MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
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# MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI

## LEARNING OUTCOME BASED CURRICULAM FRAMEWORK

## M.Sc Medical Biochemistry Course

# Program Outcomes

Undergoing 3 years M.Sc Medical Biochemistry students should be able to garner

**Knowledge of Biomolecules**

- Biochemicals & their importance

- The various metabolic pathways

- Consequences of deficiency or excess of various biomolecules

- Abnormalities possible & their causes in metabolic pathways.

-Genetic / Molecular Biology in detail

- Disease processes & associated changes in various parameters

**Skills**

- To be able to interpret medical reports
- To be able to distinguish if an error in reporting
- To be able to troubleshoot in case of crisis in lab

**Analytical & Diagnostic**

- How to use knowledge gained to be associated with the clinical case.
- To be able to give advice on further diagnostic workup of a case.
- To help predict clinical outcome / line of management.
- To be able to think of newer ways or methods of analyzing biomolecules.
- To be able to have a researcher's mindset.

# Course Outcomes

## ACADEMIC SYLLABUSFOR SEMESTER-II

| | |
|---|---|
| Name of the Programme | **M. SC MEDICAL _eg. Medical Biochemistry_____** |
| Course Code | _____ |
| Name of the Course | **Part2 ( )_____** |

| | |
|---|---|
| **CourseObjective ( Teaching Objectives)** | To create keen interest in the molecular & genetic aspect of the existence & viability of a human body |
| **Course Outcomes ( earning Objectives)** | The student should be able to develop curiosity & the ability to seek answers. They should be able to get an exposure to the teaching research & diagnostic fields, so that they are able to take an informed decision for their career ahead. |

| Unit No. | Theory Topics | Hours allotted No. of hrs |
|---|---|---|
| 1. | Module 7 | 8 |
| | Carbohydrate Metabolism- Digestion of carbohydrates, Glucose transporters, Glycolysis, Rapaport-Leubering cycle, Citric acid cycle/ Kreb's cycle/ tricarboxylic acid (TCA) cycle, Pentose phosphate pathway (PPP), Glycogenesis, Glycogenolysis, Glucogenesis, Uronic acid pathway, Metabolism of galactose, Metabolism of fructose, Minor pathways of Carbohydrate Metabolism, regulation of blood glucose levels, Diabetes mellitus, Glucose Tolerance Test (GTT) | |
| 2. | Module 8 | 6 |
| | Lipid Metabolism- Digestion of lipids, Fatty acid oxidation, Biosynthesis of Fatty acids, Metabolism in the adipose tissue, Metabolism of ketone bodies, Metabolism of cholesterol, Fatty liver, Atherosclerosis | |
| 3. | Module 9 | 9 |
| | Protein Metabolism – Digestion & absorption, General pathways of amino acid catabolism (Transamination, Deamination, Decarboxylation, Transdeamination), Ammonia Metabolism (Urea cycle, Glutamine formation), Metabolism of Glycine, Aromatic amino acids, Sulphur containing amino acids, Glutamic acid | |

| Unit No. | Theory Topics | Hours allotted No. of hrs |
|---|---|---|
| 4 | Module 10 | 8 |
| a)<br><br><br><br><br><br><br><br><br><br>b)<br><br><br><br><br><br><br><br>c) | Nucleic acid Metabolism- Overview of the pathway of de novo synthesis of purine nucleotides (starting material & end products only- AMP & GMP), Salvage pathway for purine bases & nucleotides. Lesch-Nyhan syndrome (cause & biochemical basis of clinical features).<br>Overview of the pathway of degradation of purines to form uric acid, including role of the xanthine oxidase.<br>Hyperuricemia & gout (causes, clinical features, principles of treatment, including mechanisim of action of allopurinol & probenecid).<br>Overview of pathway of de novo synthesis of prrimidine nucleotides, showing only starting material, rate-limiting enzyme & end products.<br>Hb Metabolism- Heme synthesis, Heme degradation, Porphyria, Important physiological & pathological causes of jaundice in the newborn.<br>Genetic code- Characteristics (universal, umambiguous, degenerate, without punctuation[continous/commaless]). Basis of degeneracy of the genetic code (wobble hypothesis).<br>Protein Biosynthesis- Prokaryotic & Eukaryotic Replication, Transcription, Translation(Initiation, elongation, Termination, Inhibitors of protein biosynthesis ) in brief. | |
| 5 | Module 11 | 8 |
| a)<br><br>b)<br><br><br><br>c) | Detoxification- Definition & examples, Biochemical importance of the two phases of xenobiotic metabolism. The cytochrome P450 enzyme system.<br>Water & Electrolyte balance- Distribution of water in various body compartments. Intra-extracellular fluid composition (sodium & potassium), Blood volume & osmolality, Hormonal regulation of water balance & its disorders.<br>Acid & Base balance- Definition of acid, Base & buffer. Normal pH of body fluid & importance of maintaining normal pH, Sources of hydrogen ions in the body, Simple acid base disorders, Mechanisms of regulation of pH | |
| 6 | Module 12 | 6 |
| | Organ function test- LFT, RFT, TFT, PFT, GFT | |
| | **Total** | **45** |

