B.Sc. BIOCHEMISTRY

25

Solutions to problems should be used in theory papers / subjects combined with problems like Health Programme Management, Hospital Accounting and Finance, Hospital Materials Management, Research Methodology, etc.

For example:

Based on the following data project the trend of bed occupancy of Kisi Healthcare Centre for the next three years:

Year	1999	2000	2001	2002	2003
Bed Occupancy (in %)	45	56	78	46	75

Questions on ***models / diagrams*** that triggers the creativity combined with practical experience should reflect in papers / subjects like Hospital Administration, Human Anatomy, Physiology and Medical Terminology, Health Programme Management, Human Resources Management, Healthcare Marketing and Public Relations, Hospital Materials Management, Patient Care Planning and Management, Supportive Services and Facilities Management, Information Technology in Healthcare, Health Communication Planning and Management, Strategic Management in Healthcare, Managing Quality in Healthcare, Research Methodology, etc.

For examples:

- Draw an organisation chart for a 100 beds single specialty hospital.
- Draw a model layout (not to scale) for radiology service. Also draw the patient flow and workflow diagrams to support your layout.
- Draw the central nervous system and explain the parts.
- Prepare a model consent form for a multi-specialty hospital. Discuss on the need and importance of 'Consent'.
- Prepare a questionnaire to assess aesthetic dimension of care in ward.
- Develop standard statement and criteria for medical audit on communication.
- Develop job description for the senior administrative role of a 500 beds multi-specialty teaching hospital.
- Prepare purpose, composition and terms of reference of purchase committee

Placed at the Special Meeting
of the Academic Council
held on 25.06.2008

APPENDIX - AW

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

SYLLABUS FOR B.Sc., BIOCHEMISTRY DEGREE COURSE

CHOICE BASED CREDIT SYSTEM (CBCS)

(For the affiliated colleges of MKU)

(EFFECT FROM THE ACADEMIC YEAR 2008 – 2009 ONWARDS)

Regulations

1. **Qualifications for admissions**
   Candidate should have passed the higher secondary examinations conducted by the Board of higher secondary Education, Govt. of Tamilnadu or any other examination accepted by the syndicate as equivalent there to
   a) Biology/physics/ chemistry as subjects in the higher secondary education
   b) Candidates should have secured at least 60% in the above subjects and above in the aggregate
   c) A relaxation of 10% marks in the aggregate will be given to SC/ST candidates
   d) Candidates sponsored by the industrial / hospitals/clinical laboratories may also considered for admissions.
2. **Duration of the course**
   The students will undergo the prescribed course of study for a period of not less than three academic years (six semesters)
3. **Medium of instruction :** English
4. **Subjects of Study & Scheme of Examinations :** As given in Appendix A
5. **Eligibility for the degree :** Candidate will be eligible provided he/she completes the course and pass in the prescribed examinations
6. Attendance, progress and conduct certificate from the Head of the Institution will be required for the examination.
7. **Guidelines regarding pass minimum:**
   To get a pass, a student should fulfill the following conditions:

1. 40% of the aggregate (External + Internal).
2. No separate pass minimum for internal
3. 27 marks out of 75 is the pass minimum for the External.

B) **Practicals :**

1. 40% of the aggregate (External + Internal)
2. No separate pass minimum for the internal
3. 21 marks out of 60 is the pass minimum for the External

C) **Project:**

1. 40% of the aggregate (project evaluation + Viva- voce).
2. No separate pass minimum for viva -voce
3. 28 mark out of 80 is the pass minimum for the project evalution.

8. Candidates who have secured 60% and above in aggregate of the Part II will be given First class; candidates who have secured 60% and above but not less than 50% will be given a second class; candidates who have secured 40% and above but below 50% will be given a third class.
9. Ranking will be made for the candidates who have necessarily completed the course without any arrears in each semester and secured the maximum total in the Part III be given the First Rank. Such candidates will be honoured with a Gold Medal if there is a sponsorship or an endowment.
10. **Question paper pattern**

a) For all 3 credits and above courses

The existing pattern of question paper will be as follows:

Time : 3 Hours Max Marks : 75

Section A : (10 × 1 = 10 Marks)

Question No. 1 to 10

1. Two questions from each unit.
2. Four choices in each question.
3. Answer aii questions. Choose the write answer.

Section B: (5×7 = 35 Marks)

Answer all questions – Either or types

Answer not exceeding two pages.

(one question from each unit)

Oueston NOs.

