

Molecular, Cell Biology and Genetics Course Learning Objectives

At the end of the course students will be able to:

MEDICAL KNOWLEDGE COMPETENCY

1. Utilize the principles of evidence-based medicine to search electronic resources, identify, and appraise medical literature relevant to the pathogenesis or treatment of a disease of your choosing, and provide a written report of your findings to MCBG faculty members for feedback.
2. Discuss the structure and function of proteins including the roles of individual amino acids in protein folding, charge, acid/base properties, and protein-protein interactions, using hemoglobin as one example.
3. Explain the principles of enzyme kinetics and how enzyme activity can be altered by drugs that act as competitive, non-competitive or irreversible inhibitors.
4. Analyze and interpret data and graphs related to protein expression and function, enzyme kinetics, and malfunctions of these processes in disease
5. Discuss chromatin structure and how it can be modified to affect gene expression.
6. Explain the mechanisms of DNA replication and repair, RNA synthesis and processing and protein synthesis in eukaryotic cells.
7. Describe how gene expression is regulated at the transcriptional and post-transcriptional level.
8. Analyze and interpret data and graphs generated from common laboratory techniques used to manipulate and amplify DNA, measure RNA expression, detect alterations and mutations in DNA including their role in the diagnosis of disease.
9. Apply the principles of genetics to produce a family pedigree from a family history and distinguish different patterns of inheritance for single gene disorders linked to autosomes, sex chromosomes and mitochondrial genes.
10. Describe methods used to determine the relative contribution of genes and environment to common disorders with complex inheritance, and to provide genetic counseling based on empirically derived risk tables.
11. Demonstrate an understanding of population genetics including allelic frequency, genotypic frequency, and the Hardy-Weinberg equation.
12. Perform a literature search on a specific genetic disease and inform other students of the findings in a written abstract and an oral presentation.
13. Demonstrate an understanding of cell structure and the functions of organelles.

14. Describe the mechanisms of vesicular and protein transport to various subcellular sites.
15. Discuss the mechanisms of cell to cell signaling, including intracellular second messenger pathways.
16. Analyze and interpret data and graphs related to cell biology and its malfunction in disease.
17. Explain the cell cycle and its regulation, including the mechanism of mitosis.
18. Demonstrate an understanding of molecular pathways that are altered in cancers including oncogenes, tumor suppressors, apoptosis, angiogenesis, and DNA repair.
19. Analyze and interpret data and graphs related to targeted cancer drug therapy involving cultured cells, animal models, and human clinical trials.

INTERPERSONAL AND COMMUNICATION SKILLS COMPETENCY

1. Demonstrate the ability to effectively communicate and work collaboratively with peers in the small group setting to successfully address problem sets in molecular cell biology and genetics.
2. Contribute to the education of peers by actively engaging in small group sessions and by clearly communicating information in an oral presentation based on a personal literature search on a specific genetic disease.

PRACTICE-BASED LEARNING AND IMPROVEMENT COMPETENCY

1. Critically evaluate one's performance in the course to identify strengths and personal limitations in either knowledge or study methods; develop learning goals to address any deficiencies and actively seek out assistance from appropriate sources to successfully remediate those deficiencies.
2. Demonstrate an ability to use online resources to objectively identify and evaluate the primary basic scientific and clinical literature relevant to the molecular basis and treatment of disease.

PROFESSIONALISM COMPETENCY

1. Demonstrate professional behavior by completing all course requirements, including course evaluations, in a timely manner
2. Demonstrate professionalism by behaving in a professional, courteous, and respectful manner when engaged in course activities or interacting with course faculty and staff.
3. Demonstrate responsibility and accountability by attending and being punctual at all required course activities such as small groups, team-based learning exercises, and exams.
4. Demonstrate professional behavior by requesting any excused absence from required course activities well ahead of the scheduled date.
5. Demonstrate professional behavior by responding to direct communication from the Course Director in a timely fashion, particularly in circumstances when a face-to face meeting is requested to discuss issues related to academic performance
6. Demonstrate professional and ethical behavior by honestly completing course examinations without attempting to seek an advantage by unfair means; and by reporting any unethical behavior of peers to the course administration.