrition – Macronutrients and Micronutrients (3) • Importance of water and fibres in diet (1) • Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food (3) • Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods (1) • Dietary supplements, nutraceuticals, food supplements – indications, benefits, Drug-Food Interactions (2)	10
4	Introduction to Microbiology and common microorganisms (3) Epidemiology: Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality, . (2) Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases: • Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola (7) • Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning (7)	28

	- Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya (4) - Surface infections – trachoma, tetanus, leprosy (2) - STDs, HIV/AIDS (3)	
5	Introduction to health systems and all ongoing National Health programs in India, their objectives, functioning, outcome, and the role of pharmacists.	8
6	Pharmacoeconomics – Introduction, basic terminologies, importance of pharmacoeconomics	2

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)

=

II. Short Answers (Answer 10 out of 11)

=

III. Very Short Answers (Answer ALL)

=

ER-20-11P	PHARMACEUTICS	L	T	P	Total Marks
		0	0	3	100

Scope: This course is designed to train the students in formulating and dispensing common pharmaceutical dosage forms.

Course Objectives: This course will discuss and train the following aspects of preparing and dispensing various pharmaceutical dosage forms

1. Calculation of working formula from the official master formula
2. Formulation of dosage forms based on working formula
3. Appropriate Packaging and labelling requirements
4. Methods of basic quality control tests

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Calculate the working formula from the given master formula
2. Formulate the dosage form and dispense in an appropriate container
3. Design the label with the necessary product and patient information
4. Perform the basic quality control tests for the common dosage forms

Practicals

1. Handling and referring the official references: Pharmacopoeias, Formularies, etc. for retrieving formulas, procedures, etc.
2. Formulation of the following dosage forms as per monograph standards and dispensing with appropriate packaging and labelling
 - **Liquid Oral:** Simple syrup, Piperazine citrate elixir, Aqueous Iodine solution
 - **Emulsion:** Castor oil emulsion, Cod liver oil emulsion
 - **Suspension:** Calamine lotion, Magnesium hydroxide mixture
 - **Ointment:** Simple ointment base, Sulphur ointment
 - **Cream:** Cetrimide cream
 - **Gel:** Sodium alginate gel
 - **Liniment:** Turpentine liniment, White liniment BPC
 - **Dry powder:** Effervescent powder granules, Dusting powder
 - **Sterile Injection:** Normal Saline, Calcium gluconate Injection
 - **Hard Gelatine Capsule:** Tetracycline capsules
 - **Tablet:** Paracetamol tablets
3. Formulation of at least five commonly used cosmetic preparations—
e.g. cold cream, shampoo, lotion, toothpaste etc
4. Demonstration on various stages of tablet manufacturing processes
5. Appropriate methods of usage and storage of all dosage forms including special dosages such as different types of inhalers, spacers, insulin pens
6. Demonstration of quality control tests and evaluation of common dosage forms viz. tablets, capsules, emulsion, sterile injections as per the monographs

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period i.e., a minimum of THREE assignments per student)

1. Various systems of measures commonly used in prescribing, compounding and dispensing practices
2. Market preparations (including Fixed Dose Combinations) of each type of dosage forms, their generic name, minimum three brand names and label contents of the dosage forms mentioned in theory/practical
3. Overview of various machines/equipment/instruments involved in the formulation and quality control of various dosage forms/pharmaceutical formulations.
4. Overview of extemporaneous preparations at community / hospital pharmacy vs. manufacturing of dosage forms at industrial level

5. Basic pharmaceutical calculations: ratios, conversion to percentage fraction, alligation, proof spirit, isotonicity

Field Visit

The students shall be taken for an industrial visit to pharmaceutical industries to witness and understand the various processes of manufacturing of any of the common dosage forms viz. tablets, capsules, liquid orals, injectables, etc. Individual reports from each student on their learning experience from the field visit shall be submitted.

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-12P	PHARMACEUTICAL CHEMISTRY	L	T	P	Total Marks
		0	0	3	100

Scope: This course is designed to impart basic training and hands-on experience to synthesis chemical substances used as drugs and pharmaceuticals. Also, to perform the quality control tests, impurity testing, test for purity and systematic qualitative analysis of chemical substances used as drugs and pharmaceuticals.

Course Objectives: This course will provide the hands-on experience on the following aspects of chemical substances used as drugs and pharmaceuticals

1. Limit tests and assays of selected chemical substances as per the monograph
2. Volumetric analysis of the chemical substances
3. Basics of preparatory chemistry and their analysis
4. Systematic qualitative analysis for the identification of the chemical drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Perform the limit tests for various inorganic elements and report
2. Prepare standard solutions using the principles of volumetric analysis
3. Test the purity of the selected inorganic and organic compounds against the monograph standards
4. Synthesize the selected chemical substances as per the standard synthetic scheme
5. Perform qualitative tests to systematically identify the unknown chemical substances

S. No.	Experiment
1	Limit test for Chlorides; sulphate; Iron; heavy metals
2	Identification tests for Anions and Cations as per Indian Pharmacopoeia
3	Fundamentals of Volumetric analysis Preparation of standard solution and standardization of Sodium Hydroxide, Potassium Permanganate
4	Assay of the following compounds - Ferrous sulphate-by redox titration - Calcium gluconate-by complexometric - Sodium chloride-by Modified Volhard's method - Ascorbic acid by iodometry - Ibuprofen by alkalimetry
5	Fundamentals of preparative organic chemistry Determination of Melting point and boiling point of organic compounds
6	Preparation of organic compounds - Benzoic acid from Benzamide - Picric acid from Phenol
7	Identification and test for purity of pharmaceuticals Aspirin, Caffeine, Paracetamol, Sulfanilamide
8	Systematic Qualitative analysis experiments (4 substances)

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Different monographs and formularies available and their major contents
2. Significance of quality control and quality assurance in pharmaceutical industries
3. Overview on Green Chemistry
4. Various software programs available for computer aided drug discovery
5. Various instrumentations used for characterization and quantification of drug

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-13P	PHARMACOGNOSY	L	T	P	Total Marks
		0	0	3	100

Scope: This course is designed to train the students in physical identification, morphological characterization, physical and chemical characterization, and evaluation of commonly used herbal drugs.

