PROGRAMMA DEL CORSO 461ME-2 BIOCHIMICA

AA 2022 - 2023

Amminoacidi e Proteine: proprietà e caratteristiche principali

Proteine fibrose: struttura e funzione di alfa cheratine e collagene.

Proteine globulari: struttura e funzione di mioglobina ed emoglobina.

Enzimi: natura, proprietà, classificazione, esempi di reazione per classe, catalisi enzimatica, equazione di Michaelis-Menten, Km, grafico di Lineweaver-Burk, pH e temperatura ottimali, specificità di substrato e d'azione, inibizione reversibile ed irreversibile, inibizione competitiva e non competitiva, enzimi regolatori, enzimi allosterici, regolazione dell'attività enzimatica mediante modificazioni covalenti. Isoenzimi.

Vitamine e coenzimi: natura, relazioni tra vitamine e coenzimi, tiamina, riboflavina, niacina, acido pantotenico.

Metabolismo: caratteristiche generali del metabolismo, ATP come intermedio tra le reazioni cataboliche ed anaboliche.

Glicolisi: cenni di digestione dei carboidrati, reazioni della glicolisi, prodotti finali, regolazione, fermentazione alcolica, formazione di acetil-CoA.

Gluconeogenesi: sue reazioni, differenze con la glicolisi, costo energetico, regolazione reciproca di glicolisi e gluconeogenesi.

Metabolismo del glicogeno: degradazione, biosintesi e regolazione.

Ciclo dell'acido citrico: reazioni del ciclo, sua utilità, regolazione, prodotti, utilizzazione degli intermedi del ciclo.

Catena respiratoria e fosforilazione ossidativa: trasporto degli elettroni, coppie redox, funzione dei nucleotidi piridinici, NADH deidrogenasi, ubichinone, citocromi, fosforilazione ossidativa, ATP sintasi, sistemi shuttle per il trasporto dell'NADH nei mitocondri, regolazione e bilancio complessivo di: glicolisi, ciclo dell'acido citrico e catena respiratoria.

Degradazione dei lipidi: digestione dei lipidi, attivazione degli acidi grassi saturi, beta ossidazione degli acidi grassi, produzione di acetilCoA ed ATP, bilancio energetico, produzione di corpi chetonici e loro ossidazione in organi diversi dal fegato, regolazione.

Introduction: biomolecules, general characteristics, hierarchy, cellular hierarchy.

Amino acids: structure and properties

Peptides: structure and properties, peptide bond, peptides of biological interest.

Proteins: structure and biological functions. Classification. Fibrous proteins: alpha keratins, beta keratins, collagen. Globular proteins: myoglobin and hemoglobin. Intrinsically disordered proteins and prions

Protein purification and analysis

Immunoglobulins: structure and function. Applications in research.

Enzymes: nature, properties, classification, examples of reaction by class, enzymatic catalysis, Michaelis-Menten equation, Km, Lineweaver-Burk graph, optimal pH and temperature, substrate and action specificity, reversible and irreversible inhibition, inhibition competitive and non-competitive, regulatory enzymes, allosteric enzymes, regulation of enzymatic activity through covalent modifications.

Nucleotides: structure of the different types of nucleotides and biological functions

Vitamins and coenzymes: nature, relationships between vitamins and coenzymes, thiamine, riboflavin, niacin, pantothenic acid, pyridoxine.

Carbohydrates: Monosaccharides, main disaccharides, starch, cellulose, glycogen. Complex carbohydrates: heteropolysaccharides, proteoglycans, peptidoglycans, glycoproteins.

Lipids: saturated and unsaturated fatty acids, triglycerides, phospholipids, sphingolipids, cholesterol, fat-soluble vitamins.

Biological membranes: characteristics and functions. Transport across membranes

ATP: energy demand by the cell, □G ° ', ATP as an intermediate between catabolic and anabolic reactions, phosphocreatine, ATP and active transport.

Glycolysis: outline of carbohydrate digestion, glycolysis reactions, final products, regulation, alcoholic fermentation, formation of acetyl-CoA, outline of the supply pathways from oligosaccharides, polysaccharides, and monosaccharides other than glucose.

Biosynthesis of carbohydrates: gluconeogenesis, its reactions, differences with glycolysis, energy cost, reciprocal regulation of glycolysis and gluconeogenesis, intermediates of the citric acid cycle such as glucose precursors, glucogenic amino acids, gluconeogenesis and muscle work.

The pentose phosphate pathway.

Glycogen metabolism: degradation, biosynthesis and regulation.

Citric acid cycle: reactions of the cycle, its usefulness, regulation, products, use of cycle intermediates.

Respiratory chain and oxidative phosphorylation: electron transport, redox pairs, function of pyridine nucleotides, NADH dehydrogenase, ubiquinone, cytochromes, oxidative phosphorylation, ATP synthase, shuttle systems for NADH transport in mitochondria, regulation and overall balance of: glycolysis, citric acid cycle and respiratory chain.

Degradation of lipids: digestion of lipids, activation of saturated fatty acids, production of acetylCoA and ATP, energy balance, production of ketone bodies, their usefulness, their oxidation in organs other than the liver, regulation.

Lipoproteins: structure and functions

Oxidation of amino acids: hints of protein digestion, action of transaminases, ammonia formation, urea cycle, reactions, energy cost of urea synthesis, hints on the degradation of the carbonaceous skeletons of amino acids.

Lipid biosynthesis: fatty acid biosynthesis and regulation, mechanism of action of fatty acid synthase. **Biosynthesis of triglycerides.**

Cholesterol metabolism

Biosynthesis of amino acids: outline