AVICENNA MEDICAL COLLEGE

Study Guide
OF PHARMACOLOGY
FOR 3RD PROFF MBBS

PREPARED BY

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FINAL YEAR MBBS STUDENT

MESSAGE FROM PRINCIPAL, AVICENNA MEDICAL COLLEGE

PROF. DR. GULFREEN WAHEED

It is a pleasure to see Avicenna Medical College develop, progress and achieve maximum academic excellence in a short period since its inception in 2009. The institution has live up to its mission of training and producing medical graduates of international standards. We have achieved several milestones since 2009 including the recognition of our College for FCPS training by College of Physicians and Surgeons of Pakistan (CPSP), establishment of College of Nursing and Avicenna Dental College.

As a Principal I am fortunate to take quick decisions and student friendly measures, yet managing the high standards of Medical Education at the campus. The students at Avicenna are provided with an encouraging environment conducive to their learning and growth and are trained on the pattern test concepts and strategies in Medical Education. They are groomed on modern lines with due emphasis on the highest standards of discipline, Medical Professionalism, Medical and Social ethics in conformity to our cultural and religious values. These attributes along with an inclination towards research and development in academics is the focal point of our education system. Beyond this, we provide students with various opportunities to engage in co-curricular activities thus enabling them to bring out their naturally gifted talent. The student committee and clubs at Avicenna Medical College organizes events throughout the academic year which provide an opportunity to the students to enhance their talents and ability for teamwork. As an institution, we feel pride in the fact that we have won the confidence of the parents, who feel satisfied with the conservative yet progressive atmosphere of our Institution, high standards of Medical Education and discipline. Most parents show complete satisfaction once their child joins the 'Avicenna Family'. I welcome the batch of MBBS students to the continuously expanding family of Avicenna Medical College where diligent and devoted faculty members are ready to facilitate eager learners, enabling them to become future professionals and leaders. May Allah bless your endeavors with success and may you bring honors to your Alma Mater. Ameen!

MESSAGE FROM HOD, PHARMACOLOGY

AVICENNA MEDICAL COLLEGE

DR.NAJMA NAZ

M.B.B.S.,M.PHIL

PROFESSOR/H.O.D.

A good physician has to be a good pharmacologist. Students gain a thorough knowledge of medications, such as various routes of administration, mechanisms of action, pharmacokinetics, adverse drug reactions and dosage schedules. With qualified and experienced faculty guiding them, students can look forward to an interesting learning experience during their Pharmacology lectures and lab sessions. Pharmacology students have fully equipped laboratories that provide the resources for practical training in experimental pharmacology, clinical pharmacology and pharmacy.

WHAT IS A STUDY GUIDE?

- Inform students how student learning program has been organized according to their learning objectives.
- Help students organize and manage their studies throughout the course.
- Guide students on assessment methods, rules and regulations

THE STUDY GUIDE:

- Communicates information on organization and management of the course. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the course.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstration, tutorial and case-based learning that will be implemented to achieve the course objectives.
- Provides a list of learning resources such as books, computer assisted learning programs, web- links, journals, for students to consult in order to maximize their learning.

STUDENT'S OVERALL PERFORMANCE:

- Includes information on the assessment methods that will be held to determine every student's

ACHIEVEMENT OF OBJECTIVES:

- Focuses on information pertaining to examination policy, rules and regulations.

INTRODUCTION TO THE DEPARTMENT

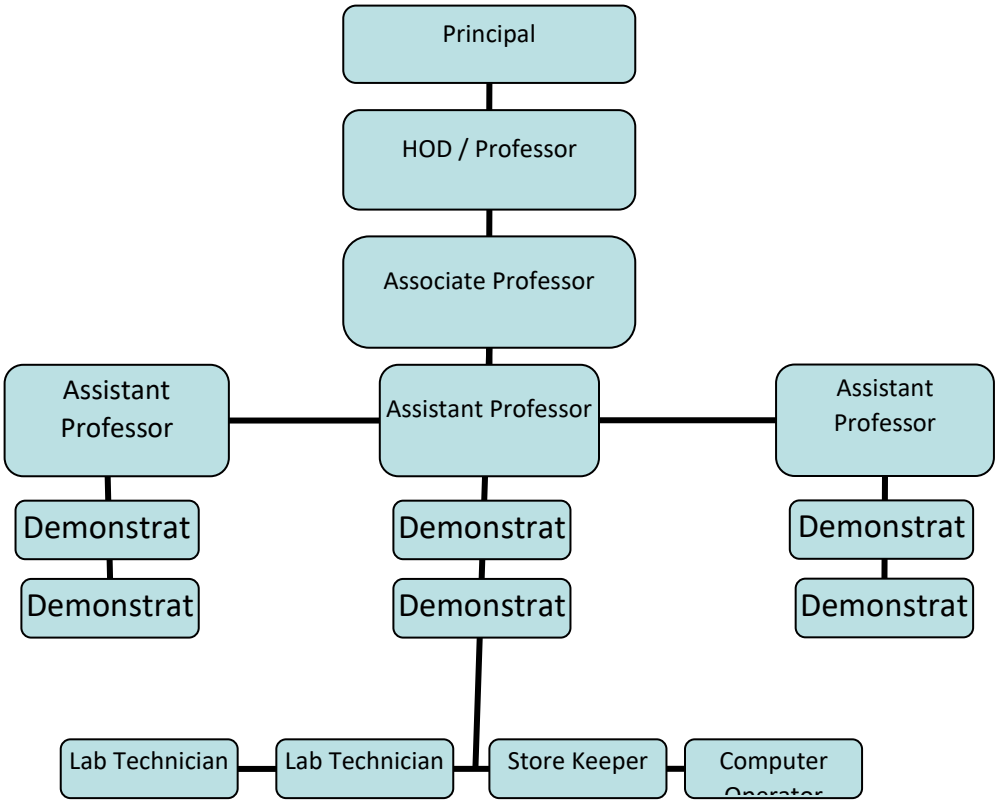
A good physician has to be a good pharmacologist. Students gain a thorough knowledge of medications, such as various routes of administration, mechanisms of action, pharmacokinetics, adverse drug reactions and dosage schedules. With qualified and experienced faculty guiding them, students can look forward to an interesting learning experience during their Pharmacology lectures and lab sessions. Pharmacology students have fully equipped laboratories that provide the resources for practical training in experimental pharmacology, clinical pharmacology and pharmacy.

