Pharm.D Syllabus

Year 01

Subjects

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1.1 - Human Anatomy and Physiology

Theory

- Scope of anatomy and physiology, basic terminologies used in this subject (Description of the body as such planes and terminologies)
- Structure of cell - its components and their functions.
- Elementary tissues of the human body: epithelial, connective, Muscular and nervous tissues-their sub-types and characteristics 4 a) Osseous system - structure, composition and functions of the Skeleton.
- Classification of joints, Types of movements of joints and disorders of joints (Definitions only) 5 Haemopoetic System
- Composition and functions of blood
- Haemopoesis and disorders of blood components (definition of disorder)
- Blood groups
- Clotting factors and mechanism
- Platelets and disorders of coagulation 6 Lymph
- Lymph and lymphatic system, composition, formation and circulation.
- Spleen: structure and functions, Disorders
- Disorders of lymphatic system (definition only) 7 Cardiovascular system
- Anatomy and functions of heart
- Blood vessels and circulation (Pulmonary, coronary and systemic circulation)
- Electrocardiogram (ECG)
- Cardiac cycle and heart sounds
- Blood pressure - its maintenance and regulation
- Definition of the following disorders Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure, Cardiac arrhythmias 8 Respiratory system
- Anatomy of respiratory organs and functions
- Mechanism / physiology of respiration and regulation of respiration
- Transport of respiratory gases
- Respiratory volumes and capacities, and Definition of: Hypoxia, Asphyxia, Dybarism, Oxygen therapy and resuscitation.
- Digestive system
- Anatomy and physiology of GIT
- Anatomy and functions of accessory glands of GIT
- Digestion and absorption
- Disorders of GIT (definitions only) 10 Nervous system
- Definition and classification of nervous system

- Anatomy, physiology and functional areas of cerebrum
- Anatomy and physiology of cerebellum
- Anatomy and physiology of mid brain
- Thalamus, hypothalamus and Basal Ganglia
- Spinal card: Structure & reflexes - mono-poly-planter
- Cranial nerves - names and functions
- ANS - Anatomy & functions of sympathetic & parasympathetic N.S.
- Urinary system
- Anatomy and physiology of urinary system
- Formation of urine
- Renin Angiotensin system - Juxtaglomerular apparatus - acid base Balance
- Clearance tests and micturition 12 Endocrine system
- Pituitary gland
- Adrenal gland
- Thyroid and Parathyroid glands
- Pancreas and gonads 13 Reproductive system
- Male and female reproductive system
- Their hormones - Physiology of menstruation
- Spermatogenesis & Oogenesis
- Sex determination (genetic basis)
- Pregnancy and maintenance and parturition
- Contraceptive devices 14 Sense organs
- Eye
- Ear
- Skin
- Tongue & Nose 15 Skeletal muscles
- Histology
- Physiology of Muscle contraction
- Physiological properties of skeletal muscle and their disorders (definitions) 16 Sports physiology
- Muscles in exercise, Effect of athletic training on muscles and muscle performance,
- Respiration in exercise, CVS in exercise, Body heat in exercise, Body fluids and salts in exercise,
- Drugs and athletics

Practical

- Study of tissues of human body (a) Epithelial tissue.
- (b) Muscular tissue.

- Study of tissues of human body (a) Connective tissue.
- (b) Nervous tissue.
- Study of appliances used in hematological experiments.
- Determination of W.B.C. count of blood.
- Determination of R.B.C. count of blood.
- Determination of differential count of blood.
- Determination of (a) Erythrocyte Sedimentation Rate.
- (b) Hemoglobin content of Blood.
- (c) Bleeding time & Clotting time.
- Determination of (a) Blood Pressure.
- (b) Blood group.
- Study of various systems with the help of charts, models & specimens (a) Skeleton system part I-axial skeleton.
- (b) Skeleton system part II-appendicular skeleton.
- (c) Cardiovascular system.
- (d) Respiratory system.
- (e) Digestive system.
- (f) Urinary system.
- (g) Nervous system.
- (h) Special senses.
- (i) Reproductive system.
- Study of different family planning appliances.
- To perform pregnancy diagnosis test.
- Study of appliances used in experimental physiology.
- To record simple muscle curve using gastroenemius sciatic nerve preparation.
- To record simple summation curve using gastroenemius sciatic nerve preparation.
- To record simple effect of temperature using gastroenemius sciatic nerve preparation.
- To record simple effect of load & after load using gastroenemius sciatic nerve preparation.
- To record simple fatigue curve using gastroenemius sciatic nerve preparation.