Course Objectives: This course will provide hands-on experience to the students in

1. Identification of the crude drugs based on their morphological characteristics
2. Various characteristic anatomical characteristics of the herbal drugs studied through transverse section
3. Physical and chemical tests to evaluate the crude drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Identify the given crude drugs based on their morphological characteristics
2. Take a transverse section of the given crude drugs
3. Describe the anatomical characteristics of the given crude drug under microscopical conditions
4. Carry out the physical and chemical tests to evaluate the given crude drugs

Practicals

1. Morphological Identification of the following drugs:

Ispaghula, Senna, Coriander, Fennel, Cardamom, Ginger, Nutmeg, Black Pepper, Cinnamon, Clove, Ephedra, Rauwolfia, Gokhru, Punarnava, Cinchona, Agar.

2. Gross anatomical studies (Transverse Section) of the following

drugs: Ajwain, Datura, Cinnamon, Cinchona, Coriander, Ashwagandha, Liquorice, Clove, Curcuma, Nuxvomica, Vasaka

3. Physical and chemical tests for evaluation of any FIVE of the following drugs:

Asafoetida, Benzoin, Pale catechu, Black catechu, Castor oil, Acacia, Tragacanth, Agar, Guar gum, Gelatine.

Assignments

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. Market preparations of various dosage forms of Ayurvedic, Unani, Siddha, Homeopathic (Classical and Proprietary), indications, and their labelling requirements
2. Market preparations of various herbal formulations and herbal cosmetics, indications, and their labelling requirements
3. Herb-Drug interactions documented in the literature and their clinical significances

Field Visit

The students shall be taken in groups to medicinal garden to witness and understand the nature of various medicinal plants discussed in theory and practical courses. Additionally, they shall be taken in groups to the pharmacies of traditional systems of medicines to understand the availability of various dosage forms and their labelling requirements. Individual reports from each student on their learning experience from the field visit shall be submitted.

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-14P	HUMAN ANATOMY & PHYSIOLOGY	L	T	P	Total Marks
		0	0	3	100

Scope: This course is designed to train the students and instil the skills for carrying out basic physiological monitoring of various systems and functions.

Course Objectives: This course will provide hands-on experience in the following:

1. General blood collection techniques and carrying out various haematological assessment and interpreting the results
2. Recording and monitoring the vital physiological parameters in human subjects and the basic interpretation of the results
3. Microscopic examination of the various tissues permanently mounted in glass slides
4. Discuss the anatomical and physiological characteristics of various organs/systems of the body using models, charts, and other teaching aids

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Perform the haematological tests in human subjects and interpret the results
2. Record, monitor and document the vital physiological parameters of human subjects and interpret the results
3. Describe the anatomical features of the important human tissues under the microscopical conditions
4. Discuss the significance of various anatomical and physiological characteristics of the human body

Practicals

1. Study of compound microscope
2. General techniques for the collection of blood
3. Microscopic examination of Epithelial tissue, Cardiac muscle, Smooth muscle, Skeletal muscle, Connective tissue, and Nervous tissue of ready / pre-prepared slides.
4. Study of Human Skeleton - Axial skeleton and appendicular skeleton
5. Determination of
 - a. Blood group
 - b. ESR
 - c. Haemoglobin content of blood
 - d. Bleeding time and Clotting time
6. Determination of WBC count of blood
7. Determination of RBC count of blood
8. Determination of Differential count of blood
9. Recording of Blood Pressure in various postures, different arms, before and after exertion and interpreting the results
10. Recording of Body temperature (using mercury, digital and IR thermometers at various locations), Pulse rate/ Heart rate (at various locations in the body, before and after exertion), Respiratory Rate
11. Recording Pulse Oxygen (before and after exertion)
12. Recording of force of air expelled using Peak Flow Meter
13. Measurement of height, weight, and BMI
14. Study of various systems and organs with the help of chart, models, and specimens
 - a) Cardiovascular system
 - b) Respiratory system
 - c) Digestive system
 - d) Urinary system
 - e) Endocrine system
 - f) Reproductive system
 - g) Nervous system
 - h) Eye
 - i) Ear
 - j) Skin

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-15P	SOCIAL PHARMACY	L	T	P	Total Marks
		0	0	3	100

Scope: This course is designed to provide simulated experience in various public health and social pharmacy activities.

Course Objectives: This course will train the students on various roles of pharmacists in public health and social pharmacy activities in the following areas:

1. National immunization programs
2. Reproductive and child health programs
3. Food and nutrition related health programs
4. Health education and promotion
5. General roles and responsibilities of the pharmacists in public health
6. First Aid for various emergency conditions including basic life support and cardiopulmonary resuscitation

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the roles and responsibilities of pharmacists in various National health programs
2. Design promotional materials for public health awareness
3. Describe various health hazards including microbial sources
4. Advise on preventive measures for various diseases
5. Provide first aid for various emergency conditions

Note: Demonstration/Hands-on experience/preparation of charts/models/promotional materials / role plays / enacting / e-brochures / e-flyers / podcasts / video podcasts / any other innovative activities to understand the concept of various elements of social pharmacy listed here. (At least one activity to be carried out for each one of the following):

Practicals

1. National immunization schedule for children, adult vaccine schedule, Vaccines which are not included in the National Immunization Program.
2. RCH-reproductive and child health-nutritional aspects, relevant national health programmes.
3. Family planning devices
4. Microscopical observation of different microbes (ready made slides)
5. Oral Health and Hygiene
6. Personal hygiene and etiquettes-hand washing techniques, Cough and sneeze etiquettes.
7. Various types of masks, PPE gear, wearing/using them, and disposal.
8. Menstrual hygiene, products used
9. First Aid- Theory, basics, demonstration, hands on training, audio-visuals, and practice, BSL (Basic Life Support) Systems [SCA-Sudden Cardiac Arrest, FBAO - Foreign Body Airway Obstruction, CPR, Defibrillation (using AED) (Includes CPR techniques, First Responder).
10. Emergency treatment for all medical emergency cases viz. snake bite, dog bite, insecticide poisoning, fractures, burns, epilepsy etc.