GOALS OF THE DERPARTMENT

- To educate the undergraduate and postgraduate medical, paramedical and science students to apply basic principles of pharmacology and therapeutics to practice rational use of drugs
- To facilitate basic and applied research that significantly advances current pharmacological knowledge.
- To provide academic services and patient care facilities

Sustained high quality research is enhanced in an environment that supports vigorous programs of undergraduate and postgraduates training so that there is increased understanding of the basic mechanisms underlying drug action.

DEPARTMENT OF PHARMACOLOGY



CURRICULUM WITH LEARNING OBJECTIVES

Topics & Learning outcomes

THEME : General Pharmacology (9% of Exam)

SUB THEME: Pharmacokinetics

Learning outcomes: *By the end of this session student should be able to:*

- Define Pharmacokinetics.
- Enumerate various types of Routes of Administration
- Enumerate Enteral Routes
- Enlist the advantages & disadvantages of: Sublingual / Buccal, Oral Route, Rectal Route; give examples
- Enlist the advantages & disadvantages of: Intravenous, Intra-arterial, Intramuscular, Subcutaneous routes; give examples
- Enlist the advantages & disadvantages of Local Route / Topical Applications; give examples
- Identify the main Factors involved in drug- movement during absorption
- Define First-Pass Effect with an example
- Define Area under the curve (AUC)
- Define Bioavailability and enlist the factors affecting it
- Explain the relationship of Bioavailability vs. AUC
- Explain the Clinical Importance of Plasma Protein Binding
- Define Volume of Distribution (Vd)
- Enlist the factors affecting Vd
- DefineDrug Redistribution, explain with anexample.
- DefineDrug metabolism
- Explain the Phase-I and Phase II reactions with example.
- Define Enzyme Induction and Inhibition; give examples.
- Define Biotransformation; give examples.
- Define Excretion, Elimination (Biodisposition) and clearance.
- Define Zero-Order and First-Order Elimination; give examples.
- Define plasma Half–Life (t ½), write its formula and clinical importance.
- Define Steady State.
- Define maintenance dose, loading dose.

SUB THEME: Pharmacodynamics:

Learning outcomes: *By the end of this session student should be able to:*

- Define Pharmacodynamics
- Define Affinity, Efficacy, potency.
- Define Agonist (or full agonist), partial agonist, inverse agonist with examples.
- Define Spare receptor and give clinical importance
- Define Transmembrane signalling
- Identify the targets for G-Proteins
- Enumerate the Effectors controlled by G-proteins
- Describe various Drug–antagonism types with examples
- Define Median Effective (ED_{50}), Median Toxic (TD_{50}) & Median Lethal Dose (LD_{50})?
- Define Therapeutic index and give clinical importance
- Define Therapeutic window and give clinical importance.
- Define Standard Margin of Safety?
- Differentiate between Graded and Quantal dose-response curves
- Explain the significance of Semi-log Transformation
- Explain the information derived from a Quantal Dose Effect Curve
- Define Desensitization, Tachyphylaxis, Tolerance, Resistance, super sensitivity, hypersensitivity, super infection, iatrogenic effect, idiosyncrasy, and give examples.
- Define Pharmacogenetics and give examples.

Topics & Learning outcomes

THEME : Drugs acting on Autonomic Nervous System (ANS) (10% of Exam)

SUB THEME: Cholinergic System

Learning outcomes: *By the end of this session student should be able to:*

- Classification of cholinergic agonists and antagonists
- Enlist theClinical Uses of Cholinomimetics?
- Enlist the Uses of Pilocarpine, Carbachol,Bethanechol,
- Explain the Mechanism of Action of Edrophonium?
- Enlist the Uses of Edrophonium?
- Enlist the Uses of Neostigmine, Physostigmine&Rivastigmine?
- Explain the Mechanism of Action of Organophosphorous Compounds
- Explain the Toxic Effects of Organophosphorous Compounds
- Explain the "aging" process? Describe the role of Pralidoxime?
- Explain the Mechanism of Action of Succinylcholine?
- Enlist the Systemic Effects of Atropine / Antimuscarinics?
- Enlist the Therapeutic Uses of Antimuscarinics?
- Enumerate the Side Effects & Toxicity and contraindications of Atropine

SUB THEME: Adrenergic system

Learning outcomes: *By the end of this session student should be able to:*

- Describe general characteristics of catecholamines?
- Enlist the therapeutic uses, adverse effects and contraindications of Epinephrine and Dopamine?
- Enlist the Uses of Isoproterenol, phenylephrine and Dobutamine
- Enlist the Uses of Albuterol /Salbutamol, Ritodrine / Terbutaline
- Explain the Mode of Action and uses of Fenoldopam?
- Explain the Mechanism of Action, uses and toxicity of Amphetamine?
- Classify alpha and beta blockers
- Enumerate the Uses of Prazosin?
- Enlist Adverse Effects of Prazosin and should know about its withdrawal effects and how that can be handled?
- Enumerate Uses of Phenoxybenzamine, phentolamine and tamsulosin?
- Enumerate Uses, adverse effects and contraindications of Propranolol?
- Enlist the Uses of Timolol and Labetalol?
- Compare the characteristics of Reserpine and Guanethidine.

Topics & Learning outcomes

THEME : Drugs acting on Central Nervous System (CNS) (12% of Exam)

SUB THEME: Sedative/hypnotics

Learning outcomes: *By the end of this session student should be able to:*

- Differentiate between Diazepam and Barbiturates?
- Enlist the toxic effects and uses of Diazepam and Barbiturates?
- Enlist the Uses of Zolpidem?
- Explain the Mechanism of Action of Buspirone and differentiate it from benzodiazepines?
- Explain the Mechanism of Action and uses of Ramelteon?
- Describe the rationale for the use of Flumazenil in benzodiazepine toxicity
- Enumerate Ethanol Adverse effects / Drug Interactions
- Describe the role of Benzodiazepines in prevention and treatment of acute ethanol withdrawal syndrome
- Enumerate the toxic effects of Methanol Poisoning
- Describe the rationale for the use of:
- Disulfiram in alcoholics
- Fomepizole in methanol poisoning
- Naltrexone in risk of relapse in alcoholism
- Thiamine (vitamin B_1) in acute alcohol intoxication or alcohol withdrawal syndrome?

