



## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy  
**Semester:** III  
**Course Code:** 108010301  
**Course Title:** Pharmaceutical Organic Chemistry-II

**Course Objectives:** Upon completion of the course the student shall be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Prepare organic compounds

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	-	4	25/10	75/30	-	-	100/40

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

General methods of preparation and reactions of compounds superscripted with asterisk (\*) to be explained.

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

Sr.	Contents	Hours
1	<b>Benzene and its derivatives:</b> <ul style="list-style-type: none"><li>• Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule.</li><li>• Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.</li><li>• Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction.</li><li>• Structure and uses of DDT, Saccharin, BHC and Chloramine</li></ul>	10



2	<ul style="list-style-type: none"><li>Phenols*: Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols</li><li>Aromatic Amines*: Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts</li><li>Aromatic Acids*: Acidity, effect of substituents on acidity and important reactions of benzoic acid.</li></ul>	10
3	<b>Fats and Oils:</b> <ul style="list-style-type: none"><li>Fatty acids – reactions.</li><li>Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.</li><li>Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.</li></ul>	10
4	<b>Polynuclear hydrocarbons:</b> <ul style="list-style-type: none"><li>Synthesis, reactions</li><li>Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives.</li></ul>	8
5	<b>Cyclo alkanes*:</b> <ul style="list-style-type: none"><li>Stabilities – Baeyer’s strain theory, limitation of Baeyer’s strain theory, Coulson and Moffitt’s modification, Sachse Mohr’s theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only.</li></ul>	7

### Reference Books:

1	Organic Chemistry by Morrison and Boyd
2	Organic Chemistry by I.L. Finar, Volume-I
3	Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4	Organic Chemistry by P.L.Soni
5	Practical Organic Chemistry by Mann and Saunders.
6	Vogel’s text book of Practical Organic Chemistry
7	Advanced Practical organic chemistry by N.K.Vishnoi.
8	Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

### Pedagogy:

- ICT tools (LCD projector, Laptop)
- Traditional method (Black board)

### Suggested Specification table with Marks (Theory) (Revised Bloom’s Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
30	40	25	5	0	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



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**Course Outcomes (CO):**

Sr.	Course Outcome Statements	%weightage
CO-1	Learn concept of aromaticity, reactions and synthesis of Benzene and its derivatives	30
CO-2	Describe reactions and synthesis of phenols, aromatic amines and acids	20
CO-3	Discuss synthesis and reactions of polynuclear hydrocarbons	20
CO-4	Explain stability and reactions of cycloalkanes	10
CO-5	Describe properties and quality control evaluation of fats and oils	20

**Curriculum Revision:**

Version:	1
Drafted on (Month-Year):	June 2021
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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010302

**Course Title:** Physical Pharmaceutics-I

**Course Objectives:** Upon completion of the course the student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	-	4	25/10	75/30	-	-	100/40

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<b>Solubility of drugs:</b> Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, Dissolution & drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications	10



2	<b>Micromeritics:</b> Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	12
3	<b>Surface and interfacial phenomenon:</b> Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.	8
4	<b>Complexation and protein binding:</b> Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants	8
5	<b>pH, buffers and isotonic solutions:</b> Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.	7

### Reference Books:

1	Physical pharmacy by Alfred Martin
2	Experimental pharmaceutics by Eugene, Parott.
3	Tutorial pharmacy by Cooper and Gunn.
4	Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5	Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6	Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7	Physical pharmaceutics by Ramasamy C and ManavalanR.
8	Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

### Pedagogy:

1. Conventional Method: Black board
2. ICT Tools: Presentation

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
30	30	25	10	5	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



## Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	State the physicochemical properties of drug molecules	25
CO-2	Gain knowledge of particle size, distribution and evaluation of powder properties	25
CO-3	Explain the mechanism of surface and interfacial phenomenon along with role of surfactants and excipients	20
CO-4	Learn the role of complexation and protein binding in modification of drug property	15
CO 5	Understand the role of pH, buffers and Isotonic solutions in formulations	15

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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010303

**Course Title:** Biochemistry

**Course Objectives:** Upon completion of the course the student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	-	4	25/10	75/30	-	-	100/40