11a or 11b

12a or 12b

13a or 13b

14a or 14b

15a or 15b

Section C: (3 × 10 =30 Marks)

Answers not exceeding four pages

Answer any **THREE** out of Five (one question from Each Unit)

Question Nos. 16-20

The pattern for **internal valuation** may be:

a) Two internal tests of 15 marks each : Average = 15 marks
b) Group Discussion/seminar/Quiz = 05 marks
c) Two assignments : 5 marks each: Average = 05 marks

b)For all 2 credits courses

The existing pattern of Question paper will be as follows:

Time : 3 Hours Max Marks : 75

Section A : (10 x 1.5 =15 Marks)

Question No. 1-10

Four choices in each question.

Answer all questions. Choose the write answer.

Secton B : (3x10 = 30 Marks)

Answer all questions – Either or types

Answer not exceeding two pages.

(one question from each unit)

Queston NOs.

11a or 11b

1. 40% of the aggregate (External + Internal).
2. No separate pass minimum for internal
3. 27 marks out of 75 is the pass minimum for the External.

B) **Practicals :**

1. 40% of the aggregate (External + Internal)
2. No separate pass minimum for the internal
3. 21 marks out of 60 is the pass minimum for the External

C) **Project:**

1. 40% of the aggregate (project evaluation + Viva- voce).
2. No separate pass minimum for viva -voce
3. 28 mark out of 80 is the pass minimum for the project evalution.

8. Candidates who have secured 60% and above in aggregate of the Part II will be given First class; candidates who have secured 60% and above but not less than 50% will be given a second class; candidates who have secured 40% and above but below 50% will be given a third class.
9. Ranking will be made for the candidates who have necessarily completed the course without any arrears in each semester and secured the maximum total in the Part III be given the First Rank. Such candidates will be honoured with a Gold Medal if there is a sponsorship or an endowment.
10. **Question paper pattern**

a) For all 3 credits and above courses

The existing pattern of question paper will be as follows:

Time : 3 Hours Max Marks : 75

Section A : (10 × 1 = 10 Marks)

Question No. 1 to 10

1. Two questions from each unit.
2. Four choices in each question.
3. Answer aii questions. Choose the write answer.

Section B: (5×7 = 35 Marks)

Answer all questions – Either or types

Answer not exceeding two pages.

(one question from each unit)

Queston NOs.

11a or 11b

12a or 12b

13a or 13b

14a or 14b

15a or 15b

Section C: (3 × 10 =30 Marks)

Answers not exceeding four pages

Answer any **THREE** out of Five (one question from Each Unit)

Question Nos. 16-20

The pattern for **internal valuation** may be:

a) Two internal tests of 15 marks each : Average = 15 marks
b) Group Discussion/seminar/Quiz = 05 marks
c) Two assignments : 5 marks each: Average = 05 marks

b)For all 2 credits courses

The existing pattern of Question paper will be as follows:

Time : 3 Hours Max Marks : 75

Section A : (10 x 1.5 =15 Marks)

Question No. 1-10

Four choices in each question.

Answer all questions. Choose the write answer.

Secton B : (3x10 = 30 Marks)

Answer all questions – Either or types

Answer not exceeding two pages.

(one question from each unit)

Queston NOs.

11a or 11b

12a or 12b

13a or 13b

Section C: (2x15 = 30 Marks)

Answers not exceeding four pages

Answer any two out of three (one question from each unit)

Question No. 14 – 16

The pattern for **internal valuation** may be:

d) Two internal tests of 15 marks each : Average = 15 marks
e) Group Discussion/seminar/Quiz = 05 marks
f) One assignments : Average = 05 marks

c) Practical Exams : External (Max: 60 marks)

one major experiment = 25
one minor experiment = 10
two spotters = 05
record book = 05
viva voce = 15

the pattern for **internal valuation** for 40 marks may be:

g) Two internal tests of 25 marks each : Average = 25 marks
h) Observation book = 10 mark
i) One assignment = 05 marks

d) Project evaluation: (Max 100 marks)

External Max: 80 marks

Dissertation work = 60

Presentation and viva voce = 20

Internal Max:20 marks = (decided by the guide)

FIRST SEMESTER

Sub. Code	Title of the paper	Weekly contact hours	No.of Credits	Examination	Marks		
					Internal	External	Total
	Part I						
TA1	Tamil	6	3	3	25	75	100
	Part II						
EN1	English	6	3	3	25	75	100
	Part III						
	Core Subjects						
CS01	Bimolecules	5	5	3	25	75	100
CS02	Enzymes	5	5	3	25	75	100
	Allied Subjects						
AS01	Chemistry-I (Theory+Practical)	6	5	3	25	75	100
	Part IV						
	Non – Major Elective						
NME1	Health and Human Diseases	2	2	3	25	75	100
	Total	30	23				600

- Tamil and English syllabi and workload are as per the other degree courses.
- The Allied I(Chemistry) and Allied II (Biology) syllabi are as per other degree courses (e.g., B.Sc., Microbiology)