SUB THEME: Anti-epileptic drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-epileptic drugs
- Explain the Mechanism of Action, uses, adverse effects and drug interactions of Phenytoin, Carbamazepine, Valproic acid and Ethosuximide?

SUB THEME: Skeletal muscle relaxants

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of action Succinylcholine / Depolarizing Neuromuscular Blocking Ager
- Describe the Clinical Applications of Succinylcholine / Depolarizing Neuromuscular Blocking Agent
- Enumerate the adverse effects of Succinylcholine / Depolarizing Neuromuscular Blocking Agent
- Explain Mechanism of action of d-Tubocurarine
- Enumerate the Clinical Applications and adverse effects of d-Tubocurarine
- Describe the drug Baclofen.

SUB THEME: Anti-parkinsonian drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify the drugs for parkinsonism
- Explain the Mechanism of action of Levodopa
- Enumerate the Clinical Applications, adverse effects and Drug Interactions of Levodopa

- Describe the rationale for the use of the following in parkinsonism :
  Levodopa + carbidopa (Sinemet)?

  Levodopa + carbidopa + entacapone
- Enlist the uses of Bromocriptine?
- Describe the role of Apomorphine in dyskinesia?
- On and off phenomenon

- Enlist the Uses of Gabapentin?

SUB THEME: Anti-psychotic drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-psychotics
- Give the Clinical Applications, adverse effects and drug interactions older and newer anti-psychotic drugs
- Explain the Mechanism of action, adverse effects and drug interactions of Lithium?

SUB THEME: Anti-Depressant drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-depressants
- Explain the Mechanism of action, uses, adverse effects and drug interactions of TCAs, SSRIs?

SUB THEME: OPIOIDs

Learning outcomes: *By the end of this session student should be able to:*

- Enumerate the sites of action / receptors of Opioids.
- Explain the effects of Opioid Receptors
- Describe the actions Morphine and other Opioids
- Enumerate the adverse effects / toxic effects of Morphine / Opioids
- Describe the rationale for the use of:
  Naloxone in Morphine / Opioid toxicity
- Explain the management of withdrawal effects of Morphine / Opioids
- Enumerate the Clinical Applications of Buprenorphine, codeine, tramadol, heroine, methadone, Dextromethorphan

Topics & Learning outcomes

THEME: NSAIDs / Drugs used for Gout/Anti-rheumatic drugs (10% of exam)

Learning outcomes: *By the end of this session student should be able to:*

- Classification of NSAIDs
- Compare Aspirin and Paracetamol?
- Enlist the Clinical applications of Aspirin?
- Explain the Toxicity of Aspirin?
- Explain the Drug interaction of Aspirin?
- Explain the Treatment of Salicylism - Aspirin Toxicity
- Explain the Toxicity of Acetaminophen (Paracetamol)?
- Enumerate the Therapeutic uses of Celecoxib?
- Discuss the drugs for acute and chronic Gout
- Explain the mechanism of action and toxicity of Allopurinol, Probenecid and Colchicine?
- Explain the Mechanism of action of Methotrexate, chloroquine and glucocorticoid and Azathioprine as DMARD?

THEME: Drugs acting on cardiovascular system (CVS) /blood and diuretics (12.5% of exam)

SUB THEME: Anti-hypertensive drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-hypertensives
- Explain the mechanism of action, uses and adverse effects of Diuretics
- Describe the Drug Interactions of Furosemide (Loop Diuretics)
- Enlist the Contraindications of Mannitol (Osmotic Diuretics)
- Explain the Mode of Action, uses and adverse effects of Clonidine
- Explain the Mode of Action, uses and adverse effects of Methyldopa?
- Enumerate the Therapeutic Uses of Ca^{++} Channel Blockers?
- Describe the rationale for the use of: CCBs in:
  - Angina (variant, stable, unstable)
  - Arrhythmias
  - Hypertension?
- Enumerate the Adverse Effects, drug interactions and contraindications of CCBs
- Describe the Mechanism of Action, adverse effects and uses of ACEIs?

- Explain the Mechanism of Action of Losartan?
- Explain the Mechanism of Action of Vasodilators?
- Enlist the Adverse Effects of Hydralazine, Monoxidil and Diazoxide?
- Describe the role of beta blockers in hypertension.

SUB THEME: Anti-anginal drugs

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Antianginal Mechanism of Nitroglycerine?
- Enumerate the Uses, adverse effects and drug interactions of Nitroglycerine?
- Explain the Anti-anginal mechanism of Beta blockers?
- Explain the Mechanism of Action of Ranolazine?

SUB THEME: Anti-arrhythmic drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-arrhythmic drugs
- Explain the Mechanism of Action of class 1A, 1B and 1C drugs?
- Enumerate the adverse Effects of Procainamide, Quinidine, Lidocaine, adenosine and Amiodarone?

SUB THEME: Drugs for CCF

Learning outcomes: *By the end of this session student should be able to:*

- Classify the drugs for CCF
- Explain the MOA, electrical and mechanical effects of Digoxin
- Describe Toxicity and treatment of toxicity of digoxin?
- Explain the Role of beta blockers in CCF

Topics & Learning outcomes

THEME: Drugs for Respiratory and Gastrointestinal disorders (9% of exam)

SUB THEME: Drugs for Respiratory diseases

Learning outcomes: *By the end of this session student should be able to:*

- Classify Expectorants, Mucolytics, Antitussives.
- Classify the Drugs used in asthma.
- Describe the Rationale of corticosteroids in asthma
- Explain the Mechanism of action, adverse effects of methylxanthines

SUB THEME: Drugs for Acid Peptic disease

Learning outcomes: *By the end of this session student should be able to:*

- Classify the drugs for acid peptic disease.
- Explain the Mechanism of action of proton pump inhibitors
- Enlist Adverse effects of omeprazole, cimetidine and bismuth compounds
- Classify antacids, their toxic effects
- Explain Mechanism of action of sucralfate
- Explain Triple and Quadruple therapy for *H.pylori* eradication
- Drugs stimulating gastrointestinal motility.

