

M.Sc Biochemistry 2015-16

Semester II

2. Microbial Biochemistry

Unit I
Cellular organisation of bacteria with special reference to molecular organisation of cell wall, flagella and pili Identification and classification of bacteria

Unit II
Handling and sterility maintenance in microbiological work, Methods of isolation and pure culture techniques, **culture media**. Microbial nutrition, bacterial growth and its kinetics.

Unit III
Energy metabolism in bacteria-fermentation, aerobic and anaerobic respiration and bacterial photosynthesis, application of microbes in food industry, dairy products and food preservation.

Unit IV
Fermentation technology-Primary and secondary metabolites, continuous and batch type culture techniques, Types and design of fermentors, fermentation processes -brewing, manufacture of penicillin, production of other antibiotics and organic compounds, like acetone, ethyl alcohol, butanol, acetic acid and citric acid, single cell proteins. Microbial assay of vitamins and amino acids.

Unit V
Viruses-Structure, proteins, classification and methods of assay. Replication of RNA and DNA viruses. Virus-host interaction, Vaccines and their role in disease prevention.

Suggested reading:

1. Microbiology by Pelczar.
2. Microbiology by Wiley and Prescott.
3. Microbiology by Bagdi.

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D. K. Bagdi
B. K. Bagdi
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D. K. Bagdi

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गुरु
प्रभाकर
मराठीभाषातून स्थापित केल्या
या शाखेतून माहितीसाठी संपर्क (म.प्र.)

Unit I
Direct and indirect calorimetry. energy value of the foods, thermal equivalent of oxygen, respiratory quotient. calorigenic action of the foods, basal metabolic rate -definition and its measurement. factors affecting BMR, energy requirements of the human beings.

Unit II
Nutritional aspects of the carbohydrates-Different dietary types, available and unavailable carbohydrates, requirements, utilization and functions. Special role of the non-starch polysaccharides
Nutritional aspects of the lipids-Different dietary types, requirements, utilization and functions. Essential fatty acids

Unit III
Nutritional aspects of the proteins-Quality of proteins, digestibility coefficient, net protein utilization, biological value and amino acid score, protein requirements and functions.

Unit IV
Nutritional aspects of the vitamins -Fat soluble and water soluble vitamins.
Minerals, Micronutrients Na, K, Mg, Ca, P AND Micronutrient ; Fe, Zn, Cu, Co, Mn.

Unit V
Balanced diet-Recommended dietary allowances for different categories of human beings. Food processing and loss of nutrients during processing and cooking. Naturally occurring anti-nutrients.
Disorders related to the nutrition -Protein energy malnutrition, Starvation, Obesity.

Suggested readings:

1. Essential of nutrition-Swaminathan.
2. Clinical dietrtics & Nutrition-F.P.Anita & Abraham Philip.
3. Nutrition-shubhangini joshi.
4. Text book of medical biochemistry-M.N.Chaterjee and Shinde..

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M.Sc. Biochemistry 2015-2016
Semester II

Paper 4. Genetics

Unit I

Mendelian Inheritance: Segregation and Independent Assortment, Extension of Mendelism: Incomplete dominance, Codominance, Multiple Allelism, Testing for Allelism, Gene Interaction: Epistasis, Pleiotropy, Linkage, recombination and crossing over.

Unit II

Genetic mapping by recombination frequency in diploids: Two factor and three factor genetic crosses, Interference, Mapping functions, Linkage detection in fungi by tetrad analysis.

Unit III

Linkage in humans: Somatic cell hybridisation, Definitions of the gene, complementation test and its limitations, complementation mapping, Viral genetics: Recombination in bacteriophages, Genetic fine structure.

Unit IV

Genetic analysis in microbes: DNA transfer, transformation, transduction and conjugation and their mechanisms, mapping by recombination, genetic map of E. coli.

Unit V

Gene mutation: Molecular basis of mutation, Types of mutation, e.g. transition, transversion, frame shift, insertion, deletion, suppressor sensitive, true reversion and suppression: dominant and recessive, spontaneous and induced mutations, Mutagenicity testing: Chemical and physical mutagens and their actions DNA repair mechanisms: Transposable elements.

