Molecules, Genes and Cells Learning Objectives

By the end of the course, the student should be able to:

Knowledge
1. (K1) Explain the structure and function of proteins and lipids.

2. (K1) Discuss the structure and function of plasma membrane lipid bilayers, membrane proteins, and membrane channels, and the regulation of water flow and ion transports.

3. (K1) Describe the gene structure and function, nucleus organization, and regulation of transcription and translation.

4. (K1) Identify cell secretory processes, intracellular transport mechanisms, and receptor-mediated endocytosis.

5. (K1) Explain mechanisms and regulation of cell cytoskeleton.

6. (K1) Summarize cellular structure, cellular organelles, and the benefit of compartmentalization.

7. (K1) Identify blood cells types and explain their functions.

8. (K1) Explain the process of hematopoiesis and the concept of stem cells and identify the stages of development of the erythroid and myeloid lineages.

9. (K1) Describe the fundamental aspects of inflammation, including participating cells.

10. (K1) Discuss the structure and function of the extracellular matrix.

11. (K1) Explain the histology of epithelium, blood, connective tissue, bone, cartilage, and muscle.

12. (K1) Explain the electrophysiology of nerve action potential and the events underlying neuronal activity, impulse propagation, and synaptic transmission.

13. (K1) Compare different types of receptor and receptor signalling.

14. (K1) Explain receptor/ligand interactions and drug interactions with receptors.

15. (K1) Explain transmembrane and intracellular receptor signaling, and signalling cross-talk.
16. (K1) Identify the central metabolism of carbohydrates, lipids, nucleotides, and amino acids.

17. (K1, K5) Describe the fundamental processes of cancer development, the role of oncogenes and tumor suppressor genes in that process, and factors leading to the metastatic process.

18. (K1, K5) Explain the molecular basis of genetic diseases (e.g., lysosomal storage diseases, Von Willebrand disease, cystic fibrosis, Batten disease, bioterrorism [plague]), and therapies (e.g., protein replacement therapy, RNA interference, viral vector-based gene therapy).

19. (K1) Identify different blood and bone marrow cell types at the microscope.

20. (K1) Recognize tissue types at the microscope.

Skills
21. (S1, K1) Evaluate inheritance patterns and genetic risk.

22. (S1, K1) Assess genetic risk for individuals and populations.

23. (S3) Critically read modern biomedical scientific literature.

24. (S1, S10) Investigate and analyze medical cases relevant to course subject matter.

25. (S3, S11) Research topics, share relevant information, and develop problem-solving skills.

Attitudes:

26. (A4, A5) Respect the views, time, and participatory rights of classmates and faculty in small and large group teaching settings

How Students are Assessed

Methods for assessing student achievement of course learning objectives include bi-weekly quizzes, performance in problem-based learning and journal club sessions, a practical exam in histology, and a final Triple Jump Exam.

Note: K, S, and A, with corresponding numbers in parentheses (e.g., K1, S2, A4), refer to Weill Cornell Medical College’s Educational Objectives of the program leading to the MD degree found at http://weill.cornell.edu/education/curriculum/edu_obj.html