

HAJEE KARUTHA ROWTHAR HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai)

Re-Accredited with “A” Grade by NAAC

UTHAMAPALAYAM – 625533



DEPARTMENT OF BIOCHEMISTRY

Bachelor of Science - Biochemistry

Syllabus

(Academic year 2017 - 2018 Onwards)

Program Specific Outcome:

PSO1: Understanding of the fundamentals of chemistry and biology and the key principles of Biochemistry.

PSO2: Ability to apply the process of science, to use modeling and simulation.

PSO3: Ability to tap into the interdisciplinary nature of science and to understand the relationship between science and society.

PSO4: Ability to understand the every aspect of the structure and function of living things at a molecular level Biochemistry

PSO5: Provides with strong career options in an expanding industry and develops expanding knowledge.

PSO6: Delivers knowledge from basic principle to the latest cutting edge developments in Biochemistry.

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE (AUTONOMOUS)

UTHAMAPALAYAM - 625533

Program name: B. Sc., Biochemistry (Choice based credit system)

Programme Scheme, Scheme of Examinations & Syllabus

(Effect from the academic year 2017-2018 onwards)

Eligibility: A pass in +2 examination conducted by the board of higher secondary education, Government of Tamil Nadu with Science is one of the subject or any other examination accepted by the syndicate as equivalent.

Duration of the course: The students who are joining the Degree shall undergo a study period of Three Academic years- Six semesters.

Eligibility for the degree: A candidate shall be declared as passed the program if he/she scored a minimum of 40% marks (Both internal and external) in each course. Minimum required mark in external is 27 marks.

For Programme Completion

A Candidate shall complete:

- Part I - Language paper - Tamil/Arabic/Malayalam in semesters I, II, III and IV.
- Part II - Language papers - English in semesters I, II, III, IV respectively
- Part III - Core papers in semesters I, II, III, IV, V, and VI respectively
- Part III - Allied papers in semesters I, II, III, and IV respectively
- Part IV - Non- Major Elective papers in semesters I and II respectively
- Part IV - Skill based Subject papers in semesters I, II, V and VI respectively
- Part IV - Environmental Studies paper in semester V
- Part IV - Value Education paper in semester VI
- Part V – Extension Activities paper in semester VI

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	- 75 Marks
Continuous Internal Assessment Examinations (CIAE)	- 25 Marks
Total	- 100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	- 20 Marks
Assignments	- 05 Marks
Total	- 25 Marks

Scheme of Examinations for Practical:

Internal	- 40 Marks
External	- 60 Marks
Total	- 100 Marks

PATTERN OF TERM END EXAMINATIONS (Max. Marks: 75 / Time: 3 Hours)

External examination Question paper pattern for Part I, Part III and IV (Non- Major Elective & Skill based Subject)

Section –A: (10x1=10 marks)

Answer all questions. (Multiple choice)

- Question numbers 1 to 10
- Two Questions from each unit
- Multiple choice questions and each question carries Four choices

Section –B: (5x7=35 marks)

Answer all questions choosing either A or B

- Question numbers 11 to 15
- One Questions from each unit
- Descriptive Type

11 A or 11 B

12 A or 12 B

13 A or 13 B

14 A or 14 B

15 A or 15 B

Section –C: (3x10=30 marks)

Answer any THREE out of Five questions.

- Question numbers 16 to 20
- One Questions from each unit
- Descriptive and Analytical Type

External examination Question paper pattern for Part IV (Environmental Studies and Value Education):

Section –A: (5 X 6 = 30 Marks)

Answer all questions choosing either A or B

- Question numbers 1 to 5
- One Questions from each unit
- Descriptive type and Analytical type

Section –B: (3x15=45 marks)

Answer any THREE out of Five questions.

- Question numbers 6 to 10
- One Questions from each unit
- Descriptive and Analytical type

External examination Question paper pattern for Part II (English):

- | | |
|----------------------------------|----------|
| • Section –A: Prose | 16 Marks |
| • Section –B: Poetry | 11 Marks |
| • Section –C: Short Story | 13 Marks |
| • Section –D: Grammar | 19 Marks |
| • Section –E: Composition | 16 Marks |

Hajee Karutha Rowther Howdia college(Autonomous)

B. Sc., Biochemistry – Programme content & Syllabus (2017 – 2018 Onwards)

Sem	Part	Course Category	Course Code	Title of the Course	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
I	I	Language	17UTAL11/ 17UARL11/ 17UMLL11	Tamil/ Arabic/ Malayalam	3	6	25	75	100
	II	Language	17UENL11	English Paper - 1	3	6	25	75	100
	III	Core	17UBCC11	Biopolymer	4	4	25	75	100
	III	Core	17UBCC2P	Qualitative analysis of biopolymers	2	2	-	-	-
	III	Allied	17UCHA11	Organic, inorganic and physical chemistry-I	4	4	25	75	100
	III	Allied	17UCHA2P	Inorganic quantitative analysis	-	2	-	-	-
	III	SBS	17UBCS11	Nutrition	2	2	25	75	100
	V	NME	17UBCN11	Human health and nutrition	2	2	25	75	100
Total					20	28	150	450	600
II	I	Language	17UTAL21/ 17UARL21/ 17UMLL21	Tamil/Arabic/ Malayalam	3	6	25	75	100
	II	Language	17UENL21	English Paper – 2	3	6	25	75	100
	III	Core	17UBCC21	Biochemical techniques	4	4	25	75	100
	III	Core	17UBCC2P	Qualitative analysis of biopolymers	2	2	40	60	100
	III	Allied	17UCHA21	Organic, inorganic and physical chemistry-II	4	4	25	75	100
	III	Allied	17UCHA2P	Inorganic quantitative analysis	1	2	40	60	100
	III	SBS	17UBCS21	Medical Lab Technology	2	2	25	75	100
	V	NME	17UBCN21	Herbal medicine	2	2	25	75	100
Total					21	28	230	570	800

Sem	Part	Course Category	Course Code	Title of the Course	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
III	I	Language	17UTAL31/ 17UARL31/ 17UMLL31	Tamil/Arabic/Malayalam	3	6	25	75	100
	II	Language	17UENL31	English Paper – 3	3	6	25	75	100
	III	Core	17UBCC31	Enzymes and enzyme technology	4	4	25	75	100
	III	Core	17UBCC4P	Quantitative analysis of Bio-organic compounds	2	2	-	-	-
	III	Allied	17UCHA31	Organic, inorganic and physical chemistry-III	4	4	25	75	100
	III	Allied	17UCHA4P	Organic qualitative analysis	-	2	-	-	-
	III	Allied	17UMBA31	Ancillary Biology – I	4	4	25	75	100
	III	Allied	17UMBA2P	Ancillary Biology Practical- I	-	2	-	-	-
Total					20	30	125	375	500
IV	I	Language	17UTAL41/ 17UARL41/ 17UMLL41	Tamil/Arabic/Malayalam	3	6	25	75	100
	II	Language	17UENL41	English Paper - 4	3	6	25	75	100
	III	Core	17UBCC41	Bio Metabolism	4	4	25	75	100
	III	Core	17UBCC4P	Core Practical - 2	2	2	40	60	100
	III	Allied	17UCHA41	Organic, inorganic and physical chemistry-IV	4	4	25	75	100
	III	Allied	17UCHA4P	Organic qualitative analysis	1	2	40	60	100
	III	Allied	17UMBA41	Ancillary Biology-2	4	4	25	75	100
	III	Allied	17UMBA2P	Ancillary Biology Practical - 1	1	2	40	60	100
	V		17UEAC61	Extensive Activities	2	0	25	75	100
Total					22	30	245	555	800

Sem	Part	Course Category	Course Code	Title of the Course	Credits	Hours	Int. Marks	Ext. Marks	Total Marks
V	III	Core	17UBCC51	Molecular Biology	6	6	25	75	100
	III	Elective	17UBCE51	Microbiology & Immunology	6	6	25	75	100
	III	Elective	17UBCE52	Pharmacology					
	III	Core	17UBCC6P	Core practical – 3 (Clinical biochemistry practical)	3	4	-	-	-
	III	Core	17UBCC6Q	Core Practical-4 (Microbiology practical)	3	4	-	-	-
	III	Core	17UMBA51	Biology-3	4	4	25	75	100
	III	Allied	17UMBA4P	Ancillary Biology Practical - 2	-	2	-	-	-
	IV	EVS	17UEVS51	Environmental Studies	2	2	25	75	100
	III	SBS	17UBCS51	Vermicomposting and mushroom culture	2	2	25	75	100
Total					26	28	125	375	500
VI	III	Core	17UBCC61	Biotechnology	5	6	25	75	100
	III	Core	17UBCC62	Plant Biochemistry	5	6	25	75	100
	III	Elective	17UBCE61	Clinical biochemistry	4	4	25	75	100
	III	Elective	17UBCE62	Food Biotechnology					
	III	Core	17UBCC6P	Core practical – 3 (Clinical biochemistry practical)	3	4	40	60	100
	III	Core	17UBCC6Q	Core practical - 4 (Microbiology practical)	3	4	40	60	100
	III	Allied	17UMBA61	Biology-4	4	4	25	75	100
	III	Allied	17UMBA4P	Ancillary Biology Practical - 2	1	2	40	60	100
	III	SBS	17UBCS61	Bioinformatics	2	2	25	75	100
	IV	VE	17UVED61	Value Education	2	2	25	75	100
Total Grand Total					31	30	295	705	1000
					140	180	1170	3030	4200

BIOPOLYMERS

Programme : B. Sc Biochemistry

Part : III / Core - I

Semester : I

Hours : 4

Course Code : 17UBCC11

Credits: 4

Course Outcome: To learn about the basic concepts of biomolecules, its occurrence structure, their classification, functions and their biological role.