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<b>Biomolecules</b> Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. <b>Bioenergetics</b> Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy, Redox potential. Energy rich compounds, classification, biological significances of ATP and cyclic AMP.	8



2	<p><b>Carbohydrate metabolism</b> Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance. HMP shunt and its significance, Glucose-6-Phosphate dehydrogenase (G6PD) deficiency. Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance. Hormonal regulation of blood glucose level and Diabetes mellitus.</p> <p><b>Biological oxidation</b> Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation &amp; its mechanism and substrate level phosphorylation. Inhibitors ETC and oxidative phosphorylation/Uncouplers.</p>	10
3	<p><b>Lipid metabolism</b> <math>\beta</math>-Oxidation of saturated fatty acid (Palmitic acid). Formation and utilization of ketone bodies; ketoacidosis De novo synthesis of fatty acids (Palmitic acid). Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D. Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.</p> <p><b>Amino acid metabolism</b> General reactions of amino acid metabolism: Transamination, deamination &amp; decarboxylation, urea cycle and its disorders. Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkeptonuria, Tyrosinemia). Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline. Catabolism of heme; hyperbilirubinemia and jaundice.</p>	10
4	<p><b>Nucleic acid metabolism and genetic information transfer</b> Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides and Hyperuricemia and Gout Disease Organization of mammalian genome. Structure of DNA and RNA and their functions. DNA replication (semi conservative model). Transcription or RNA synthesis. Genetic code, Translation or Protein synthesis and inhibitors.</p>	10
5	<p><b>Enzymes</b> Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation. Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes – Structure and biochemical functions.</p>	7



## Reference Books:

1	Principles of Biochemistry by Lehninger.
2	Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3	Biochemistry by Stryer.
4	Biochemistry by D. Satyanarayan and U.Chakrapani
5	Textbook of Biochemistry by Rama Rao.
6	Textbook of Biochemistry by Deb.
7	Outlines of Biochemistry by Conn and Stumpf
8	Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9	Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10	Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11	Practical Biochemistry by Harold Varley.
12	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2</a>
13	<a href="https://youtu.be/NoLD2MVjpII">https://youtu.be/NoLD2MVjpII</a>
14	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2</a>
15	<a href="https://youtu.be/phdPb0NFoho">https://youtu.be/phdPb0NFoho</a>

## Pedagogy:

1. Power point Presentation prepared and videography of pathway explain on projector.
2. Traditional methodology (chalk and duster)
3. Explanation through Models

## Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
50	40	10	0	0	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## Course Outcomes (CO):

Sr.	Course Outcome Statements	%Weightage
CO-1	Explain metabolic pathways of important biomolecules	40
CO-2	Summarize energetic and biological oxidation pathways	15
CO-3	Explain role of DNA and RNA in protein synthesis	20
CO-4	Describe enzymatic reactions and its applications in drug metabolism.	15
CO-5	Describe importance of enzyme, enzymatic reactions and cell metabolism	10

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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010304

**Course Title:** Pathophysiology

**Course Objectives:** Upon completion of the course the student shall be able to

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	-	4	25/10	75/30	-	-	100/40

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<b>Basic principles of Cell injury and Adaptation:</b> Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intracellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance <b>Mechanism involved in the process of inflammation and repair:</b> Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis	10
2	<b>Cardiovascular System:</b> Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis) <b>Respiratory system:</b> Asthma, Chronic obstructive airways diseases <b>Renal system:</b> Acute and chronic renal failure	10



3	<b>Haematological Diseases:</b> Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia <b>Endocrine system:</b> Diabetes, thyroid diseases, disorders of sex hormones <b>Nervous system:</b> Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.	10
4	<b>Gastrointestinal system:</b> Peptic Ulcer, Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease. <b>Disease of bones and joints:</b> Rheumatoid arthritis, osteoporosis and gout <b>Principles of cancer:</b> classification, etiology and pathogenesis of cancer	8
5	<b>Infectious diseases:</b> Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract infections <b>Sexually transmitted diseases:</b> AIDS, Syphilis, Gonorrhoea	7

