Biology 122: General Biology

Professor: Leslie Samuelson
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Course Prerequisites:
Passing grade ("C" or better) in Biology 121 or an equivalent course.

Course Description:
This course is a continuation of Biology 121 and focuses on the diversity of life. Topics to be covered include: Evolution; Classification; Taxonomy; Diversity of life forms; the structures and functions of organismal systems; Ecology; Behavior; and the Environment. This course stresses the diversity and differentiation of life processes common to all organisms, and their strategies for survival. A complete listing of concepts covered ***(A BIG OLD STUDY GUIDE)*** is attached.

Course Objectives:
Upon completion of this course, the student will be able to recognize terminology, specific biological facts, and utilize general principles associated with the structural and functional organization of living things. The student will also obtain a more fully developed series of computer-based skills. This course also stresses critical thinking skills which are designed to allow the student to: develop more meaningful learning beyond rote memorization; extend beyond lower levels of learning (knowledge and comprehension) to higher levels of learning (application, analysis, synthesis and evaluation); apply concepts and principles to real world experience and situations; and enhance problem solving skills.

Methods of Instruction:
These will include lecture, laboratory, on-line forum, computer activities, demonstration and/or multimedia presentation. Exam material will be taken from topics covered in lecture. A schedule of lectures, exams, homeworks and laboratories is attached.

Text:
Campbell & Reese. Biology.(eighth edition) 2008.
The study guide is STRONGLY recommended.

Evaluation and Testing:
Your final course grade will be based on:
3 midterm exams- 100 pts. Each
9 laboratory write-ups- 50pts. Each
1 systems report- 100 pts
4 forum posts- 5 pts. Each
4 forum replies- 5 pts. Each
1 office hour visit- 10 pts
1 final exam- 200 pts.
Total: 1100 pts.

Exams

Each **midterm** will consist of ~40 multiple choice, true/false, short answer or essay questions. The cumulative **final** will consist of ~80 similar questions. You will have 50 minutes to complete the exam individually. All exams will be collected. Then, there will be a 20 minute period where you will join 2 other students and retake the exam as a group. This exam will be handed in as well. Your individual exam will be graded, as will the group exam. If the group scores higher than the highest score for any one person within the group, the differential (up to 10 points) will be added to each group members individual exam score. For example, if the group score is 95, and the individual members scores are 60, 70, and 90, the group earns a 5 point bonus. I will add the bonus to each individual members grade, so the final grades would be 65, 75 and 95. If the group scores lower than the highest individual score, no points will be subtracted from the individual members scores. The maximum grade for any midterm exam is 100, for the final it is 200.

A #2 pencil is required for each exam. This item will not be supplied; you must bring it to each exam date. No make-up exams will be given without previous notification to the instructor. The final exam must be taken to pass this course.

LAB WRITE-UPS will be due the Thursday after completion of the lab. You will turn in the last pages of the lab packet which include the discussion, questions for review and applying your knowledge questions.

All but one (your "oops its late" assignment) of the assignments must be turned in on time. If more that one assignment is late, the work will not be graded unless the instructor has been notified prior to the due date.

NO INDIVIDUAL EXTRA CREDIT ASSIGNMENTS WILL BE GIVEN!!!

Students may earn 1 point for every MEANINGFUL **post or reply** on our class forum (after the required 8 have been completed). They may also earn 1 point for each laboratory sample brought in that relates to that evenings lab.

The forum can be accessed through our class web page at http://www.trcc.commnet.edu/Prog_Study/Sciences/samuelson/index.htm or at http://lsamuelson.proboards25.com . Be aware that the page is under construction; please report any problems to me. Please **email me** your user name so that I can keep track of the points you have earned. Be aware that I will "lurk", and may enter the discussion at any time. If inappropriate materials are posted they will be removed. General cyberspace etiquette applies at all times.

To utilize your computer account at school:

Username= Your first initial, followed by your last name, followed by the last 4 numbers of your student ID number (ex. LSamuelson2345)

Password= the first letter of your last name capitalized followed by your student ID number (ex. S@00012345)

The grade distribution will be as follows:

90%-100%=A
80%-89%=B
70%-79%=C
60%-69%=D
Less than 60%+F

This percentile grade distribution will be based on the highest total points earned by a student. Generally this "curve" is only a few percentage points lower than a grade distribution based on the total points possible. At the end of the semester, any student within 20 points of the next higher or lower grade will receive a "+" or "-" as appropriate. The exceptions are A+, F+ and F- as the administration disallows the assignment of these grades.

