BIOLOGY 120

COURSE OUTLINE 1988-89

INSTRUCTOR: Keith Roscoe

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EQUIVALENCY: Biology 20 (5 credits)

TEXTBOOK: Inquiry into Life 5th ed., Sylvia S. Mader. (also used in BI 130)

RECOMMENDED: Study Guide for Inquiry into Life

COURSE DESCRIPTION:

This course is designed to provide the student with an understanding of some basic biological concepts: interdependence of organisms and their environment (ecology, mans' impact on the environment, the basis of heredity (genetics)) and evolution. The student will also further develop basic biology laboratory skills: use of the microscope, observation skills, and the collection and analysis of data.

ATTENDANCE AND LATENESS:

Regular attendance is expected from all students and is essential for passing the course. Attendance will be taken at each class. Students who miss classes will soon find themselves falling behind and failing.

Lateness will not be tolerated. Classes start at the stated times, so please arrive a few minutes early.

TESTS AND EXAMS:

There will be a test every second week, covering the previous two week's material. There will also be several "quickie quizzes" at intervals between the tests. Absence from quizzes or exams will result in a mark of 0 for that quiz or exam unless previous arrangement is made with the instructor when absence is for medical or other legitimate reasons.

LATE DEDUCTIONS

Assignments and lab reports are due on the dates announced in class. Late penalties will be awarded as follows:

1 day late - 25%: 2 days late - 50%: 3 days late - mark of 0.

LABS:

There will be nine labs during the course, starting in the second full week of the semester. This important component of the course introduces basic laboratory skills and problem-solving and reinforces concepts introduced in lecture. A lab coat is optional but recommended for biology labs.

Attendance is compulsory for labs and missing labs will reduce your grade considerably. No reason other than a written medical excuse will be acceptable for absences.

FALL 1988 LAB SCHEDULE

Biology 120 Lab: Wednesday, 10 - 12 a.m., F130

Lab	Topic	Date
1	Analysis of an Ecosystem	Sept. 21
2	Symbiosis	Oct. 5
3	Photosynthesis I	Oct. 12
4	Photosynthesis II	Oct. 19
5	Mitosis and Meiosis	Nov. 2
6	Probability and Mendelian Genetics	Nov. 9
7	Heredity of Some Human Traits	Nov. 16
8	Genetic Differences in Peas	Nov. 23
9	Evidence for Evolution	Nov. 30

EVALUATION: The stanine grading system is used.

Stanine	Description	Percentage Equivalence
9	Outstanding	90-100
8	Excellent	80-89
7	Very Good	72-79
6	Good	65-71
5	Pass	57-64
4	Pass	50-56
3	Fail	45-49
2	Fail	26-44
1	Fail	0-25

Evaluation Breakdown:

Tests	20
Lab	20
Midterm Exam	20
Assignments	10
Final Exam	30
	100

COURSE CONTENT:

Unit 1: Ecosystems: basic ecological concepts - ecosystems, energy flow; chemical cycles.

Unit 2: Ecology of Populations: population characteristics, population growth, population regulation, competition, predation, symbiosis.

Unit 3: Ecology of Communities: terrestrial and aquatic biomes, succession.

Unit 4: Human Ecology: human ecosystems, pollution, mans impact on the environment, human population growth, resource consumption.

Unit 5: Photosynthesis: solar energy, chloropyll and other pigments, chemistry of photosynthesis, leat structure.

Unit 6: Cell Division: mitosis and meiosis.

Unit 7: Heredity: Mendel's Laws, basic concepts of inheritance, polygenes, multiple alleles, incomplete dominance, codominance, linkage, sex-linkage, human genetic disorders.

Unit 8: Molecular Basis of Heredity: DNA and RNA, protein synthesis, regulation genes,mutation.

Unit 9: Evolution: evidence for evolution, mechanisms of evolution, speciation.

UNIT OBJECTIVES

Unit 1: Ecosystems (Chapter 31: 688-693, 694-696)

1. Define: ecology, biosphere, ecosystem, population, community.

2. Distinguish between the biotic and abiotic components of an ecosystem.

3. Distinguish between habitat and niche.

4. Describe the nature of energy flow in ecosystems.

5. Define the major biotic components of an ecosystem: producers, consumers, and decomposers.

6. Distinguish between food chains, food webs, and food pyramids.

7. Define: trophic level, herbivore, carnivore.

8. Describe energy loss in food pyramids.

9. Define: biomass.

10. Describe and explain chemical cycles: the carbon cycle and the nitrogen cycle.

11. Identify the three elements of a chemical cycle: reservior, exchange pool, biotic community.

12. Define: nitrogen fixation, nitrifying bacteria, de-nitrifying bacteria.

Unit 2: Ecology of Populations (Chapter 30; 669-684: Chapter 31: 693-694: Chapter 33; 741-744)

1. Define: population, biotic potential, environmental resistance, carrying capacity.

2. Describe and explain population growth patterns: The sigmoid growth curve and exponential growth.

3. Describe characteristics of populations.

4. List and explain factors which regulate population size.

5. Distinguish between density - independent and density - independent factors.

6. Describe how competition and predation affect population size.

7. Define and explain the competition exclusion principle.

8. Describe and explain adaptations of predators and prey.

9. Define: symbiosis, parasitism, commensalism, mutualism, and give examples of each.

10. Discuss the effects of symbiosis on population size.

Unit 3: The Ecology of Communities (Chapter 32: 715-729)

1. Discuss the concept of the community and characteristics of communities.

2. Define: succession, sere, pioneer community, climax community.

3. Explain the process of succession in given communities (on rocks, in coniferous forest, in a lake).

4. Distinguish between primary and secondary succession.

5. Name and give the locations and characteristics of major terrestrial biomes: deserts, tundra, prairies, coniferous forests, deciduous forests, and tropical forests.