### Reference Books:

1	Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2	Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3	Laurence B, Bruce C, Bjorn K.; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4	Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5	William and Wilkins, Baltimore; 1991 [1990 printing].
6	Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7	Guyton A, John. E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8	Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey;
9	Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
10	V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
11	Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

### Pedagogy:

1. ICT tools (LCD projector, Laptop)
2. Traditional method (Black board)

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
40	45	15	0	0	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



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**Course Outcomes (CO):**

<b>Sr.</b>	<b>Course Outcome Statements</b>	<b>%weightage</b>
<b>CO-1</b>	Explain homeostasis, signs, symptoms and mechanism of cell injury and inflammation.	<b>24</b>
<b>CO-2</b>	Describe etiology and pathogenesis of cardiovascular, hematological and renal systems.	<b>26</b>
<b>CO-3</b>	Describe etiology and pathogenesis of endocrine, nervous, gastrointestinal system.	<b>26</b>
<b>CO-4</b>	Describe etiology and pathogenesis of infectious diseases, sexually transmitted diseases and cancer disease.	<b>24</b>

**Curriculum Revision:**

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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010305

**Course Title:** Pharmacognosy & Phytochemistry-I

**Course Objectives:** Upon completion of the course the student shall be able to

1. To understand the techniques in the cultivation and production of crude drugs
2. To describe the crude drugs, their uses and chemical nature
3. To explain the evaluation techniques for the herbal drugs
4. To analyze the microscopic and morphological evaluation of crude drugs

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	1	-	4	25/10	75/30	-	-	100/40

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<p><b>Introduction to Pharmacognosy:</b> Definition, history, scope and development of Pharmacognosy Sources of Drugs – Plants, Animals, Marine &amp; Tissue culture Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).</p> <p><b>Classification of drugs:</b> Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs.</p> <p><b>Quality control of Drugs of Natural Origin:</b> Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.</p>	10



2	<b>Cultivation, Collection, Processing and storage of drugs of natural origin:</b> Cultivation and Collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants. <b>Conservation of medicinal plants</b>	10
3	<b>Plant tissue culture:</b> Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines.	7
4	<b>Pharmacognosy in various systems of medicine:</b> Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. <b>Introduction to secondary metabolites:</b> Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins.	10
5	Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs. <b>Plant Products:</b> Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens <b>Primary metabolites:</b> 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: <b>Carbohydrates:</b> Acacia, Agar, Tragacanth, Honey <b>Proteins and Enzymes:</b> Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). <b>Lipids (Waxes, fats, fixed oils):</b> Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax. <b>Marine Drugs:</b> Novel medicinal agents from marine sources.	8

### Reference Books:

1	W. C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2	Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3	Mohammad Ali. Pharmacognosy, CBS Publishers & Distributors, New Delhi 2008



4	T.E. Wallis, Textbook of Pharmacognosy, 5th edition, CBS Publishers & Distributors, New Delhi, 2005
5	C.K. Kokate, Purohit, Gokhlae. Text book of Pharmacognosy, Gokhlae (2007), 37th Edition, Nirali Prakashan, Pune, 2007
6	R.D. Choudhary, Herbal Drug Industry Ist Edn, Eastern Publisher, New Delhi, 1996 7.
7	C.K. Kokate, Practical Pharmacognosy, 5th edition, Vallabh Prakashan, New Delhi, 2016
8	M.A. Iyengar, Anatomy of Crude Drugs, Manipal Press, Manipal, 2001.
9	Biren Shah & A. K. Seth, Textbook of Pharmacognosy & Phytochemistry, 2nd edition, Elsevier Publication, New Delhi, 2011
10	Khandelwal K. R. Practical Pharmacognosy, 9th edition, Nirali Prakashan, Pune, 2009 12.
11	Vyas S. P. and Dixit V. K., Pharmaceutical Biotechnology, 1st edition, CBS Publisher & Distributors, New Delhi, 2016.
12	WHO: Quality Control Methods for Medicinal Plant Materials, World Health Organisation, Geneva, 1988.
13	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4</a>
14	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=3">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=3</a>
15	Agrawal S.S., Herbal Drug Technology, 2 <sup>nd</sup> edition, Orient Blackswan, New Delhi, 2012.
16	SH.Ansari, Essentials of Pharmacognosy, IInd edition, Birla publications, New Delhi, 2007

