सत्यमेव जयते

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Department of Pharmacology

MBBS (Pharmacology) Curriculum, AIIMS, Nagpur

Index

Pharmacology

Goal

The broad goal of teaching pharmacology to undergraduate students is to inculcate in them a rational and scientific basis of therapeutics.

Course Outcome

At the end of the 2nd MBBS Pharmacology training, the undergraduate student shall be able to -

1. Describe essential and commonly used drugs according to various pharmacological parameters
2. Discuss mechanism of action and enumerate indications, contraindications, drug interactions and adverse reactions of drugs.
3. Explain underlying rationality for selection of drug for given disease condition according to STEP criteria for individuals and community at large under national health programs.
4. Describe the pharmacokinetic basis, clinical presentation, diagnosis and management of drug toxicity/poisonings/drug addiction.
5. Select the proper drug and dose for the at-risk population i.e. patients with kidney or liver disease, elderly, pregnant and lactating females, and children.
6. Explain the term 'Rational use of medicine' and the concept of 'Essential Drugs'.
7. Evaluate the ethics and modalities involved in the development and introduction of new drugs.
8. Demonstrate the use of various dosage forms (oral/local/parenteral; solid/liquid).
9. Prescribe the rational, correct and legible generic prescription for a given disease condition and Communicate effectively with a patient on the proper use of prescribed medication.
10. Identify & monitor adverse drug reactions and appreciate the importance of ADR reporting.
11. Interpret the data of animal experiments and in vitro studies designed to study action of various drugs.
12. Perform a critical evaluation of the drug promotional literature.
13. Prepare and explain a list of P-drugs for a given case/condition.
14. Administer drugs through various routes in a simulated environment using mannequins.
15. Describe principles of pharmacy and dispense the medications giving proper instructions.

Syllabus

Theory

Section 1:General Pharmacology

1	Introduction	8	Excretion
2	Nature & sources of drugs	9	Pharmacodynamic I
3	routes of drug administration	10	Pharmacodynamics II
4	Biotransportation	11	ADR
5	Absorption	12	Concept of Essential medicine, RUM & EBM
6	Distribution	13	Drug discovery & clinical evaluation of New drug
7	Metabolism	14	Factors modifying drug action

Section 2: ANS

1	Introduction: Neurohumoral transmission	6	alfa blocker
2	Cholinergic drugs	7	Beta blockers I
3	Anticholinergics	8	Beta blockers II
4	Adrenergic I	9	Pharmacotherapy of Glaucoma
5	Adrenergic II	10	Skeletal muscle relaxants

Section 3: Diuretics

Section 4: CVS

1	Drugs acting on RAAS	6	Hypertension I
2	Vasoactive peptides & NO	7	Hypertension II
3	IHD I	8	CHF
4	IHD II	9	Antiarrhythmic drugs
5	Calcium channel blockers	10	Pharmacotherapy of Dyslipidaemia

Section 5: Drugs affecting blood & blood formation

1. Haematinics& Erythropoietin
2. Drugs affecting coagulation, Bleeding & Thrombosis

Section 6: Autocoids

1. Histamine &antihistaminics
2. 5-HT, its antagonist & drug therapy of migraine
3. Prostaglandins, Leukotrienes & Platelet activating factors

Section 7: CNS

1	General anaesthetics	11	Drug therapy for Neurodegerative disorders
2	Local anaesthetics	12	Non-steroidal anti-inflammatory drugs &antipyeretic-analgesics
3	Sedative-Hypnotics	13	NSAIDs II

4	Antiepileptic drugs I	14	Antirhematoid& Antigout drugs
5	Antiepileptic drugs II	15	Opioid agonist
6	Antipsychotic drugs	16	Opioid antagonists
7	Antimanic drugs	17	Ethyl & Methyl alcohol
8	Antidepressants I	18	CNS stimulant & Cognition enhancers
9	Antidepressants II	19	Drug dependence & drug abuse
10	Antianxiety drugs		

