

**Coffeyville Community College**

**BIOL-206**

**COURSE SYLLABUS**

**FOR**

**BIOLOGY I: Cellular and Molecular Biology**

**Pam Oliver**  
**Instructor**

**COURSE NUMBER:** BIOL-206    **COURSE TITLE:** Biology I: Cellular and Molecular Biology

**CREDIT HOURS:** 5

**INSTRUCTOR:** Pam Oliver

**OFFICE LOCATION:** Room 205 Arts and Sciences Building (2<sup>nd</sup> floor)

**OFFICE HOURS:** See schedule posted on door

**OFFICE PHONE:** 620-251-7700 ext. 2070

**E-MAIL:** pamo@coffeyville.edu

**PREREQUISITE(S):** None

**REQUIRED TEXT AND MATERIALS:** Biology 8<sup>th</sup> edition. Campbell, Minorsky, Reece, Cain, and Lerry. Benjamin Cummins 2007.

**CLASSROOM RULES:**

1. No Cell Phones
2. No Headphones

**COURSE DESCRIPTION:** This is the first in a series of two introductory biology class designed for majors to fulfill an introductory biology requirement. Coursework includes the study of basic biological principles, basic chemistry, cell structures and functions, metabolism, photosynthesis, cellular reproduction, genetics, and biotechnology. By studying these areas, the student is exposed to the major fields of biological study.

**EXPECTED LEARNER OUTCOMES**

Upon successful completion of Biology I, the student should be able to:

1. Identify the steps of scientific method and be able to apply the Scientific Method in a laboratory setting
2. Identify and describe those properties that distinguish living from nonliving.
3. Explain the chemistry of life and describe basic biochemical molecules.
4. Identify cellular structures and describe their functions and cell transport.
5. Describe the basic principles of cellular metabolism, including cell respiration and photosynthesis.

6. Identify and explain the steps of the cell cycle and explain problems that may occur.
7. Identify the basic principles of Mendelian, molecular and human genetics.
8. Explain the mechanism of reproduction, including meiosis, fertilization, and development.
9. Describe the concepts of molecular genetics, gene technology and bioethics.
10. Explain the basic principles of cellular physiology, structure and functions of organs and organ systems.
11. Explain the concepts of population genetics and micro and macro evolution
12. Demonstration of the Proper Use of Scientific Equipment associated with biochemistry and cell biology.

**LEARNING TASKS  
& ACTIVITIES:**

A variety of teaching methods will be used and can include lectures, discussions, PowerPoint presentations and demonstrations. During laboratory time, a general introduction will be given, then the students will use laboratory time to do one of the following activities:

1. Laboratory Activities
2. Videos
3. Library Research
4. Group Discussion

**ASSESSMENT OF OUTCOMES:**

The following evaluative techniques will be used:

|                                       |                    |
|---------------------------------------|--------------------|
| Five lecture tests @ 100 points ..... | 400 points         |
| Lab Points/quizzes/tests .....        | 100 points         |
| Laboratory notebook .....             | 200 points         |
| Miscellaneous Assignments.....        | 100 points         |
| Quizzes.....                          | 100 points         |
| Attendance and Participation .....    | <u>100 points</u>  |
| <b>Total in Class.....</b>            | <b>1000 Points</b> |

All assignments will be assigned points. At the end of the semester, your total points will be divided by the total possible number of points to arrive at a percentage.

The grading scale in this course is A (100-90%), B (89-80%), C (79-70%), D (69-60%), and F (59-0%).

Incompletes given at the end of the course will only be given if

previously agreed upon by the student and instructor. Please note the college's policy on incompletes as stated in the college catalog.

## **ATTENDANCE**

### **POLICY:**

Each student is required to attend all classes. It is the responsibility of the student to make definite arrangements with the instructor for make-up work BEFORE going on a field trip or other college-sponsored event. Class periods, assignments, and tests that are missed without prior arrangements with the instructor may not be made-up unless unusual circumstances prevail and at the instructor's prerogative. Absolutely no labs can be made up, unless a student can attend lab with another class.

**COMPETENCIES:** Upon completion of this course, the following should be accomplished by the student.

Identify the steps of scientific method and be able to apply the Scientific Method in a laboratory setting.

- A. List and describe the steps of scientific method
- B. Construct testable hypotheses
- C. Perform experiments
- D. Analyze experimental results

Identify and describe those properties that distinguish living from nonliving.

- A. List the characteristics of living things
- B. Define homeostasis and give an example
- C. Explain how negative feedback works and give an example.
- D. Briefly explain the process of adaptation
- E. List the increasing complexity of organization of living organisms.

Explain the chemistry of life and describe basic biochemical molecules

- A. Distinguish between atoms and elements and list the six elements that compose over 90% of living matter.
- B. Name the subatomic particles and relate the atom's structure to its chemical properties.
- C. Describe electron orbital configuration and how it affects an element's reactivity.
- D. Name the three types of chemical bonds and how each is formed.
- E. Describe the mechanism of enzymes as catalysts in chemical reactions.
- F. Identify the four major groups of organic molecules and describe their functions.