#### Pedagogy:

1. Using chalk and blackboard
2. ICT tools (Powerpoint and projector)

#### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
40	40	15	05	0	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### Course Outcomes (CO):

Sr.	Course Outcome Statements	%Weightage
CO-1	Elaborate upon the history, scope, development of pharmacognosy and its role in traditional system of medicine.	20
CO-2	Describe sources, classification and evaluation techniques of crude drugs.	20
CO-3	Describe different aspects of primary and secondary metabolites.	30
CO-4	Discuss cultivation, collection, processing and storage of medicinal plants	15
CO-5	Describe historical perspectives, functional requirements and applications of plant tissue culture.	15



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**Aegis: Charutar Vidya Mandal (Estd.1945)**

<b>Curriculum Revision:</b>	
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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy  
**Semester:** III  
**Course Code:** 108010311  
**Course Title:** Pharmaceutical Organic Chemistry-II Practical

**Course Objectives:** Upon completion of the course the student shall be able to

1. Write the structure, name and the type of isomerism of the organic compound
2. Write the reaction, name the reaction and orientation of reactions
3. Account for reactivity/stability of compounds,
4. Prepare organic compounds

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	4	2	-	-	25/10	75/30	100/40

\* J: Jury; V: Viva; P: Practical

### List of Practicals:

1	<b>Experiments involving laboratory techniques</b> a. Recrystallization b. Steam distillation
2	<b>Determination of following oil values (including standardization of reagents)</b> a. Acid value b. Saponification value c. Iodine value



<b>3</b>	<b>Preparation of compounds</b> a. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction. b. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/Acetanilide by halogenation (Bromination) reaction c. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction d. Benzoic acid from Benzyl chloride by oxidation reaction. e. Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction. f. 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions. g. Benzil from Benzoin by oxidation reaction. h. Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction i. Cinnamic acid from Benzaldehyde by Perkin reaction j. P-Iodo benzoic acid from P-amino benzoic acid
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### Reference Books:

<b>1</b>	Organic Chemistry by Morrison and Boyd
<b>2</b>	Organic Chemistry by I.L. Finar, Volume-I
<b>3</b>	Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
<b>4</b>	Organic Chemistry by P.L.Soni
<b>5</b>	Practical Organic Chemistry by Mann and Saunders.
<b>6</b>	Vogel's text book of Practical Organic Chemistry
<b>7</b>	Advanced Practical organic chemistry by N.K.Vishnoi.
<b>8</b>	Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
<b>CO-1</b>	Perform the techniques like recrystallization and steam distillation of organic compounds	<b>10</b>
<b>CO-2</b>	Perform quality control evaluation of fats and oils	<b>30</b>
<b>CO-3</b>	Carry out synthesis of selected pharmaceutical intermediates	<b>40</b>
<b>CO-4</b>	Perform calculations and representation of data in organic chemistry	<b>20</b>

### Curriculum Revision:

Version:	1
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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy  
**Semester:** III  
**Course Code:** 108010312  
**Course Title:** Physical Pharmaceutics –I Practical

**Course Objectives:** Upon completion of the course the student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	4	2	-	-	25/10	75/30	100/40

\* J: Jury; V: Viva; P: Practical

### List of Practicals:

1	Determination the solubility of drug at room temperature
2	Determination of pKa value by Half Neutralization/ Henderson Hassel Balch equation
3	Determination of Partition co- efficient of benzoic acid in benzene and water
4	Determination of Partition co- efficient of Iodine in CCl <sub>4</sub> and water
5	Determination of % composition of NaCl in a solution using phenol-water system by CST method
6	Determination of particle size, particle size distribution using sieving method
7	Determination of particle size, particle size distribution using microscopic method
8	Determination of bulk density, true density and porosity
9	Determine the angle of repose and influence of lubricant on angle of repose
10	Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method



11	Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method
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### Reference Books:

1	Physical pharmacy by Alfred Martin
2	Experimental pharmaceuticals by Eugene, Parott.
3	Tutorial pharmacy by Cooper and Gunn.
4	Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5	Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6	Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7	Physical pharmaceuticals by Ramasamy C and Manavalan R.
8	Laboratory manual of physical pharmaceuticals, C.V.S. Subramanyam, J. Thimma settee

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Develop skills to handle equipments and instruments used in pharmaceutical procedures	20
CO-2	Interpret and represent scientific data in various forms of pharmaceutical formulations	20
CO-3	Evaluate various physical properties of drug and excipients	60

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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010313

**Course Title:** Biochemistry Practical

**Course Objectives:** Upon completion of the course the student shall be able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	4	2	-	-	25/10	75/30	100/40

\* J: Jury; V: Viva; P: Practical

### List of Practicals:

1	To identify the given unknown Carbohydrates.
2	To identify the given unknown Carbohydrates.
3	To identify the given unknown Carbohydrates.
4	Detection and Identification of proteins.
5	To identify the given unknown sample.
6	Estimation of total protein in plasma by Biuret method.
7	Qualitative Analysis of urine for abnormal constituents.
8	Estimation of Creatinine in blood sample.
9	To estimate the glucose content in the blood by Folin Wu method.
10	Estimation of total cholesterol in given sample.
11	To prepare different buffers and to determine their pH using pH meter.
12	To study the enzymatic hydrolysis of starch.
13	To determine achromic point and achromic period of salivary amylase (ptyalin).
14	To determine the effect of temperature on the activity of salivary amylase.
15	To determine the effect of substituent on the activity of salivary amylase.



## Reference Books:

1	Principles of Biochemistry by Lehninger.
2	Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3	Biochemistry by Stryer.
4	Biochemistry by D. Satyanarayan and U.Chakrapani
5	Textbook of Biochemistry by Rama Rao.
6	Textbook of Biochemistry by Deb.
7	Outlines of Biochemistry by Conn and Stumpf
8	Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9	Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10	Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11	Practical Biochemistry by Harold Varley.
12	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2</a>
13	<a href="https://youtu.be/NoLD2MVjpII">https://youtu.be/NoLD2MVjpII</a>
14	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2</a>
15	<a href="https://youtu.be/phdPh0NFoho">https://youtu.be/phdPh0NFoho</a>

## Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Perform identification and differentiation of carbohydrate and protein samples	40
CO-2	Identify normal and abnormal constituents in urine sample	30
CO-3	Demonstrate effect of external variables on enzyme activities	10
CO-4	Prepare buffer solutions as per given specifications	10

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## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 108010315

**Course Title:** Pharmacognosy & Phytochemistry-I Practical

**Course Objectives:** Upon completion of the course the student shall be able to

1. To understand the techniques in the cultivation and production of crude drugs
2. To describe the crude drugs, their uses and chemical nature
3. To explain the evaluation techniques for the herbal drugs
4. To analyze the microscopic and morphological evaluation of crude drugs

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	4	2	-	-	25/10	75/30	100/40

\* J: Jury; V: Viva; P: Practical

### List of Practicals:

1	Analysis of crude drugs by chemical tests: (i) Tragacanth (ii) Acacia (iii) Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2	Determination of stomatal number and index
3	Determination of vein islet number, vein islet termination and palisade ratio.
4	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5	Determination of Fiber length and width
6	Determination of number of starch grains by Lycopodium spore method
7	Determination of Ash value
8	Determination of Extractive values of crude drugs
9	Determination of moisture content of crude drugs
10	Determination of swelling index and foaming index

### Reference Books:

1	W. C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009.
2	Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3	Mohammad Ali. Pharmacognosy, CBS Publishers & Distributors, New Delhi 2008