Section 8: RS

1. Drug therapy of cough
2. Drugs for Bronchial asthma & COPD

Section 9: Endocrines

1	Anterior pituitary hormones	7	Corticosteroid II
2	Thyroid hormones & Thyroid inhibitors	8	Estrogen & Progestins
3	Insulin	9	Hormonal contraceptives
4	Oral antidiabetic drugs	10	Androgens & related drugs, Drugs for erectile dysfunction
5	Pharmacotherapy of DM	11	Oxytocin & other drugs acting on uterus
6	Corticosteroid I	12	Hormones & drugs affecting Calcium balance

Section 10: GIT

1. Drugs for peptic ulcer & GERD
2. Antiemetic, Prokinetic & Digestant drugs
3. Drugs for Constipation &Diarrhoea
4. Pharmacotherapy of inflammatory bowel disease, irritable bowel syndrome

Section 11: Antimicrobial drugs

1	General consideration	10	Drug therapy of STD
2	Sulfonamides, Cotrimoxazole & Quinolones	11	Tuberculosis
3	Beta-lactam antibiotics: Penicillins	12	Antileprotic drugs
4	Beta-lactam antibiotics: cephalosporins	13	Drug therapy of Malaria
5	Newer beta lactams	14	Antiamoebic& other antiprotozoal drugs
6	Tetracyclines & Chloramphenicol	15	Antifungal drugs
7	Aminoglycoside antibiotics	16	Anti viral drugs I(Non-retroviral)
8	Macrolide, Lincosamide, Glycopeptide	17	Anti viral drugs II(Anti-retroviral)
9	Pharmacotherapy of UTI	18	Anthelminthic drugs

Section 12: Anticancer drugs

Section 13: Miscellaneous topics

1	vaccines, sera & immunoglobulins	8	Drugs acting on skin & mucous membrane
2	Chelating agents	9	Drug use in pregnancy
3	Drug interactions	10	Drug use at extreme of ages
4	Immunomodulators	11	Ocular pharmacology
5	Antiseptics & Disinfectants	12	Spurious, counterfeit & Adulterated drugs
6	Pharmacotherapy of shock	13	Management of common poisoning
7	Drug treatment of Obesity	14	Chronopharmacology, Pharmacoepidemiology, Pharmacoeconomics

PRACTICALS

Section I: Pharmacy

Introduction to Pharmacology

Prescription writing

Dosage form: Oral (Powder/mixture/suspension,Emulsion)

Dosage form :Topical (Liniment/lotion/ointment)

Dosage form: Parenteral

Section II: Experimental Pharmacology (Computer Assisted Learning)

Bioassay & Dose Response Curve

Effect of drugs on isolated perfused frog's heart

Effect of various drugs on blood pressure of anaesthetized animal

Effects of drugs on rabbit’s eye

Analgesic activity of drugs in mice

Anticonvulsant effect of phenytoin in mice using electroconvulsiometer

Screening Techniques for New Drugs (Rota rod for sedative effect, Ischemic pain method for analgesics/6DCT & CFFT for psychomotor performance etc)

Section III: Clinical Pharmacology

Posology

Pharmacokinetic exercise

ADR and ADR based exercises

ADR reporting &PvPI

Rational Pharmacotherapy- I ('P' drug concept)

Rational pharmacotherapy –II

Sources of drug information

Therapeutic problems based on Drug Interaction

Importance of communication skill in clinical practice

Case study

Single drug Therapy /Complete drug therapy

Criticism of given prescription

Fixed dose formulations

Curriculum

Teaching and learning methods

Total teaching hrs: 230 ;Teaching hrs: 5 hrs/week

Semester	Didactic lecture	Tutorial	GD	Sem	PBL	Integrated session	Practicals (2 hr/session)	SDL	Total teaching hrs
3rd semester	20	6	6	2	1	1	10	4	60
4th semester	30	10	10	5	4	2	10	4	85
5th semester	30	10	10	5	4	2	10	4	85
Total	80	26	26	12	9	5	30	12	230