SECOND SEMESTER

Sub. Code	Title of the paper	Weekly conte	No.of Credi	Examination	Marks		
					Internal	Exter	Total
	Part I						
TA2	Tamil	6	3	3	25	75	100
	Part II						
EN2	English	6					
	Part III						
	Core Subjects						
CS03	Biochemical Techniques	5	3	3	25	75	100
CS04	Major- Practical-I	5	5	3	25	75	100
	Allied Subjects						
AS02	Chemistry-II (Theory+Practical)	6	3	3	40	60	100
	Part IV						
	Non – Major Elective	2	5	3	25	75	100
NME2	Herbal Medicine	2	2	3	25	75	100
	Total	30	21				600

THIRD SEMESTER

Sub. Code	Title of the paper	Weekly conte	No.of Credits	Examination	Marks		
					Internal	Extern	Total

	Part I						
TA3	Tamil	6	3	3	25	75	100
	Part II						
EN3	English	6	3	3	25	75	100
	Part III						
	Core Subjects						
CS05	Metabolism	5	5	3	25	75	100
CS06	Microbiology	5	5	3	25	75	100
	Allied Subject						
A03	Biology - I (Theory+Practical)	6	5	3	25	75	100
	Part IV						
SBS01	Skill Based Elective Nutrition	2	2	3	25	75	100
	Total	30	23				600

FOURTH SEMESTER

Sub. Code	Title of the paper	Weekly conte	No.of Credits	Examinatio	Marks		
					Internal	Extern	Total
	Part I						
TA4	Tamil	6	3	3	25	75	100
	Part II						
EN4	English	6	3	3	25	75	100
	Part III						
	Core Subjects						
CS07	Clinical Biochemistry	5	5	3	25	75	100
CS08	Major- Practical -II	5	3	3	40	60	100
	Allied Subjects						
AS04	Biology - II (Theory+Practical)	6	5	3	25	75	100
	Part IV						
ENS01	Environmental Studies	2	2	3	25	75	100
	Total	30	21				600

FIFTH SEMESTER

Sub. Code	Title of the paper	Weekly content	No.of Credi	Examination	Marks		
					Internal	Extern	Total
	Part III						
	Core Subjects						
CS09	Molecular Biology	5	5	3	25	75	100
CS10	Immunology	5	5	3	25	75	100
CS11	Plant Biochemistry	4	4	3	25	75	100
CS12	Major-Practicals - III	5	3	3	40	60	100
	Elective						
ES01	Medical Lab Technology (Theory + Practical)	5	5	3	25	75	100
	Part IV						
	Skill Based Elective						
SBS02	Pharmacology	3	2	3	25	25	100
SBS03	Bioinformatics	3	2	3	25	75	100
Total		30	26				700

SIXTH SEMESTER

Sub. Code	Title of the paper	Weekly content hours	No.of Credits	Exam Hours	Marks		
					Internal	External	Total
	Part III						
	Core Subjects						
CS13	Biotechnology	5	4	3	25	75	100
CS14	Major Practical - IV	5	3	3	40	60	100
	Elective						
ES02	Food Technology	4	4	3	25	75	100
ES03	Project	5	5	3	20	80	100
	Part IV						
	Skill Based Elective						
SBS04	Biostatistics	3	2	3	25	75	100
SBS05	Clinical Diagnostics	4	3	3	25	75	100
SBS06	Endocrinology	2	2	3	25	75	100
VE01	Value Education	2	2	3	25	75	100
	Part V						
EA01	Extension Activities		1	3	25	75	100
Total		30	26				900

Unit IV

Mechanism of Enzyme actions, Role of coenzymes in Enzyme reactions -

Eg: CoenzymeA, NAD, FAD only -Zymogens.

Unit V

A brief account of clinical and industrial application of Enzymes-Enzyme mmobilization and its application- Biosensors and their applications.

References:

1. Enzymes- Nicholas Price.

2. Enzyme structure and Mechanism by Allan Fersht.

4. Biochemistry, Lehninger, A.L Nelson, Cox

5. Biochemistry, Donald Voet & Judith Voet, Wiley International Edition, 2004.

Allied Subject

CHEMISTRY I

PHYSICAL CHEMISTRY

I. Thermodynamics:

Importance of thermodynamics – terms used in thermodynamics- isolated, open and closed system- state function and path function – extensive and intensive properties – reversible and irreversible process- mathematics form of first law of thermodynamics –second law of thermodynamics – entropy – physical significanceof entropy- gibs free energy and its significance.

II. Solutions:

Definition- concentration of solution – Types of solutions- mehthods for expressing concentration of solution – weight percentage – molarity mole fraction- Normality – Molality – ppm and ppb (problems based) and their calculation.