To determine your grade at any time during the semester, I suggest keeping 2 columns of scores. The first is the high score for each assignment; the second is the points you earned on that assignment. To determine your grade, add up each column and divide your score total by the high score total. This will let you know within a percentage point or so where you stand in the class. For example:

High scores	my scores
9	6
45	43
88	72
___	___
142	121

121/142=.85

This student has an 85% or solid B in the course at this time.

General Information:
If you must miss a class, please notify me prior to the date of absence so that work and notes may be arranged.
Students are responsible for defining and making progress toward their educational goals.
If at any time you are having difficulties with course related materials, **PLEASE** come see me. There are a multitude of learning tools available to all students—we will just have to figure our which ones will be the most helpful for you.
Academic dishonesty and plagiarism will not be tolerated.
YOUR GRADE IS YOUR RESPONSIBILITY!!!!
Last day to drop is May 9.
Last day to apply for summer graduation is April 15.
Electronic devices (cell phones, pagers etc.) will be put in **"Silent Mode"** or turned off during both lecture and laboratory.
If you need assistance or modification of class procedure owing to any type of disability, please let me know so that arrangements for accommodation can be made.

Course Objectives: BIO 122 - General Biology II

1. The student will be able to name the Kingdoms of the life forms and the main traits of each Kingdom.
2. The student will be able to name the major taxonomical units these Kingdoms.
3. The student will be able to explain the criteria used to distinguish the phyla of these Kingdoms.
4. The student will be able to explain the criteria that are used for grouping plants.
5. The student will be able to explain the characteristics used to place single-celled organisms into a classification system.
6. The student will be able to give examples and state unique characteristics of various Prokaryotae, Protista and Fungi.
7. The student will be able to give the characteristics of the main groups of plants.
8. The student will be able to demonstrate the life cycle of mosses and ferns.
9. The student will be able to demonstrate the basic life cycles in plants.
10. The student will be able to distinguish between perfect and imperfect flowers.
11. The student will be able to list the parts of a flower and state the function of each part.
12. The student will be able to list in sequence the major events in the reproductive portion of the life cycle of a flowering plant.
13. The student will be able to explain germination in both monocots and dicots.
14. The student will be able to identify and use the following criteria in the classification of the Kingdom Animalia:
    a. Shape (symmetry)
    b. Skeletons
    c. Body layers (germ layers)
    d. Body cavities
    e. Systems
    f. Embryonic development
    g. Segmentation
    h. DNA
15. The student will be able to classify the animals by phyla.
16. The student will be able to identify the characteristics of each animal group with emphasis on distinguishing characteristics for each particular phyla.
17. The student will be able to review in detail the anatomy of one or more animals within each taxonomic group.
18. The student will be able to summarize the various systems characteristic of each phyla. These will include the digestive, circulatory, excretory, respiratory and reproductive systems.
19. The student will be able to understand the role of the skeletal and muscular systems in support and movement.
20. The student will be able to demonstrate knowledge of the heart and vessel structure and function.
21. The student will be able to demonstrate knowledge of the structure and function of the lymphatic system.
22. The student will be able to demonstrate knowledge of the composition and circulation of human lymphatic fluid.

23. The student will be able to demonstrate knowledge of the composition and function of blood.
24. The student will be able to explain the phases of the respiratory process.
25. The student will be able to demonstrate knowledge of the structure and function of the respiratory passageways.
26. The student will be able to name, describe the location and give the general functions of each of the digestive organs.
27. The student will be able to list the various digestive enzymes secreted by the digestive glands and describe the function of each.
28. The student will be able to define nutrition, nutrients and essential nutrients.
29. The student will be able to list and give the general function of the major vitamins.
30. The student will be able to define excretion and identify all of the systems involved in the process.
31. The student will be able to demonstrate knowledge of the structure, location and function of the excretory organs such as the kidneys, ureters, bladder and urethra.
32. The student will be able to demonstrate knowledge of the physiology of excrement formation.
33. The student will be able to demonstrate knowledge of cell types found in nervous systems.
34. The student will be able to demonstrate knowledge of the electrochemical changes associated with impulse transmission and synaptic transmission.
35. The student will be able to demonstrate knowledge of the structure, organization and function of the brain.
36. The student will be able to demonstrate knowledge of the structure, organization and function of the spinal cord.
37. The student will be able to demonstrate knowledge of the structure, organization and function of the autonomic nervous system.
38. The student will be able to demonstrate knowledge of the structure and function of the specialized sensory receptors and organs.
39. The student will be able to demonstrate knowledge of the structure and function the sensory receptors and organs.
40. The student will be able to identify, give the location and secretion of the various endocrine glands.
41. The student will be able to demonstrate knowledge of the identity, source and function of the hormones.
42. The student will be able to demonstrate knowledge of the regulation of hormone secretion.
43. The student will be able to demonstrate knowledge of the structure, location and function of the reproductive anatomy.
44. The student will be able to demonstrate knowledge of the physiological changes relative to the reproductive cycles.
45. The student will be able to demonstrate knowledge of the process of gametogenesis.
46. The student will be able to demonstrate knowledge of fertilization and embryonic development.
47. The student will be able to define predation.

