



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತಿರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

Kud-23/9/22
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: BIOCHEMISTRY

[w.e.f 2022-23]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) AND OPEN

ELECTIVE COURSE (OEC) FOR SEM III & IV

As per N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in BIOCHEMISTRY for B. Sc
(Hons.)
Effective from 2022-23

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC 5	BIOORGANIC CHEMISTRY	04hrs	56	02 hrs	40	60	100	04
	DSCC 6	Practical : BIOORGANIC CHEMISTRY	04 hrs	52	03 hrs	25	25	50	02
	OEC 3	HORMONES-BIOCHEMISTRY AND FUNCTIONS	03 hrs	42	02 hrs	40	60	100	03
IV	DSCC 7	ANALYTICAL BIOCHEMISTRY	04 hrs	56	02 hrs	40	60	100	04
	DSCC 8	Practical: ANALYTICAL BIOCHEMISTRY	04 hrs	52	03 hrs	25	25	50	02
	OEC 4	BIOCHEMICAL TOXICOLOGY	03 hrs	42	02 hrs	40	60	100	03

SEMESTER III

Name of Course (Subject): **BIOCHEMISTRY**

B Sc Semester – III

Subject:

BIOCHEMISTRY

The course Biochemistry in III Semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under

Course No.-1 (Theory)

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033BCH011	DSCC5	Theory	04	04	56 hrs	2hrs	40	60	100

Course outcome:

These topics will enable students to understand the fundamentals of organic chemistry pertinent to their importance in understanding biochemical reactions.

UNIT 1: Reaction mechanisms and aliphatic hydrocarbons 14 hours

Introduction, meaning of the term, kinetic and non-kinetic. Fundamental aspects: Homo and heterolytic cleavage. Concept of inductive effect, mesomeric effect, resonance, and hyper conjugation. Classification of organic reactions (substitution, addition, elimination, and re-arrangement), with two examples for each. Concepts Reactive intermediates of the following – free radicals, carbo cations and carbanions, free radicals, carbines, nucleophiles and electrophiles(Formation and Stability).

Hydrocarbons -Mechanism of addition of HCl to propene, Markownikoff's rule. Peroxide effect, Alkenes – Ozonolysis, oxidation. Alkynes – formation of acetylides and their importance. Dienes– types with examples. Conjugate dienes, 1,3-butadiene – stability, mechanism of addition of HBr. Conformational analysis of ethane and n-butane.

UNIT 2: Mechanism of substitution, elimination, and addition reactions 14 hours

S_N1 and S_N2 reactions on tetrahedral carbon, energy profile diagrams, Stereochemistry, factors affecting S_N2 and S_N1 reactions

The Elimination reactions- E_2 reaction, Zaitsev rule, E_1 reaction. Stereochemistry of E_1 & E_2 reactions, E_2 & E_1 elimination from cyclic compounds. Substitution and Elimination reactions in Synthesis.

Addition reactions - Aldehydes and Ketones - nucleophilic addition of acetals & ketals. Addition of Ammonia, primary amines, and other ammonia derivatives. Conjugate addition. Conjugation addition in alpha and beta unsaturated aldehydes and ketones 1, 2 and 1,4 addition.

UNIT 3: Mechanism of electrophilic aromatic substitution reactions 14 hours

Aromatic compounds - aromaticity, criteria for aromaticity, anti-aromatic, and non-aromatic compounds with examples. Mechanism of electrophilic aromatic substitution reactions-Halogenation, nitration, sulfonation, Friedel crafts alkylation. Friedel crafts acylation- mechanism involved. Relative reactivity of substituted benzenes, polycyclic benzenoid hydrocarbons.

The reaction of the coenzymes.

Overall view of metabolism, thiamine pyrophosphate- structure and its role in decarboxylation of alpha- keto acids.

Biotin- structure and its role in carboxylation of some important biochemical reactions of carbohydrate and lipid metabolism.

Vit B₂ its role in rearrangement reactions.

Vit B₂ coenzymes its role in redox reactions with suitable examples.

UNIT 4: Bio-organic compounds 14 hours

Alcohols: Classification, monohydric alcohols: examples, general and distinguishing reactions. Dihydric alcohols: glycols, Tri hydric alcohols: glycerol – synthesis from propene, properties and uses. Phenols: Classification, electronic interpretation of acidity of phenols, mechanism of Kolbe, Reimer– Tiemann and bromination reactions.

