MOLECULAR BIOLOGY and BIOCHEMISTRY
Course Description

Molecular Biology AB
(Annual Course Grade 12)
Prerequisite: Completion of one physical science and one life science course.

Molecular Biology A Semester I 360721
Molecular Biology B Semester II 360722

Course Description

The major objective of the course is to provide students with a comprehensive overview to understand the basic concepts in molecular biology and biochemistry. These concepts include structure and diversity of cells, cellular function, gene regulation and gene expression, protein specificity and structure, cell signaling cascades, cell cycle and cancer, bioenergetics, and cellular communication. The course is laboratory-based and requires extensive student participation in laboratory experimentation to enhance independent and critical-thinking. The molecular biology course is a new course, reinforces the biological sciences content standards and goes beyond the scope of the two required courses of physical science and life science. It meets the UC entrance requirements for laboratory Sciences.

Standards: Science
Content knowledge and skills gained during this course will support student achievement of the science standards.
Upon completing one year of this course in LAUSD, students will be able to:

2. Describe, analyze, and predict the behavior of a physical system with the aid of mathematical models.
3. Describe, analyze, and predict chemical reactions, the biochemical basis of organic life, and the impact of chemicals on the environment, using knowledge of the periodic table and mathematics where applicable.
4. Analyze and explain examples of biochemical processes that are the basis of life, such as photosynthesis, respiration, and gentic inheritance.
5. Engage in effective inquiry into scientific problems by asking original questions, evaluating evidence, and drawing reasonable conclusions based on this evidence.
6. Examine and explain relationships among different scientific phenomena using experimental evidence, logical argument, graphs, mathematical equations, and other resources.
7. Design and conduct an investigation based on an original question; follow appropriate safety and ethical guidelines; use findings to revise ideas and assumptions and to design future investigations.
8. Use technology, scientific instruments, and equipment to collect, store, and analyze data; analyze how technological advances contribute to scientific progress and lead to new problems and questions.
9. Evaluate proposed solutions to challenges facing the earth and its inhabitants through the application and integration of the main concepts of the various branches of science.

Representative objectives

Students will be able to

1. explain the principles of protein and nucleic acid structure, the process of assembly of biological macromolecules and their function in the cell *(California Content Standards Biology 1b; Chemistry 10a-c, e).*
2. discuss DNA coding of proteins and describe control mechanisms regulating DNA replication, transcription and translation *(California Content Standards Biology 1d; 4a, b; 5a).*
3. demonstrate how modern technology of molecular biology is applied to clone, sequence DNA, identify genes, and gene therapy *(California Content Standards 5c-e).*
4. describe the primary sequence of proteins as the determinant of conformation and function using specialized proteins that have dual catalytic and structural roles as examples *(California Content Standards Biology 4d-f; Chemistry 8a-d, 9b).*
5. describe metabolic pathways of bioenergetics that generate and maintain a constant supply of ATP to meet the energy requirements of cellular activities *(California Content Standards Biology 1g; Chemistry 7a, b, f).*
6. describe the significance of signal transduction in cell metabolism, protein sorting and transport across cell membranes, cell to cell communication, cell transformation and apoptosis *(California Content Standards Biology 1a, c; Chemistry 11d, e).*
7. describe basic membrane properties, synapses, structure of neurons and nervous systems; ionic mechanisms responsible for generating membrane potentials, action potentials and synaptic potentials, information transduction, receptor proteins *(California Content Standards Biology 9b-e; Chemistry 5d, f, g).*
8. Demonstrate and describe the functions of specific tissues such as epithelial, blood, and connective tissue and extracellular matrix proteins associated with it, their assembly into supramolecular structures and their interactions with cells and influence on tissue formation *(California Content Standards Biology 1a, b, h; 9a; 10a, b; Chemistry 6a, c, d, f).*

Instructional Units

	Suggested Weeks[#]	
	Year – round	**Traditional**
Membrane Structure and Function; Lipids	2	3
Protein Structure and function; Catalysis	2	3
DNA and the Nucleus; replication; transcription of the genetic code; gene expression and regulation	5	6
Protein Synthesis; vesicular transport; protein sorting	3	4
Cell architecture; Connective tissue; Microfilaments; cytoskeletal structure; Microtubules; intermediate filaments	4	5

Cell Adhesion; cell environment; Physiological buffering	3	3
Extracellular matrix; cellular junction	2	2
Recombinant DNA technology	2	2
Respiration; energy of respiration; Bioenergetics	3	3
Control of cell cycle; cell- signaling Cascades; cancer	3	3
Blood; enzymes; pH and buffers	3	4
Total	**32**	**38**

[#] Suggested weeks are to be used as an estimate only. Changes in the amount of time spent on each unit are to be based upon the needs of the students, the instructional program, and the scheduling needs of the school.

Recommended Textbook

"MOLECULAR BIOLOGY OF THE CELL" by Bruce Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts, P. Walter. 4th Edn. 2002.

ISBN 0-8153-1619-4

Price: $105.00
Garland Publishing, Inc., 717 Fifth Avenue, New York, N.Y. 10022.

How Parents Can Help

- Provide your child space to study and make sure he/she completes assignments on time.
- Encourage your child to think about educational and career goals and discuss how specific coursework will assist in achieving them.
- Become involved in various educational activities and other programs to learn about the instructional and curricular programs at school.
- Recognize your child's academic achievements and accomplishments in school activities.
- Communicate with your child's teachers, counselor, and other school staff on a regular basis. Attend parent-teacher conferences and obtain provided information on school activities.
- Contact Parent Resource Network at (800) 933-8133.

UC REQUIREMENTS

Cell Adhesion; cell environment; Physiological buffering	3	3
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