Identify cellular structures and describe their functions and cell transport.

- A. Describe the cell theory.
- B. Differentiate between prokaryotic cells, eukaryotic cells and viruses.
- C. Describe the advantages of specialization in eukaryotic cells.
- D. Describe structure and function of a cell wall, plasma membrane, and cytoskeleton.
- E. Name and explain the functions of organelles comprising eukaryotic cells
- F. Describe the fluid mosaic model.

- G. Explain diffusion, osmosis, active transport and endo/exocytosis
- H. Describe the movement of water based on the tonicity of solutions.

Describe the basic principles of cellular metabolism, including cell respiration and photosynthesis.

- A. Define energy and the laws of thermodynamics
- B. Explain the role of ATP as an energy coupler.
- C. Outline the generalized formula for photosynthesis.
- D. Describe the light-dependent and light-independent pathways of photosynthesis.
- E. Relate the structure and function of a chloroplast.
- F. Outline the generalized formula for aerobic respiration.
- G. Describe glycolysis, Krebs cycle and the electron transport chain.
- H. Relate the structure and function of a mitochondrion.
- I. Compare aerobic and anaerobic respiration.

Identify and explain the steps of the cell cycle and explain problems that may occur.

- A. Describe binary fission.
- B. List the parts of the cell cycle, including the phases of mitosis.
- C. Describe the structure of DNA and explain the steps of DNA replication
- D. Explain what is happening during each phase of mitosis
- E. Differentiate between nuclear division and cytokinesis.
- F. Describe the process that causes cancer and explain the terms associated with it

Identify the basic principles of Mendelian, molecular and human genetics

- A. Explain the Mendelian principles of heredity, and illustrate how experimental crosses work.
- B. Use Punnett squares to determine phenotypic and genotypic ratios.
- C. Define terms such as gene, allele, karyotype,
- D. Relate the steps of meiosis to the Mendelian principles of heredity.
- E. Describe inheritance patterns including dominance, incomplete dominance, codominance, epistasis, and pleiotrophy, sex linked traits
- F. Compare and contrast DNA and RNA in structure and function.
- G. Explain the mechanism of protein synthesis
- H. Describe transcription and translation.
- I. Describe the mechanisms that cause mutations.
- J. Explain how genes are regulated in eukaryotes and prokaryotes.

Explain the mechanism of reproduction, including meiosis, fertilization, and development.

- A. List and explain each phase of meiosis.
- B. Compare and Contrast the processes of spermatogenesis and oogenesis.
- C. Compare the results of mitosis and meiosis
- D. Compare and Contrast asexual and sexual reproduction. .
- E. List the reproductive structures of human male and females and describe functions of each.
- F. List the hormones involved in reproductive processes and explain their functions.
- G. Describe the process of conception and fertilization.
- H. Describe embryologic development in plants and animals.

Describe the concepts of molecular genetics, gene technology and bioethics

- A. Explain the uses and process used in DNA fingerprinting
- B. Explain the uses of genetic engineering
- C. Identify the methods utilized in genetic engineering.
- D. Describe some of the benefits and risks of genetic engineering.

Explain the basic principles of cellular physiology, structure and functions of organs and organ systems.

- A. List three types of neurons and their impulse pathways.
- B. Explain how a neural impulse is generated and conducted.
- C. Identify glands of the human endocrine system.
- D. List examples of hormones produced by glands.
- E. Explain how hormones travel through a human body, and how they are recognized by target cells.
- F. Explain the sliding filament theory of muscular contraction.
- G. Describe the structure, and explain the functions of antibodies.
- H. Describe how B- and T-lymphocytes function in the specific immune response.
- I. Describe the cohesion-tension theory and pressure-flow hypothesis for plants.

Explain the concepts of population genetics and micro and macro evolution.

- A. Define population genetics, gene pool.
- B. Define microevolution and give an example.
- C. Define macroevolution and give an example.
- D. Explain how macroevolution helps explain the similarities and differences in organisms.
- E. Explain the concept of speciation through adaptive radiation.
- F. Define biological species and population
- G. Use the Hardy Weinberg equation to illustrate population change through allele frequency.

Demonstration of the proper use of scientific equipment

- A. Be able to recognize scientific equipment by name
- B. Be able perform measurements in mass, volume, temperature and length using the metric system
- C. Be able to identify and use the compound microscope.
- D. Make wet mounts for use in microscopes studies
- E. Be able to make smears, heat-fix and stain
- F. Be able to identify various types of cells and cell parts.
- G. Be able to accurately use various types of pipets
- H. Be able to use electrophoresis equipment and explain what is occurring
- I. Be able to prepare and load agarose gels
- J. Be able to follow a laboratory procedure and analyze results
- K. Be able to record accurate records of procedures and results in the laboratory