48. The student will be able to explain the relationship and interaction between the predator and prey.
49. The student will be able to define symbiosis and describe the different symbiotic relationships.
50. The student will be able to recognize the various tropic levels of energy and the characteristics of the various organisms in each level.
51. The student will be able to identify a food chain, food web, and the pyramid of energy.
52. The student will be able to recognize the living and non-living factors and their interaction within an Ecosystem.
53. The student will be able to define pollution and identify the types of pollution and their effects on the ecosystem.
54. The student will be able to define Biosphere.
55. The student will be able to define biomes, list and give the characteristics of the different types of biomes.
56. The student will be able to gain knowledge of the modern concept of Evolution

TOPICAL OUTLINE - Biology 122 General Biology II

UNIT I

1. Evolution: Introduction and Historical Background
2. Evidence
   A. Fossil Record
   B. Biogeography
   C. Comparative Anatomy
   D. Embryological Development
   E. Molecular Data
3. The modern concepts of evolution
   A. Microevolution
      1. Population Genetics
      2. Mutation
      3. Genetic Drift
      4. Gene Flow
      5. Selective Pressures
         a. Natural Selection
         b. Sexual Selection
   B. Macroevolution
      1. Speciation: Gradualism and Punctuated Equilibrium
         a. Sympatric
         b. Allopatric
         c. Parapatric
      2. Reproductive Isolation
         a. Pre-zygotic
         b. Post-zygotic
      3. Geographic Isolation
         a. Abrupt
         b. Clines
   C. Chemical Evolution
4. Primate Evolution
5. Evolution vs. Creation

UNIT II

1. Taxonomy: Introduction

   A. Phylogony
   B. Cladistic Analysis
   C. Phenetic Analysis

2. Viruses

   A. Bacteriophages
   B. Lytic
      1. DNA based
      2. RNA based
   C. Temperate
   D. New Forms

3. Kingdom Prokaryotae (Archaea & Bacteria)

A. Bacteria: Archaebacteria (Archaea)vs. Eubacteria (Bacteria)

1. Characteristics of Classification
2. Basic Morphological Characteristics
3. Basic Physiological Characteristics

B. Cyanobacteria

1. Morphological Characteristics
2. Physiological Characteristics

4. Kingdom Protista (Polyphyletic new data relate by character *, #,$,!,%))

A. Algae and Plant Like

1. Morphological and Physiological Characteristics

PHYLUM

a. green algae: Chlorophyta*: Charophyta*
b. red algae: Rhodophyta*
c. brown algae: Phaeophyta$
   golden algae: Chrysophyta$
d. dinoflagellates: Dinoflagellata$
e. diatoms: Bacillariophyta$
f. euglenoids: Euglenophyta#: Kinoplastida#

B. Protozoa and Animal Like

1. Morphological and Physiological Characteristics

PHYLUM

a. flagellates: Zoomastigina (Cercozoans)!
b. ciliates: Ciliophora$
c. amoebas: Rhisopoda (Amoebozoa)$
   Gymnamoeba
   Entamoeba
d. sporozoans: Apicomplexa$
e. foraminiferans: Foraminifera!
f. actinopods: Actinopoda (Radiolarians)!
g. choanoflagellates: Choanoflagellata%

C. Fungal Like

1. Morphological and Physiological Characteristics

a. slime molds

PHYLUM

I. plasmodial: Myxomycota (Myxogastrida)%
II. cellular: Acrasiomycota (Dictyostelida)%
III water molds: **Phylum** Oomycota$
IV nucleariids: Nucleariida%