Suggested readings:

1. Principles of genetics-Gardner.
2. Genetics-Strickberger
3. Genetics-Snustad DP

Dr. V. S. Rao *Dr. S. S. Rao* *Dr. S. S. Rao*
Dr. S. S. Rao *Dr. S. S. Rao*

Dr. S. S. Rao
माताजीजाबाई भास्करराव कर्वे
विद्यालय, मोतीबाग, पुणे-४११००४

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MSc Biochemistry III sem
2015-16

Paper 2. Metabolism I

Unit I

The concept of Gibbs free energy, exergonic and endergonic reactions, redox potential. High energy bond and key position of ATP, substrate level and oxidative phosphorylation. ETC, Inhibitors and uncouplers of ETC

Unit II

Carbohydrates : glycogenesis and glycogenolysis, glycogen storage diseases glycolysis and gluconeogenesis, Cori's cycle,

Unit III

Pyruvate dehydrogenase complex, Krebs-cycle, glyoxalate pathway, pentose phosphate pathway and uronic acid pathway. Regulation of carbohydrate metabolism.

Unit IV

Lipids. Oxidation of fatty acids-mitochondrial β -oxidation, α - and ω -oxidation. Oxidation of unsaturated and odd-chain fatty acids, ketone bodies. Biosynthesis of fatty acids, desaturases.

Unit V

Phospholipids and glycosphingolipids-synthesis and degradation, lipid storage diseases. Cholesterol synthesis and degradation including bile acids Regulation of lipid metabolism

Suggested readings:

1. Text book of Medical Biochemistry-Chatterjee & Shinde..
2. Text book of Biochemistry - West and Todd
3. Text book of Biochemistry - Lehninger.
4. Text book of Biochemistry- O.P. Agrawal.
5. Biochemistry-Harper.

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प्राचार्य
राजजीवाबाई शास्. स्नात कन्या
मोतीबाबा शास्. स्नात कन्या

Paper 2. Metabolism II

Unit I

Proteins: Digestion and absorption of proteins, general reactions of protein metabolism, nitrogen balance, ammonia transport, urea cycle.

Unit II

Biosynthesis of non essential amino acids. Amino acid metabolism: Glucogenic and ketogenic amino acids, Pyruvate forming and glutamate forming amino acids, One carbon metabolism.

Inborn errors associated with them.

Unit III

Catabolism of methionine, aspartate, lysine, branched chain and aromatic amino acids. Inborn errors associated with them.

Unit IV

Biosynthesis and degradation of purines and pyrimidines and their regulation. Structure and regulation of ribonucleotide reductase. Inhibitors of nucleotide biosynthesis. Inherited disorders of purine and pyrimidine metabolism.

Unit V

Mineral metabolism : Biological role of minerals and trace elements, toxic effects of heavy metals, such as, Hg, Cd, Pb, As.

Suggested readings:

1. Text book of Biochemistry –Chatterjee & shinde.
2. Text book of Biochemistry - West & Todd
3. Text book of Biochemistry -Lehninger.
4. Text book of Biochemistry- O.P.Agrawal.
5. Biochemistry-Harper.

Dr. Leung
T. Shinde
Sandhu

प्राचार्य
माताजीजबाई शास. स्नातक कक्षा
व्य. मोतीतबेका इन्दौर

BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND GYMNOSPERMS

Paper III (P.G.-103)

Total Credit: 07

Teaching Hrs. 90

I PTERIDOPHYTA

General Characters of Pteridophytes . Classification of Pteridophyta.

Geological Time - scale. Process of fossilization & Types of Fossil .

Structure, reproduction & life history of Psilopsida (*Psilotum* , *Rhynia*) -12 Hrs.

II PTERIDOPHYTA

Types & evolution of stele . Heterospory & Seed habit

Structure, reproduction & life history of -

Lycopada (*Isoetes*, *Lepidodendron*), Sphenopsida (*Equisetum* , *Calamites*), Pteropsida (*Ophioglossum* , *Osmunda*) -12 Hrs.

III GYMNOSPERM

General Characters of Gymnosperms .

Classification of Gymnosperms .

Economic importance of Gymnosperms

General account of Pteridospermales (*Lyginopteris* , *Medullosa* , *Caytonia*)

- 12 Hrs

IV GYMNOSPERM

General account of Cycadeoidales (*Williamsonia*) Cordaitales (*Cordaites*)

Structure and reproduction of Cycadales (*Nilssonia* , *Cycas*), Ginkgoales (*Ginkgo*)

V GYMNOSPREMS

Structure & reproduction of -

Conferales (*Pinus*), Ephedrales (*Ephedra*), Welwitschiales (*Welwitschia*)

Gnetales (*Gnetum*). Evolution of Gymnosprems. - 12 Hrs.

