

B. Pharmacy 2nd Year Subjects and Syllabus

It's always good to be knowledgeable about the chosen stream chain. The B. Pharm degree is the basic prerequisite for registration to practice as a pharmacist in many countries. In India, as we came to know that the colleges imparting this educational courses (D. Pharm, B. Pharm, M. Pharm or Pharm. D) has to be approved by Pharmacy Council Of India (PCI) or All Indian Council of Technical Education (AICTE). Similarly, outside India countries those are providing these courses are also affiliated with some universities. Let us check out those and spread the information to the students aspiring for the same.



Apart from the United States, Canadian universities having B. Pharm programs are Dalhousie University, Memorial University of Newfoundland, University of Manitoba and by the University of Saskatchewan. In Australia, all B. Pharm programs are accredited by the New Zealand and Australian Pharmacy Schools Accreditation Committee (NAPSAC). B. Pharm (Rural) program was offered by the University of Sydney (Camperdown/Darlington campus). Hong Kong provides the Bachelor of Pharmacy course offered by the Chinese University of Hong Kong (CUHK) under the Faculty of Medicine. The Bachelor of Pharmacy degree in Bangladesh is approved by the Pharmacy Council of Bangladesh (PCB). In Norway, Oslo Metropolitan University, The University of Tromsø and Nord University offer the B. Pharm degree. B. Pharm programs in Africa are offered at the National University of Lesotho - Department of Pharmacy, by some Ugandan universities and Kenyan universities too. Many universities in South Africa also accredit B. Pharm programs.

Here we are providing the syllabus of B. Pharm (2nd year). As the lateral entry on the third semester, candidates on completion approved D. Pharmacy course by Pharmacy Council of India can apply accordingly.

B. Pharmacy Subjects for 2nd year (Semester 3)

Subjects	Theory		Practical	
	Hours	Marks	Hours	Marks
PHARMACEUTICAL ORGANIC CHEMISTRY –II	45	100	4/week	50
PHYSICAL PHARMACEUTICS-I	45	100	4/week	50
PHARMACEUTICAL MICROBIOLOGY	45	100	4/week	50
PHARMACEUTICAL ENGINEERING	45	100	4/week	50
Total marks	600			

B. Pharm Syllabus for Semester 3 Second Year

Subject: PHARMACEUTICAL ORGANIC CHEMISTRY –II

Theory

Unit I

· Benzene and its derivatives

A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule

B. Reactions of benzene-nitration, sulphonation, halogenations reactivity,

Friedelcrafts alkylation- reactivity, limitations,

Friedelcrafts acylation.

C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction.

Practical

I. Experiments involving laboratory techniques

· Recrystallization

· Steam distillation

II. Determination of following oil values (in standardization of

reagents)

· Acid value

· Saponification value

· Iodine value

D. Structure and uses of DDT, Saccharin, BHC and Chloramine

Unit II

· **Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols

· **Aromatic Amines*** - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts

· **Aromatic Acids*** –Acidity, effect of substituents on acidity and important reactions of benzoic acid.

Unit III

· **Fats and Oils**

a. Fatty acids – reactions.

b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.

c. Analytical constants – Acid value, Saponification value, Ester value,

Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and

principle involved in their determination.

Unit IV

· **Polynuclear hydrocarbons:**

a. Synthesis, reactions

b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivative

Unit V

III. Preparation of compounds

· Benzanilide/Phenyl benzoate/Acetanilide
Aniline/ Phenol

/Aniline by acylation reaction.

· 2,4,6-Tribromo aniline/Para bromo acetanilide
from Aniline/

· Acetanilide by halogenation (Bromination)
reaction.

· 5-Nitro salicylic acid/Meta di nitro benzoic
Salicylic acid /

Nitro benzene by nitration reaction.

· Benzoic acid from Benzyl chloride by oxidation
reaction.

· Benzoic acid/ Salicylic acid from alkyl benzoate
alkyl salicylate by

hydrolysis reaction.

· 1-Phenyl azo-2-naphthol from Aniline by
diazotization and coupling

reactions.

· Benzil from Benzoin by oxidation reaction

· Dibenzal acetone from Benzaldehyde by Cannizzaro
Schmidt reaction

· Cinnamic acid from Benzaldehyde by Perkin
reaction

· *P*-Iodo benzoic acid from *P*-amino benzoic acid

· Cyclo alkanes*

Stabilities – Baeyer’s strain theory, limitation of Baeyer’s strain theory, Coulson and Moffitt’s modification, Sachse Mohr’s theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

Subject: PHYSICAL PHARMACEUTICS-I

Theory

Unit I

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions,

ideal solubility parameters, solvation & association, quantitative approach to the factors

influencing solubility of drugs, diffusion principles in biological systems. Solubility

of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions)

Raoult’s law, real solutions. Partially miscible liquids, Critical solution temperature and

applications. Distribution law, its limitations and applications

Unit II

States of Matter and properties of matter: State of matter, changes in the state of matter,

latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols

Practical

1. Determination the solubility of drug at room temperature

2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch

equation.

