



Rajiv Gandhi University of Health Sciences, Karnataka
4th T Block Jayanagar, Bengaluru

Curriculum design, continuous and formative assessment evaluation of B. Pharm. course of Semester 1 & 2 w.e.f Academic year 2017-18

SEMESTER-IV

BP401T: Pharmaceutical Organic Chemistry –III

Scope:

This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives:

At the end of the course, the student shall be able to

1. To understand the methods of preparation and properties of organic compounds
2. To explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. To know the medicinal uses and other applications of organic compounds

1. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	Hours: 10	Weightage: 24 Marks
Learning content distribution	Topics	
	Stereo isomerism	
Must know	<ul style="list-style-type: none">➤ Definition of stereoisomerism with examples➤ Optical activity, compounds containing one or more chiral carbon and possible number of stereoisomers.➤ Elements of symmetry and its significance➤ DL system of nomenclature of optical isomers with suitable examples➤ Sequence rules, RS system of nomenclature of optical isomers with	

	<p>example</p> <ul style="list-style-type: none"> ➤ Racemic modification and resolution of racemic mixture. ➤ Asymmetric synthesis: partial and absolute
Desirable to know	<ul style="list-style-type: none"> ➤ Definitions of optical activity, enantiomerism, diastereoisomerism, meso compounds, chiral and achiral molecules with examples ➤ Reactions of chiral molecules
Nice to know	<ul style="list-style-type: none"> ➤ Plane polarised light, Optical rotation, Symmetry and unsymmetric ➤ Definition of racemic mixture, racemic compound and racemic solution

UNIT-II	Hours: 10	Weightage: 19 Marks
Learning content distribution	Topics	
	Geometrical isomerism	
Must know	<ul style="list-style-type: none"> ➤ Definition and requirements of geometrical isomerism ➤ Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) ➤ Methods of determination of configuration of geometrical isomers. ➤ Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. ➤ Conformational isomerism in Ethane, n-Butane and Cyclohexane. 	
Desirable to know	<ul style="list-style-type: none"> ➤ Stereospecific and stereoselective reactions with examples 	
Nice to know	<ul style="list-style-type: none"> ➤ Molecular orbital picture of geometrical isomerism ➤ Difference between configuration and conformation with examples ➤ Restriction of rotation around carbon-carbon double bond ➤ Axial and equatorial hydrogen in cyclohexan 	

UNIT-III	Hours: 10	Weightage: 24 Marks
Learning content distribution	Topics	
	Heterocyclic compounds	
Must know	<ul style="list-style-type: none"> ➤ Nomenclature and classification of heterocyclic compounds ➤ Synthesis and reactions of following compounds/derivatives Pyrrole, Furan, and Thiophene ➤ Relative aromaticity and reactivity of Pyrrole, Furan, and Thiophene ➤ Basicity of Pyrrole 	

Desirable to know	➤ Medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene -
Nice to know	➤ Concept of Aromaticity, Huckel's rule ➤ Drugs containing heterocyclic ring system

UNIT-IV		Hours: 8	Weightage: 14 Marks
Learning content distribution	Topics		
	Synthesis, Reactions and Medicinal Uses Heterocyclic compounds		
Must know	<ul style="list-style-type: none"> ➤ Synthesis and reactions of following compounds/derivatives of Pyrazole, Imidazole, Oxazole, ➤ Synthesis and reactions of following compounds/derivatives of Thiazole, Pyridine, Quinoline, Isoquinoline, Acridine and Indole. ➤ Synthesis of Pyrimidine, Purine, azepines and their derivatives 		
Desirable to know	<ul style="list-style-type: none"> ➤ Medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole, Thiazole, Pyridine, Quinoline, Isoquinoline, Acridine and Indole. ➤ Basicity of pyridine, ➤ Medicinal uses of Pyrimidine, Purine, azepines and their derivatives 		
Nice to know	<ul style="list-style-type: none"> ➤ Resonance structures with examples ➤ Drugs containing heterocyclic ring system 		

UNIT-V		Hours: 7	Weightage: 14 Marks
Learning content distribution	Topics		
	Reactions of synthetic importance		
Must know	<ul style="list-style-type: none"> ➤ Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction. ➤ Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation 		
Desirable to know	<ul style="list-style-type: none"> ➤ Oppenauer-oxidation and Dakin reaction. 		
Nice to know	<ul style="list-style-type: none"> ➤ Definition of oxidation and reduction with examples. ➤ Significance of above mentioned named reactions 		

Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER								
BP401T: Pharmaceutical Organic Chemistry –III								
TIME: 3 HOURS					MAX. MARKS: 75			
Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X5)	LE (10X0)	SE (5X1)	SA (2X5)	
Unit-I	10	01	01	01	--	01	01	24
Unit-II	10	01	01	01	--	--	01	19
Unit-III	10	01	02	01	--	--	01	24
Unit-IV	08	--	02	01	--	--	01	14
Unit-V	07	--	02	01	--	--	01	14
Total	45	30	40	10	-	5	10	95
		80			15			95



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Curriculum design, continuous and formative assessment evaluation of
B. Pharm. course of Semester & 2 w.e.f Academic year 2018-19

SEMESTER-IV

BP402T: Medicinal Chemistry I

2. Departmental objectives (what the learners will be able to perform after completing the subject):
A. Learning Objectives:

Upon completion of this course the student should be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
 2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
 3. Know the Structural Activity Relationship (SAR) of different class of drugs
 4. Write the chemical synthesis of some drugs
3. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	Hours: 10	Weightage: 19 Marks
Learning content distribution	Topics	
	Introduction to Medicinal Chemistry	
Must know	Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism. Factors affecting drug metabolism including stereo chemical aspects Drug metabolism principles- Phase I and Phase II	
Desirable to know	Importance of Cytochrome – p -450 in oxidative drug metabolism. Minor pathways of Phase II conjugation.	
Nice to know	History and development of medicinal chemistry. Hit and Lead concept, Basic concept of drug-receptor interaction. Receptor	

UNIT-II	Hours: 10	Weightage: 21 Marks
Learning content distribution	Topics	
	Drugs acting on Autonomic Nervous System	
Must know	Biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. Synthesis of drugs marked with star. Structures of adrenergic agonists and antagonists with classification. SAR of B-blockers	
Desirable to know	Mechanism of action, uses and specific side effects of above drugs.	
Nice to know	Brand names, Patent names, Adverse effects and possible side effects and dosage of some clinically used drugs	

UNIT-III	Hours: 10	Weightage: 21 Marks
Learning content distribution	Topics	
	Cholinergic neurotransmitters:	
Must know	Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. Structure, classification and uses of cholinergic and anticholinergic drugs, SAR of cholinergic antagonists Synthesis of drugs marked with star.	
Desirable to know	Mechanism of action, uses and specific side effects of above drugs..	
Nice to know	Brand names, Patent names, Adverse effects and possible side effects and dosage of some clinically used drugs	

UNIT-IV	Hours: 8	Weightage: 17 Marks
Learning content distribution	Topics	
	Drugs acting on Central Nervous System	
Must know	SAR of Benzodiazepines, Barbiturates, Phenothiazines, and Anticonvulsants. Chemical classifications with structures and uses of Sedatives and Hypnotics, antipsychotics and anticonvulsants.	
Desirable to know	Mechanism of action and specific side effects of above drugs..	

know	
Nice to know	Brand names, Patent names, Adverse effects and possible side effects and dosage of some clinically used drugs

UNIT-V	Hours: 7	Weightage: 17 Marks
Learning content distribution	Topics	
	Drugs acting on Central Nervous System	
Must know	SAR of morphine analogues. Chemical classifications with structures and uses of General anaesthetics, Narcotic and NSAID drugs	
Desirable to know	Mechanism of action and specific side effects of above drugs.	
Nice to know	Brand names, Patent names, Adverse effects and possible side effects and dosage of some clinically used drugs of above class.	

Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER								
BP402T: Medicinal Chemistry-I								
TIME: 3 HOURS					MAX. MARKS: 75			
Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X5)	LE (10X0)	SE (5X1)	SA (2X5)	
Unit-I	10		3	1	-	-	1	19
Unit-II	10	1	-	2	-	1	1	21
Unit-III	10	-	3	1	-	-	2	21
Unit-IV	08	1	1	-	-	-	1	17
Unit-V	07	1	1	1	-	-	-	17
Total	45	30	40	10	-	5	10	95
		80			15			95



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Pharm. course of Semester 1 & 2 w.e.f Academic year 2017-18

SEMESTER-IV

BP 403 T:physical pharmaceutics-II

4. Departmental objectives (what the learners will be able to perform after completing the subject):

B. Learning Objectives:

Upon completion of this course the student should be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage form
2. Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation
3. Demonstrate use of physicochemical properties in evaluation of dosage forms.
4. Appreciate physicochemical properties of drug molecules in formulation research and Development
5. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I	Hours:10	Weightage: 24 Marks
Learning content distribution	Topics	
	Colloidal dispersions	
Must know	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.	
Desirable to	Classification of dispersed systems	

know	
Nice to know	Preparation and purification of colloids.

