

**MANONMANIAM SUNDARANAR UNIVERSITY  
TIRUNELVELI**

**UG COURSES – AFFILIATED COLLEGES**

**B.Sc. Biochemistry**

**(Choice Based Credit System)**

**(with effect from the academic year 2016-2017 onwards)**

**(44<sup>th</sup> SCAA meeting held on 30.05.2016)**

Sem.	Pt. I/II/ III/ IV/V	Sub No.	Subject status	Subject Title	Hrs./ week	Cre- dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	17	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	18	Language	English	6	3	25	75	100	30	40
		19	Core - 5	ENZYMOLOGY	4	4	25	75	100	30	40
		20	Major Practical- III	ISOLATION AND CHARACTERISA- TION OF BIOMOLECULES	2	-	50	50	100	20	40
	III	21	Allied -III	DIAGNOSTIC BIOCHEMISTRY	4	4	25	75	100	30	40
		22	Allied Practical-III	HAEMATOLOGY AND CLINICAL ANALYSIS	2	-	50	50	100	20	40
	IV	23	Skilled Based subject-I	A). BIOCHEMICAL DIAGNOSTIC TOOLS B). BLOOD BANKING	4	4	25	75	100	30	40
	IV	24	Non-Major Elective-I	A). BIO CHEMISTRY OF VISION B). VACCINOLOGY	2	2	25	75	100	30	40
	Subtotal					30	20				

Sem.	Pt. I/II/ III/ IV/V	Sub. No.	Subject status	Subject Title	Hrs. / week	Cre- dits	Marks					
							Maximum			Passing minimum		
							Int.	Ext.	Tot.	Ext.	Tot.	
IV	I	25	Language	Tamil/Other Language	6	3	25	75	100	30	40	
	II	26	Language	English	6	3	25	75	100	30	40	
	III	27	Core - 6		INTERMEDIARY METABOLISM	4	4	25	75	100	30	40
		28	Major Practical- IV		ISOLATION AND CHARACTERI- SATION OF BIOMLECULES	2	2	50	50	100	20	40
		29	Allied - IV		CLINICAL BIOCHEMISTRY	4	4	25	75	100	30	40
		30	Allied Practical- II		HAEMATOLOGY AND CLINICAL ANALYSIS	2	2	50	50	100	20	40
	IV	31	Skill Based Subject		A). PUBLIC HELATH STUDIES (OR) B). FORENSIC ANALYSIS	4	4	25	75	100	30	40
	IV	32	Non-Major Elective (select any one)		A).NUTRITIONAL BIOCHEMISTRY B). CHEMICAL BIOLOGY C). PRINCIPLES OF GENETICS	2	2	25	75	100	30	40
	V		Extension Activity	NCC,NSS, YRC, YWF		1						
Subtotal					30	25						

**MSU/2016-17/UG-Colleges/ Part III ( B. Sc. Bio chemistry)/  
Semester -III / Core - 5**

**ENZYMOLGY**

**Unit-1**

General characteristics of enzymes, enzyme specificity, Nomenclature, definition with examples of holoenzyme, apoenzyme, coenzymes, cofactors, activators, inhibitors, Unit of enzymes. Definition of IU, Katal, Enzyme turn over number and specific activity. Mechanism of enzyme action : Active site.

**Unit**

Enzyme kinetics: Factors affecting enzyme activity- enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis Menton equatin for uni substrate reactions. Km and its significance. Line weaver-Burk plot.

**Unit-3**

Enzyme inhibition: reversible and irreversible inhibition, competitive inhibition, non-competitive inhibition and un competitive inhibition. Allosteric enzymes.

**Unit-4**

Role of cofactors in enzyme catalysis NAD/NADP, FMN/FAD, Coenzyme ATP, Pyridoxal Phosphate, Tetrahydrofolate, Mechanism of action of chymotrypsin, lysozyme. Multienzyme complexes- pyruvate dehydrogenase complex.

**Unit-5**

Enzyme regulation: General mechanism, Feedback inhibition, Enzyme repression induction- Reversible and irreversible covalent modifications with specific examples. Immobilized enzymes and their industrial application. Isoenzymes and their medical application.