11. Role of Pharmacist in Disaster Management.
12. Marketed preparations of disinfectants, antiseptics, fumigating agents, antilarval agents, mosquito repellents, etc.
13. Health Communication: Audio / Video podcasts, Images, Power Point Slides, Short Films, etc. in regional language(s) for mass communication / education / Awareness on 5 different communicable diseases, their signs and symptoms, and prevention.
14. Water purification techniques, use of water testing kit, calculation of Content/percentage of KMnO_4 , bleaching powder to be used for wells/tanks
15. Counselling children on junk foods, balanced diets – using Information, Education and Communication (IEC), counselling, etc. (Simulation Experiments).
16. Preparation of various charts on nutrition, sources of various nutrients from Locally available foods, calculation of caloric needs of different groups (e.g. child, mother, sedentary lifestyle, etc.). Chart of glycemic index of foods.
17. Tobacco cessation, counselling, identifying various tobacco containing products through charts/pictures

Assignment

The students shall be asked to submit the written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. An overview of Women's Health Issues
2. Study the label of various packed food stuffs to understand their nutritional contents
3. Breastfeeding counselling, guidance – using Information, Education and Communication (IEC)
4. Information about the organizations working on de-addiction services in the region (city / district, etc.)
5. Role of a pharmacist in disaster management – A case study
6. Overview of the National Tuberculosis Elimination Programme (NTEP)
7. Drug disposal systems in the country, at industry level and citizen level
8. Various Prebiotics or Probiotics (dietary and market products)
9. Emergency preparedness: Study of local Government structure with respect to Fire, Police departments, health department
10. Prepare poster/presentation for general public on any one of the Health Days. e.g. Day, AIDS Day, Handwashing Day, ORS day, World Diabetes Day, World Heart Day, etc.
11. List of home medicines, their storage, safe handling, and disposal of unused medicines
12. Responsible Use of Medicines: From Purchase to Disposal
13. Collection of newspaper clips (minimum 5) relevant to any one topic and its submission in an organized form with collective summary based on the news items
14. Read a minimum of one article relevant to any theory topic, from Pharma / Science / or other Periodicals and prepare summary of it for submission
15. Potential roles of pharmacists in rural India

Field Visits

The students shall be taken in groups to visit any THREE of the following facilities to witness and understand the activities of such centres/facilities from the perspectives of the topics discussed in theory and/or practical courses. Individual reports from each student on their learning experience from the field visits shall be submitted.

1. Garbage Treatment Plant
2. Sewage Treatment Plant
3. Bio-medical Waste Treatment Plant
4. Effluent Treatment Plant
5. Water purification plant
6. Orphanage/Elderly-Care-Home/School and/or Hostel/Home for persons with disabilities
7. Primary healthcare centre

END LAB EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 80****Exam Duration: 3 Hrs.**

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER20-21T	PHARMACOLOGY	L	T	P	Total Marks
		3	1	0	100

Scope: This course provides basic knowledge about different classes of drugs available for the pharmacotherapy of common diseases. The indications for use, dosage regimen, routes of administration, pharmacokinetics, pharmacodynamics, and contraindications of the drugs discussed in this course are vital for successful professional practice.

Course Objectives: This course will discuss the following:

1. General concepts of pharmacology including pharmacokinetics, pharmacodynamics, routes of administration, etc.
2. Pharmacological classification and indications of drugs
3. Dosage regimen, mechanisms of action, contraindications of drugs
4. Common adverse effects of drugs

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the basic concepts of pharmacokinetics and pharmacodynamics
 2. Enlist the various classes and drugs of choice for any given disease condition
 3. Advise the dosage regimen, route of administration and contraindications for any given drug
- Describe the common adverse drug reactions

Chapter	Topic	Hours
1	General Pharmacology • Introduction and scope of Pharmacology • Various routes of drug administration - advantages and disadvantages • Drug absorption - definition, types, factors affecting drug absorption • Bioavailability and the factors affecting bioavailability • Drug distribution - definition, factors affecting drug distribution • Biotransformation of drugs - Definition, types of biotransformation reactions, factors influencing drug metabolism • Excretion of drugs - Definition, routes of drug excretion • General mechanisms of drug action and factors modifying drug action	10

2	Drugs Acting on the Peripheral Nervous System - Steps involved in neurohumoral transmission - Definition, classification, pharmacological actions, dose, indications, and contraindications of - Cholinergic drugs - Anti-Cholinergic drugs - Adrenergic drugs - Anti-adrenergic drugs - Neuromuscular blocking agents - Drugs used in Myasthenia gravis - Local anaesthetic agents - Non-Steroidal Anti-Inflammatory drugs (NSAIDs)	11
3	Drugs Acting on the Eye Definition, classification, pharmacological actions, dose, indications and contraindications of - Miotics - Mydriatics - Drugs used in Glaucoma	2
4	Drugs Acting on the Central Nervous System Definition, classification, pharmacological actions, dose, indications, and contraindications of - General anaesthetics - Hypnotics and sedatives - Anti-Convulsant drugs - Anti-anxiety drugs - Anti-depressant drugs - Anti-psychotics - Nootropic agents - Centrally acting muscle relaxants - Opioid analgesics	8
5	Drugs Acting on the Cardiovascular System Definition, classification, pharmacological actions, dose, indications, and contraindications of - Anti-hypertensive drugs - Anti-anginal drugs - Anti-arrhythmic drugs - Drugs used in atherosclerosis and - Congestive heart failure - Drug therapy for shock	6

6	Drugs Acting on Blood and Blood Forming Organs Definition,classification,pharmacologicalactions,dose,indications,andcontraindicationsof • Hematinicagents • Anti-coagulants • Anti-plateletagents • Thrombolyticdrugs	4
7	Definition,classification,pharmacologicalactions,dose,indications,andcontraindicationsof • Bronchodilators • Expectorants • Anti-tussiveagents • Mucolytic agents	2
8	DrugsActingontheGastroIntestinalTract Definition,classification,pharmacologicalactions,dose,indications,andcontraindicationsof • Anti-ulcerdrugs • Anti-emetics • Laxativesandpurgatives • Anti-diarrhealdrugs	5
9	DrugsActing onthe Kidney Definition,classification,pharmacologicalactions, dose, indications,andcontraindicationsof • Diuretics • Anti-Diuretics	2
10	Hormones andHormone Antagonists Physiologicalandpathologicalroleandclinicaluses of • Thyroidhormones • Anti-thyroid drugs • Parathormone • Calcitonin • Vitamin D • Insulin • Oral hypoglycemicagents • Estrogen • Progesterone • Oxytocin • Corticosteroids	8

11	Autocoids • Physiological role of Histamine, 5 HT and Prostaglandins • Classification, clinical uses, and adverse effects of antihistamines and 5 HT antagonists	3
12	Chemotherapeutic Agents: Introduction, basic principles of chemotherapy of infections, infestations and neoplastic diseases, Classification, dose, indication and contraindications of drugs belonging to following classes: • Penicillins • Cephalosporins • Aminoglycosides • Fluoroquinolones • Macrolides • Tetracyclines • Sulphonamides • Anti-tubercular drugs • Anti-fungal drugs • Anti-viral drugs • Anti-amoebic agents • Anthelmintics • Anti-malarial agents • Anti-neoplastic agents	12
13	Biologicals Definition, types, and indications of biological agents with examples	2

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-22T	COMMUNITY PHARMACY & MANAGEMENT	L	T	P	Total Marks
		3	1	0	100

Scope: The course is designed to impart basic knowledge and skills to provide various pharmaceutical care services to patients and general practitioners in the community setup.