5. Kingdom Fungi

A. Basic Characteristics
1. Morphological
2. Physiological

B. Classification

PHYLUM

1. zygomycetes: Zygomycota
2. sac fungi: Ascomycota
3. club fungi: Basidiomycota
4. imperfect fungi: Deutromycota
   - Chytrids: Chytridiomycota
   - Glomeromycetes: Glomeromycota

6. Kingdom Plantae

A. Characteristics of Classification by **PHYLUM**

B. Non-vascular Plants
1. Mosses: Bryophyta

a. morphology
b. physiology
c. reproduction (life cycles)

2. Liverworts: Hepatophyta
   a. morphology
   b. physiology
   c. reproduction (life cycles)
3. Hornworts: Anthocerophyta
   a. morphology
   b. physiology
   c. reproduction (life cycles)

C. Vascular Plants: Tracheophyta
1. Ferns: Pterophyta*
   a. morphology
   b. physiology
   c. reproduction (life cycles)
2. Wiskferns: Psilophyta*
   a. morphology
   b. physiology
   c. reproduction (life cycles)
3. Horsetails: Sphenophyta*
   a. morphology
   b. physiology
   c. reproduction (life cycles)
4. Club Mosses: Lycophyta
   a. morphology
   b. physiology

c. reproduction (life cycles)

D. Seed Plants

1. Gymnosperms: naked seed plants

a. Conifers: Coniferophyta
   I. morphology
   II. physiology
   III. reproduction (life cycles)

b. Cycads: Cycadophyta
   I. morphology
   II. physiology
   III. reproduction (life cycles)

c. Ginkos: Ginkophyta
   I. morphology
   II. physiology
   III. reproduction (life cycles)

d. Gnetophytes: Gnetophyta
   I. morphology
   II. physiology
   III. reproduction (life cycles)

2. Angiosperms: covered seed plants

a. Anthophyta: Monocots vs. Dicots
   I. morphology
   II. physiology
   III. reproduction (life cycles)

UNIT III

1. Kingdom Animalia
   A. Reasons for studying zoology
   B. Basis for animal classification

INVERTEBRATES

C. **Phylum** Porifera (Characteristics)- sponges

CLASS

1. Calcaria- calcium carbonate
2. Hexactinallida- silica
3. Demospongiae- sponging

D. **Phylum** Cnidaria (Coelenterata) (Characteristics)- jellies

CLASS

1. Hydrozoa- hydroids
2. Scyphozoa- jellies
3. Anthozoa- corals and anemones
4. Cubozoa- box jellies and sea wasps

E. **Phylum** Ctenophora (Characteristics)- comb jellies

*** ACOELOMATES ***

Phylum Acoela- acoel flatworms

Phylum Placazoa- placazoans

Phylum Kinorhyncha- kinorhynchs

F. **Phylum** Platyhelminthes (Characteristics)- flatworms

CLASS

1. Turbellaria (Rhabditophora)- free living
2. Trematoda(Rhabditophora)- - flukes
3. Cestoda(Rhabditophora)- - tapeworms
4. Monogenea (Catenulida)- parasites

G. **Phylum** Nemertea (Characteristics)- proboscis worms

*** PSEUDOCOELOMATES ***

H. **Phylum** Nematoda (Characteristics)- roundworms

I. **Phylum** Rotifera (Characteristics)- wheel animals

*** COELOMATES ***

!! PROTOSTOMES !!

J. **Phylum** Annelida (Characteristics)- segmented worms

CLASS

1. Polychaeta- sandworms
2. Oligochaeta- earthworms
3. Hirudinea- leeches

Phylum Acanthocephala- spiney headed worms

Phylum Loricifera- loriciferans

Phylum Priapula _priapulans

K. **Phylum** Mollusca (Characteristics)- mollusks

CLASS

1. Polyplacophora- chitons
2. Gastropoda- snails and slugs
3. Bivalvia- bivalves
4. Cephalopoda- squids and octipods

L. **Phylum** Arthropoda (Characteristics)- arthropods

1. Sub**Phylum** Crustacea (Characteristics)-crustaceans
   a. Class Malacortraca- seafood
   I. Order Decopoda- decopods
2. Sub**Phylum** Myriapoda (Characteristics)- unbranched arthropods

