General Biology
Biology 127 (Honors)
Alabama State University
Department of Math and Science
Fall Semester- Credit Hours-3

Textbook:  Biology 8th Edition  by Campbell and Reece

Tutorial Assistance: If students do not perform satisfactorily on a test, they should seek help from their instructors or tutors in the Mathematics and Science Center (PH 132).

Attendance Policy: The University’s attendance policy will be followed in this course.

Note: Any student requiring alternate formats for testing and or handouts for this course, or other types of accommodations, due to a handicapping condition, should advise the instructor within the first week of class.

Course Description: This is a General Biology course designed to serve honor students who have shown their dedication in learning biology. This course entails a wide array of biological phenomena and each phenomenon will be rigorously discussed. A variety of teaching tools will be employed to achieve presentational clarity of the subject. Students will be challenged with various activities in the class to test their intelligence. Each learning objective will consists of several reasoning and thought provoking concepts, which will be carried out in the form of group discussion or mini seminar sessions.

Course Goals: This course has the following major goals:

1. To cover various biological phenomena in depth.
2. To provide students an opportunity to be actively involved in learning most recent biological principles and theories.
3. To provide students an opportunity to express creativity through group discussions, seminars, and other class room activities.
4. To implement a rigorous methodology to enable students with reading and comprehending scientific articles related to biology.
5. To develop students’ skills in writing, analytical thinking, and problem solving with an emphasis on application of every-day biological concepts.
6. To familiarize students with use of databases, internet, and literature research.
Course Objectives: The following learning objectives will be addressed in this course. Each topic represents a broad study area in biology.

Objective 1. Demonstrate the understanding of the Chemistry of Life (Chapters 2-6)

Objective 2. Demonstrate the understanding of the Cell (Chapters 7-8)

Objective 3. Demonstrate the understanding of the Energy pathways (Chapters 9-10)

Objective 4. Demonstrate the understanding of Mitosis and Meiosis (Chapters 11-13)

Objective 5. Demonstrate the understanding of Genetics (Chapters 14-16)

Objective 6. Demonstrate the understanding of Genes to Proteins (Chapter 17)

Objective 7. Demonstrate the understanding of Molecular Biology (Chapters 18-20)

Objective 8. Demonstrate the understanding of Mechanisms of Evolution (Chapters 22-23)

Objective 9. Participate in critical thinking exercises and quizzes.

Objective 10. Participate in a Service Learning Project

Objective 11. Review scientific literature and complete writing assignments

Summary of Evaluation Procedure

<table>
<thead>
<tr>
<th>Test</th>
<th>No. of Questions</th>
<th>Objectives</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>50</td>
<td>1-2</td>
<td>100</td>
</tr>
<tr>
<td>Mid-term</td>
<td>50</td>
<td>3-4</td>
<td>100</td>
</tr>
<tr>
<td>Test 3</td>
<td>50</td>
<td>5-6</td>
<td>100</td>
</tr>
<tr>
<td>Final</td>
<td>50</td>
<td>7-8</td>
<td>100</td>
</tr>
<tr>
<td>Critical thinking exercises</td>
<td>9</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>quizzess</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Learning</td>
<td>10</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Writing assignments</td>
<td>11</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Total Points Possible 900

Grade Assignments

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade Percentile</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>90-100%</td>
</tr>
<tr>
<td>B</td>
<td>80-89%</td>
</tr>
<tr>
<td>C</td>
<td>70-79%</td>
</tr>
<tr>
<td>D</td>
<td>60-69%</td>
</tr>
<tr>
<td>F</td>
<td>Below 60%</td>
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</tbody>
</table>

All the students with D or F as a Final grade will be required to repeat the course, a university college core course requirement.
EVALUATION AND MINIMUM STANDARDS

Testing
During the semester four exams will be given that will evaluate the objectives of the course. The first exam will test objectives 1-2, the mid-term exam will test objectives 3-4, the third exam will test objectives 5-6 and final exam will test objectives 7-8.

Critical thinking exercises and quizzes
To achieve objective 9, (an) acceptable written report(s) must be prepared. The lecture instructor will evaluate the assignment(s).