Unit –I

Chemistry of Carbohydrates

Occurrence and general importance of carbohydrates – Basic structure of glucose, its isomer and linkages – Biologically important disaccharides like lactose, maltose and sucrose. Polysaccharides – energy storage polysaccharides, starch and glycogen – structural polysaccharide – cellulose.

Unit – II

Chemistry of Proteins

Classification of amino acids – Physical properties of amino acids – solubility, electrical properties, fundamental role of proteins in life composition of proteins – general properties of proteins- classification on the basis of biological functions.

Unit – III

Chemistry of Lipids

Fatty acids – classification of some naturally occurring fatty acids saturated fatty acids, unsaturated fatty acids, branched chain fatty acids, hydroxyl, keto derivatives and cyclic fatty acids – Physical properties of fatty acids – polymorphism, solubility, boiling point, absorption, petrochemical properties of fatty acids – salt detergents and wetting agents, esters – reactions of unsaturated fatty acids – hydrogenation, halogenations and oxidation. Fats – Chemical composition, Physical and chemical properties of fats – Waxes – Phospholipids – Classification – non phospholipids – steroids.

Unit – IV

Chemistry of Nucleic acids

Fundamental role of nucleic acids in life processes – DNA and RNA – Structure of bases nucleotides and nucleosides – bonds linking the various bases, primary, secondary and three – dimensional structures.

Unit – V

Vitamins

Introduction to Vitamins – Sources, Functions and deficiency states of Vitamin A, D, E, and K and Water soluble vitamins.

Reference:

1. Biochemistry, Lehninger, A.L. Nelson, Cox
2. Biochemistry, Lubert stryer et al., Fifth Edition, W>H> Freeman and company, New York, 2003.
3. Outlines of Biochemistry E.E.Conn and stump, Fourth edition, Wiley Eastern Limited, 1989.
4. Fundamentals of Biochemistry by J.L.Jain.
Biochemistry, Donald Voet & Judith Voet, Wiley International Edition, 2004.

QUALITATIVE ANALYSIS OF BIOPOLYMERS

Programme : B. Sc Biochemistry

Part : III/CORE PRACTICAL - I

Semester : I

Hours : 2

Course Code : 17UBCC2P

Credits: 2

Course Outcome: To gather knowledge about analyzing the biomolecules, its preparation, use of pH meter and determining the concentration of a coloured compound.

1. Analysis of Carbohydrates
2. Analysis of amino acids
3. Test for proteins
4. Test for lipids – Test for cholesterol
5. Qualitative tests for DNA and RNA
6. Biochemical Preparation:
 - a) Starch from potato
 - b) Lactose from milk
 - c) Casein from milk
 - d) Caffeine from coffee seeds
7. Use of pH meter for the preparation of buffer
8. Verification of Beer – Lambert's law using colorimeter
9. Determining the concentration of any given colored compounds using standard graph.

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY - I

Programme : B. Sc Biochemistry

Part : III / Ancillary - I

Semester : I

Hours : 4

Course code : 17UCHA11

Credits: 4

Course outcomes

CO 1: Explain the fundamentals & states of matter.

CO 2: To know about the way of bond breaking & making. How which leads to the formation of various types of biologically & economically important compounds.

Unit - I

a) HYDROGEN: Isotopes of hydrogen-preparation, properties and uses of heavy hydrogen- ortho and para hydrogen-hydrides-definition-classification-examples.

b) Oxides: Definition-classification-examples.

c) Water: Hardness of water-types of hardness-removal of hardness – removal of hardness – industrial implications of hardness in water-estimation by EDTA method (outline only) –units of hardness of water.

Unit - II

a) Detection of nitrogen and halogen in organic compounds – empirical formula - molecular formula –structural formula – simple calculation.

b) Nature of valency of carbon in organic compounds – tetrahedral arrangement of valency of carbon – bond breaking and bond forming in organic reaction – homolytic cleavage – heterolytic cleavage – reaction intermediates – formation, stability and reactions of carbocation, carbanion and free radicals.

c) Nucleophiles – Electrophiles: Definition, types and examples.

d) Types of reaction: Substitution – addition – elimination - rearrangement and polymerization – illustration with examples.

Unit - III

a) Gaseous state: Postulates of kinetic theory of gases – derivation of expression for pressure for an ideal gas on the basis of kinetic theory – deducing the basic gas laws.

b) Deviation of real gases from ideal behavior – reasons for deviation – derivation of vander walls equation – explanation of behavior of real gases on the basis of vander walls equation.

c) Liquefaction of gases: critical phenomenon – modern methods – Joule-Thomson effects – Inversion temperature.

Unit - IV

a) Bonding: V.B Theory – postulates of V.B Theory – application to the formation of simple molecules like H_2 and O_2 – overlap of atomic orbitals – s-s , s-p and p-p overlap – principle of hybridization – sp , sp^2 and sp^3 hybridization – VSEPR theory.

b) M.O Theory: Formation of M.O's – bonding, anti-bonding and non-bonding M.O's – M.O diagram for H_2 , He and F_2 .

Unit - V

Colloids: **a)** Colloidal state of matter – various types – classification.

b) Sols – dialysis – electro-osmosis – electrophoresis – stability of colloids – protective action – Hardy-schulze law – gold number.

c) Emulsion: Types of emulsion – emulsifiers with examples.

d) Gels: Classification, preparation.

e) Application of colloids.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

INORGANIC QUANTITATIVE ANALYSIS

Programme : B. Sc Biochemistry

Part: III/CHEMISTRY PRACTICAL - I

Semester : I

Hours : 2

Course Code : 17UCHA2P

Credits: 2

Course outcomes:

CO 1: Gain the knowledge about fundamental formulas, calculations for Normality, Molarity, equivalent weights.

CO 2: Different types of titrations using external indicators & self indicators.

a. ACIDIMETRY AND ALKALIMETRY

1. Titration between a strong acid and strong base
2. Titration between a strong acid and weak base
3. Titration between a weak acid and strong base.

b. PERMANGANIMETRY

1. Titration between permanganate with oxalic acid, Ferrous sulphate and ferrous ammonium sulphate(Mohr's salt)

c. IODOMETRY

1. Titration of sodium thiosulphate with potassium permanganate and potassium dichromate.

NUTRITION

Programme : B. Sc Biochemistry

Part : III / SBS - I

Semester : I

Hours : 2

Course Code : 17UBCS11

Credits: 2

Course Outcome: Enumerate the nutritional aspects of the biomolecules, their deficiency diseases, energy value of foods, future nutritional challenges, diets for different stages of development.

Unit – I

Food & Nutrition

Food groups & habits, food fads and fallacies, changing food habits. Balanced diet, Formulation & Assessment of nutritional status.

Unit – II

Protein nutrition & Nitrogen balance

Complete and incomplete proteins Quality of food proteins and requirements, Protein nutrition abnormalities, protein deficiency disorder PEM.

Unit – III

Energy Metabolism

Basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement and energy value of foods.

Unit – IV

Nutrition at various stages of growth and development

Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons.

Unit – V

Nutritional challenges of the future

Food production and food storages, future foods new protein foods.

References

1. Principles of Nutrition Determination Dietetics – Dr. M.Swaminathan
2. Advanced textbook on food and Nutrition – Vol –I & II, - Dr.M.Swami Nathan, Second edition.
3. Normal and Therapeutic Nutrition – Corine Robinson

HUMAN HEALTH AND NUTRITION

Programme : B. Sc Biochemistry

Part : V /NME - I

Semester : I

Hours : 2

Course Code : 17UBCN11

Credits: 2

Course Outcome: Overview explanation of the basic importance of health, basic human diseases, its causes and symptoms.

Unit – I

Nutrition and health

Importance of good health, nutrition & exercise - Causes of diseases (environment, age, living conditions & life style) – Obesity – BMI.