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MSc. BIOCHEMISTRY SYLLABUS REVISED FOR 2016-17

SEMESTRE II

PRACTICAL II :PHYSIOLOGY & MICROBIOLOGY: 100 MARKS

1. Counting of RBC in blood sample.
2. Counting of WBC in blood sample. (Total & differential)
3. Determination of Haemoglobin in blood sample.
4. Determination of blood group.
5. Determination of bleeding time.
6. Determination of clotting time.
7. Cultivation, isolation and staining of microorganisms.

Srinay

D. Shetty

Ramesh Kumar

Sandhu

Prady
 प्राध्यापक
 माताजीजाबाई शास्. स्नात कन्या
 महाविद्यालय मोतीतबेला इन्दौर (म.प्र.)

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MSc. BIOCHEMISTRY SYLLABUS REVISED FOR 2016-17

Sem-I

Paper 2. Analytical Biochemistry

Unit I

The concept of pH, dissociation and ionization of acids and bases, pKa, buffers and buffering mechanism, Henderson Hasselbalch equation, ionization of amino acids and proteins, measurement of pH.

General principle and different types of chromatography, adsorption and partition, Column, Paper and Thin layer chromatography.

Unit II

Principle, materials used and applications of Ion-exchange chromatography, gel filtration chromatography, affinity chromatography and high performance liquid chromatography.

Unit III

Electrophoresis: Moving boundary and zonal electrophoresis, paper and gel electrophoresis, PAGE and SDS-PAGE, isoelectric focussing technique. Sedimentation: Sedimentation velocity, preparative and analytical ultracentrifugation techniques, differential and density gradient centrifugation, subcellular fractionation.

Unit IV

Radioactivity: Disintegration of radionuclides, half-life of radioactive compounds, measurement of radioactivity, GM counters, scintillation counting & autoradiography use of radioisotopes, *in vivo* and *in-vitro* labeling. Isotopic tracer techniques.

Biological Hazards & safety measures in handling Radioisotopes

Unit V

Spectrophotometry: Beer-Lamberts law, extinction coefficient and its importance, design of colorimeter and spectrophotometer, applications of uv-vis spectrophotometry. Atomic absorption spectrophotometry and its application in biology.

Principle of optical rotatory dispersion, circular dichroism and X-ray diffraction and their applications in structure determination. Principle of NMR spectroscopy, application of NMR in Biology. *ESR:- principle & application*

ESR - To be added

Suggested readings:

1. Analytical chemistry - Chatwal and anand.
2. Modern experimental biochemistry-Rodney and Boyer.
3. Biophysical chemistry - Upadhyay, Upadhyay and Nath

Arbany
Bandhi
Rath
 प्राचार्य
 माताजीजाबाई शास्. स्नातक विद्यालय
 महाराष्ट्र

M.Sc. BIOCHEMISTRY SYLLABUS REVISED FOR 2016-17

M.Sc. Semester II

Paper-1. Physiology

Unit I

Composition and function of blood, plasma and blood corpuscles, functions of plasma proteins, structure and function of haemoglobin, abnormal haemoglobins, Blood coagulation -mechanism and regulation. Blood groups.

Unit II

Structure of nephron, composition and mechanism of urine formation, glomerular filtration, tubular reabsorption of glucose, water and electrolytes, tubular secretion. Regulation of water and electrolyte balance, role of kidneys and hormones in their maintenance.

Unit III

Hydrogen ion homeostasis, acid-base balance, metabolic and respiratory acidosis and alkalosis. Respiratory unit, exchange and transport of respiratory gases in the body, role of 2,3 DPG, Bohr effect and chloride shift.

Unit IV

Classification of muscles, Structure of skeletal, smooth and cardiac muscles. Actin, myosin, tropomyosin, troponin, Z disc and H line components. The sliding filament mechanism and subcellular ion movements during the contraction cycle in skeletal muscles.

Unit V

Structure of neuron, nerve impulse, origin and transmission, neuromuscular junction, mechanism of nerve conduction, Reflex action and reflex arc.

Neurotransmitters & its types.
Types of Neurotransmitters

Suggested readings:

1. Physiology-C.C.Chaterjee(Vol1 and vol2)
2. Concise medical physiology-A.C.Lyuyton.
3. Principles of anatomy and physiology-CJ.Tortora.
4. Review of medical physiology-W.F.Ganong.

Signature: Anurag
Signature: Ishan
Signature: Sandhu

Signature: Gao
प्राचार्य
 माताजीजाबाई शास. स्नातक कक्षा
 महाविद्यालय नोहीतबेला इंदौर (म.प्र.)