Description of Tests and Classroom activities

<table>
<thead>
<tr>
<th>Test</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>Objectives 1 &amp; 2</td>
</tr>
<tr>
<td>Test 2 (Midterm)</td>
<td>Objectives 3 &amp; 4</td>
</tr>
<tr>
<td>Test 3</td>
<td>Objectives 5 &amp; 6</td>
</tr>
<tr>
<td>Test 4 (Final)</td>
<td>Objectives 7 &amp; 8</td>
</tr>
<tr>
<td>Critical thinking exercises and quizzes</td>
<td>Objective 9</td>
</tr>
<tr>
<td>Service Learning</td>
<td>Objective 10</td>
</tr>
<tr>
<td>Writing assignments</td>
<td>Objective 11</td>
</tr>
</tbody>
</table>

Test 1-4 will consist of objective questions. To pass an objective, the student must earn a minimum of 70% of the total points for that objective.

Detailed Course Objectives

Objective 1. Chemistry of Life (Chapters 2-6)

Subtopics:
1. Themes in the study of science
2. The chemical context of life
3. Water and the fitness of the environment
4. Carbon and the molecular diversity of life

Students should be able to:
1. Use scientific inquiry as a thought process; formulate hypothesis, design experiments, and draw conclusions from the experiment results
2. List chemical elements and their role in life
3. Describe various chemical reactions in relation to biological functions
4. Discuss the importance of water in biological processes
5. Explain carbon and carbon-derived compounds and their contribution to life

Objective 2. The Cell (Chapters 7-8)

Subtopics:
1. A tour of the cells
2. Membrane structure and function

Students should be able to:
1. Explain cell structures and their functions, importance of individual cell organelles
2. Discuss cellular membranes, their composition, function and importance in cell survival

**Objective 3.** Energy pathways (Chapters 9-10)

Subtopics:
1. Cellular respiration
2. An introduction to metabolism
3. Photosynthesis

**Students should be able to:**
1. Explain generation of energy, aerobic and anaerobic respiration, glycolysis, Krebs cycle, and electron transport phosphorylation
2. Discuss metabolism, energy transformation and the role of enzymes in metabolism
3. Summarize light capture, energy generation, and the conversion of CO₂ into sugar

**Objective 4.** Mitosis and Meiosis (Chapters 11-13)

Subtopics:
1. The reproduction of cells
2. The Mitotic cell cycle
3. Meiosis and Sexual life cycles

**Students should be able to:**
1. Summarize the process of cell reproduction, growth and repair.
2. List stages of mitosis and cytokinesis
3. Explain control of cell division
4. Discuss the process of meiosis and sexual reproduction.

**Objective 5.** Genetics (Chapters 14-16)

Subtopics:
1. Mendel and the gene idea
2. The chromosomal basis of inheritance
3. The molecular basis of inheritance

**Students should be able to:**
1. Discuss Mendelian genetics, human disorders and their inheritance, and tools for genetic testing
2. Summarize linked genes, genetic recombination, chromosomal sex inheritance, and effect of genes inherited from parents
3. Explain DNA as genetic material, Watson and Crick DNA, DNA duplication and enzyme proofreading

**Objective 6.** From Genes to Proteins (Chapter 17)
Objective 10. Service Learning
The Project will be designed at the discretion of the instructor

1. Students will learn the pertinence of a concept being taught in class and are able to provide a needed service to the community.
2. Students will learn the importance of providing needed services to the community in which they live.
3. Students will learn the impact of providing a need service to the community and the reward of a more positive perception of the University at large.
4. Students will learn the rewards such as self gratification in providing a needed service in the community.
5. Students will become self motivated in comprehending the concept(s) related to the service learning project.
6. The community will benefits from the service project.

Objective 11. Writing assignment(s)
Students will research topics critical to learning and understanding contemporary topics in biology, and write a scientific review paper based on information gathered using library and information technology tools.

Reading/Writing Literacy
Students will demonstrate enhanced competence in reading/writing literacy knowledge and skills in biology.