**References**

1. Principles of Biochemistry- Lehninger 3<sup>rd</sup> edition
2. Enzymes- trevor Palmer
3. Principles of Biochemistry- B.L.Smith
4. Agarwal's text book of Biochemistry- Goel publishing house
5. Harper's Review of Biochemistry 24<sup>th</sup> edition
6. Text book of Biochemistry- Lubert Stryer 4<sup>th</sup> edition
7. Principles of Biochemistry- Emil L. Smith, Abraham White, Philip Handler- 7<sup>th</sup> edition.

**MSU/2016-17/UG-Colleges / Part-III (B. Sc Bio chemistry)/ Semester – III & IV /  
Major Practical - III**

**ISOLATION AND CHARACTERISATION OF BIOMOLECULES**

**Demonstration experiments**

1. Separation of lipids by Thin Layer Chromatography
2. Separation of Proteins by SDS PAGE
3. Separation of plant pigments by Column Chromatography

**Estimations (Any ten)**

1. Isolation and Estimation of DNA ( Animal tissue, Plant tissue sources)
2. Isolation and estimation of RNA from yeast
3. Estimation of iron from Plant sources
4. Estimation of Protein from Soya bean
5. Estimation of Carbohydrates from Wheat
6. Determination of Saponification value of oil.
7. Estimation of calcium from milk
8. Estimation of Vitamin C from Citrus Fruits
9. Estimation of chlorophyll
10. Estimation of carotenoids
11. Estimation of fructose from fruit.
12. Estimation of Vitamin –E.

**References**

1. Laboratory Manual in Biochemistry- T.N. Pattambiraman -3<sup>rd</sup> edition
2. Laboratory Manual in Biochemistry – J. Jayaraman, New Age International Publishers
3. Biochemical methods – S. Sathasivam and , A. Manicham, New Age International Publishers
4. An Introduction to Practical Biochemistry – David . T Plummer – 3<sup>rd</sup> edition

## MSU/2016-17/UG-Colleges / Part-III (B. Sc Bio chemistry)/ Semester- III - Allied – III

### DIAGNOSTIC BIOCHEMISTRY

Total Hours : 80

#### Unit-1

16 Hours

Clinical chemistry tests- Blood group, glycosylated haemoglobin, fructosamine, GTT, uric acid, Ca, P, Fe, Cu, CSF analysis.

#### Unit-2

15 Hours

Enzymes: Acid phosphatases, LDH, CPK, CPK\_MB, Alpha amylase, Hormones- T3, TSH, LH. Immunoglobulins- IgA, IgM, IgE.

#### Unit-3

16 Hours

Serodiagnostic procedures- precipitation tests, VDRL test, Vidal test, (Slide and tube method) Brucella agglutination test, ASO test, RA test, CRP test.

Complement fixation test, skin test- Montaux test, Lepramin test.

#### Unit-4

12 Hours

Complete haemogram, complete urine analysis, complete motion analysis, semen analysis.

#### Unit-5

20 Hours

Blood bank, blood group and Rh factor, Coomb's test, Coagulation studies, Prothrombin test (PT), Partial PT, Plasma fibrinogen.

Test for amino acidurias- Test for phenyl ketonuria, DNPH, Test for keto acids, sodium nitroprusside test for Cystinuria and homocysteine.

### References

1. Varley.H (1985), Practical Clinical Biochemistry, IV Edition
2. Tietz. N (1982), Fundamentals of Clinical Chemistry, W.B. Saunders Company
3. Jacques Wallach (1982), Interpretation of Diagnostic test – A Synopsis, V Edition, Little Brown and Company.
4. Jone Zilva & Pannall.P.R. , Clinical Chemistry, Diagnosis and treatment, PG Publishing Pvt. Ltd.

**MSU/2016-17/UG-Colleges/ Part-III (B. Sc Bio chemistry)/ Semester – III & IV /  
Skill Based – I (A)**

**BIOCHEMICAL DIAGNOSTIC TOOLS**

Unit- 1

General laboratory and Instrument maintenance

Organization of laboratory and safety precautions in laboratory and personal cleanliness and care with regards to infected materials and chemical burns. Quality assurance and disposal of wastes. Cleaning of equipments and glasswares.

Maintenance and use of refrigerator, deepfreezers, incubators, ovens, water bath, autoclaves, centrifuges, anaerobic chambers etc. Maintenance and knowledge of various components of microscopes and applications of various types of balances.

Unit- 2

Clinical Biochemistry and Clinical Pathology

Principle, types, uses, care & maintenance of Photoelectric colorimeter, spectrophotometer and flame photometer. Principle, types, uses of Autoanalyser, Blood Gas analyzer & role of computers in laboratory.