Unit –II

Common Diseases of Humans

Causes and Symptoms of Ulcer, Appendicitis and Anemia.

Unit – III

Vulnerable diseases

Immunodeficiency disease - AIDS, Air borne & Water borne diseases – Cholera, dysentery, diarrhoea & Amoebiasis, Viral diseases – TB, Leprosy, Dengue and Bird Flu.

Unit – IV

Diseases prevention

Disease prevention methods – vaccination – immunization schedule.

Unit – V

First aid measures

Accident care – Bleeding and wound care – Fractures and dislocations – electrical shock – burns – breathing emergency – Pregnancy care.

References:

- Microbiology-Alcamo
- Biochemistry – Thomas Devlin.
- Fundamentals of Biochemistry – A.C. Deb.
- Clinical biochemistry – Chatterjee.
- Kavanagh James. “Emergency First Aid” Waterford Publisher.
- Kathleen handal. “The American Red Cross First Aid and safety Handbook”

BIOCHEMICAL TECHNIQUES

Programme : B. Sc Biochemistry

Semester : II

Course Code : 17UBCC21

Part : III /Core - II

Hours : 4

Credits: 4

Course Outcome: Gaining of knowledge of the experimental techniques used in biochemistry and molecular biology.

Unit – I

Chromatographic Techniques:

Column, Paper and Thin layer Chromatography, Adsorption Partition, Ion exchange, Gas chromatography and HPLC, GCMS, Gel Filtration, Dialysis.

Unit II

Electrophoresis Techniques

Principles – Instrumentation, Application of different types of Electrophoresis – Agarose, SDS PAGE. Principles and application of PCR.

Unit – III

Centrifugation Techniques

Theory, relation between RPM and g – Differential centrifugation other types – Different centrifuges. Measurement of Gases: Manometer.

Unit – IV

Colorimetry & Spectroscopy techniques

Light spectrum and its wavelength regions Complementary colors. Molar Extinction co – efficient. Beer Lambert's law and its application – Spectroscopy (Visible & UV).

Unit – V

Radio isotopic Techniques

Radioactivity, Elementary units, Deduction and citification – Auto radiography, flurography, isotopic tracer technique, Isotope dilution method – Application – Safety Measures.

References

1. Tools in Biochemistry. Terrance G. Cooper
2. SEPARATION METHODS IN Biochemistry. CJOR Morris and Maris
3. Spectroscopy in Biology and Chemistry. Sow Hsinchem and Siney YI
4. The use of radioactive isotopes in the life sciences. Chapman and Aecrey
5. Manometric and Biochemical techniques. Umbrit and Burris.
6. Practical Biochemistry, Wilson and Walker
7. Modern Experimental Biochemistry 3rd edition, Rodney Boyer, Pearson education, 2004.

QUALITATIVE ANALYSIS OF BIOPOLYMERS

Programme : B. Sc Biochemistry

Part : III/CORE PRACTICAL - I

Semester : II

Hours : 2

Course Code : 17UBCC2P

Credits: 2

Course Outcome: To gather knowledge about analyzing the biomolecules, its preparation, use of pH meter and determining the concentration of a coloured compound.

10. Analysis of Carbohydrates

11. Analysis of amino acids

12. Test for proteins

13. Test for lipids – Test for cholesterol

14. Qualitative tests for DNA and RNA

15. Biochemical Preparation:

e) Starch from potato

f) Lactose from milk

g) Casein from milk

h) Caffeine from coffee seeds

16. Use of pH meter for the preparation of buffer

17. Verification of Beer – Lambert's law using colorimeter

18. Determining the concentration of any given colored compounds using standard graph.

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY - II

Programme : B. Sc Biochemistry

Part : III / Ancillary - II

Semester : II

Hours : 4

Course Code : 17UCHA21

Credits: 4

Course outcomes

CO 1: Enlightens the reaction behinds the sun & stars. Articulate the applications of radiations in recent medical, agricultural fields.

CO 2: Meticulous analysis of important biomolecules in the molecular level, with the full-fledged study of those molecules properties.

CO 3: On brief descriptions of the discovery of drugs and its synthetic methods.

Unit - I

Nuclear chemistry:

a) Composition of the nucleus – nuclear forces – mass defect – binding energy – nuclear stability

b) Soddy's group displacement law – illustration – law of radioactive disintegration.

c) Nuclear fission: Definition – theories of fission – application of fission – the Principle of atom bomb.

d) Nuclear fusion: Definition – emission of energy – stellar energy – hydrogen bomb.

e) Application of radioactivity – In medicine, agriculture, industry and analytical fields – carbon dating.

Unit - II

a) Carbohydrates: Definition – classification – monosaccharide - properties and uses of glucose and fructose – configuration of glucose – Haworth structure – conversion of glucose to fructose and vice versa.

b) Disaccharides: Sucrose – structure - distinction between sucrose, glucose and fructose.

c) Polysaccharides: Starch and cellulose (structure only) – α amylase – β amylase – difference between these two.

Unit - III

a) Stereo isomerism: Chiral centre – optical activity of compounds containing one or two chiral centers – R-S notation – diastereoisomers – racemisation - resolution.

b) Geometrical isomerism of maleic and fumaric acids – E-Z notation of geometrical isomers.

Unit - IV

a) Chemotherapy: Sulphadruugs – sulphadiazine – sulphanilamide – preparation and applications.

- Antimalarials – chloroquine and plasmoquine.
- Arsenical drugs: Salvarasan – 606 and neosalvarasan.
- Antibiotics: Definition – classification – penicillin – amoxicillin – ampicillin – tetracyclins – streptomycin – mode of application – uses only.

b) Hormones: Structure – source – importance of testosterone – progesterone – thyroxin.

Unit . V

a) Amino acids and proteins: Classification – synthesis – properties of aminoacids – polypeptides – proteins – classification and biological functions.

b) Dyes: Definition – theory of colour and constitution – classification based on structure and application – preparation of methyl orange, bismark brown, malachite green – vat dye – indigo.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

INORGANIC QUANTITATIVE ANALYSIS

Programme : B. Sc Biochemistry

Part: III/CHEMISTRY PRACTICAL - I

Semester : II

Hours : 2

Course Code : 17UCHA2P

Credits: 2

Course outcomes:

CO 1: Gain the knowledge about fundamental formulas, calculations for Normality, Molarity, equivalent weights.

CO 2: Different types of titrations using external indicators & self indicators.

d. ACIDIMETRY AND ALKALIMETRY

4. Titration between a strong acid and strong base
5. Titration between a strong acid and weak base
6. Titration between a weak acid and strong base.

e. PERMANGANIMETRY

2. Titration between permanganate with oxalic acid, Ferrous sulphate and ferrous ammonium sulphate(Mohr's salt)

f. IODOMETRY

2. Titration of sodium thiosulphate with potassium permanganate and potassium dichromate.

MEDICAL LAB TECHNOLOGY

Programme : B. Sc Biochemistry

Part : IV / SBS - II

Semester : II

Hours : 2

Course Code : 17UBCS21

Credits: 2

Course Outcome: To learn the routine clinical laboratory procedures of different parameters in Hematology, Immunology, Molecular biology and Microbiology.

Unit – I

Clinical Hematology: Abnormal hemoglobin, anemia's, disturbances in blood clotting mechanism. Collection and preservation of blood – anticoagulants – normal hematological values – prevention of clotting.

Unit – II

Urine analysis: Urine analysis – collection and preservation of urine. Macroscopic and microscopic examination of urine culture – chemical examinations of urinary calculi.

Unit – III

Immunological Diagnosis: Collection and preservation of serum for Immunological analysis– Measurement of Antibodies, Agglutinations reaction, widal test, serological tests for syphilis – VDRL slide flocculation test, ELISA.

Unit – IV

Molecular Biology Techniques: Plasmid Analysis – Polymerase chain reaction for detection of diseases – sample processing for DNA extraction – DNA finger printing.

Unit – V

Blood Banking: Complete Haemogram – grouping & “Rh” typing – Blood Banking – Blood collection, screening, storage, cross matching & Blood transfusion.

References:

1. Clinical chemistry – Tetiz
2. Practical chemistry – Varley
3. Medical lab technology – M. Mukerjee
4. Immunology – Roit
5. Molecular Laboratory techniques by – Godger
6. Medical Laboratory techniques by Godger
7. Hematology – Ramnik Sood

HERBAL MEDICINE

Programme : B. Sc Biochemistry

Part : V /NME - II

Semester : II

Hours : 2

Course Code : 17UBCN21

Credits: 2

Course Outcome: Incorporating the traditional herbal systems, pharmacological action, cultivation methods, gardening, preservation and marketing of herbals.

Unit – I: Introduction to Herbal medicine

Alternative systems of medicine – Scope of herbal medicine - herbals for human diseases.