III. Concept of acids and bases:

Lowry concept – Louis concept – ionization of weak acids and and weak bases- pH- common ion effect – Buffer solution – applications of buffer solution- acid base titration – Acid – base indication – theory of indicators.

IV. Bonding;

i. VB theory : postulates – application to the formation of simple molecule like H2 and O2 – overlap of atomic orbitals- s-s, s-p, and p-p overlap- principle of hybridization – sp, sp2 , sp3, hybridization – VSEPR theory.
ii. M.O theory:
iii. Formation of M.Os – bonding and anti bonding and non bonding M.Os – M.O. diagram for H2, He and F2.

V. Chemical kinetics:

Reaction rate- older and molecularity of a reaction – Zero order – first order . First order rate equation and half life period – derivation . Examples of first order reactions-first order reaction – second order reaction – ex., carbon dating – enzyme catalysis- Michaelis and Menton mechanism – Line weaver burk plot- significance of km.

Non major elective

HEALTH AND HUMAN DISEASES

Unit 1:

Inroduction- importance of being healthy- nutrition- exercise causes of disease- environment – age – living conditions – Life style – obesity- BMI.

Unit 2:

Diseases – causes – symptoms- treatement of – heart diseases- jaundice- cancer- AIDS- Nosocomical diseases- traveling disease- children and old age diseases – T.B- leprosy-Dengue- Bird Flu.

Diseases prevention – healthy habits, disease prevention awareness- vaccination-nization schedule- first aid measures- Pregnancy care.

ence:

WWW. Wikipedia. Com
Microbiology – Alcamo.
Biochemistry – Thomas Devlin.
Fundamentals of Biochemistry – A.C. Deb.
Clinical biochemistry- chatterjee.

ND SEMESTER

Core Subject

BIOCHEMICAL TECHNIQUES

Chromatography: Column, Paper and Thin layer chromatography, Adsorption on, Ion exchange, Gas chromatography and HPLC , Gelfiltration. Dialysis

I

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

II

Centrifugation - Theory, relation between RPM and g- Differential centrifugation- types- Different centrifuges. Measurement of Gases: Manometry.

IV

Colorimetry: Light spectrum and its wavelength regions- Complementary colours. Extinction co- efficient. Beer lambert's law and its application.

Unit V

Radioisotopes in Biochemistry: Radioactivity, Elementary units, Deduction and contification- Auto radiography, fluorography, Isotopic tracer technique, Isotope dilution method.

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.

Major Practical - I

1. Qualitative analysis of bioorganic compounds
   a. Analysis of carbohydrates
   b. Analysis of aminoacids
   c. Test for proteins
   d. Test for lipids - Test for cholesterol
   e. Qualitative tests for DNA and RNA
2. Biochemical preparation
   a. starch from potato
   b. Lactose from milk
   c. Casein from milk
   d. Caffeine from coffee seeds

. Use of pH meter for the preparation of buffer

. Verification of Beer –Lambert's law using colorimeter

i) Determining the concentration of any given coloured compounds using a tandard graph.

Allied Subject

CHEMISTRY – II

ORGANIC CHEMISTRY

Unit I

Nature of valency of carbon in organic compounds – tetrahedral arrangement of valency of carbon- bond breaking, bond forming in organic reaction- hemolytic cleavage – heterolytic cleavage- reaction intermediates-formation,stability, and reaction of carbo cation, carbanion and free radicals.

Nucleophilic and Electrophils: Definition, types and examples-specific reactions involving these.

Types of reactions: Substitution, addition-elimination-rearrangement and polymerization – illustration with examples. (Mechanism not required)

Unit II:

1. Alkaloids: Definition- pharmacological properties and importance of the following alkaloids:Nicotine, cocaine, quinine, morphine . (Structural elucidation of not required).

2. Terpenes: Classification –isoprene rule- structure and uses menthol, camphor,citral and geraniol (Structural elucidation not requiresd)

Unit III

1. Classification and biological functions of vitamins A, B6, B12, C, D, E and K
2. Antibiotics: Classification and biological functions of antibiotics-pencillin, chloramphenicol, streptomycin and tetracyclines.

Unit IV

1. Dues; definition – theory of colors and constitution – classification based on structure and application.
2. Polymers; definition- classification- addition and condensation polymerization with examples – natural rubber- isoprene and uses of polystyrene – urea – HCHO resin- Teflon and buna s-rubber.

Unit V:

Stereoisomerism: 1. Chiral centre – optical activity of compounds containing one or two chiral centres- R-S-notation – enantiomers-diastereomers-racemization-tresolution. 2. Geometrical isomerism of maleic and fumaric acids , E-Z notation of geometrical isomers.

Note: Chemistry practical syllabus will be as per the existing Syllabus.