1.2 - Pharmaceutics

Theory

- 1 a. Introduction to dosage forms - classification and definitions
- Prescription: definition, parts and handling
- Posology: Definition, Factors affecting dose selection. Calculation of children and infant doses.
- Historical back ground and development of profession of pharmacy and pharmaceutical industry in brief.
- Development of Indian Pharmacopoeia and introduction to other Pharmacopoeias such as BP, USP, European Pharmacopoeia, Extra pharmacopoeia and Indian national formulary.
- Weights and measures, Calculations involving percentage solutions, allegation, proof spirit, isotonic solutions etc.
- Powders and Granules: Classification advantages and disadvantages, Preparation of simple, compound powders, Insufflations, Dusting powders, Eutectic and Explosive powders, Tooth powder and effervescent powders and granules.
- Monophasic Dosage forms: Theoretical aspects of formulation including adjuvant like stabilizers, colorants, flavours with examples. Study of Monophasic liquids like gargles, mouth washes, Throat paint, Ear drops, Nasal drops, Liniments and lotions, Enemas and collodions.
- Biphasic dosage forms: Suspensions and emulsions, Definition, advantages and disadvantages, classification, test for the type of emulsion, formulation, stability and evaluation.
- Suppositories and pessaries: Definition, advantages and disadvantages, types of base, method of preparation, Displacement value and evaluation.
- Galenicals: Definition, equipment for different extraction processes like infusion, Decoction, Maceration and Percolation, methods of preparation of spirits, tinctures and extracts.
- Pharmaceutical calculations.
- Surgical aids: Surgical dressings, absorbable gelatin sponge, sutures, ligatures and medicated bandages.
- Incompatibilities: Introduction, classification and methods to overcome the incompatibilities.

Practical

- Syrups
- Simple Syrup I.P
- Syrup of Ephedrine Hcl NF
- Syrup Vasaka IP
- Syrup of ferrous Phosphate IP
- Orange Syrup
- Elixir
- Piperizine citrate elixir BP
- Cascara elixir BPC

- Paracetamol elixir BPC
- Linctus
- Simple Linctus BPC
- Pediatric simple Linctus BPC
- Solutions
- Solution of cresol with soap IP
- Strong solution of ferric chloride BPC
- Aqueous Iodine Solution IP
- Strong solution of Iodine IP
- Strong solution of ammonium acetate IP
- Liniments
- Liniment of turpentine IP*
- Liniment of camphor IP
- Suspensions*
- Calamine lotion
- Magnesium Hydroxide mixture BP
- Emulsions*
- Cod liver oil emulsion
- Liquid paraffin emulsion
- Powders
- Eutectic powder
- Explosive powder
- Dusting powder
- Insufflations
- Suppositories
- Boric acid suppositories
- Chloral suppositories
- Incompatibilities
- Mixtures with Physical
- Chemical & Therapeutic incompatibilities * colourless bottles required for dispensing Paper envelope (white), butter paper and white paper required for dispensing.

1.3 - Medicinal Biochemistry

Theory

- Introduction to biochemistry: Cell and its biochemical organization, transport process across the cell membranes. Energy rich compounds; ATP, Cyclic AMP and their biological significance.
- Enzymes: Definition; Nomenclature; IUB classification; Factor affecting enzyme activity; Enzyme action; enzyme inhibition. Isoenzymes and their therapeutic and diagnostic applications; Coenzymes and their biochemical role and deficiency diseases.
- Carbohydrate metabolism: Glycolysis, Citric acid cycle (TCA cycle), HMP shunt, Glycogenolysis, gluconeogenesis, glycogenesis. Metabolic disorders of carbohydrate metabolism (diabetes mellitus and glycogen storage diseases);
- Glucose, Galactose tolerance test and their significance; hormonal regulation of carbohydrate metabolism.
- Lipid metabolism: Oxidation of saturated (β-oxidation); Ketogenesis and ketolysis; biosynthesis of fatty acids, lipids; metabolism of cholesterol; Hormonal regulation of lipid metabolism. Defective metabolism of lipids (Atheroslerosis, fatty liver, hypercholesterolmiea).
- Biological oxidation: Coenzyme system involved in Biological oxidation.
- Electron transport chain (its mechanism in energy capture; regulation and inhibition); Uncouplers of ETC; Oxidative phosphorylation;
- Protein and amino acid metabolism: protein turn over; nitrogen balance;
- Catabolism of Amino acids (Transamination, deamination & decarboxylation).
- Urea cycle and its metabolic disorders; production of bile pigments; hyperbilirubinemia, porphoria, jaundice. Metabolic disorder of Amino acids.
- Nucleic acid metabolism: Metabolism of purine and pyrimidine nucleotides;
- Protein synthesis; Genetic code; inhibition of protein synthesis; mutation and repair mechanism; DNA replication (semiconservative /onion peel models) and DNA repair mechanism.
- Introduction to clinical chemistry: Cell; composition; malfunction; Roll of the clinical chemistry laboratory.
- The kidney function tests: Role of kidney; Laboratory tests for normal function includes-
- Urine analysis (macroscopic and physical examination, quantitative and semiquantitative tests.)
- Test for NPN constituents. (Creatinine /urea clearance, determination of blood and urine creatinine, urea and uric acid)
- Urine concentration test
- Urinary tract calculi. (stones) 10 Liver function tests: Physiological role of liver, metabolic, storage, excretory, protective, circulatory functions and function in blood coagulation.
- Test for hepatic dysfunction-Bile pigments metabolism.
- Test for hepatic function test-Serum bilirubin, urine bilirubin, and urine urobilinogen.
- Dye tests of excretory function.
- Tests based upon abnormalities of serum proteins.