Specimen collection: Whole blood, plasma, serum, urine, C.S.F & other body fluids, anticoagulants.

Quality control: Role of quality control and its importance. Accuracy, Reliability, Precision.

Biochemical test profiles: Principle and examination of glucose tolerance test, liver function tests, kidney function tests, thyroid function test and lipid profile.

Physical and chemical examinations of urine and microscopic examination for crystals, cells and casts. Semen analysis (count, motility, abnormal forms etc. ).

Unit- 3

Hematology

Collection of blood, preparation and use of different anticoagulant vials, preparation of blood smears, staining of blood film and mounting of slides.

Preparation of reagents for haemoglobin, counting of leukocytes, RBC, platelets and reticulocyte count, determination of ESR and PCV and techniques of these tests. Recognition of blood cells in peripheral blood smears.

Preparation of haemolysate and determination of foetal haemoglobin and haemoglobin electrophoresis, Preparation of reagents and techniques of coagulation profile, platelet profile.

#### Unit- 4

##### Microbiology

Cleaning and methods of sterilization of glasswares, media, instruments including syringes, needles and sharp instruments.

Preparation of media, plugging of test tubes, preparation of swab sticks, reagents, nutrient agar, blood agar, chocolate agar, Loeffler's serum, Dorsetts egg medium, L.J. medium, peptone water, sugar media etc.

Processing of sample for isolation of bacteria from blood, CSF, tissue, sputum, throat swab, wound swab, urine, pleural fluid, ascetic fluid, AFB culture etc. Drug sensitive tests.

Staining method: Gram stain, Ziehl-Nelsen stain, Albert's stain etc. Motility preparations, hanging drop preparation, steps in bacterial identification of Cocci, Corynebacteria, Diptheria, Mycobacteria, Gram negative bacilli and Gram positive bacilli.

#### Unit-5

Principles and techniques of agglutination, haemagglutination, Precipitation and Flocculation tests. Techniques of RA factor, CRP, ASO, VDRL, Widal. Principles of ELISA test and use of ELISA reader-TORCH, Auto Antibodies, Hepatitis, HIV testing and EBV etc. Principles and techniques of electrophoresis- Separation of plasma proteins and Immunoglobulins by gel electrophoresis.

#### References

1. Clinical Chemistry in Diagnosis and Treatment – Ziwa J.F.P Peter, Mayne P.D.
2. Practical Clinical Biochemistry – Varley Publications, W.H. Heinemann
3. A Biologist Guide to principle & techniques of Practical Biochemistry :- William & Wilson, Edward Arnold
4. Textbook of Biochemistry – Ramakrishnan Prasman & Rajan
5. Medical Biochemistry – M.N. Chatterjee, Shinde
6. Medical Biochemistry – Das
7. Clinical Laboratory Methods – John D. Benger
8. Clinical Diagnosis by Laboratory Examination, John A. Kokmer.
9. Textbook of Pathology, vol I & II – N.C. Dey
10. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D
11. Clinical Lab. Methods & Diagnosis, Vol I & II – Alex C, S L Garelt.
12. Clinical Lab. Methods – John D Benger, Pilip G. Achermann, Gelsaon Toro
13. Medical Laboratory Technology Vol I, II & III – Kanai. L. Mukherjee.

**MSU/2016-17/UG-Colleges/ Part-III (B. Sc Bio chemistry)/ Semester – III & IV /  
Skill Based – I (B)**

**BLOOD BANKING**

Unit-1

Composition of blood, Basic principle involved in Immunohaematology prior to blood transfusion, Collection of blood – requirements, preparation, Veinpuncture. Hemolysis and prevention. Separation of serum.

Unit-2

Blood collection for transfusion, Changes in blood on keeping, Anticoagulants in blood bank, Prevention of blood – precautions, Blood containers – Blood bags – Safety in blood bags.

Unit-3

Human blood group system – A, B, AB, O, Sub groups – A1 and A2 – Percentage of different groups, (D) factor system. Principles and Methods of blood grouping and Rh typing- tube and slide methods. Group interaction.

Unit- 4

Types and identification of various blood transfusion, Universal donar/recipient. Donar selection, Compatibility test – importance, types and methods – major and minor. Interpretation of compatibility test between all available donar and patient and reporting methods. Release of blood transfusion, Precautions to be followed.