Semesterwise division of topics

	3rd semester	
	Didactic lecture	**20**
	General Pharmacology	
1	Introduction to pharmacology	
2	Nature and sources of drugs	
3	Routes of administration	
4	Biotransportation	
5	Pharmacokinetic I	
6	Pharmacokinetic II	
7	Pharmacodynamics -1	
8	Pharmacodynamics -II	
9	ADR	
	ANS	
10	Cholinergics	
11	Anticholinergics	
12	Adrenergics	
13	α-blocker	
14	ß- blocker	
15	**Diuretics**	
	CVS	
16	Calcium channel blockers	
17	IHD	
18	hypertension	
19	CHF	
20	Antiarrythmics	

	Tutorials/PBL/GD/seminar/Drug presentation/Integrated sessions	**16**
1	Tutorial: Pharmacokinetic parameters	
2	Tutorial: Mechanism of drug action	
3	Group Discussion: EML	
4	Group Discussion: Evidence based medicine	
5	Tutorial: Factors modifying drug action	
6	GD: clinical trials & phases	
7	Tutorial: neurotransmission	
8	Seminar: drugs affecting parasympathetic nervous system	
9	Seminar: drugs affecting sympathetic nervous system	
10	Group discussion: Pharmacotherapy of glaucoma	
11	Tutorial: Physiology of urine formation & transporters	
12	Group discussion: Role of NO & vasoactive peptide signal molecules	
13	Flipped classroom teaching: Drugs affecting RAS	
14	Tutorial: pharmacotherapy of hypertension	
15	Integration: Management of IHD	
16	PBL: CVS	
	SDL	**4**
	4th semester	
	Didactic lecture	**30**
	Drugs affecting blood and blood formation	
1	Haematinics& erythropoietin I	
2	Drugs affecting coagulation,bleeding& thrombosis	
3	Hypolipidaemic drugs	
	PNS	
4	Local anaesthetics	
5	Skeletal muscle relaxants	
	CNS	
	General anaestetics	
6	Sedatives and Hypnotics	
7	Antiepileptics : Classification	
8	Antipsychotics	
9	Neurodegenerative disorders	
10	Antidepressants	
11	Antianxiety and drugs for mania	
12	Opioid Agonists	
13	Opioid Antagonists	
14	CNS stimulants and cognition enhancers	
	Autocoids& related drugs	
15	Histamine and antihistaminic drugs	
16	5HT and its antagonist	
17	Prostaglandins, leukotrienes and PAF	

18	NSAID	
19	Pharmacotherapy of RA & Gout	
	RS	
20	Cough and antitussives	
21	Drugs for Bronchial Asthma	
	GIT	
22	Drugs for peptic ulcer and GERD	
23	Antiemetics and prokinetic drugs	
24	Drugs for constipation and diarrhoea	
	Miscellaneous I	
25	Vaccines, sera and Immunoglobulins	
26	Chelating agents	
27	Pharmacotherapy of Obesity	
28	Pharmacotherapy of shock	
	Tutorials/PBL/GD/seminar/Drug presentation/Integrated sessions	**31**
1	GD: Hematinics II	
2	Seminar: Drugs affecting coagulation	
3	Drug presentation: Antiplatelet agent	
4	GD: LA II	
5	GD: Preanaestetic medication	
6	Tutorial: Skeletal muscle relaxants II	
7	GD: CNS neurotransmitters and its role in various mental disorders	
8	Tutorial: Drugs for epilepsy	
9	GD: Management of Epilepsy III	
10	Tutorial: Benzodiazepines	
11	Tutorial: Antidepressants	
12	Integration: Management of psychosis	
13	PBL: epilepsy	
14	PBL (depression,psychosis,anxiety)	
15	GD: Drug dependence & drug abuse	
16	Drug presentation: opiod agonist & antagonist	
17	Integration: Respiratory medicine	
18	GD: drug therapy of irritable bowel syndrome	
19	GD: drug therapy of inflammatory bowel disease	
20	GD: Cognition enhancers	
21	Tutorial: Pharmacotherapy of ulcer	
22	Drug presentation: antiemetic agents	
23	Seminar:management of diarrhoea	
24	Drug presentation: NSAIDs	
25	Seminar: Management of RA	
26	GD: Therapeutic uses of prostaglandin derivatives	
27	GD: Management of common poisonings	
29	GD: Pharmacotherapy of migrain	