Biochemistry 2018-2019

Semester I

Paper 3. Cell Biology

Unit I

Structure of plant and animal cell, plant cell wall and its composition, plasmodesmata, cytoskeleton, Cell – Cell Interaction.

Unit II

Biomembrane : models of the biomembrane, structure, constituents and fluidity and asymmetry of plasma membrane. Transport of metabolites across the plasma membrane, non-mediated and mediated, Exocytosis and endocytosis. Passive and active transport. Primary and secondary active transport.

Unit III

Structure of mitochondria, different enzymes and their location, electron transport complexes, ATPsynthase, mitochondrial DNA.
Structure of chloroplast, protein complexes and photosynthetic electron transport chain, DNA of the chloroplast.

Unit IV

Structure and functions of ribosomes and endoplasmic reticulum, protein sorting and signal hypothesis, Structure and functions of golgi body and lysosomes, mechanism of secretary processes.

Unit V

Nucleus : Structure of nucleus, nuclear membrane and chromatin.
Cell cycle and its regulation.

Suggested readings:

1. Cell and molecular biology-Roberties EDP.
2. Cell biology, Genetics and Molecular biology-P.S.Verma and K.Agarwal

~~Wadhwa~~

~~Bansal~~

~~Anand~~
~~Mehra~~

~~T. K. Ghosh~~
6-8-18

~~S. K. Ghosh~~

प्राचार्य
मानव जीवशास्त्र शाखा, महाविद्यालय
राजस्थान विश्वविद्यालय

Biochemistry 2018-2019
Semester II
Paper 4. Genetics

Unit I

Mendelian Inheritance: Segregation and Independent Assortment, Extension of Mendelism: Incomplete dominance, Codominance, Multiple Allelism, Testing for Allelism, Gene Interaction, Epistasis, Pleiotropy. **Pedigree Analysis.**

Unit II

Linkage, recombination and crossing over, Genetic mapping by recombination frequency in diploids: Two factor and three factor genetic crosses, Interference, Mapping functions, Linkage detection in fungi by tetrad analysis,

Unit III

Linkage in humans: Somatic cell hybridisation, Definitions of the gene, complementation test and its limitations, complementation mapping, Viral genetics Recombination in bacteriophages, Genetic fine structure. **Hardy Weinberg equation.**

Unit IV

Genetic analysis in microbes: DNA transfer, transformation, transduction and conjugation and their mechanisms, mapping by recombination, genetic map of E. coli.

Unit V

Gene mutation: Molecular basis of mutation, Types of mutation, e.g. transition, transversion, frame shift, insertion, deletion, suppressor sensitive, true reversion and suppression, dominant and recessive, spontaneous and induced mutations, Mutagenicity testing. Chemical and physical mutagens and their actions DNA repair mechanisms, Transposable elements.

Suggested readings:

1. Principles of genetics-Gardner.
2. Genetics-Strickberger.
3. Genetics-Snustad DP

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प्राचार्य
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जे.पी. लखेला, इन्दौर 27

M.Sc. Semester I (2019-20)
Paper 3. Cell Biology

Credit: 05
Marks: 80+20=100

Unit I

Cell : types of cell ,ultrastructure of plant and animal cell, prokaryotic ad eukaryotic cell, plant cell wall structure and composition and fuction, plasmodesmata structure and its function.

cytoskeleton : microtubules,actin filament,intermediate filament.

cell-cell interaction :types and junction, protein involve in junction.

Unit II

Biomembrane : models of the biomembrane structure, constituents and fluidity and assymetry of plasma membrane. Transport of metabolites across the plasma membrane, non-mediated and mediated, Exocytosis and endocytosis.Passive and active transport.Primary and secondary active transport.

Unit III

Structure of mitochondria, different enzymes and their location, electron transport complexes, ATPsynthase, mitochondrial DNA.

Structure of chloroplast, protein complexes and photosynthetic electron transport chain, DNA of the chloroplast.

Unit IV

Structure and functions of ribosomes and endoplasmic reticulum, protein sorting and signal hypothesis. Structure and functions of golgi body and lysosomes, mechanism of secretary processes.

Unit V

Nucleus : Structure of nucleus, nuclear membrane, nucleopore,nucleolus
Chromatin: heterochromatin and euchomatin special features and function.
Cell cycle: mitosis ,meiosis(interphase and M phase) and its regulation.