4	T.E. Wallis, Textbook of Pharmacognosy, 5th edition, CBS Publishers & Distributors, New Delhi, 2005
5	C.K. Kokate, Purohit, Gokhlae. Text book of Pharmacognosy, Gokhlae (2007), 37th Edition, Nirali Prakashan, Pune, 2007
6	R.D. Choudhary, Herbal Drug Industry 1st Edn, Eastern Publisher, New Delhi, 1996 7.
7	C.K. Kokate, Practical Pharmacognosy, 5th edition, Vallabh Prakashan, New Delhi, 2016
8	M.A. Iyengar, Anatomy of Crude Drugs, Manipal Press, Manipal, 2001.
9	Biren Shah & A. K. Seth, Textbook of Pharmacognosy & Phytochemistry, 2nd edition, Elsevier Publication, New Delhi, 2011
10	Khandelwal K. R. Practical Pharmacognosy, 9th edition, Nirali Prakashan, Pune, 2009 12.
11	Vyas S. P. and Dixit V. K., Pharmaceutical Biotechnology, 1st edition, CBS Publisher & Distributors, New Delhi, 2016.
12	WHO: Quality Control Methods for Medicinal Plant Materials, World Health Organisation, Geneva, 1988.
13	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=4</a>
14	<a href="https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=3">https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=3</a>
15	Agrawal S.S., Herbal Drug Technology, 2 <sup>nd</sup> edition, Orient Blackswan, New Delhi, 2012.
16	S.H.Ansari, Essentials of Pharmacognosy, 1 <sup>st</sup> edition, Birla publications, New Delhi, 2007

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%Weightage
CO-1	Perform physical and chemical evaluation of crude drugs.	40
CO-2	Perform microscopical evaluation of crude drugs by using scientific laboratory equipments.	60

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# CVM UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

## FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2020-21

**Programme:** Bachelor of Pharmacy

**Semester:** III

**Course Code:** 900009901

**Course Title:** Creativity, Problem solving and Innovation (CPI)

**Course Objectives:** Upon completion of the course the student shall be able to

1. To gain familiarity with the mechanics of creativity and problem solving
2. To develop an attitude for innovation
3. To develop creative thinking skills using cone of learning components leading to understanding of strategies of creativity, problem solving and innovation
4. To explore applications of the concepts of creativity and problem-solving skills in personal, social, academic, and profession life.

### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	2	2	40/14	60/21	-	-	100/35

\* J: Jury; V: Viva; P: Practical

### Detailed Syllabus:

Sr.	Contents	Hours
1	<b>Introduction to Creativity, Problem Solving and Innovation</b> <ul style="list-style-type: none"><li>• Definitions of Creativity and Innovation</li><li>• Need for Problem Solving and Innovation</li><li>• Scope of Creativity in various Domains</li><li>• Types and Styles of Thinking</li><li>• Strategies to Develop Creativity, Problem Solving and Innovation Skills</li></ul>	6
2	<b>Questioning, Learning and Visualization</b> <ul style="list-style-type: none"><li>• Strategy and Methods of Questioning</li><li>• Asking the Right Questions</li><li>• Strategy of Learning and its Importance</li><li>• Sources and Methods of Learning</li><li>• Purpose and Value of Creativity Education in real life</li><li>• Visualization Strategies - Making thoughts Visible</li><li>• Mind Mapping and Visualizing Thinking</li></ul>	6



<b>3</b>	<b>Creative Thinking and Problem Solving</b> <ul style="list-style-type: none"><li>• Creative Thinking and its need</li><li>• Strategy of Thinking Fluency</li><li>• Generating all Possibilities</li><li>• SCAMPER Technique</li><li>• Divergent Vs. Convergent Thinking</li><li>• Lateral Vs. Vertical Thinking</li><li>• Fusion of Ideas for Problem Solving</li><li>• Applying Strategies for Problem Solving</li></ul>	<b>6</b>
<b>4</b>	<b>Logic, Language and Reasoning</b> <ul style="list-style-type: none"><li>• Basic Concepts of Logic</li><li>• Statement Vs. Sentence</li><li>• Premises Vs. Conclusion</li><li>• Concept of an Argument</li><li>• Functions of Language: Informative, Expressive and Directive</li><li>• Inductive Vs. Deductive Reasoning</li><li>• Critical Thinking &amp; Creativity</li><li>• Moral Reasoning</li></ul>	<b>6</b>
<b>5</b>	<b>Contemporary Issues and Practices in Creativity and Problem Solving</b> <ul style="list-style-type: none"><li>• Cognitive Research Trust Thinking for Creatively Solving Problems</li><li>• Case Study on Contemporary Issues and Practices in Creativity and Problem Solving</li></ul>	<b>6</b>