SUB THEME: Laxatives/purgatives

Learning outcomes: *By the end of this session student should be able to:*

- Classify Laxatives & Purgatives.
- Mechanism of action of various laxatives

SUB THEME: Anti-diarrheal drugs

Learning outcomes: *By the end of this session student should be able to:*

- Name various Antidiarrheal agents.
- Drugs used in the treatment of irritable bowel syndrome and inflammatory bowel disease

Topics & Learning outcomes

THEME: Antimicrobial drugs and antibiotics of general use(9% of exam)

SUB THEME:Cell wall synthesis inhibitors

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of Action, spectrum, uses and adverse effects of Penicillin
- Enumerate the Antimicrobial Spectrum& the Clinical applications of Ampicillin, Amoxicillin, Ticarcillin, Piperacillin, Nafcillin, Oxacillin, Benzathine Penicillin, & Procaine Penicillin?
- Classify cephalosporins, spectrum and uses of all generations
- Explain the mechanism of action, Antimicrobial Spectrum, Clinical applications & adverse effects of Imipenem-cilastin, Aztreonam & Vancomycin

SUB THEME: Protein synthesis inhibitors

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of Action, spectrum, uses and adverse effects of Tetracyclines?
- Fanconi's syndrome
- Describe the Antimicrobial Spectrum & the Clinical applications of Doxycycline, Minocycline, Tigecycline?
- Explain the mechanism of action, spectrum, uses and adverse Effects Macrolides?
- Describe the Antimicrobial Spectrum & the Clinical applications of *Clarithromycin, Azithromycin?*
- Explain the Mechanism of Action and adverse effects of Clindamycin?
- Explain the Mechanism of Action, spectrum, uses, adverse effects of Chloramphenicol?
- Describe gray-baby syndrome
- Enumerate Aminoglycosides.
- Explain the Mechanism of Action, spectrum, uses, adverse effects and drug interactions of Aminoglycosides?

SUB THEME: Anti-metabolites

Learning outcomes: *By the end of this session student should be able to:*

- Describe the Mechanism of Action, uses and spectrum of Sulfonamides / Co-trimoxazole?
- Enlist the Adverse Effects of Sulfonamides

SUB THEME: Nucleic acid Synthesis Inhibitors

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of Action, uses and adverse effects of fluoroquinolones?
- Explain the Clinical applications Norfloxacin, Ofloxacin,
- Levofloxacin, Gemifloxacin and moxifloxacin?

Topics & Learning outcomes

THEME: Antimycobacterial / Antiprotozoal / Anthelmentics (10% of exam)

SUB THEME: Anti-mycobacterial drugs

Learning outcomes: *By the end of this session student should be able to:*

- Enumerate First Line & Second Line Antituberculars
- Explain the role of pyridoxine (ViatmB6)With isoniazid
- Describe the mechanism of action, Clinical Uses, adverse effects and resistance of Isoniazid (INH), rifampicin, pyrazinamide, Ethambutol and streptomycin?
- Enlist the drugs used for treating leprosy

SUB THEME: Anti-Malarial & anti-amoebic drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classification of Antimalarials.
- Explain the Mechanisms of action, Clinical applications, & Toxicity of Quinine, Chloroquine, Mefloquine &Primaquine
- Enlist Various Combinations useful as antimalarials.
- Enlist Drugs useful in Uncomplicated & Severe Complicated in Malaria.
- Classification of antiamoebics.
- Enumerate the drugs used in Luminal, Systemic & Mixed amoebiasis.
- Mechanisms of action, Clinical applications, & Toxicity of Metronidazole, Diloxanide furoate

SUB THEME: Anthelminthetics

Learning outcomes: *By the end of this session student should be able to:*

- Enlist the drugs, mode of action, spectrum and uses

SUB THEME: Anti-leishmaniasis and drugs for trypanosomiasis

Learning outcomes: *By the end of this session student should be able to:*

- Enlist the drugs, actions and uses for specific diseases

SUB THEME: Anti-cancer drugs

Learning outcomes: *By the end of this session student should be able to:*

- Anticancer drugs (Classification, common therapeutic uses and adverse effects of drugs enlisted in the “Drug List” only).
- Immunosuppressive agents’ esp. useful in organ transplants. (Classification and common therapeutic uses and adverse effects only).

SUB THEME: Anti-fungal drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify Anti-fungal drugs.

- Explain Mechanism of Action, uses and adverse effects of Amphotericin–B, Azoles, Flucytosine, Greisofulvin?

SUB THEME: Anti-Viral drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify Antivirals
- Explain the Mechanisms of Action, uses and adverse effects of Acyclovir, etc?
- Enumerate Anti-Hepatitis Drugs; what are their group actions.
- Explain the Mechanisms of Action, uses and adverse effects of Interferons?
- Enumerate Anti-Influenza Drugs; what are their group actions.
- Explain mechanism of action, antiviral spectrum, clinical applications & toxic effects of Amantadine etc.
- Explain the mechanism of action, antiviral spectrum, clinical applications & toxic effects of Antiretroviral Drugs
- Enumerate Nucleoside/nucleotide Reverse Transcriptase Inhibitor (NRTIs); what are their group actions?

Topics & Learning outcomes

THEME: Drugs Acting on Endocrine System (10% of exam)

SUB THEME: Thyroid and Anti-thyroid drugs

Learning outcomes: *By the end of this session student should be able to:*

- Classify anti-thyroid drugs
- Explain the Mechanism of Action, uses and adverse effects of Methimazole / propylthiouracil, Lugol's solution / Potassium iodide?
- Enumerate the uses and adverse effects of ^{131}I?
- Explain Antithyroid Mechanism of beta blockers?