- Selected enzyme tests.
- Lipid profile tests: Lipoproteins, composition, functions. Determination of serum lipids, total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides.
- Immunochemical techniques for determination of hormone levels and protein levels in serum for endocrine diseases and infectious diseases.
- Radio immuno assay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA) 13 Electrolytes: Body water, compartments, water balance, and electrolyte distrubution. Determination of sodium, calcium potassium, chlorides, bicarbonates in the body fluids.

Practical

- Qualitative analysis of normal constituents of urine.*
- Qualitative analysis of abnormal constituents of urine.*
- Quantitative estimation of urine sugar by Benedict's reagent method.**
- Quantitative estimation of urine chlorides by Volhard's method.**
- Quantitative estimation of urine creatinine by Jaffe's method.**
- Quantitative estimation of urine calcium by precipitation method.**
- Quantitative estimation of serum cholesterol by Libermann Burchard's method.**
- Preparation of Folin Wu filtrate from blood.*
- Quantitative estimation of blood creatinine.**
- Quantitative estimation of blood sugar Folin-Wu tube method.**
- Estimation of SGOT in serum.**
- Estimation of SGPT in serum.**
- Estimation of Urea in Serum.**
- Estimation of Proteins in Serum.**
- Determination of serum bilirubin**
- Determination of Glucose by means of Glucoseoxidase.**
- Enzymatic hydrolysis of Glycogen/Starch by Amylases.**
- Study of factors affecting Enzyme activity. (pH & Temp.)**
- Preparation of standard buffer solutions and its pH measurements (any two)*
- Experiment on lipid profile tests**
- Determination of sodium,calcium and potassium in serum.** ** indicate major experiments &