30	PBL: GIT	
31	PBL: Hematinics	
	SDL	**4**
	5th semester	
	Didactic lecture	**30**
	Endocrines	
1	Drugs acting on Anterior pituitary	
2	Thyroid hormones & Thyroid inhibitors	
3	DM: Insulin & analogues	
4	DM: Antidiabetic agents	
5	Corticosteroids I	
6	Corticosteroids II	
7	Androgens & related drugs	
8	Estrogens & Progestins	
9	Hormonal contraceptives I	
10	Oxytocin and other drugs acting on uterus	
11	Hormones and drugs affecting calcium balance	
	Chemotherapy	
12	Chemotherapy : general Considerations	
13	Sulphonamides	
14	Cotrimoxazole and Quinolones	
15	Beta lactam antibiotics :Penicillins	
16	Cephalosporins, Monobactams, Carbapenems	
17	Tetracyclines and Chloramphenicol	
18	Aminoglycosides	
19	Macrolides ,lincosamide and glycopeptides	
20	Tuberculosis	
21	Antileprotic drugs	
22	Drug therapy of Malaria	
23	Antiamoebic and other antiprotozoal drugs	
24	Antifungal Drugs	
25	Antiviral drugs I(Non retroviOral)	
26	Anti retroviral agents	
27	Antihelmintic drugs	
28	anticancer drugs	
	Miscellaneous	
29	Drug interactions	
30	Drugs acting on skin and mucous membranes	
	Tutorials/PBL/GD/seminar/Drug presentation/Integrated sessions	
1	GD: Insulin analogues	**31**
2	GD: Management of DM	
3	Tutorial: Corticosteroids III	
4	Tutorial: SERM	

5	Tutorial: Hormonal contraceptives II	
6	Tutorial: Drugs acting on uterus	
7	Tutorial: sulfonamides & quinolones	
8	GD: beta lactam antibiotics-I	
9	GD: beta lactam antibiotics -II	
10	Tutorial: aminoglycosides, macrolides, lincosamides	
11	PBL: chemotherapy	
12	GD: Management of TB	
13	Integrated session: TB	
14	Tutorial: Pharmacotherapy of malaria	
15	Integrated session:Malaria	
16	Tutorial: antiamoebic agents	
17	Drug presentation: Antihelmintic agents	
18	Tutorial: antifungal agent	
19	Seminar: Pharmacotherapy of HIV	
20	Seminar: Drug use at extremes of ages	
21	Tutorial: Drugs acting on skin and mucous membrane	
22	Tutorial: Immunomodulators	
23	Tutorial: Antiseptic & Disinfectant	
24	GD: Ocular Pharmacology	
25	GD: Medication errors	
26	GD: Drugs in pregnancy	
27	PBL: chemotherapy	
28	PBL: Endocrines	
29	Tutorial: Spurious,counterfeit % adulterated drugs	
30	GD: Anabolic steroid	
31	Sem: Chronopharmacology, Pharmacoepidemiology, Pharmacoeconomics	
	SDL	4

Semester wise syllabus for practical in Pharmacology

	3 rd semester	10
1	Introduction	
2	Prescription writing	
3	Routes of drug administration: Oral dosage forms	
4	Routes of drug administration:Topical dosage form	
5	Routes of drug administration: Parenteral dosage form	
6	Bioassay & Dose Response Curve (DRC)	
7	Effects of various drugs on blood pressure of anaesthetized animal	
8	Effects of drugs on isolated perfused frog's heart	
9	Complete drug therapy/single drug therapy(3rd semester syllabus)	
10	Criticize, Correct and Rewrite given prescription/Justify drug combination(3rd semester syllabus)	