Unit- 5

Screening procedures for blood transfusion – HbsAg, HCV, HIV (ELISA, Western blot tests), VDRL, TPHA, Identification of Malarial and filarial parasites and LD bodies (Principles and methods).

References

1. Clinical diagnosis and Management by laboratory methods by Henry Bernard, J., Sanford, T and Davidson, 2002. W.B. Saunders, New York.
2. Clinical Laboratory Methods and Diagnosis by Gradwohls, 2000. (ed) Ales C. Sonnenwirth and Leonard Jarret, M.D. B.I. publications, New Delhi.
3. Clinical Laboratory Medicine by Richard. R , 1989 Medical public., Chicago
4. Haematology by Williams and J. William, 1990 Mc Graw Hill, New York.
5. Medical Laboratory Technology Vol. I, II & III – Kanai .L. Mukherjee



**MSU/2016-17/UG-Colleges/ Part-IV (B. Sc Bio chemistry)/ Semester – III & IV /  
Non -Major Elective – I (A)**

**BIOCHEMISTRY OF VISION**

Unit -1

Introduction, human eye – Anatomy –Cornea, Sclera, Choroid, Ciliary body, Iris, Retina, Aqueous humor, Lens, Vitreous body. Structure and function of cones and rods.

Unit -2

Process of vision: Role of vitamin A in vision, Retinol transport, metabolism and function. Lens proteins – collagen, laminin, fibrinolection and proteoglycon.

Unit- 3

Retinal pigments and Phototransduction mechanism – second messengers- adenylyate cyclase system, phosphoinositide breakdown, Guanylate cyclase and ANF.

Unit-4

Biochemical composition of lens, retina, Vitreous and tears. Metabolism of carbohydrates in the lens, cornea and retina. Glucose transport, Insulin and aldose reductase. Glutathione metabolism in the lens.

Unit-5

Clinical disorders – Keratoconjunctivitis, Micin deficiency diseases, Corneal dystrophies, Muccopolysaccharidoses and Mucolipidoses, Aging and Cataracts, sugar cataracts, Radiation cataracts and Selenium cataracts and their risk factors, Glaucoma

References

1. Garrett and Grisham's textbook of Biochemistry, updated 3<sup>rd</sup> edition
2. Nelson DL and Cox, M M Lehninger, Principles of Biochemistry ( 4<sup>th</sup> ed. Freeman, 2005).
3. Textbook of biochemistry- White, Handler and Smith
4. Textbook of Anatomy – Guyton
5. Clinical Chemistry – Teity and Co
6. Textbook of Biochemistry- Lubert Stryer 4<sup>th</sup> edition
7. Donald Voet, J.G.Voet, John Wiley, Biochemistry, 1995.
8. Biochemistry of the eye by Elaine R. Berman. Published by Springer, 1991 ISBN 0306436337, 9780306436338 ([www.springer.com](http://www.springer.com))
9. Biochemistry of the eye David Whikehart, University of Alabama at Birmingham, Birmingham, AL, USA aperback, Butterworth Hainemann ([www.elsevier.com](http://www.elsevier.com))
10. Human eye physiology by Vaclav Hlavac ([www.sight savers.org](http://www.sight savers.org))

**MSU/2016-17/UG-Colleges/ Part-IV (B. Sc Bio chemistry)/ Semester – III & IV /  
Non -Major Elective – 1(B)**

**VACCINOLOGY**

Unit- 1

Introduction to infection and immunity, sources of infection and infectious diseases, Immunity- Innate and Acquired immunity prevention on infectious diseases- vaccines- Historical aspects- Edward Jenner, cowpox and small pox vaccine. Louis Pasteur and antirabies vaccine, 20<sup>th</sup> century developments – vaccines against diphtheria, rubella, tetanus, polio, eradication of small pox.

Unit-2

Types of vaccines- Live attenuated, killed, subunit, antitoxins, antivenom, vectored vaccines, nucleic acid (DNA) vaccines.

Currently licensed vaccines- Recombinant delivery systems for future vaccines- New approaches for better vaccines- Recombinant proteins produced in yeast, bacteria, cell culture or plants- synthetic peptides, Anti –idiotypic vaccines- Adjuvants.