UNIT-II	Hours: 10	Weightage: 19 Marks
Learning content distribution	Topics	
	Rheology	
Must know	Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatants, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary and rotational viscometers Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus	
Desirable to know	Determination of viscosity falling Sphere,	
Nice to know	Brookfield Viscometer	

UNIT-III	Hours: 10	Weightage: 19 Marks
Learning content distribution	Topics	
	Coarse dispersion	
Must know	Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of suspensions. Emulsions and theories of emulsification,; Physical stability of emulsions, rheological properties of emulsions, phase equilibria and emulsion formulation by HLB method.	
Desirable to know	Microemulsion and multiple emulsions, preservation of emulsions,	
Nice to know	Nano suspension and emulsion.	

UNIT-IV	Hours: 08	Weightage: 19 Marks
Learning content distribution	Topics	
	Micromeritics	
Must know	Particle size and distribution, , methods for determining particle size by (s), counting and separation method, particle shape, specific surface, methods surface area, permeability, adsorption, derived properties of powders, porosity,	

	ment, densities, bulkiness & flow properties.
Desirable to know	Average particle size, number and weight distribution, particle number
Nice to know	Applications of derived properties of powders in designing solid dosage forms

UNIT-V	Hours: 7	Weightage: 14 Marks
Learning content distribution	Topics	
	Drug stability	
Must know	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,. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms.	
Desirable to know	Simple numerical problems, Photolytic degradation and its prevention	
Nice to know	Applications of kinetics in bioavailability	

Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER								
BP403T: Physical Pharmaceutics-II								
TIME: 3 HOURS					MAX. MARKS: 75			
Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X5)	LE (10X0)	SE (5X1)	SA (2X5)	
Unit-I	10	1	2	1	–		1	24
Unit-II	10	1	1	1	–		1	19
Unit-III	10	1	1	1	–		1	19
Unit-IV	08		2	1	–	1	1	19
Unit-V	07		2	1	–		1	14
Total	45	30	40	10	-	5	10	95
			80			15		95



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Curriculum design, continuous and formative assessment evaluation of B.
Pharm. course of Semester 4 w.e.f Academic year 2018-19

SEMESTER-IV

BP404T: PHARMACOLOGY-I (Theory)

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

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

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences
6. Content distribution as per the list of topics, time allotted for each topic, distribution for 'Must know', 'Desirable to know' and 'Nice to know' and the probable weightage.

The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

UNIT-I		Hours: 8	Weightage: 15 Marks
Learning content distribution	Topics		
	General Pharmacology		
Must know	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.		
Desirable to	Addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.		

know	
Nice to know	Alcohol de-addiction and tobacco de-addiction

UNIT-II	Hours: 12	Weightage: 25 Marks
Learning content distribution	Topics	
	General Pharmacology	
Must know	<p>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 receptor and receptors that regulate transcription factors.</p> <p>b) Adverse drug reactions.</p> <p>c) Drug interactions (Pharmacokinetics and pharmacodynamics)</p> <p>d) Drug discovery and clinical evaluation of new drugs, Drug discovery phase, preclinical evaluation phase, clinical trial phase.</p>	
Desirable to know	Pharmacovigilance	
Nice to know	Hemovigilance and adverse drug reaction reporting.	

UNIT-III		Hours: 10	Weightage: 25 Marks
Learning content distribution	Topics		
	Pharmacology of peripheral nervous system		
Must know	a)	Organization and function of ANS	
	b)	Neurohumoral transmission, co-transmission and classification of neurotransmitters.	
	c)	Parasympathomimetic, Parasympathetic, Sympathomimetics, sympatholytic.	
	d)	Neuromuscular blocking agents and skeletal muscle relaxants (peripheral)	
Desirable to know	e)	Local anaesthetic agents.	
	f)	Drugs used in myasthenia gravis and glaucoma	
Nice to know	Signalling pathways, Cranial nerves and functions		