	4 th semester	10
11	Posology	
12	Pharmacokinetics exercises	
13	Demonstrate effect of drugs on rabbits eye using computer aided learning	
14	Demonstrate analgesic & anticonvulsant effect of drugs in experimental animals.	
15	Demonstrate effect of drugs on psychomotor performance	
16	Screening techniques of new drugs	
17	Adverse drug reactions:Identification and Management	
18	ADR reporting and Pharmacovigilance programme of India	
19	Complete drug therapy/single drug therapy(4th semester syllabus)	
20	Criticize, Correct and Rewrite given prescription/Justify drug combination(4th semester syllabus)	
	5 th semester	10
21	Rational Pharmacotherapy I(P-drug concept)	
22	Rational Pharmacotherapy II	
23	Sources of drug information including critical appraisal of Promotional literature	
24	Therapeutic problems based on drug interactions	
25	Essential medicine list	
26	Exercise based on communication skill	
27	Case study	
28	Complete drug therapy/Single drug therapy	
29	Criticize, correct and rewrite given prescription	
30	Fixed dose drug combination	

Assessment Plan

Formative assessment

1. Formative assessment serves as an important tool for obtaining student's feedback about teaching
2. Assessment at the end of each session (theory/practical) will be done by the faculty-in-charge
3. End of module assessment will be done at the end of each module
4. Pattern of examination will be decided by faculty in-charge
5. Written/oral/practical examination can be conducted depending on need.
6. Marks will not be included for internal assessment

Internal Assessment

Two Internal assessment examination at the end of semester (Theory/Practical)

One Pre-professional examination (Theory/Practical)

One Professional examination (Theory/Practical)

Examinations	Theory	Practical
1st IA exam (Third Sem)	50	50
2nd IA exam(Fourth Sem)	50	50
Total	100	100
Out of	**50**	**50**
Pre-professional exam	Paper I:50 Paper II:50	100
Total	100	100
Out of	**50**	**50**
Professional exam	Paper I:50 Paper II:50	100
Total	**100**	**100**
Grand Total	**200**	**200**

Eligibility for appearing in Professional exam: Minimum 50 % marks in theory and 50% marks in practical each.
Passing criteria: Minimum 50 % marks in theory & Practical each
Theory paper duration: for 50 marks: 2hrs 30mins

For Internal assessment examination

Theory paper pattern:(50 Marks)

Type of question	**level of assessment**	**No of question**	**Marks for each question**	**Total marks**	**Time allotted**
MCQs	Knowledge comprehension	20	0.5	10	30 mins
Short answer question (SAQ)	Knowledge Comprehension application	6	2	12	35 mins
Brief answer question (BAQ)	Knowledge Comprehension Application Analysis	3	4	12	35 mins
Long answer question (LAQ)	Application Analysis Synthesis Evaluation	2	8	16	50 mins
Total				50	2 hrs 30 mins

Practical examination pattern (50 marks)

Type of question	Level of assessment	No of questions	Marks for each question	Total marks	Time allotted
Prescription writing (OSPE)	K/KH/SH	4	5	20	30 mins
Pharmacy	K/KH/SH	1	10	10	15 mins
Spotters	K/KH	10	1	10	20 mins
Viva voce	K/KH	-	-	10	10 mins

A) Prescription writing (20)

1. Prescribe the rational, correct and legible complete generic drug prescription for a given disease condition
2. Prepare and explain selection of P-drugs for a given clinical condition
3. Criticize, correct & rewrite the given Prescription/ critical analysis of given prescription and rewrite corrected prescription.
4. Justify the given Fixed dose combination. Write its Indication, C/I, Precautions if any

B) Clinical Pharmacy (dosage forms, routes of administration, label information and instructions) (05)

C) Spots: (05)

- Experimental Pharmacology– Graphs, Models for evaluation, Instruments
- Problems based on interpretation of data
- Exercises based on Pharmacokinetic properties of drugs
- Exercises based on pharmacodynamic properties of drugs
- Therapeutic problems based on drug interaction, rational pharmacotherapy, Outdated tablet, Ethics and Sources of drug information
- Each spots will carry 1 marks & 2 mins.