SUB THEME: Corticosteroids

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects&Drug interactions ofCorticosteroids

SUB THEME: Drugs acting on male and female sex hormones

Learning outcomes: *By the end of this session student should be able to:*

- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects & Drug interactions of Ethinyl-estradiol and Progestins.
- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects & Drug interactions of Tamoxifen (Antiestrogens-*SERMS*)
- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects & Drug interactions of Clomiphene

- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects & Drug interactions of Testosterone
- Explain the Mechanism of Action, Pharmacological Effects, Therapeutic Uses, Adverse Effects & Drug interactions of Anabolic Steroids
- Explain the Mechanism of Action, Therapeutic Uses of Finasteride (5α-reductase inhibitors)

SUB THEME: Drugs for the treatment of diabetes mellitus

Learning outcomes: *By the end of this session student should be able to:*

- Explain the characteristics of Rapid-acting-*Lispro, Aspart, Glulisine,* Short acting-*Regular,* Intermediate-acting-*NPH,* Long acting-*Detemir, Glargine*
- Explain the Mechanism of action, uses and adverse effects of Insulins?
- Classify oral hypoglycemic drugs
- Explain Mechanism of action, uses and adverse effects of sulfonylureas, biguanides (metformin), DPP4 inhibitors, thiazolidinediones and
  Acarbose (Alpha-Glucosidase Inhibitors?

UHS SYLLABUS OF PHARMACOLOGY

The course outline is as follows:

1) General Pharmacology:

1. Definition of pharmacology, objectives of learning pharmacology, definition of drug and drug nomenclature.
2. Branches/divisions of pharmacology.
3. Sources of drugs.
4. Active principles of drugs and pharmacopoeias.
5. Dosage forms and doses of drugs.
6. Route of drug administration.
7. Absorption of drugs and processes involved in drug absorption.
8. Factors modifying absorption of drugs.
9. Transport of drugs across cell-membrane.
10. Bio-availability, its clinical significance and factors affecting bio- availability.
11. Drug reservoirs, distribution and redistribution of drugs, plasma protein binding.
12. Pro-drug, bio-transformation of drugs, enzyme induction, enzyme inhibition and entero-hepatic circulation.
13. Plasma half-life of drugs, steady state concentration, its clinical importance and factors affecting it.
14. Excretion of drugs.
15. Mechanism of drug action.
16. Dose response curves, structure-activity relationship.
17. Factors modifying action and doses of drugs.
18. Pharmacokinetics, pharmacodynamics and receptors.
19. Pharmacogenetics.

2) Dermatological and topical drugs (Locally Acting Drugs)

- ③ Demulcents, emollients, irritants, counter irritants, astringents. Antiseborrhoeics, locally acting enzymes.
- ③ Antiseptics and disinfectants.
- ③ Ectoparasiticides.

3) Drugs Acting on Gastrointestinal Tract:

- ③ Emetics and anti emetics.
- ③ Drugs affecting motility of GIT.
- ③ Ulcer healing drugs.
- ③ Purgatives/ laxatives.
- ③ Antidiarrhoeals.

4) Cardiovascular Drugs ③ Antiarrhythmic drugs.

- ③ Inotropic drugs.
- ③ Antihypertensive drugs.
- ③ Thrombolytics/ anticoagulants/ antiplatelets.
- ③ Antihyperlipidemic drugs.
- ③ Anti-anginal drugs.
- ③ Drug management of CCF.

5) Diuretics

6) Autocoids

7) Drugs Acting on Autonomic Nervous System Cholinergic Drugs.

- ③ Choline esters.
- ③ Anticholine-esterases cholinomimetic alkaloids.

Anti-cholinergic drugs -

Anti muscarinic

- Anti nicotinic

Sympathomimetics / adrenergic drugs:

- Catecholamine
- Non catecholamine

Sympatholytics/antiadrenergics

- Alpha adrenergic receptor blockers.
- Beta adrenergic receptor blockers

Adrenergic neuron blockers

Autonomic ganglionic blockers

Skeletal muscle relaxants

A) neuromuscular blocking agents - d-tubocurarine, suxamethonium, etc.

B) central muscle relaxants , meprobamate, mephenesin, diazepam, etc.

8) Central Nervous System

a. Sedative-hypnotics.
b. Anti-epileptics.
c. General anaesthetics.
d. Local anesthetics.
e. Drugs for movement disorder/ muscle relaxant.
f. Alcohol.
g. Drugs for migraine.
h. Stimulants of the central nervous system: - Caffeine, theophyline, theobromine - Brain stem stimulants: picrotoxin, nikethamide.
   - Ethamivan, doxapram.
   - Spinal cord stimulants: strychnine.

i. Psychopharmacology: - Anti-psychotics.
   - Anxiolytics.
   - Anti-depressant / anti mania drugs.
   - Alcohol and drugs of abuse. - Anti-parkinson drugs.
   - Anti epileptic drugs

9) Analgesics

a. Opioids and narcotics analgesics.
b. Nonsteroidal anti inflamatory drugs (nsaid).
c. Antigout drugs.

10) Drugs Acting on Respiratory System

a. Drugs used in treatment of bronchial asthma.
b. Expectorants.
c. Mucolytics.
d. Antitussives.

11) Drugs Acting on Endocrine System

a. Pituitary-hypothalamic drugs.
b. Adrenocorticoids.
c. Sex hormones
d. Thyroid/ parathyroid drugs.
e. Pancreatic hormones and oral anti diabetic drugs.
f. Oral contraceptives and anabolic steroids.

12) Drugs Acting on Uterus

a. Ergometrine.

b. Terbutaline.
c. Dinoprostone.
d. Carboprost.
e. Ritodrine.
f. Oxytocin.

Antimicrobial Drugs a.

Sulfonamides.

b. Penicillins.
c. Cephalosporins.
d. Aminoglycosides.
e. Tetracyclines.
f. Macrolides:
   Chloramphenicol.
g. Quinolones.
h. Anti- tuberculous drugs.
i. Antileprosy drugs.
j. Anti fungal drugs.
k. Antiviral drugs.
l. Anti-protozoal drugs:
   - Anti- malarial drugs. - Anti-amoebic drugs.
m. Urinary tract antiseptics.
n. Anti cancer drugs.
o. Immunosuppressive agents.
p. Miscellaneous.
q. Vaccines and immunoglobulin drug interaction.