Unit-3

Practices of immunization- therapeutic principles- new approaches to immunization- mucosal vaccine, maternal immunization. National Immunization schedule for pregnant women, neonatal and children recommended by WHO

Unit-4

Recombinant vaccines: polynucleotide as vaccines; vector vaccines; naked DNA vaccines; biosynthetic and chemically synthesized vaccines; subunit vaccine; anti idiotypic vaccines; fusion vaccines; mixed particle vaccines; human mucosal vaccines; Combination vaccines; Edible vaccines produced in transgenic plants and microencapsulation.

Unit- 5

EPI vaccines- production and testing of tetanus toxoid, diphtheria toxoid, pertussis vaccine, BCG vaccines; preparation of Hepatitis B vaccine and tissue culture derived rabies vaccine and research on AIDS vaccine

References

1. Roitt *et al.* Roitt's Essential immunology. 10<sup>th</sup> ed. Blackwell Sci. 2001
2. Richard A Goldsby *et al.* Kuby Immunology. 4<sup>th</sup> ed. WH Freeman & Co. 2003
3. Abbas *et al.* Cellular and Molecular Immunology. W. B Saunders Company, 2000
4. Janeway, C. (Ed). Paul Travers; Immunology 5<sup>th</sup> ed. Garland publ. 2001
5. Eli Benjaminini AU *et al.* Immunology 5<sup>th</sup> ed. Garland publ. 2001
6. NMS Series in Immunology. 3<sup>rd</sup> ed. Lippincott Williams and Wilkins.
7. Bier *et al.* Fundamentals of Immunology, Springer Verlag, 1986.

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester -IV / Core-6**

**INTERMEDIARY METABOLISM**

**Unit-1**

General introduction to metabolism Carbohydrates metabolism – glycolysis, oxidation of pyruvate to acetyl coA. TCA cycle, Bioenergetics, Cori's cycle, metabolism of hexoses- galactose, fructose, mannose, pentose phosphate pathway, Glyoxalate pathway, Glycogen metabolism, Glucuronate pathway, gluconeogenesis.

**Unit-2**

Lipid metabolism. Oxidation of fatty acid-  $\alpha$ ,  $\beta$  and  $\omega$  oxidation,  $\beta$ -Oxidation, role of carnitine in  $\beta$ -oxidation. Biosynthesis of fatty acid- saturated fatty acid- synthesis of palmitic acid, Unsaturated fatty acid – synthesis of linolenic acid, linoleic acid and palmito oleic acid, biosynthesis of triacylglycerol, biosynthesis of phospholipids, biosynthesis of cholesterol, break down of cholesterol to bile acid.

**Unit-3**

Bioenergetics- Laws of thermodynamics and concepts of free energy, enthalpy and entropy. Endergonic and exergonic reactions with suitable examples. High energy phosphate compounds and significance of ATP. Electron transport chain and its significance, inhibitors of ETC, oxidative phosphorylation- chemiosmotic theory, site of oxidative phosphorylation, P/O ratio, inhibitors and uncouplers of oxidative phosphorylation.

**Unit-4**

Amino acid metabolism. Transamination, deamination and decarboxylation of amino acids. Metabolism of non-essential amino acids – tyrosine, phenyl alanine, Urea cycle. Integration of carbohydrate, lipid and protein metabolism, ketogenesis.

**Unit-5**

Nucleotide metabolism- purine and pyrimidine biosynthesis and degradation.

**References**

1. Principle of Biochemistry- Lehninger 3<sup>rd</sup> edition
2. Biochemistry- David Rawn
3. Principles of Biochemistry- B.L.Smith
4. Agarwal's text book of Biochemistry- Goel publishing House
5. Harper's Review of Biochemistry- 24<sup>th</sup> edition
6. Text book of Biochemistry- Lubert Stryer 4<sup>th</sup> edition
7. Principles of Biochemistry- Emil L. Smith, Abraham White, Philip Handler- 7<sup>th</sup> edition

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester - IV / Major Practical**

**ISOLATION AND CHARACTERISATION OF BIOMOLECULES**

**Demonstration experiments**

4. Separation of lipids by Thin Layer Chromatography
5. Separation of Proteins by SDS PAGE
6. Separation of plant pigments by Column Chromatography

**Estimations (Any ten)**

13. Isolation and Estimation of DNA ( Animal tissue, Plant tissue sources)
14. Isolation and estimation of RNA from yeast
15. Estimation of iron from Plant sources
16. Estimation of Protein from Soya bean
17. Estimation of Carbohydrates from Wheat
18. Determination of Saponification value of oil.
19. Estimation of calcium from milk
20. Estimation of Vitamin C from Citrus Fruits
21. Estimation of chlorophyll
22. Estimation of carotenoids
23. Estimation of fructose from fruit.
24. Estimation of Vitamin –E.