D) OSPE (10)

- ADR: Identification and filling of ADR form
- Critical evaluation of the drug promotional literature

E) Viva voce (10)

For Pre-professional exam and Professional exam

Theory paper pattern:(Theory Paper I: 50 marks; Paper II: 50 marks)

Type of question	level of assessment	No of question	Marks for each question	Total marks	Time allotted
MCQs	Knowledge comprehension	20	0.5	10	30 mins

Short answer question (SAQ)	Knowledge Comprehension application	6	2	12	35 mins
Brief answer question (BAQ)	Knowledge Comprehension Application Analysis	3	4	12	35 mins
Long answer question (LAQ)	Application Analysis Synthesis Evaluation	2	8	16	50 mins
Total				50	2 hrs 30 mins

Syllabus for Paper I & Paper II- Theory

Paper I: General Pharmacology; Autonomic Nervous System; Cardiovascular System including those acting on the Kidneys; Haematinics; Autocoids& related drugs; Agents used in Gastro-Intestinal Disorders; Miscellaneous I.

Paper II: CNS; PNS; Chemotherapy including Cancer Chemotherapy; Endocrinology; RS; Drug interactions; Dermatology; Ocular pharmacology; Miscellaneous II.

Topics included in miscellaneous I

- Chelating agents;
- Management of common poisoning
- Pharmacotherapy of Obesity;
- Pharmacotherapy of shock

Miscellaneous II

- Drug interactions;
- Dermatology;
- Ocular pharmacology;
- Immunomodulators;
- Vaccines, sera &immunoglobulins ;
- Drug use at extremes of ages;
- Antiseptic & Disinfectant;
- Drug therapy during pregnancy & lactation;
- Chronopharmacology, Pharmacoepidemiology, Pharmacoeconomics
- Medication error
- Spurious, counterfeit & adulterated drugs

Practical examination pattern (100 marks)

Type of question	Level of assessment	No of questions	Marks for each question	Total marks	Time allotted
Prescription writing (OSPE)	K/KH/SH	4	10	40	40 mins
Pharmacy	K/KH/SH	1	20	20	15 mins
Spotters	K/KH	10	2	20	20 mins
Viva voce	K/KH	-	-	20	15 mins
Total				100	1 hr 30 mins

A) Prescription writing (40)

1. Prescribe the rational, correct and legible complete generic drug prescription for a given disease condition
2. Prepare and explain selection of P-drugs for a given clinical condition
3. Criticize, correct & rewrite the given Prescription critical analysis of given prescription and rewrite corrected prescription.
4. Justify the given Fixed dose combination. Write its Indication, C/I, Precautions if any

B) Clinical Pharmacy (dosage forms, routes of drug administration, label information and instructions) (10)

C) Spots: (10)

- Experimental Pharmacology– Graphs, Models for evaluation, Instruments
- Problems based on interpretation of data
- Exercises based on Pharmacokinetic properties of drugs
- Exercises based on pharmacodynamic properties of drugs
- Therapeutic problems based on drug interaction, rational pharmacotherapy, communication skill, Outdated tablet, Ethics etc.
- Each spots will carry 2 marks & 4 mins.

D) OSPE (20)

- ADR: Identification and filling of ADR form
- Critical evaluation of the drug promotional literature

E) Viva voce (20)

TEXT-BOOKS RECOMMENDED

1. Essentials of Medical Pharmacology by K.D. Tripathi
2. Principles of Pharmacology by HL Sharma & KK Sharma
3. Rang & Dale's Pharmacology
4. Pharmacology for MBBS By S K Shrivastav
5. Lippincott's Illustrated Reviews Pharmacology by Karen Whalen
6. Pharmacology and Pharmacotherapeutics by RS Satoskar, SD Bhandarkar, SS Ainapure
7. Practical Pharmacology for MBBS by Dr MN Chowta, Dr A Shenoy, Dr A Kamath

Reference Books

1. Goodman & Gilman’s - The Pharmacological Basis of Therapeutics
2. Basic & Clinical Pharmacology by Bertram G, Katzung
3. Clinical Pharmacology by DR Lawrence, PN Bennett & MJ Brown