Unit – II: Secondary metabolites

Sources – types – pharmacological action of secondary metabolites from medicinal plants.

Unit – III: Cultivation of Herbal Plants

Cultivation methods of different types of herbs (any 5) -Marketing & patency of herbal products (GATT, TRIPS & WTO in brief).

Unit – IV: Herbal gardening

Herbs grown in home gardens – Different methods in maintaining herbal gardens – Uses in treating diseases - herbal formulations.

Unit – V: Herb Plant Propagation

Endangered herbal plants – need for their conservation – techniques used in herbal plant propagation – (Micro propagation – requirements & techniques).

References:

1. Biotechnology of Secondary metabolites – K.g. Ramawat, J.M. Murittion.
2. Indian medicinal plants Vol – I to Vol – V
 - a. A compendium of 500 Species – Orient Longman
3. Introduction to spices, plantation crops, Medicinal aromatic plants – N.Kumar et. Al.

ENZYMES & ENZYME TECHNOLOGY

Programme : B. Sc Biochemistry

Part : III / CORE - III

Semester : III

Hours : 4

Course Code : 17UBCC31

Credits: 4

Course Outcome: Provides the theory and knowledge to the Enzymology principles including fundamental properties of Enzymes, enzyme catalytic mechanisms, Enzyme kinetics and Application of enzyme technology.

Unit – I

Introduction to Enzyme technology: Nomenclature and classification, function, isolation, purification and characterization of Enzymes.

Unit – II

Enzyme specificity & Reactions: Specificity of enzymes - Different types of Enzyme reactions – oxidation and reduction, isomerisation, phosphorylation acetylation and methylation, dehydration, decarboxylation, transamination.

Unit-III

Enzyme substrate complexes (Theory & Mechanism) – Michaelis and Menten kinetics: Determination of K_m and V_{max} – Line Weaver Burks plot – Factor influencing enzyme reactions – Enzyme inhibition.

Unit – IV

Mechanism of Enzyme actions, Role of coenzymes in Enzyme reactions – Ex: Coenzyme A, NAD, FAD only – Zymogens.

Unit –V

A brief account of clinical and Industrial application of Enzymes – Enzyme immobilization and its application – Biosensors and their applications.

References:

- Enzymes – Nicholas Price.
- Enzymes structure and Mechanism by Allan Fersht.
- Biochemistry, Lehninger, A.L. Nelson, Cox
- Biochemistry, Donald Voet & Judith Voet, International Edition

QUANTITATIVE ANALYSIS OF BIO-ORGANIC COMPOUNDS

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - II

Semester : III

Hours : 2

Course Code : 17UBCC4P

Credits: 4

Course Outcome: Calorimetric determination of concentration of the bioorganic compounds such as carbohydrates, proteins, lipids, vitamins quantitatively

1) Analysis of Lipids

- a. Determination of iodine number
- b. Determination of saponification number
- c. Estimation of total cholesterol.

2) Analysis of Carbohydrates

- i. Estimation of glucose by (any two methods)
 - a. Phenol sulphuric acid method
 - b. Anthrone method.
 - c. Benedict's method
 - d. Copper reduction method
- ii. Estimation of pentose by Bial's method
- iii. Estimation of fructose by Seliwanoff's method
- iv. Estimation of reducing sugar in a fruit
- v. Estimation of lactose in milk

3) Analysis of Proteins

- a. Protein determination – Lowry's method
- b. Protein determination – Biuret method

4) Estimation of Vitamins

- a. Determination of ascorbic acid (Colorimetry)

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY - III

Programme : B. Sc Biochemistry

Part : III/ Ancillary - III

Semester : III

Hours : 4

Course code : 17UCHA31

Credits: 4

Course outcomes

CO 1 Amplification of essential conditions required for the photo induced chemical reactions & the crum application of photo physical phenomenon.

CO 2 Clear sectioning of applied chemistry for smoothen life & know about natural sources available for those chemical grounding.

Unit - I

a) Adsorption: Definition – differences between adsorption and absorption – adsorbate, adsorbent – physical adsorption – chemical adsorption – differences between these two types – factor influencing adsorption – adsorption isotherm – Langmuir isotherm (no derivation statement only) – adsorption of gases on solid surface.

Unit - II

a) Catalysis: Definition – different types of catalysis – acid-base catalysis – surface catalyzed reactions – definition and examples of auto catalyst – catalytic poisoning – promoters – enzyme catalysis – characteristics.

b) Polymers: Definition – classification of polymers – properties of polymers – addition and condensation polymerization reactions with examples – natural rubber – isoprene unit – vulcanization of rubber – preparation and applications of polystyrene, urea-formaldehyde resin, Teflon and buna-s rubber.

Unit - III

a) Photochemistry: Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grothu's- Draper law quantum efficiency – reasons for low and high quantum yield with examples – consequences of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence – photosensitization – chemiluminescence – bioluminescence – application of photo chemistry.

Unit - IV

a) Coordination compounds: Definition – nomenclature - definition of various terms involved in coordination chemistry – Werner's theory – EAN rule – VB theory (outline only) – Nickel carbonyls - chelates.

Unit - V

Fertilizers: Plant Nutrient – Role of NPK in plant growth – classification of fertilizers – natural and chemical fertilizers – urea – super phosphate – triple super phosphate – potassium nitrate – potassium chloride – ammonium nitrate – calcium ammonium nitrate (CAN) and complex fertilizers – fertilizer industry in India.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

ORGANIC ANALYSIS

Programme : B. Sc Biochemistry

Part: III/CHEMISTRY PRACTICAL - II

Semester : III

Hours : 2

Course Code : 17UCHA4P

Credits: 2

Course outcomes

CO 1 To know the detection of special elements, functional groups identification in organic compounds.

Analysis:

Analysis of organic compound containing one / two functional groups and conformation by the preparation of a solid derivative / colour reactions – acids, phenols, aldehydes, esters, amines(primary, secondary and tertiary), amides, anilides, aliphatic diamide and monosaccharide.

GENERAL BIOLOGY

Programme : B. Sc Biochemistry

Part : III / Biology Ancillary - I

Semester : III

Hours : 4

Course Code : 17UMBA31

Credits: 4

Course outcome

- To introduce about the classification and physiology of plants.
- To understand the physiology of human system.

Unit - I

Basis of classification - units of classification - Species, Genus, Family - Nomenclature- Binomial system. Bentham and hooker system of classification of plants.

Unit - II

Morphology, structure and reproduction of plants. Algae - General characters and classification- sargassum as an example. Fungi - General characters and classification - Yeast as an example. Bryophytes - General characters and classification - Funaria as an example.

Unit - III

Pteridophytes - selaginella, heterospory and seed habit. Gymnosperm – Pinus - economic uses of gymnosperm. Angiosperm - Monocot plant - Allium sp, Dicot plant-Tribulus terrestris.

Unit -IV

Human physiology - Structure and function of Digestive system - Respiratory system - circulatory system - Blood and their properties - Excretory system.

Unit - V

Muscular system - Nervous system - Endocrine glands - Reproductive system – Hormones - menstrual cycle.

References:

1. A.C Dutta, Botany for Degree students, Oxford university press.
2. W.T. Tailor and R.J. Wehe-General Biology, East West press pvt ltd.
3. E.L. Jordan and verma. Invertebrate Zollogy, S. Chandra &Co, New Delhi.
4. E.L. Jordan and verma.Chordate Zollogy, S. Chandra &Co, New Delhi.

ANCILLARY BIOLOGY PRACTICAL - I

Programme : B. Sc Biochemistry

Part: III/ANCILLARY PRACTICAL - I

Semester : IV

Hours : 2

Course Code : 17UMBA4P

Credits: 2

Course outcome

- To introduce about the basic structure of cell.
- To understand the mechanism of various cell regulation.

Botany

1. Vegetative structure and reproductive structure in sargassum, yeast, funaria, seleginella and pinus (section cutting of sargassum and seleginella, pinus stem and needles)

2. Structure of monocot flower-*Allium cepa*

3. Structure of Dicot flower-*Tribulus terrestris*

Zoology

1. Cockroach-external and digestive system, reproductive system and nervous system.

2. Frog-External, digestive system, urogenital system and brain (spotters only).

3. Morphology of the representative for each phylum spotters only- Amoeba, Euglena, paramecium, Hydra, Planaria, Liverfluke, Teania, Ascaris, earthworm, Prawn, Pila, Starfish, Shark, Mugil, pigeon, rat.

4. Blood cells of man and blood vessels.

5. Study of mitosis by smear technique of *Allilum cepa* root.

6. Demonstration of Histochemical staining methods

7. Determination of blood groups & Rh factors.

8. Determination of haemoglobin.

9. Blood cell counts

BIO METABOLISM

Programme : B. Sc Biochemistry

Part : III / CORE - IV

Semester : IV

Hours : 4

Course Code : 17UBCC41

Credits: 4

Course Outcome: Understand the fundamental energetic of biochemical processes, logic of metabolic pathways, and basic mechanism of pathway regulation.