CLASS

a. Chilopoda- centipedes
b. Diplopoda- millipedes

Sub**Phylum** Hexopoda

CLASS Insecta- insects

ORDER

I. Thysanaura- silver fish
II. Odonata- dragonflies
III. Orthoptera- crickets and grasshoppers
IV. Blattodea- cockroaches
V. Isoptera- termites
VI. Anoplura- lice
VII. Hemiptera- bugs
VIII. Homoptera- aphids and scales
IX. Lepidoptera- butterflies
X. Diptera- flies
XI. Siphonaptera- fleas
XII. Coleoptera- weevils
XII. Hymenoptera- bees and wasps

3. Sub**Phylum** Chelicerata (Characteristics)

CLASS

a. Arachnida- spiders
b. Merostomata- horseshoe crabs

Phylum Tartigrada- water bears

Phylum onychophora- velvet worms

!! DUETEROSTOMES !!

M. **Phylum** Lophophora (Characteristics)- lophophores

1. **Phylum** Phoronida- tube worms
2. **Phylum** Ectoprocta- bryozoans
3. **Phylum** Brachiopoda- lampshells
4. **Phylum** Cycliophora- Cycliophorans

N. **Phylum** Echinodermata (Characteristics)- echinoderms

CLASS

1. Chrinoidea- feather stars and sea lilies
2. Asteroidea- sea stars
3. Ophiuroidea- brittle stars
4. Echinoidea- sea urchins
5. Holothuroidea- sea cucumbers

O. **Phylum** Chaetugnatha (Characteristics)- arrow worms

P. **Phylum** Hemichordata (Characteristics)- acorn worms

Q. **Phylum** Chordata (Characteristics)- chordates

1. Sub**Phylum** Urochordata- tunicates
2. Sub**Phylum** Cephalochordata- lancets

VERTEBRATES

3. Sub**Phylum** Vertebrata (Craniata)- vertebrates
   a. Super class Pisces- fish

CLASS

1. Agnatha- jawless
   myxini- hagfish
   petromyzontida- lampreys
2. Chondrichthyses- cartilaginous finned
   Actinisti- coelacanths
   Dipnoi- lungfish
3. Osteichthyes- bony finned

ORDER

I. Actinopterygians- ray finned
II. Sarcopterygians- lobed finned

b. Superclass Tetrapoda- limbed

CLASS

1. Amphibia- amphibians

ORDER

I. Urodela- salamanders
II. Anura- frogs and toads
III. Apoda- caecilians

CLASS

2. Reptilia- reptiles

ORDER

I. Chelonia- turtles
II. Squamata- snakes and lizards
III. Crocodilia- crocodiles and alligators

CLASS

3. Aves- birds
4. Mammalia- mammals

SUBCLASS

I. Prototheria (Monotremes)- platypus
II. Metatheria (Marsupials)- kangaroos and wallabies
III. Eutheria (Placentals)- having a placenta

ORDER

a. Eulipotyphla- moles, shrews (insectivores)
b. Chiroptera- bats
c. Carnivora- carnivores
d. Xenarthra- sloths
e. Rodentia- rodents
f. Lagomorpha- bunnies
g. Perissodactyla- horses and rhinos
h. Cetartiodactyla- cattle and giraffes
i. Proboscidea- elephants
j. Sirenea- manatees and sea cows
k. Cetacea- whales and dolphins
l. Pinnipedia- seals and sea lions
m. Tubulidentata- aardvarks
n. Hyracoidea- hyraxes
o Primates- apes and monkeys

1. Suborder Prosimii- prosimians

FAMILY

I. Cherogallidae- dwarf lemurs
II. Lemuridae- lemurs
III. Indriidae- indris
IV. Daubentoniidae- aye-ayes
V. Lorisidae- bush babies
VI. Tarsiidae- tarsiers

2. Suborder Antropoidea- anthropoids

FAMILY

I. Callitrichidae- marmosets
II. Cebidae- new world monkeys
III. Cercopithecidae- old world monkeys
IV. Hylobatidae- gibbons
V. Pongidae- great apes
VI. Hominidae- humans

Genus Sahelanthropus
Tchadensis

Genus Orrorin
Tugenensis

Genus Ardipithecus
ramidus

.Genus Australopithecus- ancient humans
SPECIES
afarensis- lucy
anamensis
africanus- Africa
garhi

Genus Kenyanthropus
Platyops

Genus Paranthropus
boisei
robustus

.Genus Homo- modern humans
SPECIES
habilis- handy
rudolfensis
ergaster
erectus- peking/java
neanderthalensis
. sapien- us