1.4 - Pharmaceutical Organic Chemistry

Theory

- Structures and Physical properties:
- Polarity of bonds, polarity of molecules, M.P, Inter molecular forces, B.P, Solubility, non ionic solutes and ionic solutes, protic and aprotic Solvents, ion pairs,
- Acids and bases, Lowry bronsted and Lewis theories
- Isomerism 2 Nomenclature of organic compound belonging to the following classes Alkanes, Alkenes, Dienes, Alkynes, Alcohols, Aldehydes, Ketones, Amides, Amines, Phenols, Alkyl Halides, Carboxylic Acid, Esters, Acid Chlorides And Cycloalkanes.
- Free radicals chain reactions of alkane : Mechanism, relative reactivity and stability
- Alicyclic compounds : Preparations of cyclo alkanes, Bayer strain theory and orbital picture of angle strain.
- Nuclophilic aliphatic substitution mechanism: Nucleophiles and leaving groups, kinetics of second and first order reaction, mechanism and kinetics of SN2 reactions. Stereochemistry and steric hindrance, role of solvents, phase transfer catalysis, mechanism and kinetics of SN1 reactions, stereochemistry, carbocation and their stability, rearrangement of carbocation, role of solvents in SN1 reaction, Ion dipole bonds, SN2 versus SN1 solvolyses, nucleophilic assistance by the solvents.
- Dehydro halogenation of alkyl halides: 1,2 elimination, kinetics, E2 and E1 mechanism, elimination via carbocation, evidence for E2 mechanism, absence of rearrangement isotope effect, absence hydrogen exchange, the element effect, orientation and reactivity, E2 versus E1, elimination versus substitution, dehydration of alcohol, ease of dehydration, acid catalysis, reversibility, orientation.
- Electrophillic and free radicals addition: Reactions at carbon-carbon, double bond, electrophile, hydrogenation, heat of hydrogenation and stability of alkenes, markownikoff rule, addition of hydrogen halides, addition of hydrogen bromides, peroxide effect, electrophillic addition, mechanism, rearrangement, absence of hydrogen exchange, orientation and reactivity, addition of halogen, mechanism, halohydin formation, mechanism of free radicals additon, mechanism of peroxide initiated addition of hydrogen bromide, orientation of free addition, additions of carbene to alkene, cyclo addition reactions.
- Carbon-carbon double bond as substituents: Free radical halogenations of alkenes, comparision of free radical substitution with free radical addition, free radical substitution in alkenes, orientation and reactivity, allylic rearrangements.
- Theory of resonance: Allyl radical as a resonance hybrid, stability, orbital picture, resonance stabilisation of allyl radicals, hyper conjugation, allyl cation as a resonance hybrid, nucleophyllic substitution in allylic substrate, SN1 reactivity, allylic rearrangement, resonance stabilisation of allyl cation, hyper conjugation, nucleophilic substitution in allylic substrate, SN2 nucleophilic substituion in vinylic substrate, vinylic cation, stability of conjugated dienes, resonance in alkenes, hyper conjugation, ease of formation of conjugated dienes, orientation of elimination, electrophilic addition to conjugated dienes, 1,4-addition, 1,2-versus 1,4-addition, rate versus equilibrium, orientation and reactivity of free radical addition to conjugated dienes.

- Elecrophilic aromatic substitution: Effect of substituent groups, determination of orientation, determination of relative reactivity, classification of substituent group, mechanism of nitration, sulphonation, halogenation, friedel craft alkylation, friedel craft acylation, reactivity and orientation, activating and deactivating O,P,M directing groups, electron release via resonance, effect of halogen on electrophilic aromatic substitution in alkyl benzene, side chain halogination of alkyl benzene, resonance stabilization of benzyl radical.
- Nucleophilic addition reaction: Mechanism, ionisation of carboxylic acids, acidity constants, acidity of acids, structure of carboxylate ions, effect of substituent on acidity, nucleophilic acyl substitution reaction, conversion of acid to acid chloride, esters, amide and anhydride. Role of caboxyl group, comparison of alkyl nucleophilic substitution with acyl nucleophilic substitution.
- Mechanism of aldol condensation, claisen condensation, cannizzaro reaction, crossed aldol condensation, crossed cannizzaro reaction, benzoin condensation, perkin condensation. Knoevenagel, Reformatsky reaction, Wittig reaction, Michael addition.
- Hoffman rearrangement: Migration to electron deficient nitrogen, Sandmeyer's reaction, basicity of amines, diazotisation and coupling, acidity of phenols, Williamson synthesis, Fries rearrangement, Kolbe reaction, Reimer tieman's reactions.
- Nucleophilic aromatic substitution: Bimolecular displacement mechanisms, orientation, comparison of aliphatic nucleophilic substitution with that of aromatic.
- Oxidation reduction reaction.
- Study of the following official compounds-preparation, test for purity, assay and medicinal uses of Chlorbutol, Dimercaprol, Glyceryl trinitrate, Urea, Ethylene diamine dihyrate, Vanillin, Paraldehyde, Ethylene chloride, Lactic acid, Tartaric acid, citric acid, salicylic acid, aspirin, methyl salicylate, ethyl benzoate, benzyl benzoate, dimethyl pthalate, sodium lauryl sulphate, saccharin sodium, mephensin.

Practical

- Introduction to the various laboratory techniques through demonstration involving synthesis of the following compounds (compounds to be synthesised):
- Acetanilde / aspirin (Acetylation)
- Benzanilide / Phenyl benzoate (Benzoylation)
- P-bromo acetanilide / 2,4,6 - tribromo aniline (Bromination)
- Dibenzylidene acetone (Condensation)
- 1-Phenylazo-2-napthol (Diazotisation and coupling)
- Benzoic acid / salicylic acid (Hydrolysis of ester)
- M-dinitro benzene (Nitration)
- 9, 10 - Antharaquinone (Oxidation of anthracene) / preparation of benzoic acid from toluene or benzaldehyde
- M-phenylene diamine (Reduction of M-dinitrobenzene) / Aniline from nitrobenzene
- Benzophenone oxime
- Nitration of salicylic acid
- Preparation of picric acid

- Preparation of O-chlorobenzoic acid from O-chlorotolune
- Preparation of cyclohexanone from cyclohexanol
- Identification of organic compounds belonging to the following classes by Systematic qualitative organic analysis including preparation of derivatives Phenols, amides, carbohydrates, amines, carboxylic acids, aldehyde and ketones, Alcohols, esters, hydrocarbons, anilides, nitrocompounds.
- Introduction to the use of stereo models Methane, Ethane, Ethylene, Acetylene, Cis alkene, Trans alkene, inversion of configuration.