Suggested readings:

1. Cell and molecular biology-Roberties EDP.
- 2.Cell biology,Genetics and Molecular biology-P.S.Verma and K.Agarwal

M.Sc. Semester-(IV) (2019-20)**Practical I : Enzyme and protein study in serum (100marks)**

1. Assay of serum enzymes-acid phosphatase.
2. Assay of serum alkaline phosphatase.
3. Assay of serum enzymes SGOT and SGPT
4. Assay of serum enzymes amylase.
5. Electrophoretic separation of proteins
6. Determination of antigen concentration by radial immuno diffusion.
7. Determination of antibody concentration by ouchterlony double diffusion method.

Practical II : Estimations in serum (100marks)

1. Estimation of cholesterol in serum
2. Estimation of Chloride in serum
3. Estimation of Urea in serum
4. Estimation of Bilirubin in serum
5. Estimation of Uric acid in serum
6. Estimation of creatinine in serum
7. Estimation of calcium in serum
8. Estimation of phosphorous in serum

SCHEME OF PRACTICAL EXAMINATION FOR M.Sc. I to IV SEMESTER**Duration 7 hr**

1. Two experiments from the Semester wise list (60marks)
2. Viva (30marks) Record (10marks)

MATA JIJABAI GOVT.PG GIRLS COLLEGE
DEPARTMENT OF BIOCHEMISTRY

M.Sc. Semester-111 (2019-20)
Paper 2. Metabolism I

Credit: 05
Marks: 80+20=100

Unit I

The concept of Gibbs free energy, exergonic and endergonic reactions, redox potential, High energy bond and key position of ATP, substrate level and oxidative phosphorylation. Electron transport chain, Inhibitors and uncouplers of ETC.

Unit II

Carbohydrate metabolism : digestion and absorption of carbohydrates, glycolysis and its regulation, Pyruvate dehydrogenase complex, Krebs-cycle and its regulation, pentose phosphate pathway.fermentation (lactic acid and alcoholic fermentation)

Unit III

glycogenesis and glycogenolysis and their regulation, glycogen storage diseases. gluconeogenesis, Cori's cycle. uronic acid pathway.

Unit IV

Lipid metabolism: Oxidation of fatty acids-mitochondrial β -oxidation, α -and ω -oxidation in brief, Oxidation of unsaturated and odd-chain fatty acids, ketone bodies. Biosynthesis of saturated and unsaturated fatty acids, desaturase enzymes.

Unit V

Phospholipids and glycosphingolipids-synthesis and degradation, lipid storage diseases.Cholesterol synthesis and degradation including bile acids.Regulation of lipid metabolism.

Suggested readings:

1. Text book of Medical Biochemistry-Chaterjee& shinde..
2. Text book of Biochemistry - West and Todd
3. Text book of Biochemistry - Lehninger.
4. Text book of Biochemistry- O.P.Agrawal.
5. Biochemistry-Harper.

M.Sc.Semester-(IV) (2019-20)
Paper 2. Metabolism II

Credit: 05
Marks: 80+20=100

Unit I

Proteins: Digestion and absorption of proteins, general reactions of protein metabolism (deamination, transamination, decarboxylation), nitrogen balance, ammonia transport in body, urea cycle and its regulation.

Unit II

Biosynthesis of non essential amino acids (glycine, serine, cysteine, alanine, glutamate, aspartate, tyrosine, proline, asparagine, glutamine)
Glucogenic and ketogenic amino acids, Pyruvate forming amino acid (gly, ser, cys, thr, tyr) and glutamate forming amino acids (pro, arg, gln, his),
One carbon metabolism.
Inborn errors associated with them.

Unit III

Catabolism of methionine, aspartate, lysine, branched chain amino acid (valine, leucine, iso leucine) and aromatic amino acids (phenylalanine, tyrosine, tryptophan) Inborn errors associated with them.

Unit IV

Biosynthesis of purines and its regulation, degradation (catabolism) of purines.
Biosynthesis of pyrimidines and its regulation, degradation (catabolism) of pyrimidines.
Structure, function and regulation of ribonucleotide reductase enzyme.
Inherited disorders of purine and pyrimidine metabolism.

Unit V

Mineral metabolism : Biological role of major minerals (Na, K, Ca, P, Mg, Cl) and trace elements (Fe, Cu, Mn, I, Zn, Mo) toxic effects of heavy metals, such as, Hg, Cd, Pb, As.

Suggested readings:

1. Text book of Biochemistry – Chatterjee & Shinde.
2. Text book of Biochemistry - West & Todd
3. Text book of Biochemistry - Lehninger.
4. Text book of Biochemistry- O.P. Agrawal.
5. Biochemistry-Harper.