3. Determination of Partition coefficient of benzoic acid in benzene and water

4. Determination of Partition coefficient of Iodine in CCl₄ and water

5. Determination of % composition of NaCl in a solution using phenol-water system by CST method

6. Determination of surface tension of given liquids by drop count and drop weight method

7. Determination of HLB number of a surfactant by saponification method

8. Determination of Freundlich and Langmuir constants using activated charcoal

9. Determination of critical micellar concentration of surfactants

– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid crystalline,

amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation,

dielectric constant, dipole moment, dissociation constant, determinations and applications.

Unit III

Surface and interfacial phenomenon:

Liquid interface, surface & interfacial tensions,

surface free energy, measurement of surface & interfacial tensions, spreading coefficient,

adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

Unit IV

Complexation and protein binding:

Introduction, Classification of Complexation,

Applications, methods of analysis, protein binding, Complexation and drug action,

crystalline structures of complexes and thermodynamic treatment of stability constants

Unit V

pH, buffers and Isotonic solutions:

Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in

10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method

11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

pharmaceutical and biological systems,
buffered isotonic solutions

Subject: PHARMACEUTICAL MICROBIOLOGY

Theory

Unit I

Introduction, history of microbiology, its branches, scope and its importance.

Introduction to Prokaryotes and Eukaryotes

Study of ultra-structure and morphological classification of bacteria,

nutritional requirements, raw materials used for culture media and physical

parameters for growth, growth curve, isolation and preservation methods

for pure cultures, cultivation of anaerobes, quantitative measurement of

bacterial growth (total & viable count).

Study of different types of phase contrast microscopy, dark field

microscopy and electron microscopy.

Unit II

Identification of bacteria using staining techniques (simple, Gram's & Acid

fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and

Practical

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.

2. Sterilization of glassware, preparation and sterilization of media.

3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.

4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).

5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.

6. Microbiological assay of antibiotics by cup plate method and other methods

mechanical method of sterilization, Evaluation of the efficiency of sterilization methods, Equipments employed in large scale sterilization, Sterility indicators

7. Motility determination by Hanging drop method.

Unit III

8. Sterility testing of pharmaceuticals.

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

9. Bacteriological analysis of water

Classification and mode of action of disinfectants, Factors influencing disinfection, antiseptics and their evaluation. For

10. Biochemical test.

bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP

Unit IV

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Principles and methods of different microbiological assay. Methods for

standardization of antibiotics, vitamins and amino acids.

Assessment of a new antibiotic.

Unit V

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants,

assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

Subject: PHARMACEUTICAL ENGINEERING

Theory

Unit I

· **Flow of fluids:** Types of manometers, Reynolds number and its significance,

Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

· **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

· **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank microscopy, dark field microscopy and electron microscopy.

Unit II

· **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction,

Practical

I. Determination of radiation constant of unpainted and painted glass.

II. Steam distillation – To calculate the efficiency of steam distillation.

III. To determine the overall heat transfer coefficient by heat exchanger.

IV. Construction of drying curves (for calcium carbonate and starch).

V. Determination of moisture content and rate of drying.

convection & radiation. Heat interchangers & heat exchangers.

· **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

· **Distillation:** Basic Principles and methodology of simple distillation, flash

distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

Unit III

· **Drying:** Objectives, applications & mechanism of drying process, measurements

& applications of Equilibrium Moisture content, rate of drying curve. principles,

construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

· **Mixing:** Objectives, applications & factors affecting mixing, Difference between

solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer,

planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier

Unit IV

· **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle,

VI. Determination of humidity of air – i) and dry bulb temperatures – use of Dew method.

VII. Description of Construction working application of Pharmaceutical

Machinery such as rotary tablet machine bed coater, fluid energy mill,

de humidifier.

VIII. Size analysis by sieving – To evaluate distribution of tablet granulations – Comparison of various size frequency curves including normal and logarithmic probability plots.

IX. Size reduction: To verify the laws of size reduction using ball mill and

determining Kicks, Rittinger's, Bond's coefficients power requirement and

critical speed of Ball Mill.