Hydroxy acids: Structure and properties: Lactic acid, Citric acid and Isocitric acid. Dicarboxylic acids: Maleic and Fumaric acid. Ketoacids: Pyruvic, α -Ketoglutaric, Oxaloacetic acid.

Carbonyl compounds: General properties, Keto-enol tautomerism. Mechanisms: addition of HCN to acetaldehyde, Claisen and aldol condensations. Quinones: o and p-benzoquinones-structure and properties.

Amines: Classification, properties, functional group – Basicity of amines, acylation. Reaction with HNO₂ & Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines.

Heterocyclic compounds: Definition, classification with examples, structure and biological importance of furan, pyrrole, thiophene, pyridine, pyran, thiazole, pyrimidine, purine, indole, imidazole, quinoline and isoquinoline. Basicity of pyrrole and pyridine.

Terpenes: Definition, Isoprene rule, classification, isolation, structure and biological importance of menthol, camphor, farnesol, phytol, lanosterol, lycopene and dolichols.

Steroids: Basic ring structure in steroids. Structure and biological importance of cholesterol, phytosterols, ergosterol, cortisol, β -estradiol, testosterone, and aldosterone. Bile acids (Mono, Di & Tri cholic acids).

Alkaloids: Definition, classification based on their structure and biological functions, Isolation of alkaloids, structure and physiological action of morphine, nicotine and atropine.

REFERENCES

1. Textbook of Organic Chemistry 22nd Edition S. Chand Publishers 2019.
2. Organic Chemistry. Vol. I Fundamental Principles. I. L. Finar. 6th Edn. ELBS, 2002
3. Organic Mechanisms, Peter Sykes, Longman, 1977
4. Organic Chemistry. R.T. Morrison and R.N. Boyd. 6th Edn. Prentice Hall, India, 2018
5. Lehninger- Principles of Biochemistry; DL Nelson and MM Cox [Eds), 6th Edn. Macmillan Publications 2012
6. Chemistry- An Introduction to General, Organic and Biological Chemistry, 7th Edn. Karen C. Timberlake, Benjamin Cummings, 1999
7. Reaction Mechanisms at a Glance, ed. M. Moloney, Blackwell Science 2000.

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation & Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/ Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

**SEMESTER III
BIOORGANIC
PRACTICALS III**

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033BCH012	DSCC6	Practical	02	04	52 hrs	3hrs	25	25	50

Course outcome:

This course aims to familiarize students with the principles of organic chemistry and basic qualitative analysis of organic compounds. Course objective is to provide experimental practice of preparation of organic compounds and extraction of biologically important compounds.

Experiments:

- I. Systematic qualitative analysis of organic compounds (6 practicals)
 1. Urea
 2. Aniline
 3. Benzoic Acid
 4. Salicylic acid
 5. Benzaldehyde
 6. Acetophenone
 7. Chlorobenzene
 8. Nitrobenzene

- II. Preparation of following organic compounds (2 practicals)
 1. Acetylation: Preparation of acetyl salicylic acid from salicylic acid.
 2. Oxidation: Preparation of benzoic acid from benzaldehyde.
 3. Nitration: Preparation of m-dinitrobenzene from nitrobenzene.
 4. Hydrolysis: Preparation of benzoic acid from ethyl benzoate.

- III. Extractions
 1. Extraction of caffeine from tea leaves
 2. Extraction of starch from potatoes
 3. Extraction of casein from milk

REFERENCES:

1. Practical Organic Chemistry: Qualitative Analysis by S.P. Bhutani, A. Chhikara 2009
2. Textbook of Practical Organic Chemistry Including Qualitative Organic Analysis
3. Comprehensive practical organic chemistry- preparation and quantitative analysis. V. K. Ahluwalia and Renu Aggarwal 2004
4. Practical Hand Book of Systematic Organic Qualitative Analysis. Md. Rageeb Md. Usman, S. S. Patil 2017
5. Laboratory Manual of Inorganic & Organic Chemistry (Qualitative

SEMESTER III OPEN ELECTIVE 1

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
033BCH051	OEC 3	Theory	03	03	42 hrs	2hrs	40	60	100

Course outcome: These topics will enable the students to:

- Understand the function of hormones and their regulation.
- Know how hormonal systems act in an integrated manner to regulate overall body functions.
- Understand how failure of these normal physiologic functions and integrations are associated with some endocrine disorders.