**ACADEMIC SYLLABUSFOR SEMESTER-I**

| | |
|---|---|
| Name of the Programme | **M. SC MEDICAL _eg. Medical Biochemistry_____** |
| Course Code | _____ |
| Name of the Course | **Part1 ( )_____** |

| | |
|---|---|
| **CourseObjective ( Teaching Objectives)** | To create keen interest in the molecular & genetic aspect of the existence & viability of a human body |
| **Course Outcomes ( earning Objectives)** | The student should be able to develop curiosity & the ability to seek answers. They should be able to get an exposure to the teaching research & diagnostic fields, so that they are able to take an informed decision for their career ahead. |

| Unit No. | Theory Topics | Hours allotted No. of hrs |
|---|---|---|
| 1. | Module 1 | 4 |
| | Cell Biology- Biophysical principles of Basic Sciences, Structure & function of different cell organelles, Separation of cell organelles, Markers for cell organelles, Structure & function of cell membrane, Cytoskeleton elements, Transport mechanism, Ion channels, Artificial membrane (liposome & its application) | |
| 2. | Module 2 | 10 |
| a) | Chemistry of Carbohydrate- Definition, Physiological functions, Classification, Monosaccharide, Disaccharide, Polysaccharides, Properties of Carbohydrates, Epimers, Isomers, Mutarotation | |
| b) | Chemistry of Lipids- Definition, Physiological functions, Classification of lipids, fatty acids, Essential fatty acids , Simple lipids , Compound Lipids, Derived Lipids | |
| 3. | Module 3 | 10 |
| a) | Chemistry of Protein- Amino acids & their Classification, various ways of Classification of protein, Structure of protein, Properties of proteins, Isoelectric pH, Denaturation, Biologically important peptides | |
| b) | Chemistry of Nucleic acids- Nucleosides, Nucleotides, Purine & Pyrimidine bases, Types & structure of DNA, Types & structure of RNA | |

| Unit No. | Theory Topics | Hours allotted No. of hrs |
|---|---|---|
| 4. | Module 4 | 5 |
| | Enzyme- Definition , Nomenclature & Classification- Systematic & recommended nomenclature, IUBMB Classification of enzymes only (names, definition, general reaction catalyzed and one example for each class).<br>Properties of enzymes- Mechanism of action of an enzyme with regard to its effect on activation energy of a reaction. Concept of active sites in enzymes, Lock & key & induced fit models of enzyme- substrate binding, Specificity of enzymes- reaction & substrate specificity-definition & an example for each,<br>Cofactors- metals & coenzymes (definition, examples of coenzymes) & examples of enzymes that require them .<br>Factors that influence enzyme activity- Effect of pH (concept of optimal pH with examples).<br>Effect of temperature (concept of optimal temperature). Overview of concept of effect of substrate concentration (Michaelis- Mention equation(no derivation required), basic concept of $K_m$ & $V_{max}$).<br>Effects of enzyme & product concentration<br>Inhibition of enzymes- Types of enzyme inhibition – competitive, non- competitive, suicide inhibition, Examples of commonly used drugs that act by competitive inhibition of enzymes.<br>Regulation of enzyme activity – Overview of mechanisms involved in regulating the activity of enzymes, Allosteric activation & inhibition .Covalent modification- (phosphorylation & de phosphorylation ) Induction & repression , Concept of feed back inhibition.<br>Isoenzymes , Therapeutic & diagnostic uses of enzymes | |
| 5. | Module 5 | 15 |
| a) | Vitamins- Sources , RDA, Functions & deficiency manifestation of Fat soluble vitamins(A, D, E, K), Water soluble vitamins (B complex & Vitamin C) | |
| b) | Biological Oxidation- Role of ATP, The respiratory chain & oxidative phosphorylation, Role of brown fat (non-shivering thermogenesis & role of uncoupling protein / thennogenin). | |

| Unit No. | Theory Topics | Hours allotted No. of hrs |
|---|---|---|
| c) | Minerals- Sources, Functions & deficiency manifestation of Calcium, Phosphorus, Iron, Copper, Zinc, Magnesium, Maganese, Iodine, Sodium, Potassium, Fluoride, Selenium | |
| 6. | Module 6 | 8 |
| a) | Hb Chemistry- Structure & functions of Hb, Physiological Hb , Abnormal Hb, Hb derivatives | |
| b) | Hormone- Classification of hormones: Group 1 & Group 2 hormones | |
| c) | Signal Transduction – Mechanism of intracellular signaling of hormones, G protein coupled receptors. Second messengers in hormone action: cAMP, cGMP, Ca2+ & phosphatidyl inositol. Hoemone receptors as gene-specific transcription factors | |
| | **Total** | **45 hrs** |

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