X. Demonstration of colloid mill, planetary fluidized bed dryer, freeze dryer and such major equipment.

XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration Thickness/ viscosity)

Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & XII. To study the effect of time on the Ra Crystallization.

Cartridge filter, membrane filters and Seidtz filter.

· **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge. XIII. To calculate the uniformity Index for sample by using Double Cone Blender.

Unit V

· **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention.

Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

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B. Pharmacy Subjects for Semester 4

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Subjects	Theory		Practical	
	Hours	Marks	Hours	Marks
PHARMACEUTICAL ORGANIC CHEMISTRY –III	45	100	-	-
MEDICINAL CHEMISTRY – I	45	100	4/week	50
PHYSICAL PHARMACEUTICS -II	45	100	3/week	50
PHARMACOLOGY-I	45	100	4/week	50

PHARMACOGNOSY AND PHYTOCHEMISTRY I	45	100	4/week	50
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Total marks **700**

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B. Pharmacy Second Year Syllabus for Semester 4

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Subject: PHARMACEUTICAL ORGANIC CHEMISTRY –III

Theory

Unit I

Stereo isomerism

Optical isomerism –Optical activity, enantiomerism, diastereoisomerism, meso compounds, Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, Reactions of chiral molecules, Racemic modification and resolution of racemic mixture.

Unit II

Geometrical isomerism, Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems), Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane, Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions

Unit III

Heterocyclic compounds:

Nomenclature and classification, Synthesis, reactions and medicinal uses of following compounds/derivatives, Pyrrole, Furan, and Thiophene, Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

Unit IV

Synthesis, reactions and medicinal uses of following compounds/derivatives.

Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine, Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

Unit V

Reactions of synthetic importance

Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation

Subject: MEDICINAL CHEMISTRY – I

Theory

Unit I

Introduction to Medicinal Chemistry, History and development of medicinal chemistry, Physicochemical properties in relation to biological action

Unit II

Practical

I Preparation of drugs/ intermed

1. 1,3-pyrazole
2. 1,3-oxazole
3. Benzimidazole

Drugs acting on Autonomic Nervous System, Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

· Direct acting:

Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

· Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine,

Propylhexedrine.

· Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine,

Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*,

Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol,

Labetolol, Carvedilol.

Unit III

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

4. Benztriazole
5. 2,3- diphenyl quinoxaline
6. Benzocaine
7. Phenytoin
8. Phenothiazine
9. Barbiturate

II Assay of drugs

1. Chlorpromazine
2. Phenobarbitone
3. Atropine
4. Ibuprofen
5. Aspirin
6. Furosemide

III Determination of Partition coefficient for any two drugs

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol,

Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible):

Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride,

Tacrine hydrochloride, Ambenonium chloride, Isoflurophate, Echothiophate

iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents, Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide,

Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate

hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*,

Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide,

Ethopropazine hydrochloride.

Unit IV

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines,
Chlordiazepoxide, Diazepam*,

Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturates: SAR of barbiturates, Barbitol*, Phenobarbital,
Mephobarbital,

Amobarbital, Butobarbital, Pentobarbital, Secobarbital

Miscellaneous:

Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meproamate,
Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazines: SAR of Phenothiazines - Promazine
hydrochloride,

Chlorpromazine hydrochloride*, Triflupromazine,
Thioridazine

hydrochloride, Piperacetazine hydrochloride,
Prochlorperazine maleate,

Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene,
Thiothixene,

Loxapine succinate, Clozapine.

Fluorobutyrophenones: Haloperidol, Droperidol,
Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital.

Hydantoins:

Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:**

Trimethadione, Paramethadione **Succinimides:**

Phensuximide, Methsuximide, Ethosuximide* **Urea and**

monoacylureas: Phenacemide, Carbamazepine*

Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate

Unit V

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbiturates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride,

Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*,

Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride,
Levallorphan tartarate,

Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin,
Mefenamic acid*,

Meclofenamate, Indomethacin, Sulindac, Tolmetin,
Zomepriac, Diclofenac,

Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin,
Acetaminophen, Antipyrine, Phenylbutazone.

Subject: PHYSICAL PHARMACEUTICS-II

Theory

Unit I

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties.

Effect of electrolytes, coacervation, peptization & protective action.

Unit II

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature,

non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in

formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Practical

1. Determination of particle size, particle size distribution using sieving method

2. Determination of particle size, particle size distribution using Microscopic method

3. Determination of bulk density, true density and porosity

4. Determine the angle of repose and influence of lubricant on angle of repose

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus.