Part IV

Non major elective

HERBAL MEDICINE

Unit 1

Introduction : Scope - Alternative systems of medicine – advantages – human system – herbals for human system – definition.

Unit 2

Secondary metabolites : Source- different types – action – medicinal plants – pharmacological action – toxicity.

Unit 3

Herbal cultivation : Plant – types - Methodology – marketing – economic potential – pharmacological companies – manufacture – patency – GATT- TRIPS- WTO.

nit 4

erbal gardening : Types – methodologies – applications – home gardens – types – ethodologies – application – home made remedies – herbal formulations- herbal ysiotherapy.

nit 5

ant propagation : Definition – types – grafting – endangered plants- need for nservation– techniques – tissue culture – requirements - techniques - Micro propagation.

ference:

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

IRD SEMESTER

Core Subject

METABOLISM

it I:

Bioenergetics: High energy and low energy phosphates; Electron Transport chain, dative phosphorylation.

t II:

Carbohydrate metabolism: Conversion of simple sugars into glucose, Glycolysis, A cycle, Energetics of TCA cycle, HMP shunt, Glyconeogensis, Glycogenolysis, coneogenesis.

Unit III:

Lipid metabolism: Oxidation of Fatty acid, energetics of oxidation, ketone body metabolism, Glycerol metabolism, Biosynthesis of Triglycerides, phospholipids, Cholesterol metabolism (Structure is not needed)

Unit IV:

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

Unit V:

Nucleic acid metabolism - Purine and pyrimidine bases – Biosynthesis of purine, pyrimidine – biosynthesis of DNA and RNA –

References:

1. Harper's Illustrated Biochemistry- 26th edition, Robert K.Murray, 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.

Core Subject

MICROBIOLOGY

t I:

ganization and structure of microorganisms:

General classification of microorganisms and their characteristics. Prokaryotic anization- cytoplasmic membrane and their functions- mesosomes. Cell wall- gram itive and gram negative reactions, capsules and slime layers- Flagella and cilia- terial chromosomes, Plasmids, ribosomes, reserved food endospore.

it II:

cterial nutrition:

Growth and reproduction- autotrophic and heterotrophic nutrition- bacterial otosynthesis- Bacterial metabolism- fermentation: homo fermentative and hetero mentative types- Binary fission- other modes of reproduction- Conjugation- nsformation- transduction- sporulation- kinetics of bacterial growth - normal owth curve.

nit III

croscopy

Simple, compound microscope, light and dark field microscope, parts and their ictions, resolving power, aperture, electron, phase contrast microscope and their plications.

nit IV

plied microbiology

Food microbiology - food spoilage, food poisoning, food borne infection. dustrial microbiology - use of microbes in industries - ethanol, organic acid (lactic d citric), antibiotics (Penicillin and Streptomycin) production. Microorganism and ilk - fermentation of milk, milk souring, proteolysis, alkali production, sweet rding, butyric acid fermentation.

Unit V

Medical Microbiology

Pathogenesis and prevention of air and water borne diseases – Typhoid, Cholera, Dysentry, Diarrhea, hepatitis, amoebiosis, tuberculosis, pox diseases, diphtheria and poliomyelitis.

References:

1. Microbiology – A Human perspective, Nester, Roberts, Nester
2. Microbiology, Pelezar, Tata McGraw Hill company
3. Microbiology, 6/e Prescott, Harley and Klein, Tata McGraw Hill company 2006.
4. The Microbial world, Stanier, Prentice Hall
5. Microbiology, Tortora

Allied Subject

BIOLOGY-I

Unit1

a. Algae- Sargassum-structure and reproduction – importance of sea weeds.
b. Fungi-Yeast – structure and reproduction-economic importance of fungi.
c. Bryophytes-Funaria-structure and reproduction –alternation of generation.

Unit 2

d. Pteridophytes-selaginella-structure and reproduction –heterospory.
e. Gymnosperms-Pinus-structure and reproduction – economic uses.
f. Angiosperms-monocot flower – Allium cepa dicot flower-Tribulus terrestris.

Unit 3

1. Organisation and secretion of gastrointestinal tract in man.
2. Respiration-respiratory organ in mammals-morphology-respiratory pigment.
3. Blood and circulation-composition of blood-General organization circulatory system in man.
4. Excretion-excretory organs – general organization in man.

Unit 4

5. muscular system- ultra structure of voluntary muscle-construction of muscle.
6. Nervous system-central nervous system-autonomous nervous system.
7. Endocrine glands in man.
8. Reproduction- malesd and females reproductive systems in man-reproductive hormones – menstrual cycle-contraception.