Course Objectives: This course will discuss the following:

1. Establishing and running a community pharmacy and its legal requirements
2. Professional aspects of handling and filling prescriptions
3. Patient counselling on diseases, prescription and or non-prescription medicines
4. Scope for performing basic health screening in community pharmacy settings

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the establishment, legal requirements, and effective administration of a community pharmacy
2. Professionally handle prescriptions and dispense medications
3. Counsel patients about the disease, prescription and or non-prescription medicines
4. Perform basic health screening on patients and interpret the reports in the community pharmacy settings

Chapter	Topic	Hours
1	Community Pharmacy Practice – Definition, history and development of community pharmacy-International and Indian scenarios	2
2	Professional responsibilities of community pharmacists Introduction to the concept of Good Pharmacy Practice and SOPs.	3
3	Prescription and prescription handling • Definition, parts of prescriptions, legality of prescriptions, prescription handling, labelling of dispensed medications (Main label, ancillary label, pictograms), brief instructions on medication usage • Dispensing process, Good Dispensing Practices, dispensing errors and strategies to minimize them	7

4	Communications skills • Definition, types of communications skills • Interactions with professionals and patients • Verbal communication skills (one-to-one, over the telephone) • Written communications skills • Body language • Patient interview techniques	6
5	Patient counselling • Definition and benefits of patient counselling • Stages of patient counselling - Introduction, counselling content, counselling process, and closing the counselling session • Barriers to effective counseling - Types and strategies to overcome the barriers • Patient counselling points for chronic diseases/disorders - Hypertension, Diabetes, Asthma, Tuberculosis, Chronic obstructive pulmonary disease, and AIDS • Patient Package Inserts - Definition, importance and benefits, Scenarios of PPI use in India and other countries • Patient Information leaflets - Definition and uses	10
6	Medication Adherence Definition, factors influencing non-adherence, strategies to overcome non-adherence	2
7	Health Screening Services in Community Pharmacy Introduction, scope, and importance of various health screening services - for routine monitoring of patients, early detection, and referral of undiagnosed cases	5
9	Over The Counter (OTC) Medications • Definition, need and role of Pharmacists in OTC medication dispensing • OTC medications in India, counseling for OTC products • Self-medication and role of pharmacists in promoting the safe practices during self-medication • Responding to symptoms, minor ailments, and advice for self-care in conditions such as - Pain management, Cough, Cold, Diarrhea, Constipation, Vomiting, Fever, Sore throat, Skin disorders, Oral health (mouth ulcers, dental pain, gum swelling)	15

10	Community Pharmacy Management • Legal requirements to set up a community pharmacy • Site selection requirements • Pharmacy designs and interiors • Vendor selection and ordering • Procurement, inventory control methods, and inventory management • Financial planning and management • Accountancy in community pharmacy – Daybook, Cashbook • Introduction to pharmacy operation softwares – usefulness and availability • Customer Relation Management (CRM) • Audits in Pharmacies • SOP of Pharmacy Management • Introduction to Digital Health, mHealth and Online pharmacies	25
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END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-23T	BIOCHEMISTRY & CLINICAL PATHOLOGY	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart basic knowledge on the study of structure and functions of biomolecules and the chemical processes associated with living cells in normal and abnormal states. The course also emphasizes on the clinical pathology of blood and urine.

Course Objectives: This course will discuss the following at the fundamental level

1. Structure and functions of biomolecules

2. Catalytic activity, diagnostic and therapeutic importance of enzymes
3. Metabolic pathways of biomolecules in health and illness (metabolic disorders)
4. Biochemical principles of organ function tests and their clinical significance
5. Qualitative and quantitative determination of biomolecules/metabolites in the biological sample
6. Clinical pathology of blood and urine

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the functions of biomolecules
2. Discuss the various functions of enzymes in the human system
3. Explain the metabolic pathways of biomolecules in both physiological and pathological conditions
4. Describe the principles of organ function tests and their clinical significances
5. Determine the biomolecules/metabolites in the given biological samples, both qualitatively and quantitatively
6. Describe the clinical pathology of blood and urine

Chapter	Topic	Hours
1	Introduction to biochemistry: Scope of biochemistry in pharmacy; Cell and its biochemical organization.	2
2	Carbohydrates • Definition, classification with examples, chemical properties • Monosaccharides-Structure of glucose, fructose, and galactose • Disaccharides-structure of maltose, lactose, and sucrose • Polysaccharides-chemical nature of starch and glycogen • Qualitative tests and biological role of carbohydrates	5
3	Proteins • Definition, classification of proteins based on composition and solubility with examples • Definition, classification of amino acids based on chemical nature and nutritional requirements with examples • Structure of proteins (four levels of organization of protein structure) • Qualitative tests and biological role of proteins and amino acids • Diseases related to malnutrition of proteins.	5
4	Lipids • Definition, classification with examples • Structure and properties of triglycerides (oils and fats) • Fatty acid classification-Based on	5

	chemical and nutritional requirements with examples • Structure and functions of cholesterol in the body • Lipoproteins-types, composition and functions in the body • Qualitative tests and functions of lipids	
5	Nucleic acids • Definition, purine and pyrimidine bases • Components of nucleosides and nucleotides with examples • Structure of DNA (Watson and Crick model), RNA and their functions	4
6	Enzymes • Definition, properties and IUB and MB classification • Factors affecting enzyme activity • Mechanism of action of enzymes, Enzyme inhibitors • Therapeutic and pharmaceutical importance of enzymes	5
7	Vitamins • Definition and classification with examples • Sources, chemical nature, functions, coenzyme form, recommended dietary requirements, deficiency diseases of fat- and water-soluble vitamins	6
8	Metabolism (Study of cycle/pathways without chemical structures) • Metabolism of Carbohydrates: Glycolysis, TCA cycle and glycogen metabolism, regulation of blood glucose level, Diseases related to abnormal metabolism of Carbohydrates • Metabolism of lipids: Lipolysis, β-oxidation of Fatty acid (Palmitic acid) ketogenesis and ketolysis. Diseases related to abnormal metabolism of lipid such as Ketoacidosis, Fatty liver, Hypercholesterolemia • Metabolism of Amino acids (Proteins): General reactions of amino acids and its significance – Transamination, deamination, Urea cycle and decarboxylation. Diseases related to abnormal metabolism of amino acids, Disorders of ammonia metabolism, phenylketonuria, alkaptonuria and Jaundice. • Biological oxidation: Electron transport chain and Oxidative phosphorylation	20
9	Minerals: Types, Functions, Deficiency diseases, recommended dietary requirements	05
10	Water and Electrolytes • Distribution, functions of water in the body	05