Unit III

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in

suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

Unit IV

Micromeritics: Particle size and distribution, mean particle size, number and weight

distribution, particle number, methods for determining particle size by different

methods, counting and separation method, particle shape, specific surface, methods for

determining surface area, permeability, adsorption, derived properties of powders,

porosity, packing arrangement, densities, bulkiness & flow properties.

Unit V

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like

5. Determination of viscosity of liquid using Ostwald's viscometer

6. Determination sedimentation volume with effect of different suspending agent

7. Determination sedimentation volume with effect of different concentration of single suspending agent

8. Determination of viscosity of semisolid by using Brookfield viscometer

9. Determination of reaction rate constant first order.

10. Determination of reaction rate constant second order

11. Accelerated stability studies

hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.

Subject: PHARMACOLOGY-I

Theory

Unit I

1. General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of

pharmacology, nature and source of drugs, essential drugs concept and routes of

drug administration, Agonists, antagonists(competitive and non competitive), spare

receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and

excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

Unit II

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor,

transmembrane enzyme linked receptors, transmembrane JAK-STAT binding

Practical

1. Introduction to experimental pharmacology.

2. Commonly used instruments in experimental pharmacology.

3. Study of common laboratory animals.

4. Maintenance of laboratory animals as per CPCSEA guidelines.

5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.

6. Study of different routes of drugs administration in mice/rats.

7. Study of effect of hepatic microsomal enzyme inducers on the

receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

b. Adverse drug reactions.

c. Drug interactions (pharmacokinetic and pharmacodynamic)

d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

Unit III

Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.

b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.

c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.

d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

e. Local anesthetic agents.

f. Drugs used in myasthenia gravis and glaucoma.

Unit IV

Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S, special emphasis on importance of various

phenobarbitone sleeping time in mice.

8. Effect of drugs on ciliary motility of frog oesophagus.

9. Effect of drugs on rabbit eye.

10. Effects of skeletal muscle relaxants using rota-rod apparatus.

11. Effect of drugs on locomotor activity using actophotometer.

12. Anticonvulsant effect of drugs by MES and PTZ method.

13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.

14. Study of anxiolytic activity of drugs using rats/mice.

15. Study of local anesthetics by different methods.

neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. *Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos*

b. General anesthetics and pre-anesthetics.

c. Sedatives, hypnotics and centrally acting muscle relaxants.

d. Anti-epileptics

e. Alcohols and disulfiram

Unit V

Pharmacology of drugs acting on central nervous system

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.

b. Drugs used in Parkinsons disease and Alzheimer's disease.

c. CNS stimulants and nootropics.

d. Opioid analgesics and antagonists

e. Drug addiction, drug abuse, tolerance and dependence.

Subject: PHARMACOGNOSY AND PHYTOCHEMISTRY I

Theory

Practical

Unit I

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy

(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero

taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical,

chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants,

camera lucida and diagrams of microscopic objects to scale with camera lucida.

Unit II

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin

Factors influencing cultivation of medicinal plants.

Plant hormones and their applications.

1. Analysis of crude drugs by chemical tests:
(i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin starch (vi) Honey (vii) Castor oil

2. Determination of stomatal number and index

3. Determination of vein islet number, vein islet termination and palisade ratio.

4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer

5. Determination of Fiber length and width

6. Determination of number of starch grains by Lycopodium spore method

7. Determination of Ash value

8. Determination of Extractive values of crude drugs

9. Determination of moisture content of crude drugs

10. Determination of swelling index and foam index

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

Unit III

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.
Edible vaccines

Unit IV

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda,

Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides,

Flavonoids, Tannins, Volatile oil and Resins.

Unit V

Study of biological source, chemical nature and uses of drugs of natural origin containing

following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical

Aids and/or Medicines for the following

Primary metabolites: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey, **Proteins and Enzymes:** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

Scenario of Pharmacy abroad

In some countries, B. Pharm degree has been superseded by the Doctor of Pharmacy (Pharm. D) and Master of Pharmacy (M. Pharm) degrees. In the United Kingdom B. Pharm is replaced by M. Pharm long back. Pharmacy is taught in University of Helsinki and University of Eastern Finland. M. Pharm is a must in order to be a druggist. In the Republic of Ireland, M. Pharm (Hons) degrees are offered by Trinity College, Dublin, University College Cork, Royal College of Surgeons in Ireland, Dublin. However, in Northern Ireland (which is part of the United Kingdom) M. Pharm degrees (as opposed to BSc or B. Pharm degrees) are offered at Queen's University Belfast as in the rest of the UK. In Pakistan, Pharm. D is the only Basic Pharmacy Degree (5 years program) awarded by universities approved by Pharmacy Council of Pakistan.