Unit 5

Applied Biology: Vermiculture- vermicompost methods- advantages.Aquaculture-methodology and significance. Single cell protein- mushroom – spirulina- cultivation – nutritional values-biofertilizers-types – adnantages. Biocontrol agents- BT- uses.

Reference

1. Biotechnology – H.D. Kumar.
2. Applied plant Biotechnology – Ignacimuthu.

Part IV

Skill Based Elective

NUTRITION

Unit I:

Food groups, food habits, food fads and fallacies, changing food habits. Carbohydrates: Kinds, Functions, food sources- Fats: Kinds, Functions, food sources, essential fatty acids and cholesterol- Proteins: Kinds, Functions, food sources, complete and incomplete proteins- Energy: Basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement and energy value of foods.

Unit II:

Protein nutritional Nitrogen balance, Quality of food proteins and requirements, Protein nutrition abnormalities, Protein deficiency disorder, PEM- Balanced diet formulation- Assessment of nutritional status

Unit III:

Nutrition at various stages of growth and development- Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons. 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.Swaminathan, second edition.
3. Normal and Therapeutic Nutrition- Corine Robinson.

FOURTH SEMESTER

Core Subject

CLINICAL BIOCHEMISTRY

Unit I:

Introduction: scope of clinical biochemistry- Development of clinical biochemistry. Laboratory investigation in Clinical Biochemistry - Evaluation of laboratory test - Normal range- system of international units- Techniques used in clinical assays.

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.

it III:

Disorders of lipid metabolism: hypo and hyper Lipoproteinemias, disorders of iglycerides, Phospholipids and Cholesterol metabolism- Inborn errors of lipid etabolism.

nit IV:

Disorders of amino acid and protein metabolism: amino acid metabolism in arvation- disorders of Plasma proteins, urea, Uric acid, Creatinine, ammonia, Uremia, recemia and Porphyria- Inborn errors of amino acid metabolism.

nit V:

Disorders of Nucleic acid metabolism: Purine and Pyrimidine metabolism- Gout, NS, Orotic aciduria, Xanthinuria.

teferences:

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

Major Practical II

Analysis of Lipids:

a. Determination of iodine number

b. Determination of saponification number.

c. Estimation of total cholesterol.

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 Selivanoff's method.

iv. Estimation of reducing sugar in a fruit.

v. Estimation of lactose in milk.

Proteins:

a. Protein determination- Lowry's method

b. Protein determination - Biuret method.

Vitamins:

a. Determination of ascorbic acid (Colorimetry)

b. Determination of Nicotinic acid.

Allied subject

BIOLOGY – II

Unit 1

Structural organization of prokaryotes and eukaryotic cells. The nucleus, ultra structure of plasma membrane, mitochondria, rough and smooth ER, golgi apparatus, Lysosome and peroxisomes and plastids.

Unit 2

Molecular organization and membrane transport-different models and theories – fluid mosaic model- simple diffusion-Active transport – Na,K pump- Ca pump- ionohores.

Unit 3

Cell cycle-stages of mitosis and meosis-significance.

Unit 4

Genetics- introduction to metabolism- Mendel laws- Mendel experiments-monohybrid & dihybrid tests – Theories from Mendels experiments- One gene one enzyme hypothesis.

Unit 5

Population and evolutionary genetics-mutation, types of mutation – mutagenesis-role of mutation in evolution and speciation-altruism,mimicry-kin selection-Gene pool-hardy Weinberg law- applications – significance.

Reference:

1. Principles of Genetics – Gardner
2. principles of Genetics- Tamrine

Note: Biology practical syllabus will be as per the existing syllabus

Part IV

Environmental Studies: Common syllabus

FIFTH SEMESTER

Core Subject

MOLECULAR BIOLOGY

Unit I:

Origin of Molecular Biology- Prebiotic origin of Biomolecules- Self replicating Biomolecules- Advantages of compartmentalization of Biomolecules.

Unit II:

Chemical basis of hereditary- Nucleic acid as the genetic material - Chromatin structure and composition.

Unit III:

Fundamentals of DNA structure and its replication - - DNA damage-DNA repair-Introduction to Genetic code - molecular changes associated with Gene mutation

Unit IV:

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

Unit V:

Translation process - tRNA, rRNA, mRNA and their roles-Post translational regulation -. Ways of gene transfer, transformation, transduction, conjugation.

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, D. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (2nd ed) Freeman (1982).
3. Molecular Biology- Freifelder.
4. The cell & Molecular biology Geoffrey M. Cooper, 2nd Edition, 2000

Core subject

IMMUNOLOGY

Unit I

Definition: Immunity, host resistance, antigen, antibody, Leucocytes, lymphocytes etc., Principles of Innate and acquired immunity, Memory specificity - self/non self diversity - introduction to cells and organs of the immune system.