	• Water turnover and balance • Electrolyte composition of the body fluids, Dietary intake of electrolyte and Electrolyte balance • Dehydration, causes of dehydration and oral rehydration therapy	
11	Introduction to Biotechnology	01
12	Organ function tests • Functions of kidney and routinely performed tests to assess the functions of kidney and their clinical significances • Functions of liver and routinely performed tests to assess the functions of liver and their clinical significances • Lipid profile tests and its clinical significances	06
13	Introduction to Pathology of Blood and Urine • Lymphocytes and Platelets, their role in health and disease • Erythrocytes - Abnormal cells and their significance • Normal and Abnormal constituents of Urine and their significance	06

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I.	Long Answers (Answer 6 out of 7)	=	6x5=30
II.	Short Answers (Answer 10 out of 11)	=	10x3=30
III.	Very Short Answers (Answer ALL)	=	20x1=20

ER20-24T	PHARMACOTHERAPEUTICS	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart basic knowledge on etiopathogenesis of common diseases and their management along with quality use of medicines.

Course Objectives: This course will discuss about

1. Etiopathogenesis of selected common diseases and evidence-based medicine therapy
2. Importance of individualized therapeutic plans based on diagnosis
3. Basic methods for assessing the clinical outcomes of drug therapy

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Help assessing the subjective and objective parameters of patients in common disease conditions

2. Assist the healthcare provider to analyse drug related problems and provide therapeutic interventions
3. Participate in planning the rational medicine therapy for common diseases
4. Design and deliver discharge counselling for patients

Chapter	Topic	Hours
1	Pharmacotherapeutics – Introduction, scope, and objectives. Rational use of Medicines, Evidence Based Medicine, Essential Medicines List, Standard Treatment Guidelines (STGs)	8
2	Definition, etiopathogenesis, clinical manifestations, non-pharmacological and pharmacological management of the diseases associated with	
	(a) Cardiovascular System • Hypertension • Angina and Myocardial infarction • Hyperlipidaemia • Congestive Heart Failure	8
	(b) Respiratory System • Asthma • COPD	4
	(c) Endocrine System • Diabetes • Thyroid disorders - Hypo and Hyperthyroidism	5
	(d) Central Nervous System • Epilepsy • Parkinson's disease • Alzheimer's disease • Stroke • Migraine	8
	(e) Gastrointestinal Disorders • Gastroesophageal reflux disease • Peptic Ulcer Disease • Alcoholic liver disease • Inflammatory Bowel Diseases (Crohn's Disease and Ulcerative Colitis)	8
	(f) Haematological disorders • Iron deficiency anaemia • Megaloblastic anaemia	4
	(g) Infectious diseases • Tuberculosis • Pneumonia • Urinary tract infections • Hepatitis	12

	• Gonorrhoea and Syphilis • Malaria • HIV and Opportunistic infections • Viral Infections (SARS, CoV2)	
	(h) Musculoskeletal disorders • Rheumatoid arthritis • Osteoarthritis	3
	(i) Dermatology • Psoriasis • Scabies • Eczema	3
	(j) Psychiatric Disorders • Depression • Anxiety • Psychosis	4
	(k) Ophthalmology • Conjunctivitis (bacterial and viral) • Glaucoma	2
	(l) Anti-microbial Resistance	2
	(m) Women's Health • Polycystic Ovary Syndrome • Dysmenorrhea • Premenstrual Syndrome	4

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-25T	HOSPITAL & CLINICAL PHARMACY	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart fundamental knowledge and professional skills required for facilitating various hospital and clinical pharmacy services.

Course Objectives: This course will discuss and train the students in the following

1. Hospital and Hospital Pharmacy organization and set-ups

2. Basics of hospital pharmacy services including the procurement, supply chain, storage of medicines and medical supplies
3. Basics of clinical pharmacy including introduction to comprehensive pharmaceutical care services
4. Basic interpretation of common laboratory results used in clinical diagnosis towards optimizing the drug therapy

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Explain about the basic concepts of hospital pharmacy administration
2. Manage the supply chain and distribution of medicines within the hospital settings
3. Assist the other healthcare providers in monitoring drug therapy and address drug related problems
4. Interpret common lab investigation reports for optimizing drug therapy

S. No.	Topic	Hours
1	Hospital Pharmacy - Definition, scope, national and international scenario - Organisational structure - Professional responsibilities, Qualification and experience requirements, job specifications, work load requirements and interprofessional relationships - Good Pharmacy Practice (GPP) in hospital - Hospital Pharmacy Standards (FIP Basel Statements, AHSP) - Introduction to NAQS guidelines and NABH Accreditation and Role of Pharmacists	6
2	Different Committees in the Hospital - Pharmacy and Therapeutics Committee- Objectives, Composition, and functions - Hospital Formulary - Definition, procedure for development and use of hospital formulary - Infection Control Committee- Role of Pharmacist in preventing Antimicrobial Resistance	4
3	Supply Chain and Inventory Control - Preparation of Drug lists - High Risk drugs, Emergency drugs, Schedule H1 drugs, NDPS drugs, reserved antibiotics - Procedures of Drug Purchases – Drug selection, short term, long term, and tender/e-tender process, quotations, etc. - Inventory control techniques: Economic Order Quantity, Reorder Quantity Level, Inventory Turnover etc. - Inventory Management of Central Drug Store – Storage conditions, Methods of storage, Distribution, Maintaining Cold Chain, Devices used for cold storage	14