1.5 - Pharmaceutical Inorganic Chemistry

Theory

- Errors
- Volumetric analysis
- Acid-base titrations
- Redox titrations
- Non aqueous titrations
- Precipitation titrations
- Complexometric titrations
- Theory of indicators
- Gravimetry
- Limit tests
- Medicinal gases
- Acidifiers
- Antacids
- Cathartics
- Electrolyte replenishers
- Essential Trace elements
- Antimicrobials
- Pharmaceutical aids
- Dental Products
- Miscellaneous compounds
- Radio Pharmaceuticals

Practical

- Limit test
- Limit test for chlorides
- Limit test for sulphates
- Limit test for iron
- Limit test for heavy metals
- Limit test for arsenic
- Modified limit tests for chlorides and sulphates
- Assays
- Ammonium chloride-Acid-base titration

- Ferrous sulphate-Cerimetry
- Copper sulpahte-Iodometry
- Calcilugluconate-Complexometry
- Hydrogen peroxide - Permanganometry
- Sodium benzoate - Nonaqueous titration
- Sodium chloride - Modified volhard's method
- Assay of KI - KIO3 titration
- Gravimetric estimation of barium as barium sulphate
- Sodium antimony gluconate or antimony potassium tartarate
- Estimation of mixture
- Sodium hydroxide and sodium carbonate
- Boric acid and Borax
- Oxalic acid and sodium oxalate
- Test for identity
- Sodium bicorbonate
- Barium sulphate
- Ferrous sulphate
- Potassium chloride
- Test for purity
- Swelling power in Bentonite
- Acid neutralising capacity in aluminium hydroxide gel
- Ammonium salts in potash alum
- Adsorption power heavy Kaolin
- Presence of Iodates in KI
- Preparations
- Boric acids
- Potash alum
- Calcium lactate
- Magnesium suphate

1.6 - Remedial Mathematics and Biology

Theory

Remedial Mathematics

- Algebra: Determinants and matrices.
- Trigonometry: Sides and angles of a triangle; solution of triangles.
- Analytical geometry: Points, straight line, circle and parabola.
- Differential calculus: Limit of a function; differentiation of a sum, product, quotient, composite, parametric, exponential, trigonometric and logarithmic functions; successive differentiation; Leibnitz's theorem; partial differentiation; Euler's theorem on homogeneous functions of two variables.
- Integral calculus: Definite integrals; integration by substitution and by parts; properties of definite integrals.
- Differential equations: Definition, order and degree; variable separable, homogeneous, linear and heterogeneous equations; linear differential equations with constant coefficients; simultaneous linear equations of second order.
- Laplace transform: Definition; Laplace transforms of elementary functions; properties of linearity and shifting.

Biology - Part A: Plants

- Introduction.
- General organisation of plants and their inclusions.
- Plant tissues.
- Plant kingdom and its classification.
- Morphology of plants.
- Root, stem and leaf and their modifications.
- Inflorescence and pollination of flowers.
- Morphology of fruits and seeds.
- Plant physiology.
- Taxonomy of Leguminosae, Umbelliferae, Solanaceae, Liliaceae, Zingiberaceae and Rubiaceae.
- Study of fungi, yeast, Penicillium and bacteria.

Biology - Part B: Animals

- Study of the animal cell.
- Study of animal tissues.
- Detailed study of the frog.
- Study of Pisces, Reptilia and Aves.
- General organisation of mammals.

- Study of poisonous animals.

Practical

- Introduction of biology experiments
- Study of cell wall constituents and cell inclusions
- Study of Stem modifications
- Study of Root modifications
- Study of Leaf modifications
- Identification of Fruits and seeds
- Preparation of Permanent slides
- T.S. of Senna, Cassia, Ephedra, Podophyllum.
- Simple plant physiological experiments
- Identification of animals
- Detailed study of Frog
- Computer based tutorials

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