P R A C T I C A L S

A - EXPERIMENTAL PHARMACOLOGY

Experiments designed to observe the action of drugs on animals and isolated tissue.

Experiments on the actions of selected drugs to be demonstrated to the students.

1. Effects of drugs on reflex time.
2. Effects of drugs on frog's heart in situ.
3. Effects of drugs on rabbit's eye.
4. Effects of Acetylcholine and Atropine on isolated rabbit's ileum.
5. Effects of histamine and antihistamines on isolated rabbit's ileum.
6. Schemes to find out unknown drug having stimulatory or inhibitory effect on isolated rabbit's ileum.
7. Effects of neuromuscular blocking agents on frogs rectus abdominus muscle.
8. Methodology of clinical trials.
9. Introduction to Biostatistics.

B. PRESCRIPTION WRITING

General principles ③ General

principles

③ Guideline for rational use of drugs
③ Prescription writing for common ailments
- Acute watery diarrhea Bacillary dysentery
- Amoebic dysentery Ascariasis
- Tape-worm infestation
- Acute streptococcal pharyngitis
- Iron deficiency anemia
- Allergic rhinitis Scabies
- Acute malarial fever
- Cerebral malaira Typhoid fever
- Bronchial asthma
- Hypertension Migraine
- Cardiac failure
- Shock

Clinico-Pharmacological Seminars on Rational Drug Therapy and Drug Interaction should be conducted

Antibiotics:

Frequency distribution of antibiotic prescribed in different clinical settings/units. Rational prescribing pattern of antibiotics.

Parameters: provisional diagnosis, investigation, empirical therapy. Prescribing after culture and sensitivity.

Vitamins:

Parameters

Groups of vitamin prescribed.
Vitamins prescribed on basis of therapeutic indication or empirical.
Single / multiple vitamins
Frequency of prescribing and rational use of vitamins/ otherwise.

Analgesics

Parameters

a. Frequency distribution of various groups of analgesic prescribed.
b. Single / multiple drug prescription.
c. Non specific indications of analgesic prescription.

Adverse Drug Reactions

a. Anti-microbials, Cytotoxic drugs , Steroids etc.

SOURCE OF KNOWLEDGE

RECOMMENDED BOOKS

1. **Basic and Clinical Pharmacology** by Katzung, 10th Ed., Mc Graw-Hill.

2. **Pharmacology** by Champe and Harvey, 2nd Ed., Lippincott Williams & Wilkins.

POLICY & GUIDELINES OF

LEARNING STATERGIES & STUDY SKILLS FOR MEDICAL STUDENTS

This document is a Summary written for the purpose of the study guides. For details refer to the document "A HANDBOOK OF POLICY & GUIDELINES OF LEARNING STATERGIES & STUDY SKILLS FOR MEDICAL STUDENTS" available for the students at website, Bookshop and the Department of Medical Education.

STEPS TO STRATEGIC LEARNING:

1. **Set realistic learning goals.**
   These goals serve as the driving force to generate and maintain the motivation, thoughts, and behaviour necessary to succeed. Set and use long-term occupational goals (you want to be a doctor) and short-term learning goals (you want to understand this new material).

2. Types of knowledge needed to be a strategic learner:

- Know yourself as a learner (learning preferences, talents, best times of day to study, ability to match study skills to learning task) this knowledge helps you set realistic yet challenging learning goals.
- Knowing the nature and requirements of different types of educational tasks.
- Knowing a variety of study skills and learning strategies and how to use them.
- Knowing the contexts in which what is being learned can be used now or in the future.

3. **Use a variety of learning strategies:**
   - Manage your study environment,
   - Coordinate study and learning activities,
   - Keep your motivation for learning clear,
   - **G**enerate positive behaviours toward learning,
   - **M**ake new information meaningful to you,
   - **O**rganize and integrate new information with existing knowledge, or Re-organize existing knowledge to fit the new understanding and information.
   - Place new information in a present or future context.

ACADEMIC HOURS BREAK DOWN

Pharmacology				
Week	**Lectures (1hr)**	**Tutorial (1.5 hrs)**	**Practical (1.5hrs)**	**Assessment Hours**
1	3	4	3	
2	7		3	
3	8		3	
4		2	2	GT
5	7		4	GT
6	5		3	
7	4		4	
8		3	4	GT
9	4		4	GT
10	6		4	
11	1	3	4	GT
12	3		4	GT
13	4		4	
14	4	2	4	
15	4	2	4	GT
16				GT; RT (6)
17				
18				ESE
19				
20	3		4	
21	4	2	4	
22	4		4	GT
23	4	2	4	
24	3		4	GT
25	4		4	GT
26	4		4	GT
27	4		4	GT
28	4		4	
29	4	2	4	GT
30	3		3	
31		1	3	
32	3		4	
33	5		4	RT (3)
34	2			RT (3); MSE
35				
36	3		3	
37	4	1	4	GT (2)
38				RT (5)
39				RT (3)
40				
41				
42				
43				LSE
Total Sessions	118	24	115	
Total Hours	118	36	172.5	
Hours:	Lect. & Tut.	154	Practical	172.5
Gross Total	326.5			

ASSESSMENT HOURS

Pharmacology				
Test	**Total Tests**	**Total Hours**		
GT	16	32		
RT	20	30		
ESE/MSE/LSE	3	9		
Grand Total	39	71	**110**	

- **100 HOURS ARE GIVEN PER YEAR FOR SELF DIRECTED STUDY.**
- **20 HOURS ARE GIVEN PER YEAR ACCORDING TO ALPHA PROGRAM.**

INTERNAL ASSESMENT POLICY

The assessment policy of Avicenna Medical College clearly reflect that the assessment must covers knowledge, skills and attitude to be acquired by a medical student at the end of the each Professional Year and the entire MBBS Course.

- Theoretical knowledge is assessed by means of MCQs, SEQs, Structured Viva, CBD Tutorials and Pre-Test Tutorials.
- Professional and Clinical Skills are assessed through OSPE, OSCE, Practical Exams and Long and Short Cases.
- Attitudes are assessed through OSPE, OSCE, Practical Exams, Long Cases, Short Cases and Vivas

Assessment Procedures

Performance of students will be assessed as follows:

a. Programmatic Assessment During Academic Year: Grand Tests and Revision Test

It will incorporate both formative and summative assessment for all academic years.