1. Students will be able to read and respond in writing to challenging texts that demand critical thinking in Biology.
   Exercise or Activity: Scientific writing assignment
   Performance Indicators:
   Students will
   - Use appropriate writing conventions to organize and categorize information/materials.
   - Use information from library and information technology tools, scientific journals, books, magazines, newspapers, textbooks, audio and media presentations, and from such forms as basic charts, graphs, maps, and diagrams to write for critical analysis and evaluation

2. Students will be able to demonstrate effective use of various patterns for organizing and developing written communication in biology.
   Exercise or Activity: Scientific writing assignment
   Performance Indicators:
   Students will
   - Address assigned topics, providing adequate and specific supporting evidence.
   - Identify the pattern of development (narration, description, process, comparison-contrast, illustration).
3. Students will be able to recognize and use correctly and effectively the rules and conventions of standard English as applied in scientific communication.
   - Students will be able to write various types of sentences (simple, compound, complex) that convey clear thought, using correctly the grammar and mechanics of standard English.
   - Students will be able to parse sentences in texts written by professional writers and by their peers, identifying what makes the sentences work to convey a clear message.

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
Students will
- write personal responses to scientific literature and vocabulary.
- communicate the meaning of scientific literature by using appropriate citation and documentation techniques.

**Quantitative literacy**
Students will demonstrate enhanced competence in quantitative literacy knowledge and skills

1. Students will demonstrate knowledge of fundamental mathematical concepts, symbols, and principles in performing basic computational operations

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
Students will
- Evaluate basic mathematical calculations used in scientific research such as preparation of media, or buffers

2. Students will interpret mathematical, quantitative models (such as formulas, graphs, charts, tables and maps) that describe real-world phenomena.

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
Students will
- Interpret the tables, charts, graphs and figures used in scientific literature
- Evaluate mathematical data from several studies, and draw pertinent conclusions

3. Students will demonstrate competence in analytical and quantitative reasoning skills as they apply to real world situations

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
Students will
- Evaluate quantitative data from scientific literature associated with human health
- Interpret the data to discover trends and draw reasonable scientific conclusions

**Information literacy**
Students will demonstrate enhanced competence in information literacy knowledge and skills
Subtopics:
1. The connection between genes and proteins
2. The synthesis and processing of RNA
3. The synthesis of protein

Students should be able to:
1. Define the term gene
2. Explain the process of transcription and translation
3. Summarize protein synthesis in prokaryotes and eukaryotes

Objective 7. Molecular Biology (Chapters 18-20)

Subtopics:
1. Microbial models: The genetics of viruses and bacteria
2. The organization and control of eukaryotic genomes
3. DNA technology (genetic engineering)

Students should be able to:
1. Discuss genetics of viruses and bacteria
2. Explain gene expression in eukaryotes, control of gene expression, and abnormal gene expression resulting in cancer
3. Summarize recombinant DNA technology, its use in human health, agriculture and the environment

Objective 8. Mechanisms of Evolution (Chapters 22-23)

Subtopic:
The evolutions of populations

Students should be able to:
1. Explain modern evolution-Darwinism and Mendelism
2. Discuss population, gene frequency, microevolution and genetic drift.
3. List mutations, natural selection and genetic variation

Objective 9. Critical thinking exercises and quizzes
Individual instructor will determine format, frequency, and scoring of critical thinking exercise(s) and quizzes.

Writing exercises will be given in the form of study guides and scientific article summaries. They are to be completed by the students and turned in on their due dates.

Group Discussions are designed to discuss the topics from the textbook, papers and other sources. All students are required to participate and discuss the topic. Group discussions will count as an exercise.
1. Students will be able to identify and articulate their information needs in the process of defining a problem, question, or project for research

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
- Students will
  - Take a short seminar on defining problems, identifying research topics, and gathering scientific information.

2. Students will be able to use library and information technology tools and resources to carry out research

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
- Students will
  - Visit the library and learn how to use various scientific databases such as Science direct and Pubmed to gather information on the research topic assigned

3. Students will be able to design and execute a research project using a systematic process to collect, analyze, and present information in written formats, properly incorporating, citing, and documenting resources

**Exercise or Activity:** Scientific writing assignment

**Performance Indicators:**
- Students will
  - Systematically evaluate and analyze the data collected and complete the research paper citing the references in the text with a proper literature cited section at the end.