**References**

5. Laboratory Manual in Biochemistry- T.N. Pattambiraman -3<sup>rd</sup> edition
6. Laboratory Manual in Biochemistry – J. Jayaraman, New Age International Publishers
7. Biochemical methods – S. Sathasivam and , A. Manicham, New Age International Publishers
8. An Introduction to Practical Biochemistry – David . T Plummer – 3<sup>rd</sup> edition

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester - IV / Allied – IV**

**CLINICAL BIOCHEMISTRY**

Total hours : 80

**Unit-1**

16 hours

Disorders of carbohydrates metabolism:

Hypoglycemia, hyperglycemia, diabetes mellitus-types, Clinical features, diagnostic tests- blood and urine tests, Benedict's method, glucose tolerance test, glycogen storage diseases, ketonemia and ketonuria.

**Unit-2**

16 hours

Disorders of lipid metabolism. Plasma lipids and lipoproteins- Hyper lipoproteinemia – types, LCAT deficiency, Hyper and hypo Cholesterolemia, atherosclerosis and fatty liver.

**Unit-3**

16 Hours

Disorders of aminoacid metabolism and protein abnormalities: Inborn errors of aminoacid metabolism- phenylketonuria, maple syrup urine disease, albinism, Hartnup's disease, Willson's disease, Gout, hypouricemia

Disorders of protein metabolism- proteinuria.

**Unit-4**

16 Hours

Liver and kidney function tests. Jaundice- types, clinical features, diagnostic tests- Vanderberg, fouchet's, Hay's test, test for urobilinogen. Renal clearance – urea, inulin and creatinine. Pancreatic function test.

**Unit-5**

16 Hours

Enzymes in clinical diagnosis, Isoenzymes- LDH, CPK, AST, ALT, Alkaline phosphatase, acid phosphatase. Electrophoretic pattern of isoenzymes in myocardial infarction, liver and muscular diseases.

**References**

1. Text book of Medical Biochemistry- M.N.Chaterjee and Rane Shinde
2. Biochemistry with clinical correlation – Devlin
3. Clinical Biochemistry – William Hoffman
4. Practical Clinical Biochemistry – Harold Varley
5. Textbook of Medical Biochemistry – S.Ramakrishnan, K.G. Prassanan and R.Rajan
6. Harper's Biochemistry 24<sup>th</sup> edition

Clinical chemistry – Teity and Co

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester –III & IV / Allied Practical**

**HAEMATOLOGY AND CLINICAL ANALYSIS**

**Haematology**

1. Identification of blood group
2. Differential count of leukocytes
3. Enumeration of RBC
4. Enumeration of WBC
5. Determination of Erythrocyte sedimentation rate
6. Estimation of haemoglobin by Drabkin's method
7. Estimation of blood sugar by OT method
8. Estimation of blood urea by Dam method
9. Estimation of serum creatinine by Alkaline picrate method
10. Estimation of serum cholesterol by Zak's method

**References**

1. Basic Medical Laboratory Techniques – Estridge, Reynold and Walter- 4<sup>th</sup> edition
2. Medical Lab Technology- Kanai L Mukherjee
3. Medical Lab Technology – Ramnik Sood
4. Laboratory manual in Biochemistry – T.N. Pattabiraman 3<sup>rd</sup> edition

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester -IV / Skill Based – II (A)**

**PUBLIC HEALTH STUDIES**

Unit- 1

Concept of health and diseases: - Preventive Medicine, Social Medicine, Definition of health, Dimension of health, Spectrum of health, Determinants of health and Indicator of Health. Natural history of disease, concept of disease control, levels of prevention and modes of intervention for diseases and condition, International classification of diseases and coding system.

Unit- 2

Principles of epidemiology and epidemiologic methods: Aims of epidemiology, epidemiological approaches, rates and ratios, measurements of mortality, measurement of morbidity. Epidemiology of communicable diseases - Small pox, chicken pox, influenza, diphtheria, Whooping cough, tuberculosis, Dengue, Malaria, Filariasis, Rabies, Plague, Japanese Encephalitis, Leishmaniasis, Leprosy, Sexually transmitted diseases and Acquired Human immunodeficiency syndrome.

