GRANDE PRAIRIE REGIONAL COLLEGE
ACADEMIC UPGRADING DEPARTMENT

BIOLOGY 0120
COURSE OUTLINE
WINTER 2001

INSTRUCTOR: Gordon Pellerin

OFFICE: C310

PHONE: (780) 539-2088 (office)

EQUIVALENCY: Biology 20 (5 credits)

TEXTBOOK: Modern Biology by Albert Towle, Holt Rinehart Winston

SUPPLIES: Notebook, lab notebook, unlined white paper for lab drawings, lab coat (optional), lab manual (on loan to student)

ATTENDANCE: Regular attendance is expected from all students and is essential for passing the course. Students who miss classes soon find themselves falling behind and failing. If you must be absent, please contact the instructor. The student remains responsible for any missed material.

Lateness will NOT be tolerated as it interrupts the instructor and fellow classmates.

TESTS & EXAMS: There will be several tests and quizzes throughout the term. Absence from tests, quizzes, or exams WILL result in a mark of zero. You will NOT be permitted to have a makeup test unless you have called and either talked with me or left a message on my voice mail BEFORE the test. Absence from the midterm or final exam requires a medical note from your doctor.

LABS: Developing lab skills is essential in a biology course. There will be a number of labs during the course. Some lab reports will be submitted at the end of the lab period while others will be handed in at a later date announced during the lab period. It is essential that you come to the lab prepared and that your lab reports are submitted on time.

I will NOT accept late labs after I have returned marked labs. Late labs will receive 10% off per day late.

A missed lab will result in a mark of zero. A medical note verifying an accident or illness is required if the student wishes to have an opportunity to make-up the lab at a later date. Such a make-up lab cannot be guaranteed and is at the discretion of the lab technician.

EVALUATION:

Tests and Quizzes	30%
Labs	20%
Midterm Exam	20%
Final Exam	30%

COURSE OVERVIEW: This course is designed to provide the student with an understanding and appreciation of some basic biological concepts and related social issues. These include,

- flow of energy in the biosphere from the sun through the chemical processes of photosynthesis and cellular respiration, and cycling of matter through biogeochemical cycles,
- the impact that human activity has on the environment such as global warming, ozone depletion and acid rain,
- evidence of evolution and changes in species over time, including discussion of natural selection, variability in populations, and speciation, and
- energy and matter flow and homeostasis in humans, including structure, function and regulatory mechanisms of the digestive, excretory, circulatory, and respiratory systems.

The laboratory component of the course is designed to aid the student in developing biological laboratory skills such as observation and collection and analysis of data.

OBJECTIVES:

UNIT 1: THE BIOSPHERE

The biosphere is maintained by a constant flow of energy.

1. Explain energy storage in the biosphere and the relationship between photosynthetic and cellular respiratory activities.
2. Describe how stored biological energy is eventually lost as heat e.g., muscle heat generation, decomposition

The cycling of matter through the biosphere perpetuates its steady state equilibrium.

3. Summarize and explain the biogeochemical cycles for carbon, nitrogen, and phosphorous.
4. Explain how water is cycled through the biosphere along characteristic pathways.
5. Identify the properties of water and explain their relevance to the hydrologic cycle e.g., freezing point, hydrogen bonding, specific heat, density

The balance of energy and matter exchange in the biosphere , as an open system, maintains its steady state equilibrium.

6. Explain how the equilibrium between gas exchanges in photosynthesis and cellular respiration influences atmospheric composition.
7. Describe how human activities can have a disrupting influence on the balance of photosynthetic and cellular respiratory activities. e.g., fossil fuel combustion, forest destruction

UNIT 2: ENERGY FLOWS AND CELLULAR MATTER

Photosynthesis stores energy in organic compounds.

1. Explain, in general terms, how pigments absorb light, transfer that energy as reducing power in nicotinamide adenine dinucleotide, reduced form (NADH), and to chemical potential in ATP by chemiosmosis, describing where those processes occur.
2. Explain, in general terms, how the products of the light reactions, NADH and ATP, are used to reduce carbon in the Calvin-Benson cycle, describing where the process occurs in the cell.

Respiration releases potential energy from organic compounds.

3. Explain, in general terms, how carbohydrates are oxidized by glycolysis and Kreb's cycle to produce reducing power in NADH and flavin adenine dinucleotide, reduced form (FADH), and chemical potential in ATP, describing where in the cell those processes occur
4. Explain, in general terms, how chemiosmosis converts the reducing power of NADH and FADH to the chemical potential of ATP, describing where in the cell the process occurs
5. Explain the role of oxygen in cellular respiration; e.g., aerobic, anaerobic
6. Summarize and explain the role of ATP in metabolism; e.g., synthesis, movement, active transport
7. Explain how environmental pollutants, like cyanide or hydrogen sulfide, inhibit cellular respiration.

UNIT 3: ENERGY AND MATTER EXCHANGE IN ECOSYSTEMS

The biosphere is composed of a diversity of biomes, each with distinctive biotic and abiotic factors.

1. Describe how energy and matter exchange contribute to the existence of the major biomes; e.g., tundra, taiga, deciduous forest, rain forest
2. Identify ecosystem biotic and abiotic factors and explain their influence in an aquatic and a terrestrial ecosystem; e.g., stream or lake, prairie, boreal forest, sports field

Ecosystems have characteristic structures determined by their energy and matter exchange.

3. Explain the structure of ecosystem trophic levels, such as food chains and food webs.
4. Explain the energy and matter exchange in ecosystems, such as pyramids.

Populations are basic components of ecosystem structure.

5. Describe, in general terms, the nature of variation within populations; e.g., inherited versus acquired, continuous versus discontinuous
6. Explain how populations are adapted to their environment; e.g., drug resistance, cold tolerance
7. Explain, in general terms, how a great range of variation exists within individual populations; e.g., blood groups, enzymes
8. Summarize and describe lines of evidence to support the evolution of modern species from ancestral forms; e.g., hominids, horses
9. Describe natural selection and explain its action on future populations leading to evolutionary change.

UNIT 4: ENERGY AND MATTER EXCHANGE BY THE HUMAN ORGANISM

The human organism's digestive and respiratory systems exchange energy and matter with the environment.

1. Describe the intake of matter from the environment, its chemical and physical processing through the digestive system into the blood stream and the return of the remaining material to the environment.
2. Explain how gases and heat are exchanged between the human organism and its environment.

The human organism's excretory system exchanges energy and matter with the environment.

3. Explain the role of the kidney in excreting metabolic wastes from the body and expelling them into the environment.
4. Explain how the excretory system maintains internal equilibrium with respect to water, pH and ions.

The human organism's circulatory system transports energy and matter to maintain equilibrium among the body systems as well as between the organism and its external environment.

5. Explain the role of the circulatory system in aiding the digestive, excretory and respiratory systems' exchange of energy and matter with the environment.
6. Explain the role of the body surface in maintenance of organism equilibrium; e.g., temperature regulation, protection from pathogens
7. Describe the main components of blood and their role in transport, and their role in resisting the influence of pathogens; e.g., erythrocytes, leukocytes, platelets, plasma
8. List main cellular and noncellular components of the human immune system and describe their role; e.g., macrophage, helper T cell, B cell, killer T cell, suppressor T cell, memory T cell