UNIT 1 :

14 hours

Introduction to the system and concepts of signaling. Classification, intercellular communication, regulation of synthesis and secretion of hormones. Chemical signaling- endocrine, paracrine, autocrine, and neuroendocrine mechanisms. Mechanisms of hormone action: synergism, antagonism, permissive effects. Division of hormones by the origin, chemical structure, location, and mechanism of action. Physiological role and disorders of Pituitary, Pineal, Thyroid and Parathyroid hormones. Introduction to the hypothalamus as the true master gland with Releasing hormones and inhibitory substances. Neurohypophysis and its secretions – ADH and Oxytocin

UNIT 2 :

14 hours

Physiological role and disorders of hormones of pancreas, adrenal, and placenta. Introduction to gastrointestinal hormones and neurotransmitters (Acetyl choline, GABA, Serotonin). Mechanism of action, target tissues, and the physiological effects of gastrointestinal hormones. Structure and functions of sex hormones. Hormones during ovarian and uterine phases of menstrual cycle; Placental hormones; role of hormones during parturition and lactation. Hormone receptors: receptors in the cell membrane and in the cell. Secondary and tertiary messengers (cAMP and Ca^{+2}). Overview on signal transduction pathways for steroidal and non-steroidal hormones (One example each).

UNIT 3 :

14 hours

Clinical endocrinology- Blood volume, composition and functions of plasma and serum. Separation and storage of body fluids. Methods of hormone estimation, principles of assay systems, normal range of hormones in tissues and clinical conditions leading to abnormal levels with interpretations. Thyroid function test- Determination of T3, T4, and TSH. Infertility profile: Determination of LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone. Major manifestations of disease of the endocrine pancreas, thyroid, hypothalamus, and pituitary disease.

REFERENCES:

1. Norman AW, Litwack G (1997), Hormones, 2nd Edition, Elsevier Publications.
2. Bolander F (2004), Molecular Endocrinology, 3rd Edition, Elsevier Publications.
3. Rifai N (2007), Teitz Fundamentals of Clinical Chemistry, 6th Edition, Elsevier Publications.
4. Henry's Clinical Diagnosis and Management by Laboratory Methods (2011), 22nd Edition, Elsevier.
5. Vasudevan DM (2011), Text book of Medical Biochemistry, 6th Edition, Jaypee Publishers.
6. Chatterjea MN & Shinde R (2012), Text book of Medical Biochemistry, 8th Edition, Jaypee Publications.
7. Bishop ML, Fody EP, Schoeff LE (2013), Clinical Chemistry: Principles, Techniques, and Correlations, 7th Edition, Wiley Publications.
8. J N Singh (2017), Biochemistry General, Hormonal and Clinical - 1st Edition, Atithibooks Publishers.
9. Rifai N (2017), Teitz Textbook of Clinical Chemistry and Molecular Diagnostics, 6th Edition Saunders Publications.

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation & Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/ Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

SEMESTER IV
B.Sc Semester – IV
Subject: BIOCHEMISTRY (DSC)

The course Analytical Biochemistry in IV semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-2 (Theory)

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
034BCH011	DSCC 7	Theory	04	04	56 hrs	2hrs	40	60	100

Course outcome: These topics will enable the students to

- Understand the concept of biological sample preparation
- Appreciate chemistry and application of analytical instruments.
- Get acquainted with care and maintenance of equipment and chemicals.
- Understand clinically relevant biochemical analysis of all biochemical components i.e., proteins, electrolytes, hormones etc.,
- Have basic knowledge of clinical and forensic analytical methods and their principles.

UNIT 1: Biological sample preparation and fractionation **14 hours**

Introduction and objectives of bioanalysis and extraction of molecules from tissues and cells. Sample preparation types of sample living, postmortem extraction of macromolecules from tissues; liquid-liquid, liquid-solid and precipitation methods.

Centrifugation- Introduction, principles of centrifugation, Sedimentation, angular velocity, centrifugal field, relative centrifugal field. Types of centrifugations- Preparative and analytical. Differential, density gradient and ultra-centrifugation. Basic instrumentation; types of rotors and their design. Laboratory centrifuge; operational instruction and applications. Analytical Centrifuges- Optics; Application in sub-cellular fractionation. Sedimentation coefficient, care, and maintenance of instrument.

UNIT 2: Chromatography **14 hours**

General principles of chromatography, history of chromatography. Classification based on 1. physical way stationary and mobile phase are brought together- Planar and column chromatography, 2. based on types of mobile and/or liquid phase adsorption and partition- Gas chromatography and liquid chromatography. Based on stationary phase- thin layer chromatography, Paper chromatography - ascending, descending and circular, 2-D chromatography, Rf values.