Unit – I

Bioenergetics: High energy and Low energy phosphates: Electron Transport chain, Oxidative phosphorylation.

Unit – II

Metabolism of Carbohydrates: Glycolysis, TCA cycle, Energetic of TCA cycle, HMP shunt, Glyconeogenesis, Glycogenolysis Glycogenesis.

Unit – III

Metabolism of Amino acids: A brief account of amino acid metabolism of Glycine, Cyteine, Proline, Homoserine, Phenylalanine only.

Unit – IV

Metabolism of Lipids: Oxidation of fattyacid. Energetics of oxidation, Ketone body metabolism. Glycert metabolism Biosynthesis of TG, Phospholipids, Cholesterrlmetabolism (Structure not needed)

Unit – V

Metabolism of Nucleic acids: Biosynthesis of purine and Pyrimidine bases.

References

1. Harper's Illustrated Biochemistry – 26th edition, Robert K. Murraray, Peter A.Meyes, Victor W. Rodwell. 2003.
2. Principles of Biochemistry- Albert L. Lehninger. 2003.
3. Bender, David, A. Amino acid Metabolism, Willey (1985),
4. Biochemistry by Devlin
5. Biochemistry, Donald voet & Judith Voet, Wiley International Edition, 2004.
6. Biochemistry, Lubert Stryer et al., Fifth edition, W.H. Freeman and company, New York, 2003.V.

QUANTITATIVE ANALYSIS OF BIO-ORGANIC COMPOUNDS

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - II

Semester : IV

Hours : 2

Course Code : 17UBCC4P

Credits: 4

Course Outcome: Calorimetric determination of concentration of the bioorganic compounds such as carbohydrates, proteins, lipids, vitamins quantitatively

5) Analysis of Lipids

- d. Determination of iodine number
- e. Determination of saponification number
- f. Estimation of total cholesterol.

6) Analysis of Carbohydrates

- vi. Estimation of glucose by (any two methods)
 - e. Phenol sulphuric acid method
 - f. Anthrone method.
 - g. Benedict's method
 - h. Copper reduction method
- vii. Estimation of pentose by Bial's method
- viii. Estimation of fructose by Seliwanoff's method
- ix. Estimation of reducing sugar in a fruit
- x. Estimation of lactose in milk

7) Analysis of Proteins

- c. Protein determination – Lowry's method
- d. Protein determination – Biuret method

8) Estimation of Vitamins

- b. Determination of ascorbic acid (Colorimetry)

ORGANIC, INORGANIC AND PHYSICAL CHEMISTRY

Programme : B. Sc Biochemistry

Part: III/ANCILLARY - IV

Semester : IV

Hours : 4

Course Code : 17UCHA41

Credits: 4

Course outcomes

CO 1: Study of basic heterocyclic compounds, natural products with admirable biological activity and source of those compounds.

CO 2: Notify the production of electricity using chemical reaction. Explain the suitable condition for the generation of electricity eco-friendly.

Unit - I

a) Hetero cyclic compounds: Preparation and reactions of furan, pyrrole, pyridine, quinoline, isoquinoline (structural elucidation & synthesis not necessary).

Unit - II

a) Alkaloids: Pharmacological properties and importance of the following alkaloids – nicotine, quinine, piperine and cocaine (structural elucidation not necessary).

b) Vitamins and antibiotics: i) Classification and biological functions of vitamins A, B₆, B₁₂, C, D, E and K (structure elucidation not required).

Unit - III

Chemical kinetics: Reaction rate – order and molecularity of a reaction – zero order – first order. First order rate equation and half life period – derivation. Examples of first order reactions – second order reactions – examples. Carbon dating – enzyme catalysis – Michaelis and menton mechanism – Lineweaver-Burk plot – Significance of K_m .

Unit – IV

Chromatographic techniques: Principle and application – partition and adsorption chromatography – thin layer chromatography – column chromatography – paper chromatography – gas-solid and gas-liquid chromatography.

Unit - V

Electro chemistry

- a) pH – Definition-simple calculation of pH from Molarity of acid and bases-common ion effect-and its application in analytical chemistry-buffer solution-definition-theory of buffer action-application.
- b) Acid- base indicators-working range – commercial cells and batteries – primary and secondary cells-Weston – cadmium cell-lead storage cell- electroplating – principle and methods.

BOOKS RECOMMENDED:

1. Essential of physical chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand,2010)
2. Principles of physical chemistry: Puri, Sharma, Pathania (revised edition, Vishal pub.,2010)
3. Modern Inorganic chemistry: R.D Madan (Revised edition, S.Chand,2010)
4. A Text book of organic chemistry: ArunBhal, B.S.Bhal, G.D.Tuli (revised edition, S.Chand, 2010).

ORGANIC ANALYSIS

Programme : B. Sc Biochemistry

Part: III/CHEMISTRY PRACTICAL - II

Semester : IV

Hours : 2

Course Code : 17UCHA4P

Credits: 2

Course outcomes

CO 1 To know the detection of special elements, functional groups identification in organic compounds.

Analysis:

Analysis of organic compound containing one / two functional groups and conformation by the preparation of a solid derivative / colour reactions – acids, phenols, aldehydes, esters, amines(primary, secondary and tertiary), amides, anilides, aliphatic diamide and monosaccharide.

CELL BIOLOGY

Programme : B. Sc Biochemistry

Semester : IV

Course Code : 17UMBA41

Course outcome

Part: III/ANCILLARY - II

Hours : 4

Credits: 4

- To introduce about the basic structure of cell.
- To understand the mechanism of various cell regulation.

Unit - I

Cell structure - Prokaryotic and eukaryotic - Plant and Animal cell - Plasma membrane - chemistry and ultrastructure - Fluid mosaic model - Protoplasm-chemistry and organization - microtubules and microfilaments

Unit - II

Cytoplasmic organelles in Eukaryotes - ER, Golgi complex, lysosomes, Mitochondria, Chloroplast, Ribosomes, mesosomes

Unit - III

Nucleus-structure and functions, chromatin - Eu and Hetero chromatin, chemistry – chromosome – kinds - functions, nucleolus-structure – functions - mechanism of photosynthesis and generation of ATP.

Unit - IV

Cell cycle - mitosis and meiosis - interphase and division phase - Cell growth - normal and cancerous.

Unit - V

Microscopy – Types – Light - Electron and Phase contrast microscope structure and function.

References:

1. Albert, bray, D. Lewis, J. raff, M. Roberts. K and Watson, J.D-Molecular biology of the cell, New York, garland 1983
2. De Roberties E.D.P., F.A Saez and De Roberties E.M.F-cell biology, 1990.
3. K.V. Krishnamoorthy -methods in plant histochemistry, S. Viswanathan publications 1988.
4. P.S. Verma and V.K. Agarwal. Text book of cytology. S. Chand & Co., New Delhi 1995.
5. P.S. Verma and V.K. Agarwal. Text book of Cell Biology, Genetics, Evolution and Ecology. S. Chand & Co., New Delhi.

ANCILLARY BIOLOGY PRACTICAL - I

Programme : B. Sc Biochemistry

Part: III/ANCILLARY PRACTICAL - I

Semester : IV

Hours : 2

Course Code : 17UMBA2P

Credits: 2

Course outcome

- To introduce about the basic structure of cell.
- To understand the mechanism of various cell regulation.

Botany

1. Vegetative structure and reproductive structure in sargassum, yeast, funaria, seleginella and pinus (section cutting of sargassum and seleginella, pinus stem and needles)

2. Structure of monocot flower-*Allium cepa*

3. Structure of Dicot flower-*Tribulus terrestris*

Zoology

1. Cockroach-external and digestive system, reproductive system and nervous system.

2. Frog-External, digestive system, urogenital system and brain (spotters only).

3. Morphology of the representative for each phylum spotters only- Amoeba, Euglena, paramecium, Hydra, Planaria, Liverfluke, Teania, Ascaris, earthworm, Prawn, Pila, Starfish, Shark, Mugil, pigeon, rat.

4. Blood cells of man and blood vessels.

5. Study of mitosis by smear technique of *Allilum cepa* root.

6. Demonstration of Histochemical staining methods

7. Determination of blood groups & Rh factors.

8. Determination of haemoglobin.

9. Blood cell counts

MOLECULAR BIOLOGY

Programme : B. Sc Biochemistry
Semester : V
Course Code : 17UBCC51

Part : III / CORE - V
Hours : 6
Credits: 6

Course Outcome: To provide on depth knowledge of life molecular process at the sub cellular and molecular level. Advance in the study of DNA replication, transcription, translation, genetic code & its regulation.