	(Refrigerator,ILR,Walk-in-Coldrooms) • FEFO,FIFO methods • Expiry drug removal and handling, and disposal. - Disposal of Narcotics, cytotoxic drugs • Documentation-purchase and inventory	
4	Drug distribution • Drug distribution (in-patients and out-patients)–Definition, advantages and disadvantages of individual prescription order method, Floor Stock Method, Unit Dose Drug Distribution Method, Drug Basket Method. • Distribution of drugs to ICCU/ICU/NICU/Emergency wards. • Automated drug dispensing systems and devices • Distribution of Narcotic and Psychotropic substances and their storage	7
5	Compounding in Hospitals. Bulk compounding, IV admixture services and incompatibilities, Total parenteral nutrition	4
6	RadioPharmaceuticals-Storage, dispensing and disposal of radiopharmaceuticals	2
7	Application of computers in Hospital Pharmacy Practice, Electronic health records, Software used in hospital pharmacy	2
8	Clinical Pharmacy: Definition, scope, and development- in India and other countries Technical definitions, common terminologies used in clinical settings and their significances such as Paediatrics, Geriatric, Anti-natal Care, Post-natal Care, etc. Daily activities of clinical pharmacists: Definition, goal, and procedure of • Ward round participation • Treatment Chart Review • Adverse drug reaction monitoring • Drug information and poisons information • Medication history • Patient counselling • Interprofessional collaboration Pharmaceutical care: Definition, classification of drug related problems. Principles and procedure to provide pharmaceutical care Medication Therapy Management, Home Medication Review	12
9	Clinical laboratory tests used in the evaluation of disease states- significance and interpretation of test results • Haematological, Liver function, Renal function,	10

	thyroid function tests • Tests associated with cardiac disorders • Fluid and electrolyte balance • Pulmonary Function Tests	
10	Poisoning: Types of poisoning; Clinical manifestations and Antidotes Drugs and Poison Information Centre and their services – Definition, Requirements, Information resources with examples, and their advantages and disadvantages	6
11	Pharmacovigilance • Definition, aim and scope • Overview of Pharmacovigilance	2
12	Medication errors: Definition, types, consequences, and strategies to minimize medication errors, LASA drugs and Tallman lettering as per ISMP Drug Interactions: Definition, types, clinical significance of drug interactions	6

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)	=	6x5=30
II. Short Answers (Answer 10 out of 11)	=	10x3=30
III. Very Short Answers (Answer ALL)	=	20x1=20

ER20-26T	PHARMACY LAW & ETHICS	L	T	P	Total Marks
		3	1	0	100

Scope: This course is designed to impart basic knowledge on several important legislations related to the profession of pharmacy in India

Course Objectives: This course will discuss the following

1. General perspectives, history, evolution of pharmacy law in India
2. Act and Rules regulating the profession and practice of pharmacy in India
3. Important code of ethical guidelines pertaining to various practice standards
4. Brief introduction to the patent laws and their applications in pharmacy

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Describe the history and evolution of pharmacy law in India
2. Interpret the act and rules regulating the profession and practice of pharmacy in India

3. Discuss the various codes of ethics related to practice standards in pharmacy
Interpret the fundamentals of patent laws from the perspectives of pharmacy

Chapter	Topics	Hours
1	General Principles of Law, History and various Acts related to Drugs and Pharmacy profession	2
2	Pharmacy Act- 1948 and Rules: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils, Registration of Pharmacists, Offences and Penalties. Pharmacy Practice Regulations 2015	5
3	Drugs and Cosmetics Act 1940 and Rules 1945 and New Amendments Objectives, Definitions, Legal definitions of schedules to the Act and Rules Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. Study of schedule C and C1, G, H, H1, K, P, M, N, and X. Sale of Drugs – Wholesale, Retail sale and Restricted license, Records to be kept in a pharmacy Drugs Prohibited for manufacture and sale in India Administration of the Act and Rules – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, licensing authorities, controlling authorities, Drug Inspectors.	23
4	Narcotic Drugs and Psychotropic Substances Act 1985 and Rules Objectives, Definitions, Authorities and Officers, Prohibition, Control and Regulation, Offences and Penalties.	2

5	Drugs and Magic Remedies (Objectionable Advertisements) Act 1954 Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.	2
6	Prevention of Cruelty to Animals Act-1960: Objectives, Definitions, CPCSEA - brief overview, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and Acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.	2
7	Poisons Act-1919: Introduction, objective, definition, possession, possession for sale and sale of any poison, import of poisons	2
8	FSSAI (Food Safety and Standards Authority of India) Act and Rules: brief overview and aspects related to manufacture, storage, sale, and labelling of Food Supplements	2
9	National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO) - 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Pharmaceutical Policy 2002, National List of Essential Medicines (NLEM)	5
10	Code of Pharmaceutical Ethics: Definition, ethical principles, ethical problem solving, registration, code of ethics for Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.	5
11	Medical Termination of Pregnancy Act and Rules – basic understanding, salient features, and Amendments	2
12	Role of all the government pharmacy regulator bodies – Central Drugs Standards Control Organization (CDSCO), Indian Pharmacopoeia Commission (IPC)	1
13	Good Regulatory practices (documentation, licenses, renewals, e-governance) in Community Pharmacy, Hospital pharmacy, Pharma Manufacturing, Wholesale business, inspections, import, export of drugs and medical devices	3
14	Introduction to BCS system of classification, Basic concepts of Clinical Trials, ANDA, NDA, New Drug development, New Drugs and Clinical Trials Rules, 2019. Brand v/s Generic, Trade name concept, Introduction to Patent	7

	Law and Intellectual Property Rights, Emergency Use Authorization	
15	Bloodbank –basic requirements and functions	2
16	Clinical Establishment Act and Rules –Aspects related to Pharmacy	2
17	Biomedical Waste Management Rules 2016 – Basic aspects, and aspects related to pharma manufacture to disposal of pharma/medical waste at homes, pharmacies, and hospitals	2
18	Bioethics - Basic concepts, history and principles. Brief overview of ICMR's National Ethical Guidelines for Biomedical and Health Research involving human participants	2
19	Introduction to the Consumer Protection Act	1
20	Introduction to the Disaster Management Act	1
21	Medical Devices –Categorization, basic aspects related to manufacture and sale	2

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period, i.e., a minimum of THREE assignments per student)

1. Requirements for Ayurvedic, Homeopathic manufacturing, sale, and licensing requirements
2. Layout and content of official websites of various agencies regulating the profession of pharmacy in India: e.g., CDSCO, SUGAM portal, PCI, etc.
3. Licenses required, application processes (online/offline), drug regulatory office website of the respective state
4. Case studies – action taken on violation of any act/rule related to pharmacy
5. Schedule H1 drugs and its implementation in India
6. Counterfeit / Spurious medicines
7. Drug Testing Labs in India
8. Overview of Pharma marketing practices
9. Generic Medicines

END EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Long Answers (Answer 6 out of 7)

= 6x5=30

II. Short Answers (Answer 10 out of 11)

= 10x3=30

III. Very Short Answers (Answer ALL)

=

20x1=20

PHARMACY

ER-20-21P	PHARMACOLOGY	L	T	P	Total Marks
		0	0	2	100

Scope: This course provides the basic understanding about the uses, mechanisms of actions, dose dependent responses of drugs in simulated virtual animal models and experimental conditions.