1) **Formative Assessments:**
   These are Conducted throughout the academic year. These are low stake examinations with feedback to improve student learning, leading to better performance in summative assessments and the UHS Professional Examinations. At Avicenna Medical College the formative assessment is in the form of Grand Tests, Revision Tests, Research, Tutorials, Assignments, Long Cases and Short Cases presentations etc.
2) **Summative Assessments:**
   These are conducted at the end of each term, consisting of Session Examinations conducted on the pattern of UHS annual Prof Exams. These consist of One best type of MCQs and SEQs which has two to three parts require written short essay responses from the students. The MCQs, the SEQs are mostly clinical and scenario based and designed to test the concepts.

b. End of Term Assessment

This will be summative carried out at the end of each academic year.

Assessment Tools:

Various tools selected are as follows according to UHS guidelines.

a. Written Assessment

1) **Multiple Choice Question (MCQ)**
   MCQs are extensively used for in both formative and summative assessment owing to their ability to offer a broad range of examination items that incorporate several subject areas. They are the one best type of MCQs and designed to test factual knowledge, understanding and clinical reasoning.

A multiple choice item consists of a problem, known as the stem, and a list of suggested solutions, known as the choices. The choices consist of one correct or best choice, which is the answer, and incorrect or alternatives, known as distractors. Each MCQ carries one mark. The number of MCQs vary in the Grand Tests, Revision Test and the Session Exams as needed.

2) **Short Essay Questions (SEQs)**

Written assessment formats are the most widely used assessment methods in medical education. Learning outcomes which are mainly based on cognitive domains (knowledge) can be assessed by them.

The SEQs have a statement or clinical scenario followed by two to three questions, which require application of concepts and are thought provoking.

b. Assignments and Presentations

Every month in various departments, topics of clinical significance are given to the students for assignment and presentations for small group discussions (SGD) sessions. These will be a part of formative assessment. Clinico- Basic and Clinico-Pathological Conferences (CPC) are held for preclinical and clinical years, respectively.

c. Practical/Clinical Assessment

1) Objective Structured Practical Exam (OSPE)

A formative OSPE will be held during terms and summative at the end of year. It will consist of laboratory-based and practical questions related to the learning objectives covered in the course. The students will be given feedback after formative assessment.

2) Objective Structured Clinical Exam (OSCE):

A formative OSCE will be held during the term and summative at the end of year. It will consist of clinical and practical questions related to the learning objectives covered in the course. The students will be given feedback after formative assessment.

3) Long Case

At the end of fourth and final year each subject will be assessed by a long case. Daily encountered problems will be the case scenarios for which students will be trained during formative assessment in clinics.

4) Structured Viva

At the end of examination an integrated viva will be taken in which relevant specialists will sit and ask questions. There will be guidelines for examiners to follow.

5) Log Books

In case of log books, required entries will be countersigned by observer. It will be criterion referenced whereas the students will have to fulfill the following criteria: for example assignments, case presentations in wards, departmental log books.

6) Observation

Internal Assessment

The progress report from teachers will have separate column about behavior and attitude of students in each term in addition to academic record with minimum pass of 50%.

Internal Assessment

The progress report from teachers will have separate column about behavior and attitude of students in each term in addition to academic record with minimum pass of 50%.

The question papers are prepared in secrecy and approved by the Principal. The department then gets sufficient copies made in secrecy and submits the same to the directorate of Medical Education 24 hours before the scheduled test / exam. On the day of the examinations these papers along with the answer sheets are collected from the DME and taken straight to the examination hall where they are opened and are distributed to the students for attempting the question.

After the papers have been solved, the MCQs are marked immediately and the SEQs marked and submitted within two days (except for revision tests where the results have to be submitted within 24 hours) from here, the assessment system as envisaged in the earlier paragraphs is applied.

Every test / examination is supported by keys both for MCQs and SEQs. Adequate time is air marked for key discussion in which the member of the faculty explains to the class how in fact they should have attempted the MCQs and SEQs. This gives an opportunity to the class to make the assessment of how they have attempted the paper and what mistakes they have made and how not to repeat them in future.

Avicenna Medical College endeavors to implement the assessment system of the UHS subject based curriculum as it is in vogue at present by implementing the curriculum with the basic ingredients of assessment implementation as follows:

a. Grand Test
b. Revision Test
c. Session Examinations
d. OSPE
e. OSCE
f. Viva
g. Log books / Copies
h. Assignments
i. Research work
j. Tutorials
k. Long case
l. Short case

Practical Assessments

The regulations for the preparation and conduct of practical assessments vary between subject areas. Where regulations have not been specified they have to be put up to the Academic Committee.

Clinical Assessment

The clinical assessment is carried out in the following forms:

a. Scenario based Clinical Oriented MCQs
b. Scenario/Clinical based SEQs/SAQs
c. On-Patient training viva
d. Ward tests
e. OSPE
f. OSCE

Assessment Framework

The framework for assessment involves the University guideline of:

a. Pass marks 50%
b. Equal marks for theory and for practical
c. Internal Assessment 10% to be awarded by the college
d. Allocation of marks as under

Allocation of Marks

Sr.	Subject	Marks Theory	Marks Practical / OSPE / OSCE	Remarks
1	Anatomy	100	100	Internal assessment 10%
2	Physiology	100	100	Internal assessment 10%
3	Biochemistry	100	100	Internal assessment 10%
4	Islamiyat & Pak Studies	100	-	
5	Pathology	150	150	Internal assessment 10%
6	Pharmacology	150	150	Internal assessment 10%
7	Forensic Medicine	100	100	Internal assessment 10%
8	Community Medicine	150	150	Internal assessment 10%
9	Special Pathology	150	150	Internal assessment 10%
10	ENT	100	100	Internal assessment 10%
11	Ophthalmology	100	100	Internal assessment 10%
12	Medicine	200	300	Internal assessment 10%
13	Surgery	250	250	Internal assessment 10%
14	Gynae	150	150	Internal assessment 10%
15	Paeds	100	100	Internal assessment 10%
16	Behavioral Sciences	100	100	Internal assessment 10%

Grand Test: The syllabus of each subject for which the table of specification has been formulated in detail is divided into various topics and grand tests are held after the topic has been covered in theory, practical and in tutorial classes. The grand test is the first exposure of the students towards assessment of his/her knowledge and skills and is held once only for each topic covered as the syllabus goes along. The grand test has the following ingredients:

a. MCQs 45% marks
b. SEQs 45% marks
c. Viva / Copy 10% marks

Note: The DME maintains a record of all grand tests along with the keys to the MCQs and SEQs and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills.