Unit – I

Origin of Molecular Biology

Periodic origin of Biomolecules – Self replicating Biomolecules. Significance of cells & organelles in biochemical studies.

Unit – II

Chemical basis of hereditary

Nucleic acid as the genetic material – Chromatin structure and composition.

Unit – III

Replication

Fundamentals of DNA Structure and its replication – DNA repair - - Introduction to Genetic code – Gene mutation and its types.

Unit – IV

Transcription

Process of Transcription - Post transcriptional modification. Modulation of gene expression
Concepts of Operons – Inducers and repressors (Lac operon only)

Unit – V

Translation

Process of translation – tRNA, rRNA, mRNA and their roles – Post translational modification.

References

1. The Biochemistry of the Nucleic acids, 9th edition, 1981, R.L.P. Adams, R.H. Burdon, A.M. Camphell, D.P. Leader, R.M.S. Smith Chapman and Hall.
2. Freifelder, F. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (2nd ed) Freeman (1982)
3. Molecular Biology – Freifelder.
The cell & Molecular biology Geoffrey M. Cooper, 2nd Edition.
4. Principles of Biochemistry, Abert Lehinger.

MICROBIOLOGY & IMMUNOLOGY

Programme : B. Sc Biochemistry

Part : III / Elective - I

Semester : V

Hours : 6

Course Code : 17UBCE51

Credits: 6

Course Outcome: Illustrate the nature of microorganism their classification, mode of transformation mechanism of infection. Introduce the principle of immunology including development of the immune system. Immunological structure, antigen and antibody reactions and immune disease.

Unit – I

Microscopy, Microbial Nutrition & Reproduction

Gram positive and gram negative reactions

Simple, Compound, electron and phase contrast microscopes and their applications

Autotrophic and heterotrophic nutrition – Bacterial metabolism – Fermentation: homo fermentative and hetero fermentative types

Modes of reproduction – Binary fission, Conjugation, Transformation, Transduction, Sporulation – Kinetics of bacterial growth – normal growth curve.

Unit – II

Applied and Medical Microbiology

Food poisoning (Causes and symptoms)

Use of microbes in industries in the production of ethanol, organic acid (lactic and citric), antibiotics (Penicillin and Streptomycin)

Pathogenesis and prevention of air and water borne diseases – Typhoid, Cholera, Dysentery, Diarrhea, hepatitis, amoebiasis, Tuberculosis, Pox diseases, Diphtheria and Poliomyelitis.

Unit – III

Introduction to Immunology

Immunity, Host resistance, antigen, antibody, leucocytes etc., Principles of Innate and acquired immunity, Memory specificity – self/non self diversity – introduction to cells and organs of the immune system. Ig M, Ig G, Ig A, and Ig E – Structure of antibody molecule Ig G only. The nature of antigens – immunogen and hapten – T dependent and independent antigens.

Unit – IV

Immuno diagnostic techniques

Agglutination – precipitation – immunodiffusion – immunoelectrophoresis – radioimmunoassay – immunofluorescence – complement fixation – ELISA – production of antisera – production of monoclonal antibodies.

Unit – V

Immuno incompatibility & Hypersensitivity reactions

Major histocompatibility complex – autoimmune disease – vaccines. Hypersensitivity reactions (Types & Mechanism)

References:

1. Microbiology – A Human perspective, nester, Roberts, Nester
2. Microbiology, Pelczar, TATA McGraw Hill company
3. Microbiology, 6/e Prescott, Harley and Klein, Tata McGraw Hill Company 206.
4. The Microbial world, tanier, Prentice Hall
5. Microbiology, Tortora
6. Roitt – IH, 2005. Essential of Immunology, ELBS, Blackwell Scientific Publication.
7. Kuby, J.2004. Immunology V.Edition. W.H. Freeman and company. NY
8. Immunology – Tizard
9. Immunology – Eli Benjamin

PHARMACOLOGY

Programme : B. Sc Biochemistry

Semester: V

Course Code: 17UBCE52

Part: III / Elective-II

Credits: 6

Hours: 6

Course Outcome: Provide Pharmacological knowledge of indications, rationally, pharmacological actions, pharmacokinetic features, efficacy, adverse effects, contra indications and drug interactions.

Unit – I

General Introduction to Pharmacology, principle and Concept of Pharmacology Drug classes – herbal drugs and allopathy drugs.

Unit – II

Drug metabolism – Drug absorption, transformation and elimination Chemical pathways of drug metabolism Phase - I and II reactions. Microsomal and non - microsomal metabolism of drugs, role of cyt p450.

Unit – III

Herbs and nutrition, Herbs side effects, Herbal drugs for various diseases, herbal drug formulation, route of administration.

Unit - IV

Scientific evaluation drugs, Herbal drug formulation, route of administration & acute toxic on animals.

Unit V

Safety & efficacy of drugs, Herbal drug formulation, route of administration & acute toxic on animals.

References:

Basic pharmacology – Henry, Hinter and Barbaroongle.

Pharmacological Microbiology – Hegho WB and Rusellael

Pharmacological Chemistry – Satoskar Vol I and II

CLINICAL BIOCHEMISTRY PRACTICAL

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - III

Semester : V

Hours : 4

Course Code : 17UBCC6P

Credits: 4

Course Outcome: Practical skill in diagnostic performance of the laboratory tests by collection of blood & urine specimens

1. Introductory, collection of blood and urine specimen.

2. Blood Analysis:

- a. Analysis of Blood sugar – Copper reduction method
- b. Analysis of Blood cholesterol – Ferric chloride method
- c. Analysis of Blood urea – Urease method
- d. Analysis of Blood uric acid – Molybdate method
- e. Analysis of Blood Creatinine – Picric acid method
- f. Serum phosphorus
- g. Estimation of hemoglobin

3. Urine analysis

- a. Normal & Abnormal Analysis of Urine
- b. Collection & Preservation of urine Sample

4. Estimation of any two enzymes

- a. LDH
- b. Acid phosphates
- c. Alkaline phosphates
- d. SGOT
- e. SGPT
- f. Amylase
- g. Urease

MICROBIOLOGY & MOLECULAR BIOLOGY TECHNIQUES

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - IV

Semester : V

Hours : 4

Course Code : 17UBCC6Q

Credits: 4

Course Outcome: Practical skill in basic microorganism handling techniques, staining procedure, preparation of culture media their applications.

1. Cleaning of glass wares & Sterilization techniques
2. Preparation of simple culture media
3. Selection of suitable culture medium
4. Gram's staining, motility – Hanging drop
5. Isolation of microbes – serial dilution, streak plate technique
6. ES – Erythrocyte Sedimentation rate
7. RBC and WBC count
8. Enumeration of *E. coli* in milk and ice cream
9. Water Quality analysis
10. Haemagglutination

Demonstration only

1. SDS PAGE
2. Agarose gel electrophoresis
3. Immunodiffusion
4. Disc diffusion method (Antibiotic resistance)
5. Plasmid DNA Isolation
6. Plant DNA Isolation
7. Restriction DNA Digestion

GENETICS AND BIOSTATISTICS

Programme : B. Sc Biochemistry

Part: III /ANCILLARY - III

Semester : V

Hours : 4

Course Code : 17UMBA51

Credits: 4

Unit - I

Mendelian Genetics - Mendel's works, experiments, observations and results - Mendel's laws – terms - Back cross, Test cross - complete and incomplete dominance - co dominance

Unit - II

Allelic interaction - Multiple Alleles - blood group inheritance-Rh factor - Multiple gene inheritance - genes and chromosomes-crossing over and linkage.

Unit - III

Biostatistics – Introduction - Data collection - Types of data – primary, secondary and tertiary data - sampling and sampling designs-random and non-random sampling.

Unit - IV

Representation of data - Diagrammatic - simple bar diagram, Pie diagram - graphical representation - Histogram, frequency curve, cumulative frequency curve - Measures of central tendency - Explanation - Types of average-Arithmetic mean – median – Mode - Continuous series - discrete series.

Unit – V

Measures of dispersion – Explanation – Types – range - Mean deviation - Standard deviation – Variance - correlation and regression.

References:

1. Principles of Genetics - edmund. W. Sinnot, Dunn, L.C
2. Molecular Biology - David Frifielder.
3. An introduction to Biostatistics.2005.N.Gurumani
4. Statistics. Pillai. R.S.N and bhagavathi 2003

ANCILLARY BIOLOGY PRACTICAL –II

Programme : B. Sc Biochemistry

Part: III / ANCILLARY PRACTICAL - II

Semester : V

Hours : 2

Course Code : 17UMBA6P

Credits: 2

Course outcome:

- To introduce about the basic of genetics.
- To understand about the testing of various environmental sample.