Course Objectives: This course will demonstrate/provide hands-on experience in the virtual platform using appropriate software on the following

1. Study of pharmacological effects of drugs like local anaesthetics, mydriatic and mitotic on rabbit eye
2. Screening the effects of various drugs acting in the central nervous system
3. Study of drug effects on isolated organs/tissues
4. Study of pyrogen testing on rabbit

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Study and report the local anaesthetic, mydriatic and mitotic effects of the given drug on the rabbit eye
2. Choose appropriate animal experiment model to study the effects of the given drugs acting on the central nervous system and submit the report
3. Perform the effects of given tissues (simulated) on isolated organs/tissues and interpret the results
4. Interpret the dose dependent responses of drugs in various animal experiment models

Practicals

Introduction to the following topics pertaining to the experimental pharmacology have to be discussed and documented in the practical manuals.

1. Introduction to experimental pharmacology
2. Study of laboratory animals
 - (a) Mice; (b) Rats; (c) Guinea pigs; (d) Rabbits
3. Commonly used instruments in experimental pharmacology
4. Different routes of administration of drugs in animals
5. Types of pre-clinical experiments: In-Vivo, In-Vitro, Ex-Vivo, etc.
6. Techniques of blood collection from animals

Experiments

Note: Animals shall not be used for doing / demonstrating any of the experiments given. The given experiments shall be carried out / demonstrated as the case maybe, ONLY with the use of software program(s) such as 'Ex Pharm' or any other suitable software

1. Study of local anaesthetic on rabbit eye

2. Study of Mydriatic effect on rabbit eye
3. Study of Miotic effect on rabbit eye
4. Effect of analgesics using Analgesiometer
5. Study of analgesic activity by writhing test
6. Screening of anti-convulsant using Electro Convulsiometer
7. Screening of Muscle relaxants using Rota-Rod apparatus
8. Screening of CNS stimulants and depressants using Actophotometer
9. Study of anxiolytic activity using elevated plus maze method
10. Study of effect of drugs (any 2) on isolated heart
11. Effect of drugs on ciliary motility on frog's buccal cavity
12. Pyrogen testing by rabbit method

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period, i.e., a minimum of THREE assignments per student)

1. Introduction to Allergy Testing
2. Introduction to Toxicity Studies
3. Drug Facts Label of USFDA
4. Pre-clinical studies in new drug development
5. Medicines and meals: Before or After food
6. Pre-clinical studies in new drug development
7. Drugs available as paediatric formulations
8. Drug information apps

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-22P	COMMUNITY PHARMACY & MANAGEMENT	L	T	P	Total Marks
		0	0	3	100

Scope: The course is designed to train the students and improve professional skills to provide various pharmaceutical care services in community pharmacy.

Course Objectives: This course will train the students in the following

1. Professional handling and filling prescriptions
2. Patient counselling on diseases and minor ailments
3. Patient counselling on prescription and /or non-prescription medicines
4. Preparation of counselling materials such as patient information leaflets
5. Performing basic health screening tests

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Handle and fill prescriptions in a professional manner
2. Counsel patients on various diseases and minor ailments
3. Counsel patients on prescription and or non-prescription medicines
4. Design and prepare patient information leaflets
5. Perform basic health screening tests

Practicals

Note: The following practicals shall be carried out in the model community pharmacy with appropriate simulated scenarios and materials. Students shall be trained through role plays wherever necessary. The activities of the students shall be assessed/evaluated using a structured objective assessment form.

1. Handling of prescriptions with professional standards, reviewing prescriptions, checking for legal compliance and completeness (minimum 5)

2. Identification of drug-drug interactions in the prescription and follow-up actions (minimum 2)

3. Preparation of dispensing labels and auxiliary labels for the prescribed medications (minimum 5)

4. Providing the following health screening services for monitoring patients/detecting new patients (one experiment for each activity)

Blood Pressure Recording, Capillary Blood Glucose Monitoring, Lung function assessment using Peak Flow Meter and incentive spirometer, recording capillary oxygen level using Pulse Oximeter, BMI measurement

5. Providing counselling to simulated patients for the following chronic diseases /disorders including education on the use of devices such as insulin pen, inhalers, spacers, nebulizers, etc. where appropriate (one experiment for each disease)

Type 2 Diabetes Mellitus, Primary Hypertension, Asthma, Hyperlipidaemia, Rheumatoid Arthritis

6. Providing counselling to simulated patients for the following minor ailments (any three)

Headache, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhoea, constipation), Worm infestations, Pyrexia, Upper Respiratory Tract infections, Skin infections, Oral and dental disorders.

7 Appropriate handling of dummy dosage forms with correct administration techniques - oral liquids with measuring cup/cap/dropper, Eye Drops, Inhalers, Nasal drops, Insulin pen, nebulizers, different types of tablets, patches, enemas, suppositories

8 Use of Community Pharmacy Software and digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

1. SOPs for various activities in Community Pharmacy (as discussed in Theory and Practical)
2. List out the various abbreviations, short forms used in prescriptions and their interpretation
3. Patient Information Leaflet for a given chronic disease / disorder
4. Patient Information Leaflet for prescription / non-prescription medicines
5. Preparation of window / shelf display materials for the model community pharmacy
6. Overview of Software available for retail pharmacy management including billing, inventory, etc.
7. Dosage / Medication Reminder Aids
8. Overview on the operations and marketing strategies of various online pharmacies
9. Overview on the common fixed dose combinations
10. Overview on the medications requiring special storage conditions
11. Role of Community Pharmacists in preventing Antimicrobial Resistance
12. Jan Aushadhi and other Generic Medicine initiatives in India
13. Global Overview of Online Pharmacies
14. Community Pharmacy Practice Standards: Global Vs. Indian Scenario
15. Overview of pharmacy associations in India

Field Visit

The students shall be taken in groups to visit community pharmacies and medicine distributors to understand and witness the professional activities of the community pharmacists, and supply chain logistics. Individual reports from each student on their learning experience from the field visit shall be submitted.

