



PRE-MEDICAL TRACK 2020/2021
McDaniel College Budapest Campus

BIO 1118 – HUMAN BIOLOGY

BIOLOGY TOPIC LIST 2020

1. CARBOHYDRATES
 - a. monosaccharides
 - b. disaccharides
 - c. polysaccharides
2. LIPIDS
 - a. triglycerides/triacylglycerols/neutral fats
 - b. phospholipids
 - c. steroids
 - d. carotenoids
3. AMINO ACIDS
 - a. general properties
 - b. classification (polar, non-polar, ionic (acidic and basic) special cases)
4. PROTEINS
 - a. four levels of organization
 - b. functions
 - c. denaturation
5. DNA
 - a. the structure of deoxyribonucleotides
 - b. four levels of organization
 - c. function
6. RNA
 - a. the structure of ribonucleotides
 - b. four levels of organization
 - c. functions of different types of RNAs
7. COMPARISON OF PROKARYOTIC AND EUKARYOTIC CELLS
8. COMPONENTS OF EUKARYOTIC CELLS
 - a. cell nucleus
 - b. endoplasmic reticulum
 - c. Golgi complex
 - d. lysosomes
 - e. mitochondria
 - f. cytoskeleton
 - g. centrioles, cilia, flagella
 - h. protein traffic within the cell

9. THE CELL MEMBRANE

- a. the fluid mosaic model
- b. components of the cell membrane and their functions

10. MEMBRANE TRANSPORTS

- a. transmembrane transports
 - i. simple diffusion
 - ii. osmosis
 - iii. facilitated diffusion
 - iv. primary active transport
 - v. secondary active transport
- b. vesicular transport (endocytosis, exocytosis and receptor-mediated endocytosis)

11. Classification of biochemical reactions

- a. endergonic and exergonic reactions
- b. catabolic and anabolic reactions
- c. the structure and the role of ATP in metabolism

12. ENZYMES, ENZYME REACTIONS

- a. activation energy
- b. biocatalysts
- c. properties of enzymatic reactions
- d. chemical composition of enzymes: apoenzyme, cofactor, coenzyme and prosthetic group
- e. regulation of enzymatic activity

13. CATABOLIC REACTIONS IN THE CELL

- a. cellular respiration
 - i. glycolysis
 - ii. acetyl-CoA formation
 - iii. citric acid cycle
 - iv. the electron transport chain and chemiosmosis
- b. fermentation
 - i. lactate fermentation
 - ii. alcoholic fermentation

14. PHOTOSYNTHESIS

- a. light-dependent reactions
- b. light-independent reactions

15. TRANSCRIPTION/RNA synthesis

- a. overview of gene expression
- b. phases of transcription
- c. post-transcriptional modification of pre-mRNA in Eukaryotes
- d. comparison of eukaryotic and prokaryotic transcription

16. TRANSLATION/Protein synthesis

- a. phases of translation
- b. comparison of eukaryotic and prokaryotic translation
- c. properties of the genetic code
- d. gene expression in retroviruses

17. THE CELL CYCLE and MITOSIS

- a. the organization of chromosomes
- b. the phases of the cell cycle
- c. the phases of mitosis
- d. overview of the regulation of the cell cycle

18. MEIOSIS

- a. sexual vs. asexual reproductions
- b. the phases of meiosis
- c. the comparison of mitosis and meiosis

19. Replication/DNA SYNTHESIS

- a. the semi-conservative nature of replication
- b. the phases of replication

20. Gene MUTATIONS

- a. base substitutions
- b. frameshift mutations
- c. effects of gene mutations (missense, nonsense and silent mutations and altered amino acid sequence)

21. GENETICS

- a. Mendelian genetics
 - i. basic terms
 - ii. Mendelian principles
- b. extension of Mendelian genetics
 - i. multiple alleles
 - ii. codominance and incomplete dominance
- c. non-Mendelian genetics
 - i. linkage
 - ii. sex-linkage
 - iii. polygenic inheritance
- d. human genetics
 - i. human karyotype
 - ii. determination of the sex
 - iii. chromosomal abnormalities in number and in structure

22. VIRUSES

- a. structure
- b. life cycle

23. BACTERIA

- a. structure
- b. reproduction
- c. metabolism

24. TISSUES

- a. definition of tissues
- b. epithelial tissue
- c. connective tissue
- d. muscle tissue
- e. nervous tissue

25. NEURONAL SIGNALING

- a. neurons
- b. glial cells
- c. resting potential
- d. graded potential
- e. action potential
- f. synapses
- g. neurotransmitters

26. NERVOUS SYSTEM

- a. organization and development of the nervous system
- b. spinal cord: structure and functions of the grey and white matter
- c. brain: structure and function of the following parts
 - i. brain stem
 - ii. diencephalon
 - iii. cerebellum
 - iv. cerebrum
- d. PERIPHERAL NERVOUS SYSTEM
 - i. structure: cranial and spinal nerves, ganglia
 - ii. function: somatic and autonomic division (including sympathetic and parasympathetic branch)

27. ENDOCRINE SYSTEM

- a. overview of chemical signaling
- b. mechanism of hormonal action
- c. hormones of the main endocrine glands
- d. endocrine malfunctions

28. REPRODUCTIVE SYSTEM

- a. male reproductive system
- b. female reproductive system
- c. menstrual cycle
- d. endocrine regulation of the reproductive organs
- e. conception and pregnancy

29. INTEGUMENTARY SYSTEM

- a. the structure and function of the skin

30. LOCOMOTION

- a. skeletal system
 - i. parts of the skeleton
 - ii. structure of bones
 - iii. bone development
 - iv. joints
- b. muscular system
 - i. structure of skeletal muscles
 - ii. neuromuscular junctions
 - iii. mechanism of muscle contraction

31. INTERNAL TRANSPORT

- a. overview of the organization and function of the cardiovascular system
- b. blood
- c. heart (structure, function, regulation)
- d. blood vessels (structure, blood pressure and its regulation)
- e. the lymphatic system

32. RESPIRATORY SYSTEM

- a. overview of the processes involved in organismic respiration
- b. airways and lungs
- c. mechanics of ventilation
- d. gas exchange
- e. regulation of respiration

33. DIGESTIVE SYSTEM

- a. overview of the processes involved in food processing
- b. structure of the digestive tract
- c. digestion
- d. absorption
- e. neural and hormonal regulation

34. EXCRETORY SYSTEM

- a. overview of excretion and osmoregulation and the organs involved
- b. parts of the urinary system
- c. parts of the kidney
- d. processes of the kidney: filtration, reabsorption, (tubular secretion)
- e. hormonal regulation

35. IMMUNE SYSTEM

- a. nonspecific immune responses
- b. specific immune responses
 - i. cell-mediated immunity
 - ii. antibody-mediated immunity
 - iii. immunological memory
- c. phenomena related to the immune system (immunization, Rh-incompatibility, AIDS, allergy, graft rejection),

36. SENSE ORGANS

- a. the mechanism of sensation, transmission and perception, receptor potential
- b. the classification of receptors,
- c. chemoreception: tasting and smelling
- d. hearing and balance: the structure and function of the human ear
- e. vision: the structure and function of the eye

37. EVOLUTION

- a. Origin of life, chemical evolution, RNA world
- b. Darwin and the theory of natural selection