Unit II

Types of immunoglobulins - Ig M, Ig G, IgA, and Ig D, Ig E- structure of antibody molecule - IgG only .The nature of antigens- immunogen and hapten - T dependent and T independent antigens.

Unit III

Antigen antibody interaction- agglutination-preciptiation-immunodiffusion-immunoelectrophoresis-redioimmunoassay-immunofluorescence-complement fixation - ELISA-production of antisera- production of monoclonal antibodies..

Unit IV

Blood group antigen- Rhesus-incompatibility-major histocompatibility complex-

Unit V

Hyper sensitivity- types-mechanism-transplantation-graft rejection, tissue typing, immuno suppression, tumor antigen, cancer immuno therapy.

References

1. Roitt, I M, 2005. Essential of Immunology, ELBS, Blackwell Scientific Publication.
2. Kuby, J.2004. Immunology V Edition.W.H.Freeman and company, NY.
3. Immunology-Tizard
4. Immunology- Eli Benjamin

Core Subject

PLANT BIOCHEMISTRY

Unit I

Introduction: Occurrence, classification, structure and function of naturally occurring pigments, Carotenoids, flavones, flavanols 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.

it IV

Plant growth regulators: Normal growth hormones- Auxins, GA, Cytokinins, hylene and ABA - Synthetic growth hormones.

nit V

Physiology and reproduction: Brief account on physiology of germination- ormancy- Photoperiodism- Vernalization. Plant tissue culture.

eferences:

1. Plant Biochemistry by Devlin and Witham.
2. Plant Biochemistry by Ross and Salisburry
3. Plant Biochemistry by Bonner and Varner, 3rd edition, Academic press.
4. Plant Physiology by Hopkins.
5. Plant Physiology, Noggle Fritz

MAJOR PRACTICALS III

lood Analysis:

1. Blood sugar - Folin Wu method
2. Blood urea - Urease method
3. Blood cholesterol- Ferric chloride method
4. Blood uric acid - Molybdate method
5. Creatinine- Picric acid method
6. Serum phosphorus
7. Estimation of haemoglobin

2. Urine analysis

a. Qualitative analysis for urine (sugar, urea, uric acid & Creatinine)

3. Estimation of Any two enzymes

a. LDH

b. Acid phosphatase

c. Alkaline phosphatase

d. SGOT

e. SGPT

f. Amylase

g. Urease

Major Elective

MEDICAL LAB TECHNOLOGY

Theory

Unit I:

Blood of urine analysis

Blood analysis – collection and preservation of blood- anticoagulants- normal haematological values – prevention of clotting. Blood banking urine analysis- collection and preservation of urine. Macroscopic and microscopic examination of urine culture- chemical examination of urinary calculi.

Unit II

Mycology and Immunology

Mycology - Introduction to common fungal disease – Investigation of fungal infections candiosis, Mycetomos, Cryptococcus. Immunology – Collection and preservation of serum- Measurement of Antibodies, Agglutinations reaction, widals test, serological tests for syphilis- VDRL slide flocculation test, ELISA.

Unit III

Molecular Bilogy Techniques:

Plasmid Analysis- polymerase chain reaction for detection of diseses – sample processing for DNA extraction – DNA finger printing.

Reference:

3. Clinical chemistry – Teetz.
4. Practical chemistry – Varley.
5. Medical lab technology – M. Muckerjee.
6. Immunologu – Roit
7. Molecular biology – David frifelder.

Practicals

1. Urine culture and sensitivity.
2. prothrombin test
3. Widal test
4. Urine deposits
5. stone analysis
6. Bleeding time cloting time
7. Blood serum study for parasites.

Reference:

1. Medical laboratory techniques by – Godger

2. Haematology – Ramnik Sood.

Part IV

Skill Based Elective

PHARMACOLOGY

Unit 1:

General Introduction to pharmacology, Principle and Concept of pharmacology. Drug classes- herbal drugs and allopathy drugs.

Unit 2:

Drug metabolism:

Drug absorption, distribution, 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 3:

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

Reference:

Basic pharmacology – Henry, Hinter and Barbaroongle.

Pharmacological Microbiology – Hegho WB and Rusellael

Pharmaacological Chemistry- Satoskar Vol I and II

Skill Based elective

BIOINFORMATICS

Unit I

Internet basics – Browsing – web – pictures-Videolinks- search tips and tricks-On line journals- Literature database- Pubmed- Agricola – Homology and diversity – evolutionary basis of sequence alignment- searching for similarity.

Unit II

Computing: Basic codes, computer networking and computer analysis, brief introduction on database management systems (DBMS). Information networks: Internet, Web, HTTP, HTML and VRLS, EMB net, NCBI and virtual library – Medline, PubMed, Electronic journals.