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-23P	PATHOLOGY	L	T	P	Total Marks
		0	0	2	100

Scope: This course is designed to train the students in the qualitative testing of various biomolecules and testing of biological samples for determination of normal and abnormal constituents

Course Objectives: This course will train and provide hands-on experiences on the following

1. Qualitative determination of biomolecules/metabolites in simulated biological samples
2. Determination of normal and abnormal constituents of simulated blood and urine samples

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Qualitatively determine the biomolecules/metabolites in the given biological samples
2. Determine the normal and abnormal constituents in blood and urine samples and interpret the results of such testing

Practicals

1. Qualitative analysis of carbohydrates (4 experiments)
2. Qualitative analysis of Proteins and amino acids (4 experiments)
3. Qualitative analysis of lipids (2 experiments)
4. Qualitative analysis of urine for normal and abnormal constituents (4 experiments)
5. Determination of constituents of urine (glucose, creatinine, chlorides) (2 experiments)

6. Determination of constituents of blood/serum (simulated) (Creatine, glucose, cholesterol, Calcium, Urea, SGOT/SGPT) (5 experiments)

7. Study the hydrolysis of starch from acid and salivary amylase enzyme (1 experiment)

Assignments

The student shall be asked to submit written assignments on Various Pathology Lab Reports (One assignment per student per sessional period. i.e., a minimum of THREE assignments per student)

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-24P	PHARMACOTHERAPEUTICS	L	T	P	Total Marks
		0	0	1	100

Scope: This course is designed to train the students in the basic skills required to support the pharmaceutical care services for selected common disease conditions.

Course Objectives: This course will train the students on

1. How to prepare a SOAP (Subjective, Objective, Assessment and Plan) note for clinical cases of selected common diseases
2. Patient counselling techniques/methods for common disease conditions

Course Outcomes: Upon successful completion of this course, the students will be able to

1. Write SOAP (Subjective, Objective, Assessment and Plan) notes for the given clinical cases of selected common diseases
2. Counsel the patients about the disease conditions, uses of drugs, methods of handling and administration of drugs, life-style modifications, and monitoring parameters.

Practicals

II. Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for at least SIX clinical cases (real / hypothetical) of the following disease conditions.

1. Hypertension
2. Angina Pectoris
3. Myocardial Infarction
4. Hyperlipidaemia
5. Rheumatoid arthritis
6. Asthma
7. COPD
8. Diabetes
9. Epilepsy
10. Stroke
11. Depression
12. Tuberculosis
13. Anaemia (any one type as covered in theory)
14. Viral infection (any one type as covered in theory)
15. Dermatological conditions (any one condition as covered in theory)

III. Patient counselling exercises using role plays based on the real / hypothetical clinical case scenarios. The students are expected to provide counselling on disease condition, medications, life-style modifications, monitoring parameters, etc. and the same shall be documented. (Minimum 5 cases)

IV. Simulated cases to enable dose calculation of selected drugs in paediatrics,
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and geriatrics under various pathological conditions. (Minimum 4 cases)

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II. Experiments (Major, Minor and Spotters)	=	50
III. Viva voce	=	10
IV. Practical Record Maintenance	=	10

ER-20-25P	HOSPITAL & CLINICAL PHARMACY	L	T	P	Total Marks
		0	0	1	100

Scope: This course is designed to train the students to assist the healthcare providers in the basic services of hospital and clinical pharmacy.

Course Objectives: This course will train the students with hands-on experiences, simulated clinical case studies in the following:

1. Method to systematically approach and respond to drug information queries
2. How to interpret common laboratory reports to understand the need for optimizing dosage regimens
3. How to report suspected adverse drug reactions to the concerned authorities
4. Uses and methods of handling various medical/surgical aids and devices
5. How to interpret drug-drug interactions in the treatment of common diseases.

Course Outcomes: Upon completion of the course, the students will be able to

1. Professionally handle and answer the drug information queries
2. Interpret the common laboratory reports
3. Report suspected adverse drug reactions using standard procedures
4. Understand the uses and methods of handling various medical/surgical aids and devices
5. Interpret and report the drug-drug interactions in common diseases for optimizing the drug therapy

Note: Few of the experiments of Hospital and Clinical Pharmacy practical course listed here require adequate numbers of desktop computers with internet connectivity, adequate drug information resources including reference books, different types of surgical dressings and other medical devices and accessories. Various charts, models, exhibits pertaining to the experiments shall also be displayed in the laboratory.

Practicals

1. Systematic approach to drug information queries using primary/secondary/tertiary resources of information (2 cases)
2. Interpretation of laboratory reports to optimize the drug therapy in a given clinical case (2 cases)
3. Filling up IPC's ADR Reporting Form and perform causality assessments using various scales (2 cases)
4. Demonstration/ simulated /hands-on experience on the identification, types, use/application/administration of
 - Orthopaedic and Surgical Aids such as knee cap, L S belts, abdominal belt, walker, walking sticks, etc.
 - Different types of bandages such as sterile gauze, cotton, crepe bandages, etc.
 - Needles, syringes, catheters, IV set, urine bag, RYLE's tube, urine pots, colostomy bags, oxygen masks, etc.
5. Case studies on drug-drug interactions (any 2 cases)
6. Wound dressing (simulated cases and role play – minimum 2 cases)
7. Vaccination and injection techniques (IV, IM, SC) using mannequins (5 activities)
8. Use of Hospital Pharmacy Software and various digital health tools

Assignments

The students shall be asked to submit written assignments on the following topics (One assignment per student per sessional period, i.e., a minimum of THREE assignments per student)

1. Typical profile of a drug to be included in the hospital formulary
2. Brief layout and various services of the Central Sterile Supplies Department (CSSD)
3. Various types of sterilizers and sterilization techniques used in hospitals
4. Fumigation and pesticide control in hospitals
5. Role of Pharmacists in Transition of Care: Discharge cards, post hospitalization care, medicine reconciliation activities in developed countries
6. Total parenteral nutrition and IV admixtures and their compatibility issues
7. Concept of electronic health records
8. Invasive and Non-invasive diagnostic tests - HRCT, MRI, Sonography, 2D ECHO, X-rays, Mammography, ECG, EMG, EEG
9. Home Diagnostic Kits - Pregnancy Test, COVID testing etc
10. Measures to be taken in hospitals to minimize Antimicrobial Resistance
11. Role and responsibilities of a pharmacist in public hospital in rural parts of the country
12. Safe waste disposal of hospital waste

Field Visit

The students shall be taken in groups to visit a Government / private healthcare facility to understand and witness the various hospital and clinical pharmacy services provided. Individual reports from each student on their learning experience from the field visits shall be submitted.

END LAB EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

I. Synopsis	=	10
II.Experiments (Major, Minor and Spotters)	=	50
III.Viva voce	=	10
IV. Practical Record Maintenance	=	10

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