

**MEDFORD HIGH SCHOOL
COURSE SYLLABUS**

Department:	Science
Course Title:	Biology
Level and/or Grade:	Honors; Grades 9-10
Prerequisite:	A grade of "A-" or better in grade 8 science, qualifying score on the science placement exam in grade 8; a grade of "A-" or better in Introductory Physics.

Course Description:

This is a course for students selected by the Science Department for acceleration in Grade 9 or 10. Strong mathematical and reading abilities are essential. Standards are covered in more depth and at higher levels of sophistication than those for the standard level course. The course emphasizes inquiry, research, and lab-based experiences to explore the fundamental principles of living things and examine systems from the molecular level through cell biology and genetics, to the tissue and organ level in vertebrate anatomy and physiology, and at the level of organisms and populations through ecology. Students encounter standards in the areas of *The Chemistry of Life, Cell Biology, Genetics, Anatomy and Physiology, Evolution and Biodiversity, and Ecology*. In classes where dissection is used as an instructional activity, students will be presented with alternatives as described in the district's Dissection Policy.

Learning Standards: *Through inquiry, experimentation, labs, use of tools, discussion, presentation, and composition, students will be able to...*

The Chemistry of Life:

- ◆ Recognize the six most common elements in organic molecules: C, H, N, O, P, S.
- ◆ Identify the types of atomic bonds and molecular interactions: ionic, covalent, hydrogen bonds.
- ◆ Describe the composition and functions of carbohydrates, lipids, proteins, and nucleic acids.
- ◆ Explain the role of enzymes in biochemical reactions.

Cell Biology:

- ◆ Relate cell parts/organelles to their functions; describe how cells function in a narrow range of physical conditions such as temperature and pH, to perform life functions that help maintain homeostasis.
- ◆ Explain the role of cell membranes as a highly selective barrier.
- ◆ Differentiate between prokaryotic cells and eukaryotic cells; distinguish between plant and animal cells.
- ◆ Use cellular evidence and modes of nutrition to describe various kingdoms.
- ◆ Explain the interrelated nature of photosynthesis and cellular respiration.
- ◆ Identify the reactants and products in the general reaction of photosynthesis.
- ◆ Provide evidence that the organic compounds produced by plants are the primary source of energy and nutrients for most living things.
- ◆ Describe and compare the processes of mitosis and meiosis, and their role in the cell cycle.
- ◆ Compare and contrast a virus and a cell in terms of genetic material and reproduction.
- ◆ Recognize that while viruses lack cell structure, they have the genetic material to invade living cells.

Genetics:

- ◆ Describe the structure and function of DNA; describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology; explain mutations in DNA sequence.
- ◆ Identify and describe cell cycle regulation by means of genes.
- ◆ Describe the effect of mutations in humans (e.g. cancer cells).
- ◆ Differentiate between dominant, recessive, co-dominant, polygenic, and sex-linked traits.
- ◆ State Mendel's laws of segregation and independent assortment.
- ◆ Use a Punnett Square to determine the genotype and phenotype of monohybrid crosses and dihybrid crosses.

Anatomy & Physiology: *The following concepts of anatomy and physiology will be viewed in the context of comparative anatomy of the animal kingdom.*

- ◆ Explain how the major organ systems in humans have functional units with specific anatomy that perform a function of that organ system.
- ◆ Be familiar with parts of the digestive, circulatory, respiratory, nervous, muscular, sexual reproductive systems: generalize their functions.
- ◆ Describe how the functions of individual systems within humans are integrated to maintain homeostatic balance in the body.

Evolution and Biodiversity:

- ◆ Explain how the fossil record, comparative anatomy, and other evidence support the theory of evolution.
- ◆ Describe how the taxonomic system classifies living things into domains and kingdoms based on morphological, behavioral, and molecular similarities.
- ◆ Illustrate how genetic variation is preserved or eliminated from a population through Darwinian natural selection resulting in biodiversity.

Ecology:

- ◆ Identify factors in an ecosystem that influence fluctuations in population sizes.
- ◆ Analyze changes in an ecosystem resulting from natural causes, changes in climate, human activity, or introduction of non-native species.
- ◆ Use a food web to identify and distinguish producers, consumers, and decomposers.
- ◆ Explain how symbiotic behavior produces interactions within ecosystems and how biotic and abiotic factors cycle in an ecosystem (water, carbon, oxygen, nitrogen).

Standards for Literacy in History/Social Studies, Science, and Technical Subjects:***Key Ideas and Details***

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

Standards for Writing in History/Social Studies, Science, and Technical Subject:

Text Types and Purposes

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development organization and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, and trying a new approach.
6. Use technology, including the internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary and informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Course Alignment with 21st Century Learning Expectations:

Students will...

- Become self-directed learners.
- Communicate effectively.
- Apply problem-solving skills and critical and creative thinking.
- Use technology appropriately as a tool for learning, collaboration, presentation, research, and design.
- Act with integrity, respect and responsibility toward themselves, others and the environment.
- Exhibit flexibility and adaptability.
- Collaborate in diverse groups to share knowledge, build consensus, and achieve goals.
- Practice leadership in and service to their community.

Become contributing citizens in a global society.

Assessment:

- See grading policy attached.