Classification of chromatography based on separation: Principles, methodologies and applications of adsorption, partition, ion-exchange, gel-filtration and affinity chromatography. Advanced chromatography- HPLC and FPLC, UPLC and GLC.

UNIT 3: Electrophoretic and radio isotopic methods**14 hours**

Electrophoresis: General principle of electrophoresis, velocity of a charged molecule in the applied electric field, relevance of Ohm's law in electrophoretic separations. Supporting media for electrophoresis; work of Tiselius, paper, agarose, polyacrylamide. Chemistry of polymerization of acrylamide gels, methodology and applications of native PAGE and SDS- PAGE, 2-D electrophoresis, Identification of proteins post electrophoresis- dyes and biological activities. Agarose gel and Pulse field electrophoresis, Applications of capillary electrophoresis and isoelectric focusing. Cellulose acetate electrophoresis. Principle and applications of immune-electrophoresis.

Radioisotopic methods: Radioactivity–Types of radioactive decay, Properties of α , β , γ radiations. Group displacement law. Decay law - decay constant, Half-life period and average life of a radioactive element. Detection of radioactivity – GM counter and scintillation counters (only principal and working) Applications of radioisotopes – ^3H , ^{14}C , ^{131}I , ^{60}Co and ^{32}P . Biological effects of radiations. Radiolabeling, safety measure in handling radio isotopes.

UNIT 4: Spectroscopic methods of bio-analysis**14 hours**

Spectroscopic methods: Wave particle duality of light, electromagnetic spectrum, transition in spectroscopy. Principle, design and application of UV-Vis spectrophotometer. Beer's law and its limitations, determination of molar absorption coefficient of molecules. Working principle and application of a colorimeter, flame photometer and fluorimeter. Principle and application of IR, and Raman, ESR and NMR spectroscopy.

REFERENCES:

1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer 2011
2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th Edn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018.
3. Biochemistry and Molecular Biology; 5th Edn. D. Papachristodoulou, A. Snape, W.H. Elliott, and

D. C. Elliott, Oxford University Press 2014

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation & Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
034BCH012	DSCC 8	Practical	02	04	52 hrs	3hrs	25	25	50

Course outcome: This course aims to provide experimental practice of analytical techniques in Biochemistry. Upon successful completion, students should develop skills in handling instruments and understand its application in research work.

- Sourcing and handling biological samples. Develop skill and proficiency in basic techniques
- Centrifugation
- Chromatography
- Electrophoresis and
- Spectroscopy

Experiments:

1. Preparation of human lymphocytes using clinical centrifuge
2. Determination of packed cell volume/ hematocrit
3. Resolution of basic, acidic and aromatic amino acids by descending and circular paper chromatography.
4. Separation of plant pigments by gel-permeation chromatography
5. Identification and resolution of pigments by thin layer chromatography.
6. Determination of void volume of a gel-filtration column
7. Recording the absorption spectrum of riboflavin
8. Colorimetric estimation of glucose by DNS method
9. Estimation of DNA by diphenylamine method
10. Electrophoretic separation of plasma proteins

REFERENCES:

1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer, 2011
2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology 8th Edn. Andreas Hoffman and Samuel Clockie, Ed., Cambridge University Press, 2018.
3. Biochemistry and Molecular Biology; 5th Edn. D. Papachristodoulou, A. Snape, W.H. Elliott, and
D. C. Elliott, Oxford University Press, 2014

General instructions: *10 students per batch

Scheme of Practical Examination (Distribution of marks): 25 marks for Semester end examination

1. Plan and procedure	05 Marks
2. Conducting experiment	05 Marks
3. Results	05 Marks
4. Viva	05 Marks
5. Journal	05 Marks

25 Marks for IA (Formative Assessment) Examination

Journal	05
IA Test 1st & 2nd	20 (10+10)
Total	25

**SEMESTER IV
OPEN ELECTIVE
BIOCHEMICAL TOXICOLOGY**

CourseNo.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
034BCH051	OEC 4	Theory	03	03	42 hrs	2hrs	40	60	100

Course outcome: This open elective course offered to various streams gives basic idea about biochemical basis of various effects of toxins/ pharmaceuticals and an outline of process involved in toxicity testing and drug dosing.