Unit-3

Nutrition and Health: Concept of balanced diet. Common Nutritional deficiency disorders, Assessment of Nutritional status, Social aspects of Nutrition. Nutrition surveillance, Food hygiene, Milk hygiene, Meat hygiene, Food borne diseases, Community Nutrition Programmes, Diets in disease condition like Diabetes and hypertension

Unit- 4

Demography & Family planning: Demographic cycles, Demographic trends, fertility, National Health Policy, National Population policy, Contraceptive methods and its evaluation.

Health education and communication: Health education objectives contents, principles, communication in health education, Audio Visual, AIDS, Practice of Health education, Counselling process.

International Health agencies: WHO, UNICEF, Voluntary Health Agencies

Unit- 5

Health Programmes in India, Health Planning and Management: Health Planning Objectives, planning cycle, Management process methods and techniques, Health system in India, Evaluation of Health Services, Planning for a Health programme in a community, monitoring and supervision and ethics.

References

1. Park. K. Textbook of preventive and Social medicine. Jabalpur: Banarsidas Bhanot
2. Public health and preventive medicine - John M. Last
3. Textbook of public health - Hollance
4. Yash Pal Bedi, A, Handbook of Social and Preventive Medicine: Atma Ram and Sons
5. O.P.Ghai and Piyush Gupta- Essential preventive Medicine. 'Vikas publishing House Pvt. Ltd'.

**MSU/2016-17/UG-Colleges/ Part III (B. Sc. Bio chemistry)/  
Semester -IV / Skill Based – II (B)**

**FORENSIC ANALYSIS**

Unit-1

Forensic Science: Definition, History and Development.

Crime scene management and investigation; collection, preservation, packing and forwarding of physical and trace evidences for analysis

Unit-2

Fresh blood – grouping and typing of fresh blood samples including enzyme types.

Analysis of stains of blood and allied body fluids for their groups and enzyme types.

Cases of disputed paternity and maternity problems, DNA profiling

Unit- 3

Analysis of illicit liquor including methyl and ethyl alcohol and alcohol in body fluids and breathe.

Analysis of petroleum products. Chemical examination, physiology and pharmacology of Insecticides and pesticides.

Unit- 4

Psychotropic drugs- Sedatives, stimulants, opiates and drugs of abuse.

Extraction, isolation and identification of poisons from viscera, tissues and body fluids.

Unit- 5

Identification of hair, determination of species origin, sex, site and individual identification from hair.

Classification and identification of fibers. Examination and identification of saliva, Urine, faecal matter and milk. Examination and identification of semen stains including the species origin and individual characteristics.

References

1. An Introduction to Forensic DNA Analysis by Norah Rudin & Keith Inman USA, Second edition.
2. Forensic Science Handbook, Volume 2 & 3 by Saferstein, Richard E.
3. Forensics by Stewart Gail B
4. Forensics by Embar-Seddon, Ayn and Pass. Allan D.
5. Forensic Medicine by Adelman, Howard C & Kobilinsky, Lawrence



**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/  
Semester - IV / Non Major Elective – II (A)**

**NUTRITIONAL BIOCHEMISTRY**

**Unit - 1**

Introduction and definition of food and nutrition, Function of foods and its relation to nutrition and clinical health, essential nutrients, analysis of food composition, food groups, food habits.

**Unit - 2**

Physiological role, nutritional significance and food sources of carbohydrates, fats, proteins, minerals (calcium, phosphorous, sodium and potassium) and trace elements (copper, cobalt, zinc, iodine and iron)  
Protein malnutrition (Kwashiorkor) and under nutrition (Marasmus).

**Unit - 3**

Vitamins- definition, classification, sources, absorption, daily requirements, metabolism, physiology, nutritional significance and deficiency.  
Composition of balanced diet and RDA for infants, children, adolescents (male and female), pregnant & lactating women and old age.

**Unit – 4**

Measurement of food stuffs by Bomb calorimeter. Calorific values of proteins, carbohydrates and fats. Energy - basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs total energy requirement, estimation of energy requirement and energy value of foods.

**Unit - 5**

Nutritional value and Nutritional intake analysis: diet survey 24 hr recall and house hold data. Nutritional challenges in future , food production, food storages, functional foods, new protein foods, new fat foods and changing food habits. Food adulteration and hygiene.