1. Survey of mendelian traits in man.
2. Law of probability.
3. Estimation of dissolved Oxygen in different water samples.
4. Estimation of salinity in different water samples.
5. Estimation of alkalinity in different water samples.
6. Soil testing for pH, alkalinity, nitrate and phosphates.
7. Problems in Measures of central tendencies-Mean, median and Mode.
8. Problems in Measures of dispersion-Standard deviation.

ENVIRONMENTAL STUDIES

Programme : B. Sc Biochemistry
Semester : V
Course Code : 17UEVS51

Part: IV
Hours : 2
Credits: 2

COURSE OUTCOMES:

CO1: Demonstrate basic knowledge about Ecology, Living Organisms and its allied problems.

CO2: Acquire skills to help individuals in identifying and solving problems related to pollution.

CO3: Motivate public to understand the values of Conservation of Biodiversity.

UNIT – I: Earth and its Environment

a) Earth- formation and Evolution of Earth over time - structure of Earth and its components – Atmosphere, Lithosphere, Hydrosphere and Biosphere.

b) Resources – renewable and non renewable resources

UNIT – II: Ecology and ecosystem concepts

a) Ecology – definition - Ecosystem : Definition – structure and function – energy flow – food chain and Food web – one example for an ecosystem

b) Biogeochemical cycles – Nitrogen, carbon, Phosphorous and Water

UNIT – III: Biodiversity of India

a) Introduction – definition – Values of Biodiversity _ Threat to Biodiversity –Conservation of Biodiversity

b) Biodiversity of India – as a megadiversity nation – bio-geographical distribution – Hot spots of biodiversity – National Biodiversity conservation Board and its function

UNIT – IV: Pollution and Global issues

a) Definition, causes, effects and control measures of Air, Water, Soil, Marine, Noise, Thermal and Nuclear pollution

b) Global issues: Global Warming and Ozone layer Depletion

UNIT – V: Development and Disaster Management

a) Sustainable Development – Sustainable Agriculture – Organic farming, Irrigation – Water harvesting and Waste recycling – Cyber waste and management

b) Disaster Management – Flood and Drought – Earthquake and Tsunami – Landslides and Avalanches – Cyclones and Hurricanes –Precautions, Warnings, Rescue and Rehabilitation.

TEXT BOOK:

1.Environmental studies – Published by Madurai Kamaraj University.

REFERENCES:

1.Environmental Studies by Dr.N.Arumugam&Prof.V.Kumarasan, Saras Publication-2009.

2.Environmental Studies by Bharathiar University, Coimbatore – 2004.

VERMICOMPOSTING & MUSHROOM TECHNOLOGY

Programme : B. Sc Biochemistry

Part : III / SBS - III

Semester : V

Hours : 2

Course Code : 17UBCS51

Credits: 2

Course Outcome: Acquires the knowledge of fertilization, types of earthworm, techniques of vermicomposting & mushroom culture.

Unit - I

Introduction to Vermi composting:

Histroy & scope of Vermicomposting – Scope of Earth worms in fertilizer preparation.

Unit - II

Types of earthworms

Epigeics, Aneic & Endogeics - Vermicasts – Coccons.

Unit - III

Vermicomposting technique

Requirements for vermicomposting - Vermicake – Economic importance of Vermicompost.

Unit - IV

Mushroom culture

Introduction & Scope of Mushroom culture – Types of Mushrooms.

Unit - V

Cultivation of edible mushroom – techniques in mushroom cultivation – problems in mushroom cultivation

References:

1. Biotechnology & Genomics by P.K.GUPTA
2. A textbook of Biotechnology – R.C. Dubey

BIOTECHNOLOGY

Programme : B. Sc Biochemistry

Part : III / CORE - VII

Semester : VI

Hours : 6

Course Code : 17UBCC61

Credits: 5

Course Outcome: Understanding the basics skills in recombinant DNA technology of plant & animal.

Unit – I

Genetic Engineering

Introduction to gene cloning, restriction enzymes and mode of action, Types of cloning vectors, plasmid, cosmid, m13 phage.

Unit – II

Plant Biotechnology

Vector for gene transfer using Agrobacterium only, Transgenic plants, crop Improvement.

Unit – III

Animal Biotechnology

Genetic engineering in animals viral vector and Yeast. Vectors, Transgenic animals. Maintenance of animal cell culture, measurement of viability, cytotoxicity, measurement of cell death – apoptosis. Embryonic stem cell - Application of animal cell culture.

Unit – IV

Microbial biotechnology

Bioprocess, Basic principles of microbial growth, types, design and operation of fermentors, oil spill clean by microbes, Biodegradable plastics.

Unit – V: Applications of Biotechnology

Production of Novel proteins – Insulin – Interferon's vaccines – Gene therapy – Treatment of Various human disorders.

References

1. Biotechnology by P.K. Gupta
2. Principles of Biochemistry by Lehinger & Cox.
3. Biotechnology by Satyanarayana.

PLANT BIOCHEMISTRY

Programme : B. Sc Biochemistry

Semester : VI

Course Code : 17UBCC62

Part : III / CORE - VIII

Hours : 6

Credits: 5

Course Outcome: learning in context of plant biology, plant cell, pigments, photosynthesis, importance of plant growth regulator & plant tissue culture.

Unit – I

Plant Pigments

Occurrence, classification, structure and function of naturally occurring pigments, Carotenoids, flavones, flavonols and chlorophylls.

Unit – II

Photosynthesis

Photosynthetic apparatus and photosynthesis pigments, Light and dark reactions of photosynthesis, C₃, C₄ and CAM plants – factors affecting photosynthesis, photorespiration.

Unit – III

Plant Nutrition

Essential mineral nutrients – function, effects of toxicity and deficiency, N₂ cycle, N₂ fixation – symbiotic and asymbiotic Nitrogen Fixation – Nitrogenase, nitrate assimilation – sulphur as a mineral nutrient, sulphate assimilation.

Unit – IV

Plant growth regulators

Natural growth hormones – Auxins, GA, Cytokinins, Ethylene and ABA – Synthetic growth hormones.

Unit – V

Plant tissue culture

Importance of plant tissue culture, Basic requirements formulation of medium, culture of plant tissues, Applications.

References:

- i. Plant Biochemistry by Devlin and Witham
- ii. Plant Biochemistry by Ross and Salisbury
- iii. Plant Biochemistry by Bonner and Vamer, 3rd edition, acadmic press.
- iv. Plant physiology by Hopkins
- v. Plant physiology, Noggle Fritz

CLINICAL BIOCHEMISTRY

Programme : B. Sc Biochemistry

Semester : VI

Course Code : 17UBCE61

Part : III / Elective - III

Hours : 4

Credits: 4

Course Outcome: Acquire knowledge about clinically assessing the laboratory indicator of physiologic condition and disease

Unit – I

Tissue function test

Tissue function test of Liver, Pancreas & Kidney and their significance.

Unit – II

Disorders of Carbohydrate metabolism

Sugar level in normal blood Hypo and Hyperglycemia, glycosuria, obesity and Galactosemia Glucose tolerance test – Inborn errors of carbohydrate metabolism

Unit – III

Disorders of lipid metabolism

Hypo and hyper Lipoproteinemias, disorders of Triglycerides, Phospholipids and Cholesterol metabolism – Inborn errors of lipid metabolism.

Unit – IV

Disorders of amino acid & protein metabolism

Amino acid metabolism in starvation – disorders of Plasma proteins – urea, Uric acid, Creatinine, ammonia, Uremia, Uremia and Porphyria - Inborn errors of amino acid metabolism.

Unit – V

Disorders of Nucleic acid metabolism & Enzymology

Gout, LNS, Orotic aciduria and Xanthinuria. Diagnostic enzymology – SGOT, SGPT, LDH & CK.

Reference:

1. Physiological Chemistry – Hawk's
2. Practical Clinical Biochemistry – Harold Varley, Fourth edition.
3. Clinical Biochemistry – Tietz.
4. Biochemistry – Chatterjee
5. Physiological basis for medical practice, Best & Taylor
6. Human Physiology, Guyton

FOOD BIOTECHNOLOGY

Programme : B. Sc Biochemistry

Semester : VI

Course Code : 17UBCE62

Part : III / Elective - IV

Hours : 4

Credits: 4

Course Outcome: Explains the chemistry underline the properties of food components, discusses the important pathogens and spoilage microorganisms in foods. Effects of common food storage and microbial contaminants.

Unit – I

Single cell protein: Sources of SCPs, Nutritive value of SCPs, conception of SCPs, Production of SCP by genetic engineering, Applications of SCP.

Unit – II

Mushroom Technology: Mushroom and its types introduction a mushroom cultures methodology significance of mushrooms.

Unit – III

Microbial production of fermentation. Introduction production of amino acids, alcohols, organic acids process of vegetables – fruit processing – citrus juices, apple juices, slices, grapes juices and raisins, squashes, Jams, ketchups. Polysaccharrides, antibiotic production, alcoholic beverages.