6. Identify and explain factors which determine the type of biome found in a given location.

7. Describe the major characteristics of freshwater biomes: lakes and ponds, and rivers and streams.

Unit 4: Human Ecology (Chapter 31; 697-711: Chapter 33; 741-758)

1. Compare human and natural ecosystems.

2. Discuss sources and effects of air pollution, land pollution and water pollution.

3. Discuss effects of air pollution on the weather, eg. the greenhouse effect.

4. Discuss problems associated with mans impact on the environment: monoculture, biocides, irrigation, fuel consumption, soil quality, garbage.

5. Suggest ways in which resources could be used more efficiently and wisely.

6. Discuss the growth curve of the human population.

7. Define: growth rate, doubling time.

8. Compare population growth rates in developed and developing countries.

9. Discuss the impact of human population growth on resource consumption: energy sources, food, stable human population size.

Unit 5: Photosynthesis (Chapter 6; 115-118, 127-128: Chapter 7; 142-145)

1. State the importance of photosythesis to all living things.

2. Give the overall word and chemical equations for photosynthesis.

3. Describe the structure of the chloroplast and relate the structure to its function.

4. Describe the role of chlorophyll and other plant pigments in photosynthesis.

5. List and explain factors affecting photosynthesis: light intensity, temperature, Co_2 concentration.

6. Distinguish between the two suoreactions of photosynthesis: the "light" reaction and the "dark" reaction.

7. Compare photosynthesis and cellular respiration.

8. Describe the structure of a leaf and relate the structure of the parts of their function.

Unit 6: Cell Division (Chapter 4; 75-89)

1. Discuss the need for cell division.

2. Define: mitosis, karyotype, chromosome number, sex chromosome, autosome, chromatid, centromere, gamete, zygote, mother cell, daughter cell, spindle fibers, asters.

3. Name and describe the stages of mitosis.

4. Define: meiosis, haploid, diploid, homologous chromosomes, synapsis, tetrads, crossing-over.

5. Name and explain the stages of meiosis.

6. Explain the importance of meiosis.

7. Compare mitosis and meiosis.

8. Distinguish between spermatogenesis and oogenesis.

Unit 7: Heredity (Chapter 21; 445-470)

1. Define: trait, gene, allele.

2. Describe Mendel's experiments with garden peas.

3. State Mendel's three laws of Heredity.

4. Define: dominant, recessive, P_1 generation, F_1 generation, F_2 generation, genotype, phenotype, homozygous, heterozygous, hybrid, monohybrid, testcross.

5. Use Punnett squares to solve genetic problems: monohybrid and dihybrid crosses, multiple alleles, incomplete dominance, codominance.

6. Define and explain: polygenic inheritance, multiple alleles, incomplete dominance and codominance, linkage, crossing-over.

7. Describe and explain inheritance of ABO and RH blood types.

8. Explain the determination of sex by sex chromosomes.

9. Define and explain sex linkage (sex-linked inheritance) and solve problems involving sex-linked genes (color blindness and hemophilia).

10. Describe the causes and nature of common human genetic disorders: inversions, deletions, duplications, translocations, Down's Syndrome, nondisjunction, Turner's Syndrome, Klinefelter's Syndrome and other selected genetic diseases.

11. Construct pedigree charts for selected traits and interpret given pedigree charts.

Unit 8: Molecular Basis of Inheritance (Chapter 1; 37-38: Chapter 22; 475-495)

1. Define and describe: nucleic acid, nucleotide.

2. Describe the structure of DNA and state its function.

3. Describe the structure of RNA.

4. Compare the structure of RNA to DNA.

5. Describe the replication of DNA.

6. Given the base sequence of a strand of DNA, predict the base sequence of a complimentary strand of DNA or RNA.

7. Define a gene and state the relationship between genes, enzymes, proteins and DNA.

8. Describe the process of protein synthesis.

9. Define: transcription, translation, messenger RNA, transfer RNA, ribosomal RNA, codon, anticodon.

10. Distinguish between structural genes and regulatory genes.

11. Explain how protein sythesis is controlled by regulatory genes.

12. Define mutation and describe how genetic engineering and natural mechanisms can produce mutations.

Unit 9: Evolution (Chapter 23; 505-525)

1. Define: evolution.

2. Summarize the evidence for evolution: the fossil record, comparative anatomy, comparative embryology, vestigial structures, comparative biochemistry, biogeography.

3. Summarize and apply Lamarck's theory of evolution.

4. Summarize and apply Darwin's theory of evolution.

5. Describe the modern theory of evolution: (1) the production of variations, (2) the reduction of variations.

6. Describe three sources of genetic variations.

7. Describe two methods by which variations are reduced.

8. Name two effects of natural selection on a population and give examples of natural selection.

9. Describe the two steps of speciation.

10. Give examples of adaptive radiation .

11. Define: mutation, gene flow, recombination, genetic drift, natural selection, founder principle, species, speciation, pre-mating isolating mechanisms, post-mating isolating mechanisms, adaptive radiation.