### Reference Books:

<b>1</b>	R Keith Sawyer, Zig Zag, The Surprising Path to Greater Creativity, Jossey-Bass Publication 2013
<b>2</b>	Michael Michalko, Crackling Creativity, The Secrets of Creative Genus, Ten Speed Press 2001
<b>3</b>	Michael Michalko, Thinker Toys, Second Edition, Random House Publication 2006
<b>4</b>	Edward De Beno, De Beno's Thinking Course, Revised Edition, Pearson Publication 1994
<b>5</b>	Edward De Beno, Six Thinking Hats, Revised and Update Edition, Penguin Publication 1999
<b>6</b>	Tony Buzan, How to Mind Map, Thorsons Publication 2002
<b>7</b>	Scott Berkum, The Myths of Innovation, Expanded and revised edition, Berkun Publication 2010
<b>8</b>	Tom Kelly and David Kelly, Creative confidence: Unleashing the creative Potential within Us all, William Collins Publication 2013
<b>9</b>	Ira Flatow, The all Laughed, Harper Publication 1992
<b>10</b>	Paul Sloane, Des MacHale & M.A. DiSpezio, The Ultimate Lateral & Critical Thinking Puzzle book, Sterling Publication 2002

### Supplementary learning Material:

<b>1</b>	Keith Sawyer, Group Genius, The Creative Power of Collaboration, Basic Books Publication 2007
<b>2</b>	Edward De Beno, Lateral Thinking, Creativity Step by Step, Penguin Publication 1973
<b>3</b>	Nancy Margulies with Nusa Mall, Mapping Inner Space, Crown House Publication 2002
<b>4</b>	Tom Kelly with Jonathan Littman, The Art of Innovation, Profile Publication 2001



5	Roger Von Oech, A Whack on the Side of the Head. Revised edition, Hachette Publication 1998
6	Roger Von Oech, A Kick in the Seat of the Head, William Morrow 1986
7	Jonah Lehrer, Imagine How Creativity Works, Canongate Books Publication 2012
8	James M Higgins, 101 Creative Problem Solving Techniques, New Management Publication 1994
	Soctt G Isaksen, K Brain Doval, Donald J Treffinger, Creative Approach to Problem Solving, Sage Publication 2000
9	Donald J Treffinger, scott G Isaksen, K Brain stead Dorval Creative Problem Solving An Introduction, Prufrock Press 2006
10	H Scott Fogler & Steven E. LeBlance, Strategies for Creative Problem Solving, Prentice Hall Publication 2008
11	Dave Gray, Sunni Brown and James Macanufu, Game Storming, O'reilly Publication 2010.
12	Howard Gardner, Creating minds, Basic Books Publication 1993
13	Mihaly Csikzentmihalyi, Creativity–Flow and Psychology of Discovery and Invention, Harper Publication 1996
14	Martin Gerdner, W. H., Ahal Insight, Freeman Publication 1978
15	Paul Sloane, Test Your Lateral Thinking IQ, Sterling Publication 1994
16	Paul Sloane & Des Machale Intriguing, Lateral Thinking Puzzles, Sterling Publication 1996
17	Internet Search based May TED talks and other sources for videos, slide shares, problems, etc

### Pedagogy:

1. The course is based on practical learning. Teaching will be facilitated by Slides Presentations, Reading Material, Discussions, Case Studies, Puzzles, Ted Talks, Videos, Task-Based Learning, Projects, Assignments and various Individual and Interpersonal activities like, Critical reading, Group work, Independent and Collaborative Research, Presentations, etc

### Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
10	50	25	10	00	05	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%Weightage
CO-1	Demonstrate creativity in their day to day activities and academic output	35
CO-2	Solve personal, social and professional problems with a positive and an objective mindset	35
CO-3	Think creatively and work towards problem solving in a strategic way	15
CO-4	Initiate new and innovative practices in their chosen field of profession	15



**CVM**  
**UNIVERSITY**

**Aegis: Charutar Vidya Mandal (Estd.1945)**

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