Unit III

Sequence analysis; Sequence databases, biological databases and protein & nucleic acid sequence analysis. GCG – Genetic Computation Group – Wisconsin package. Analysis Packages: Commercial databases and software packages specializing in DNA analysis, internet packages BLAST & FASTA.

References:

Bioinformatics

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.

SIXTH SEMESTER

Core Subject

BIOTECHNOLOGY

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.

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

Production of Novel proteins – Insulin – Interferons- vaccines- Gene therapy- Treatment of Various human disorders.

Major Practical IV

1. Cleaning of glass wares
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. RBC, WBC count

7. ESR- Erythrocyte Sedimentation rate

8. Enumeration of E.coli in milk and ice cream

9. Water Quality analysis

Demonstration only

1. Separation of aminoacids by Paper chromatography, TLC
2. Separation of proteins by SDS – PAGE
3. Identification of nucleic acids by Agarose Gel Electrophoresis
4. Haemagglutination
5. Immunodiffusion

Major elective

FOOD TECHNOLOGY

1. Cereals and Pulses:

Grain characteristics and plants products – wheat milling process – pasta – nolldles- baking process. Rice processing- quick cooking dals- fermentation and germination.

2. Fruits and vegetables:

Structure, composition , physiological and biochemical changes during ripening, hardling and storage. Processing of vegetables. Fruit processing- citrus juices, apple juices, slices. Grape juice and raisins. Squashes jams, ketchups.

3. Milk and Milk products:

Milk pricessing – pasturisation, homogenization, packing – fortified milk,skim milk- cream, butter, cheese, ice creams, khoa, paneer, yoghurt.

4. Meat, fish, and eggs:

Aging, tenderizing, freezing- storage Fish preservation and processing- Dehydrated egg powder. frozen egg – egg storage.

Reference;

1. Hand book on food biotechnology by NIIR Board, New Delhi.
2. Food processing and preservation- B. Sivasankar , Anna University, Chennai
3. Food and Nutrition- Swaminathan.

Part IV

Skill based elective

BIOSTATISTICS

Unit I:

Introduction: Basis of Statistics- Definition- Statistical Methods- Kinds of Biological Data Collection, organization and Representation of Data:

1. Collection of Data - Types of data: primary Data, Secondary Data- Methods of Collecting Data.

2. Sampling and Sampling Designs- Meaning and definitions- Random and Non random sampling.

3. Editing the Data: Definition for editing, Objectives of Editing, Problems of Accuracy, Problems of approximation and errors.

4. Classification of Data: Meaning, Definition, Objectives of classification of Data.

   a. Ungrouped raw data- continuous- discrete variation.

   b. Univariate frequency distribution, Continuous frequency distribution, discrete frequency distribution.

   c. Cumulative frequency distribution

Unit II:

Tabulation: Meaning and definition - of parts of table - advantages.

Representation of the Data:

Diagrammatic: simple bar diagram, Rectangles, squares, circles or Pie diagram - Graphic representation: Histogram, Frequency- Polygon frequency curve, cumulative frequency curve or O give curve.

Measures of central Tendency:

Explanation, Types of averages:1. Arithmetic mean 2. Median 3. Mode Explanation problems related to: ungrouped data, Simple grouped data: continuous, discrete series.

Measures of Dispersion

Explanation, Types of dispersion: 1. Range, 2. Mean deviation 3. Standard deviation and Variance. Problems related to the above mentioned dispersion taking ungrouped data.

Unit III:

Measures of Symmetry:

Explanation and definition, Explanation for Skewness, Kurtosis of different types moments, Tests of Skewness, Measures of Skewness, Measures of Kurtosis (problems not necessary).

Probability:

Definition and Explanation:

1. Theorem and probability: addition theorem and multiplication theorem.
2. Types of theoretical distribution: Binomial distribution (simple problems, Poisson distribution and Normal distribution (explanation problems not

Unit IV:

Correlation and Regression

Correlation - Explanation

1. Types of Correlation: Positive and negative correlation- simple partial multiple correlation- linear and non-linear correlation.
2. A method of studying correlation using Karl Pearson's co-efficient correlation (simple problems related to correlation).

Regression analysis:

Explanation: Regression line - Regression equation: regression equation of X on regression equation of Y on X.

References

1. Statistical methods- S.P. Gupta
2. Biostatistics - A foundation for analysis in health science – Daniel
3. Biostatistical Analysis, Jerrold H. Zar, Fourth edition, Pearson Education, 2004
4. Research methodology- R.C.Kothari

Skill based elective

CLINICAL DIAGNOSTICS

Unit I:

Tissue function tests- Biochemical tests of Liver, kidney, and Pancreas Significance of tissue function tests.