- Categorize the classes of toxicants/drugs and know specific examples
- State the routes of exposure to toxins/drugs;
- Explain the processes of absorption, metabolism and elimination of toxins/drugs; and
- Explain environmental and physiological factors that affect toxicant metabolism

UNIT 1 : Fundamentals of toxicology and dose response 14 hours

Scope of toxicology; why should we know about toxins/xenobiotics (drugs) and What makes a substance toxic? Grading toxicity, Use of animal studies for toxicity, *in vitro* toxicity, organ toxicity (liver and kidney toxicity). Indicators of toxicity/drug effects; biomarkers. Concentration and site of action, dose response, effect of route of administration, ED₅₀, LD₅₀/TD₅₀. Hazard and risk assessment, risk, acceptable daily intake (ADI) and tolerable daily intake (TDI).

UNIT 2 : Factors affecting toxic responses 14 hours

Disposition- Outline of toxin/drug uptake, entry to cells and systemic circulation. Effect of size, shape, solubility, and charge on their uptake. Major sites of absorption, liver, intestine, skin, role of transporters, role of plasma proteins in distribution, plasma levels of toxins/drugs, plasma half-life, excretion- disposition by kidney, biliary excretion.

Metabolism- types of metabolic changes of foreign compounds, biotransformation/detoxification reactions, phase-1 and, phase -2 reactions, nature of phase-1 and phase 2 enzymes.

UNIT 3 : Targets of toxic damages and biochemical mechanism of toxicity 14 hours

Toxins/drugs causing liver, kidney, gall bladder, and lung damage, methods of identifying the damages.

Examples of biochemical toxicity mechanisms; chemical carcinogens - Benzo[a]pyrene, Tamoxifen.

Liver necrosis- carbon tetrachloride, Valproic Acid, and Isoniazid, Kidney damage- Chloroform, Antibiotics- gentamycin,

Lung damage- 4-Ipomeanol,

Neurotoxicity- Isoniazid, paracetamol, primaquine, cyclophosphamide.

REFERENCES:

1. Biopharmaceuticals Biochemistry and Biotechnology 2nd Edn. Gary Walsh, John Wiley & Sons, Ltd, England, 2003.
2. Fundamentals of Experimental Pharmacology, Ghosh, M.N. 2nd Edition, Scientific Book Agency, Kolkata, 1984.
3. Introduction to Biochemical Toxicology, 3rd Edn., Ernest Hodgson, Robert C. Smart; Wiley-Interscience; , 2001
4. Principles of Biochemical Toxicology, John A. Timbrell, 4th Edn. 2009, Taylor & Francis
5. Remington Pharmaceutical Sciences, Lippincott, Williams and Wilkins, 2000

Pedagogy: Lecture, Assignments, Interactive Sessions, ICT, Group Discussion

Formative Assessment 40 (Weightage in Marks includes: Written Tests, Activities/Assignment/Seminar/Presentation & Attendance)			
Assessment Occasion/type	C1	C2	Total Marks
Written Test (2)	10	10	20
Seminar/Presentation/Activity	10	---	10
Case work/Assignment/Field work/Project work etc	---	10	10
Total	20	20	40

NOTE: ALL SECTIONS ARE COMPULSORY

SECTION A

1. Answer any FIVE of the following
5 x 2 = 10a.
b.
c.
d.
e.
f.
g.

SECTION B

Answer any FOUR of the following

4 x 5 = 20

2.
3.
4.
5.
6.
7.

SECTION C

Answer any THREE Questions

3 x 10 = 30

8. .
9.
10.
11.
12.

Note: Section C may include sub questions a, b

BSc III & IV SEMESTERS MODEL QUESTION PAPER BIOCHEMISTRY

OPEN ELECTIVE MAX. MARKS: 60

NOTE: ALL SECTIONS ARE COMPULSORY

SECTION A

1. Answer any FIVE of the following

5 x 2 = 10a.

- b.
- c.
- d.
- e.
- f.
- g.

SECTION B

Answer any FOUR of the following

4 x 5 = 20

- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

SECTION C

Answer any THREE Questions

3 x 10 = 30

- 8.
- 9.
- 10.
- 11.
- 12.

Note: *section C may include sub questions a, b*

INTERNAL ASSESMENT (as on 4th October meeting proceedings)

DISCIPLINE CORE	DISCIPLINE /OPEN ELECTIVE	PRACTICLAS
60 + 40 (IA)	60 + 40 (IA)	25 + 25 (IA)
Class Test -20	Class Test -20	Continuous evaluation & class test – 15
Seminars /Class work - 10	Seminars /Class work – 10	Record / Viva – 10
Assignment /Open discussion - 10	Assignment /Open discussion - 10	