UNIT-IV		Hours: 8	Weightage: 15 Marks
Learning content distribution	Topics		
	Peripheral nervous system		
Must know	a.	Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.	
	b.	General anaesthetics and pre-anaesthetics.	
	c.	Sedatives, hypnotics and centrally acting muscle relaxants.	
	d.	Anti-epileptics	
Desirable to know	e.	Alcohols and disulfram	

Nice to know	Misuse of sedative and hypnotics drugs and their toxicity management.
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UNIT-V	Hours: 7	Weightage: 15 Marks
Learning content distribution	Topics	
	Pharmacology of central nervous system	
Must know	a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, antimanics and hallucinogens. b. Drugs used in Parkinson's disease and Alzheimer's disease. c. CNS stimulants and nootropics. d. Opioid analgesics and antagonists	
Desirable to know	e. Drug addiction, drug abuse, tolerance and dependence	
Nice to know	Non-pharmacological management of psychosis and depressant Management of opioid poisoning	

Blueprint of question paper, for each QP. This shows the weightage given to each chapter in the summative assessment. This improves the content validity by distributing the assessment of learners in the competencies that are represented by learning objectives under each chapter.

BLUE PRINT OF MODEL QUESTION PAPER								
BP404 T.PHARMACOLOGY-I								
TIME: 3 HOURS					MAX. MARKS: 75			
Unit No	Hours	Must know			Desirable to know			Weightage of marks
		LE (10X3)	SE (5X8)	SA (2X5)	LE (10X0)	SE (5X1)	SA (2X5)	
Unit-I	8	-	1	1	-	1	1	14
Unit-II	12	1	2	1	-	-	1	24
Unit-III	10	1	2	1	-	-	1	24
Unit-IV	08	1	2	1	-	-	1	24
Unit-V	07	--	1	1	-	-	1	09
Total	45	30	40	10	-	05	10	95
		80			15			95

Template for curriculum designing

Fourth Semester of B. Pharmacy (PHARMACOGNOSY AND PHYTOCHEMISTRY I THEORY – 45 HOURS)

7. Content distribution as per the list of topics, time allotted for each topic, distribution for ‘Must know’, ‘Desirable to know’ and ‘Nice to know’ and the probable weightage. The following table can also be a reference frame for continuous and formative assessment of learning. If the curriculum management is scheduled as per the tabulation, there can be clarity for both learners and teachers to take stock of the mastery achieved in each objective. This will also help for professional excellence that goes beyond the examination process.

Unit	Topic	Hours	Learning content distribution			Wt'age (Marks)
			Must know	Desirable to know	Nice to know	
1	Introduction to Pharmacognosy	10	<p>Quality control of drugs.</p> <p>a. Adulteration of drugs of natural origin, Evaluation by organoleptic, microscopic, physical, chemical and biological methods.</p> <p>Quantitative microscopy of crude drugs including Lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida</p>	<p>Scope and development of Pharmacognosy.</p> <p>Sources of drugs – Plants, animals, Marine and tissue culture.</p> <p>Organised and unorganised drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleo resins and oleo gum resins).</p>	<p>Classification of drugs.</p> <p>Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs.</p>	20
2.	Cultivation, collection, processing and storage of drugs of natural origin.	10	<p>Plant hormones and their applications.</p> <p>Polyploidy, mutation and hybridization with reference to medicinal plant.</p>	<p>Cultivation and collection of drugs of natural origin</p> <p>Factors influencing cultivation of medicinal plants</p>	<p>Conservation of medicinal plants.</p>	24

3.	Plant tissue culture	07	Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance	Applications of plant tissue culture in pharmacognosy	Edible vaccines	14
4.	Pharmacognosy in various systems of medicine	10	Definition, classification, properties and test for identification of alkaloids, glycosides, flavonoids, tannins, volatile oil and resins.	Traditional systems of medicine namely Ayurveda, Unani, Siddha, Homeopathy and Chinese system of Medicine	Role of pharmacognosy in allopathy.	21
5.	Study of plant products	08	Plant products: Fibres- Cotton, jute, hemp, Primary metabolites – General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic uses 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 enzyme (Papain, Bromelain, seratiopeptidase, urokinase, streptokinase, pepsin) lipids (Waxes. Fats, fixed oils): Castor oil, chaulmoogra oil, wool fat, beeswax.	Hallucinogens, teratogens and natural allergens	Marine drugs: Novel medicinal agents from Marine sources.	16

