

UNDERGRADUATE PROGRAMME IN BIOCHEMISTRY

Metabolism of Amino Acids and Nucleotides

THEORY

- 1. Overview of amino acid metabolism (8 lectures)**
Nitrogen cycle, incorporation of ammonia into biomolecules. Metabolic fates of amino groups. Digestion and absorption of dietary proteins. Protein calorie malnutrition - Kwashiorkar and Marasmus. Nitrogen balance, transamination, role of pyridoxal phosphate, glucose-alanine cycle, Krebs's bicycle, urea cycle and inherited defects of urea cycle.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p695-710, p881-891; Textbook of Biochemistry with Clinical Correlations (2011) Devlin, p841 and p1107]
- 2. Catabolism of amino acids (10 lectures)**
Catabolic pathways of individual amino acids. Glucogenic and ketogenic amino acids. Metabolism of one carbon units. Disorders of amino acids metabolism, phenylketonuria, alkaptonuria, maple syrup urine disease, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p710-726; Textbook of Biochemistry with Clinical Correlation (2011) Devlin, p771, p778, p1049]
- 3. Biosynthesis of amino acids (6 lectures)**
Overview of amino acid synthesis. Biosynthesis of non-essential amino acids and its regulation.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p891-902]
- 4. Precursor functions of amino acids (6 lectures)**
Biosynthesis of creatine and creatinine, polyamines (putresine, spermine, spermidine), catecholamines (dopamine, epinephrine, norepinephrine) and neurotransmitters (serotonin, GABA). Porphyrin biosynthesis, catabolism and disorders of porphyrin metabolism.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p902-910]
- 5. Biosynthesis of purine and pyrimidine nucleotides (6 lectures)**
De novo synthesis of purine and pyrimidine nucleotides, regulation and salvage pathways.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p910-916]
- 6. Deoxyribonucleotides and synthesis of nucleotide triphosphate (4 lectures)**
Biosynthesis of deoxyribonucleotides and its regulation, conversion to triphosphates, biosynthesis of coenzyme nucleotides.
[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p916-920]

7. Degradation of purine and pyrimidine nucleotides (4 lectures)

Digestion of nucleic acids, degradation of purine and pyrimidine nucleotides. Inhibitors of nucleotide metabolism. Disorders of purine and pyrimidine metabolism – Lesch-Nyhan syndrome, Gout, SCID, adenosine deaminase deficiency.

[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p920-925]

8. Integration of metabolism (4 lectures)

Integration of metabolic pathways (carbohydrate, lipid and amino acid metabolic pathways), tissue specific metabolism (brain, muscle, and liver).

[Lehninger: Principles of Biochemistry (2013) Nelson and Cox, p939-951]

Essential Readings

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470-60152-5.

PRACTICALS

1. Assay of serum transaminases – SGOT and SGPT.
2. Estimation of serum urea.
3. Estimation of serum uric acid.
4. Estimation of serum creatinine.