Revision Test: The revision tests are designed to precede every session exam and they are aimed at breaking up the syllabus and covering the same in small bits so that the students can have exhaustive study of the portion of the syllabus to be tested upon. The schedule of revision test is decided jointly by the Assessment Committee and the students' class representatives so that the student input is brought into consideration. In this case the students' representatives include the weak students, the average ones and good students. And this mix ensures that adequate time is provided to weak students to do exhaustive studies.

Depending upon the syllabus covered. 8 to 10 revision tests are held in preparation for the session exams. The contents of the revision tests are:

a. MCQs (30) 30 marks
b. SEQs (6) 30 marks

Note: The DME maintains a record of all grand tests along with the keys to the MCQs and SEQs and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills. Four sets of revision tests are held annually. One each before the early session, mid-session, late session and/or send-up examination.

Session Examination: As per the annual planner and schedule, three session exams are held every year and these are generally held in March, June and August each year. The late session examination is held in August and as an extra opportunity for the students to qualify the send-ups for the border line cases is only held one month before the prof exam. The following session exams are held:

a. Early Session Examination 50% of syllabus
b. Mid-Session Examination 85% syllabus
c. Late Session Examination 100% syllabus
d. Send-up Examination For the very weak

The details of the session examination are as under

a. Theory - 50% marks divided as under

1) MCQs 45% of theory marks
2) SEQs 45% of theory marks
3) Log book / copy 10% of theory marks

b. OSPE/OSCE/Viva – 50% marks

Note: The DME maintains a record of all session exams along with the keys to the MCQs and SEQs and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills. Four sessions examinations are held annually.

OSPE (Objective Structured Practical Examination): This depicts the scenario based clinical setting and various stations are arranged. The student has to go from one station to the other to answer the question or to display his practical skill. This is aimed at assessing both the knowledge and skills of the student. The format and the standard of the scenario based problems/questions are in line with the standards prescribed by the University of Health Sciences.

Note: The DME maintains a record of all OSPEs along with the keys to the OSPE and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills. Sample OSPE paper is attached as **Annexure-B**. Since OSPE is a part of session exams therefore four sessions of OSPE are held each year.

OSCE (Objective Structured Clinical Examination): This depicts the scenario based clinical setting and various stations are arranged. The student has to go from one station to the other to answer the question or to display his clinical skills. This is aimed at assessing both the knowledge and skills of the student. The format and the standard of the scenario based problems/questions are in line with the standards prescribed by the University of Health Sciences.

Note: The DME maintains a record of all OSCEs along with the keys to the OSCE and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills. Sample OSCE paper is attached as **Annexure-C**. Since OSCE is a part of session exams therefore four sessions of OSCE are held each year.

Viva: This is an oral examination to which the student is subject to be examined by two members of the Faculty one acting as the internal examiner and the other acting as the external examiner. The student is grilled in these oral questioning sessions. The student is asked on various clinical aspects to ascertain his knowledge.

Note: The DME maintains a record of all Viva and the results. These results are used for the calculation and assessment of each student in terms of their acquisition of knowledge and skills. Since Viva is a part of session exams therefore four sessions are held each year.

Copies and Log Books: Whereas copies are maintained in 1st 2nd and 3rd year of the basic sciences, the log books are maintained for the 4th year and the final year for the clinical subjects. The completion of the copies and the log books is mandatory and these have to be produced before the internal and the external examiner on all session examinations and annual Prof exam. Copies and log books carry 10 marks and are a valid record for the purpose of assessment besides being a record of the students' clinical exposure.

Assignments: These are normally generated by the Community Medicine and the Department of Medicine in which the departments give assignments for the students to be completed in their own time. Assignments are included as a part of practical assessment and left to the discretion of the Head of Department.

Research work: The Department of Community Medicine as a part of its Curriculum train the students in carrying out research. These research projects are covered in Standard 12 – Research & Scholarship and research records are available in the Department of Community Medicine. Research works are included as a part of practical assessment and left to the discretion of the Head of Department.

Tutorials: These are held before every grand test to clear the concepts of the students on the subject. The performance of the students in the tutorials is included in the viva assessment.

Long Case and Short Case: This system of OSPE and OSCE is to ascertain the clinical acumen of the student. These are held with the session examinations and form of a part of the practical/clinical assessment.

Notification of Results
The Assessment Committee will display result on notice board as well as the results are sent through SMS to the father of the student.

Results as hard copy will also be sent to parents after each term.

Conducting Examinations and Assessments
Conducting Examinations and Assessments According to University of Health Sciences Guidelines. In all examinations and assessments, the conditions underpinning the examination or assessment shall be displayed on concerned department notice boards to students prior to the examination or assessment taking place.

Note: *Any requests for special assistance example reader/writer are to be made prior to the examination or assessment.*

g. Introducing students to the system of simulated and standardized patients

Response to Parents:
Parents are kept informed about the result of each student. The results are dispatched as follows:

a. Grand Test: by SMS
b. Revision Test: by SMS

c.	Session Examinations:	as a report containing the results of all grand tests of all subjects for that class. Three session exam reports are sent. Reports of each session for each class are attached as **Annexure-I**.
d.	OSPE	Included in the session result
e.	OSCE	Included in the session result
f.	Viva	Included in the session result
g.	Log books / Copies	Included in the session result
h.	Assignments	Included in the session result
i.	Research work	Included in the session result
j.	Tutorials	Included in the session result
k.	Long case	Included in the ward test / clinical test
l.	Short case	Included in the ward test / clinical test