**References**

1. Principles of nutrition and dietetics - M. Swaminathan
2. Normal and therapeutic nutrition - Corine Robinson
3. Human nutrition and dietetics - Davidson and Passmore
4. Food nutrition and diet therapy – Krause and Husscher
5. Advanced text book on food and nutrition – M. Swaminathan (Vol. 1 & 2)

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/  
Semester - IV / Non Major Elective - II (B)**

**CHEMICAL BIOLOGY**

**Unit - 1**

Structure and function of Macromolecules (Nucleic acids, proteins, carbohydrates and lipids) and their building blocks amino acids, purine and pyrimidine bases, fatty acids and sugars. Small molecules of biological importance: vitamins and minerals.

**Unit - 2**

Enzymes: classification, catalysis, kinetics, activation and inhibition. Coenzymes and cofactors and their relevant reactions, Allosteric enzymes.

**Unit -3**

Proteins: classification, Structure and Function. Primary, Secondary, Tertiary and Quaternary structure. Physical methods to study protein folding.

**Unit - 4**

Chemical approaches to study protein functions (Mutagenesis, Foldamer, unnatural amino acid incorporation, solid phase peptide synthesis, Non- ribosomal peptide synthesis), Proteomics kinases and phosphatases. Post translational modifications.

**Unit - 5**

Chemical biology applications: Bio imaging (GFP, metal detection), nucleic acid catalysis, catalytic antibodies, cell surface glycoproteins, engineered polyketide synthase, DNA- template synthesis.

**References**

1. Biochemistry by Donald Violet and Judith G. Voet, 3<sup>rd</sup> edition 2004
2. Protein Structure and Function by George A. Petsko
3. Nelson, DL and Cox, MM Lehninger, Principles of Bio chemistry (4<sup>th</sup> ed. Freeman, 2005)
4. Structure and Mechanism in Protein Science, Fersht, A. 3<sup>rd</sup> edition 1999
5. Bioorganic Chemistry, Dugas, H., 3<sup>rd</sup> edition 1996
6. Mechanism in Protein Chemistry, Kyte, J., 1<sup>st</sup> edition 1995
7. Principles of Bio inorganic Chemistry, Lippard, S.J & Berg, J.M.1994.

**MSU/2016-17/UG-Colleges/ Part IV (B. Sc. Bio chemistry)/  
Semester - IV / Non Major Elective – II (C)**

**PRINCIPLES OF GENETICS**

**Unit - 1**

Introduction to Genetics – Science of Heredity – Historical milestones – Classical, Molecular and Evolutionary Genetics. Cell – Overview, Cell cycle – Stages of Mitosis and Meiosis. Chromosome – Structure, Variation in structure, number of chromosomes (Haploid and Diploid), Variation in number.

**Unit-2**

Classical Genetics – Introduction to Mendelism – discovery and rediscovery of Mendelism. Mendel experiment – Monohybrid and Dihybrid test. Theories from Mendel's experiment, Test cross. One gene one enzyme hypothesis.

**Unit - 3**

Sex Determination, Linkage and Mapping – Sex determination – Sex chromosomes (XY system, Genic balance theory), Sex determination in human and plants, Dosage compensation. Sex linkage – X linkage, Inheritance – Dominant, Recessive and sex linked and extra chromosomal (Mitochondria and Chloroplast), Diploid mapping (TWO and THREE point cross over alone).

**Unit - 4**

Molecular Genetics – Structure of gene (Cistron, mucon and recon), Regulation of gene expression in prokaryotes – Operon model ( Lac operon alone). Regulation of gene expression in eukaryotes – developmental genetics of Drosophila. Regulation of gene expression in Virus – Genetics of lytic and lysogenic cycle.

**Unit - 5**

Population and Evolutionary Genetics – Hardy Weinberg equilibrium, natural selection Mutation – Fluctuation test, point mutation (frame shift, back mutation and suppression), chemical Mutagenesis and Ames test, Role of Mutation in evolution & Speciation, Altruism, mimicry, Kin selection & Industrial Melanism.

**References**

1. Principles of genetics – Tamrine
2. Principles of genetics – Gardner
3. Molecular Biology of the gene – Watson
4. Molecular and cell biology – Lodish, Baltimore
5. Genes VII (2000) Benjamin Lewin, Oxford University press