UNIT IV (Descriptions of Characteristics)

1. Support and Movement

A. Non-skeletal Systems
B. The Skeletal System
   1. Bones
      a. classification and numbers of bones
      b. functions
   2. Cartilages
      a. types
      b. functions
C. The Muscular System
   1. Striated (skeletal) Muscle
      a. location in the body
      b. how they are named
      c. histological features
   d. function
      2. Cardiac Muscle
         a. location in the body
         b. histological features

c. function
3. Smooth Muscle
a. location in the body
b. histological features
c. function

2. The Cardiovascular and Lymphatic Systems

A. Blood
1. Composition
a. plasma
b. formed elements
1. red blood cells
2. white blood cells
3. platelets

B. Blood vessels, their structures and functions
1. arteries/arterioles
2. veins/venules
3. capillaries

C. The Heart
1. structure
2. the role of the heart in the body

D. The Lymphatic System
1. Lymphatic (tissue) Fluids
a. composition and method of circulation
2. Lymphatic vessels
3. Associated glands
4. The role of the lymphatic system in the body

3. The Respiratory System

A. The organs of respiration, their structure and function
B. The phases of the respiratory process
1. Breathing (Inhalation / Exhalation)
2. External respiration
3. Internal respiration
4. Cellular respiration

4. Nutrition and Digestion

A. Nutrition and Nutrients (Essential)
B. The role of vitamins in nutrition
C. The basic metabolic rate
D. Digestive systems
1. Structures
2. The role of these structures in the digestive process

5. The Excretory System

A. The organs of the excretory system
B. Structure and function
C. The process of excrement formation
1. Filtration
2. Reabsorption

3. Secretion

6. Balance and Control

A. The Nervous System

1. Nerve tissues
   a. neurons, how they are classified and their functions
   b. glial cells, types and functions
2. The physiology of impulse transmission
3. The reflex arc
4. The divisions of the nervous system
   a. composition
   b. function
5. Special sense organs and receptors, their structures and functions
   a. receptors of the skin
   b. chemoreceptors
   c. auditory receptors

d. visual receptors

B. The Endocrine System

1. The chemical composition of the endocrine secretions

a. proteins
b. steroids
c. amines

2. The glands

a. their location in the body
b. the hormones they secrete
c. the action of these hormones

7. Reproduction and Development

A. The organs of reproduction
   1. Structure and Function
   2. The reproductive cycle
   3. Fertilization

B. Development
   1. The fertilized egg (zygote)
   2. Cleavage
      a. mitosis
      b. morula
      c. blastula
      d. gastrula
         1. ectoderm
         2. mesoderm
         3. endoderm
   3. The embryo
      a. implantation of the blastocyst

b. extra embryonic membranes
4. The fetus
   a. stages of growth
b. stages of birth

Unit V

1. Behavior
   A. Cycles
   B. Innate
   C. Learned
      1. Classical Conditioning
      2. Operant Conditioning
      3. Imprinting
      4. Habituation
      5. Insight

D. Social Behavior and Communication

1. Hierarchies
2. Defense
   a. Active
   b. Passive
3. Sexual
4. Selective Behaviors
5. Competition, Predation and Parasitism
   a. intraspecific
   b. interspecific
6. Symbiosis
   a. Commensalism
   b. Mutualism
   c. Altruism
7. Play

UNIT VI.

1. Ecology
   A. Energy Flow and Chemical Cycling
      1. Carbon
      2. Nitrogen
      3. Phosphorus
      4. Sulfur
      5. Water
   B. Food Chains and Webs
      1. Niche vs. Habitat
      2. Trophic Levels
      3. Productivity
   C. Population Ecology

1. Biotic Potential
2. Environmental Resistance
    a. Density Dependent
    b. Density Independent
3. Food and Populations
4. Human Populations

D. The Biosphere (Ecosystems)
1. Community
2. Biomes

a. Land
I. Tundra
II. Taiga
III. Temperate Forest
A. rain
B. deciduous
IV. Grasslands
V. Chaparral
VI. Desert
VII. Tropical Forest
b. Freshwater
I. Standing Water
II. Running Water
c. Transitional Aquatic
I. Wetlands
II. Estuaries
III. Marshes
d. Marine
I. Intertidal
II. Nertic
III. Oceanic
IV. Benthic

3. Changes in an ecosystem
4. Pollution and the ecosystem