Unit – IV

Dairy chemistry: Composition of milk, physical properties of milk, milk clothing enzymes, frozen Dairy Products.

Unit – V

Animal food processing: Aging – tendering, freezing, storage fish, preservation and processing, Dehydrated egg powders, frozen egg, egg storage.

References:

1. Introduction of Food Science and Technology – Text book by George F. Stewart
2. Food Technology: An introduction book by Anita Tull.
3. Food Processing Technology- Text book by P. Fellows

CLINICAL BIOCHEMISTRY PRACTICAL

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - III

Semester : VI

Hours : 4

Course Code : 17UBCC6P

Credits: 4

Course Outcome: Practical skill in diagnostic performance of the laboratory tests by collection of blood & urine specimens

5. Introductory, collection of blood and urine specimen.

6. Blood Analysis:

- h. Analysis of Blood sugar – Copper reduction method
- i. Analysis of Blood cholesterol – Ferric chloride method
- j. Analysis of Blood urea – Urease method
- k. Analysis of Blood uric acid – Molybdate method
- l. Analysis of Blood Creatinine – Picric acid method
- m. Serum phosphorus
- n. Estimation of hemoglobin

7. Urine analysis

- a. Normal & Abnormal Analysis of Urine
- b. Collection & Preservation of urine Sample

8. Estimation of any two enzymes

- a. LDH
- b. Acid phosphates
- c. Alkaline phosphates
- d. SGOT
- e. SGPT
- f. Amylase
- g. Urease

MICROBIOLOGY & MOLECULAR BIOLOGY TECHNIQUES

Programme : B. Sc Biochemistry

Part: III/CORE PRACTICAL - IV

Semester : VI

Hours : 4

Course Code : 17UBCC6Q

Credits: 4

Course Outcome: Practical skill in basic microorganism handling techniques, staining procedure, preparation of culture media their applications.

11. Cleaning of glass wares & Sterilization techniques
12. Preparation of simple culture media
13. Selection of suitable culture medium
14. Gram's staining, motility – Hanging drop
15. Isolation of microbes – serial dilution, streak plate technique
16. ES – Erythrocyte Sedimentation rate
17. RBC and WBC count
18. Enumeration of *E. coli* in milk and ice cream
19. Water Quality analysis
20. Haemagglutination

Demonstration only

8. SDS PAGE
9. Agarose gel electrophoresis
10. Immunodiffusion
11. Disc diffusion method (Antibiotic resistance)
12. Plasmid DNA Isolation
13. Plant DNA Isolation
14. Restriction DNA Digestion

ENVIRONMENTAL BIOLOGY

Programme : B. Sc Biochemistry

Semester : VI

Course Code : 17UMBA61

Unit - I

Part: III /ANCILLARY - IV

Hours : 4

Credits: 4

Environmental biology and its relevance to human civilization - environmental factors - Physical, chemical and biological – and their influence in living system-population explosion and its consequences - Deforestation and its consequences.

Unit - II

Ecosystem and flow energy and nutrients - Concept of ecosystem, biosphere and types of ecosystem - biotic and abiotic factors - primary and secondary productivity - food chain and food web - ecological pyramids-biogeochemical cycles.

Unit - III

Resource and conservation - Natural resources - aquatic and terrestrial resources-renewable and non - renewable energy (introduction) - Aquatic resources - sewage treatment - fish culture and management - Terrestrial resources - Agriculture-soil fertility and nitrogen fixation - biofertilizer.

Unit - IV

Environmental pollution and management - Types of pollution - Air, Water, Soil and Noise - sources, effect and control measures - environmental pollution management and environmental education.

Unit - V

Population biology - Population parameters and their estimation - life table - reproductive effort - evolution of demographic traits - population growth models - species interaction and competition – population – regulation - density dependent and independent.

References:

1. Dasmann, R., environmental Conservation - II Ed.
2. J. Kormondy, Concepts of Ecology - II Ed.
3. Odum, E.P. Fundamentals of Ecology - 1980.
4. Ehrlich, P.R., J.P. Holdreh and R.W. Kolm, Man and Ecosphere, 1989.
5. Verma. P.S and V.K Agarwal., environmental Biology, S. Chand & Co., New Delhi, 1995.

ANCILLARY BIOLOGY PRACTICAL –II

Programme : B. Sc Biochemistry

Part: III / ANCILLARY PRACTICAL - II

Semester : VI

Hours : 2

Course Code : 17UMBA6P

Credits: 2

Course outcome:

- To introduce about the basic of genetics.
- To understand about the testing of various environmental sample.

9. Survey of mendelian traits in man.

10. Law of probability.

11. Estimation of dissolved Oxygen in different water samples.

12. Estimation of salinity in different water samples.

13. Estimation of alkalinity in different water samples.

14. Soil testing for pH, alkalinity, nitrate and phosphates.

15. Problems in Measures of central tendencies-Mean, median and Mode.

16. Problems in Measures of dispersion-Standard deviation.

BIOINFORMATICS

Programme : B. Sc Biochemistry

Part : IV / SBS - III

Semester : VI

Hours : 2

Course Code : 17UBCS61

Credits: 2

Course Outcome: Knowledge and basics principle of biology integrating computer science& information about the software database of the human genome..

Unit – I

Internet basics

Browsing – Web – pictures – Video links – search tips and tricks – On line journals – literature database Pubmed, Medline, Electronic Journals – Agricola.

Unit – II

Computing Principles

Basic codes, Computer networking and computer analysis, brief introduction on Data Base Management System (DBMS).

Unit – III

Information networks

Internet, Web, HTTP, HTML and VRLS EMB net, NCBI and mm library.

Unit – IV

Homology and diversity

Evolutionary basis of sequence alignment – searching for similarity.

Unit – V

Sequence analysis

Sequence databases, biological databases and protein & nucleic acid sequence analysis. GCG – Genetic Computation Group – Wisconsin packages specializing in DNA analysis, internet packages BLAST & FASTA.

References:

1. Attwood, T.K and Parry – Smith D.J. Introduction to Bioinformatics, Pearson Education private Ltd., Singapore 2002.
2. Gribshow, Sequence Analysis, University Press 2000.
3. Introduction to Bioinformatics 2002. S. Sundarrajan & R. Balaji. Himalaya Publishing House, Mumbai.
4. Bioinformatics 2003. D.R. West Head. J.H. Parish and R.M Twyman. VIVA Books Pvt, Ltd Chennai.
5. Bioinformatics – a beginners guide, Jean – Michel Claverie, Wiley, 2004.

VALUE EDUCATION

Programme : B. Sc Biochemistry

Semester : VI

Course Code : 17UVED61

Part : IV

Hours : 2

Credits: 2

COURSE OUTCOMES:

CO1: Develop the overall personality including physical, mental, emotional and spiritual aspects

CO2: Demonstrate good manners and cooperative citizenship

CO3: Develop respect for the dignity of individual and society

UNIT – I: Values and the Individual

Values meaning – The Significance of Values – Classification of Values – Need of Value Education –Values and the individual: Self Discipline, Self Confidence, Self Initiative, Empathy, Compassion, Forgiveness, Honesty and Courage.

UNIT – II: Values and Religion

Karmayoga in Hinduism – Love and Justice in Christianity – Brotherhood in Islam – Compassion in Buddhism – Ahimsa in Jainism – and Courage in Sikhism – Need for Religious Harmony.

UNIT – III: Values and Society

Definition of Society – Democracy – Secularism – Socialism – Gender Justice – Human Rights – Socio-Political Awareness – Social Integration – Social Justice.

UNIT – IV: Professional Values

Definition – Accountability – Willingness to learn – Team Spirit – Competence Development –Honesty – Transparency – Respecting Others – Democratic Functioning – Integrity and Commitment.

UNIT- V: Role of Social Institutions in Value Formation

Role of Family – Peer Group – Society – Educational Institutions – Role Models, and Mass Media in value formation.

Text Book:

Value Education, Madurai Kamaraj University Publications

REFERENCE BOOKS:

- Subramanyam, .K , values in Education. Madurai; Ramana Publications, 1995.
- Doss. A. G. Indian Social Institutions, Delhi: Forward Publishing Company, 2000.
- Joseph.K.P, e.d., Peace and Value Education : A Creative Response to Consumerism and Communalism, Hyderabad: National Institute of Peace and Value Education. 2003.
- BediKiran, What Went Wrong....and Continues, Delhi: UBS Publishers and Distributors Pvt.Ltd., 2005.
- Sekar, Vincent, Quest for Harmony: An Anthology of Religions in Dialogue, Bangalore: Claretian Publications, 2001.

METHODOLOGY: The each above mentioned values may be taught through parables, new analysis, role play, group discussions, debates, case studies and field work.