



General Biology

Produced by Palomar College
39, 30-minute programs
Closed Captioned

Textbook

Biology 100/101 Lecture Outline and Study Guide, by Daniel Sourbeer (Whittier Publishing). It must be purchased at the Palomar College bookstore. The lecture outline is the script for the videos.

Recommended:

Biology: Concepts and Connections by Campbell, Reese, Mitchell and Taylor, 4th Ed..

Periodic Table of the Elements. A Periodic Table can be purchased at the Palomar College bookstore, or go to <http://images.google.com/images>, enter "Periodic Table of the Elements" in the search window, and select and print one you like.

This video series covers the basic principles of general biology as they relate to the cellular, organismic, and population levels of organization. Includes cell ultrastructure and function, energy transfer, reproduction, genetics, evolution, diversity of organisms, and ecology.

PROGRAM DESCRIPTIONS

- 1. The Nature of Science.**
The process of science; characteristics of experimentation (controlled study); logic; the products of science; characteristics of good science; double blind studies and placebo effect; public confusion/frustration with science.
- 2. Basic Chemistry—Atomic Structure**
States of matter; characteristics of protons, neutrons, and electrons; the Periodic Table of the Elements; atomic number, mass, and isotopes; electron distribution and reactivity.
- 3. Basic Chemistry—Chemical Bonding and Reactions**
Compounds; ionic bonds, covalent bonds; polar and nonpolar covalent bonds; chemical equations, chemical reactions, and moles; electronegativity, valence shells, and bonding.
- 4. Biochemistry—Important Inorganics**
Organic vs. inorganic molecules; monomers and polymers; dehydration synthesis; important organic groups; characteristics of water; acids, bases and pH; buffers.
- 5. Biochemistry—Carbohydrates and Protein Structure**
Carbohydrate characteristics and functions; structural formulas; common monosaccharides; common disaccharides and their synthesis; common polysaccharides; amino acid structure; peptide bonds; complete vs. incomplete proteins; common protein 3-dimensional structures and their relationship to amino acid sequence; relationship between protein shape and function.
- 6. Biochemistry—Protein Function and Lipids**
Enzymes; transport proteins; carrier proteins; other protein functions; lipid characteristics; fatty acids; triglycerides; phospholipids; glycolipids; energy value of common organics.
- 7. Plasma Membranes and Solutions**
Characteristics and structure of plasma membranes; semipermeability; characteristics of solutions; diffusion; osmosis; osmotic pressure, hypertonic vs. hypotonic solutions; isotonic solutions; predicting osmosis; dialysis; facilitated transport; active transport; endocytosis; exocytosis, active vs. passive processes; environmental factors that affect the speed of diffusion.
- 8. Cells and Their Structures**
Relationship between surface area and volume; prokaryotic cells and their structures; eukaryotic cells and their organelles; microscopy; magnification vs. resolving power.
- 9. Energetics, An Overview**
First and second laws of energy; ATP; exergonic and endergonic reactions; nuclear fusion; electromagnetic and visible light spectrum; the role of photosynthesis in ecosystems; the role of the cellular oxidation of glucose in ecosystems; food chains and food webs; ecological roles; energy pyramids; matter recycling vs.

energy flow.

10. **Pieces of the Energy Puzzle**

Oxidation vs. reduction reactions; the role of NAD, FAD, NADP and their reduced counterparts; enzymatic pathways; enzymatic cycles; electron transport systems; chemiosmotic phosphorylation.

11. **Energetics, Photosynthesis**

A detailed look at the light and dark reactions of photosynthesis. Chloroplast structure; photosystems, accessory pigments, and resonance transfer; initiation of photosynthesis and the role of chlorophyll-a and water; photosystem II and photosystem I; ATP production; the Calvin Cycle; the role of glucose; guard cells, stomata, and carbon dioxide; C4 and CAM plants.

12. **Energetics, The Cellular Oxidation of Glucose**

A detailed look at glycolysis and cellular respiration. Aerobic and anaerobic glycolysis; mitochondrial structure; pyruvate to acetyl CoA; Krebs's Cycle; mitochondrial electron transport system; ATP production; the role of oxygen; the metabolic relationship between carbohydrates, proteins, and lipids.

13. **DNA Structure and Transcription**

The historical debate between proteins and DNA as genetic material; DNA structure: nucleotide structure, purines and pyrimidines, strand structure and complementary strands, 3' vs 5'; the central dogma; a comparison of DNA and RNA; a detailed look at transcription.

14. **Mutation and Translation**

A discussion of mRNA, tRNA, and rRNA (ribosomes); a detailed look at translation (codons, anticodons, tRNA charging, etc.); polymerase misreads; point mutations; frame-shift mutations; causes of mutations (radiation, chemicals, transposition, translocation, viruses); the evolutionary role of mutation.

15. **Control of Gene Expression and Chromosome Replication**

Repressible and inducible operons; eukaryotic chromosomes; activator and inhibitory proteins; hypercoiling; a detailed look at chromosomal replication; telomeres and causes for shortening.

16. **Mitosis**

Ploidy; cell cycle; subphases of interphase; prophase, metaphase, anaphase, telophase in plants and animals; cytokinesis; the role of mitosis in nature.

17. **Meiosis**

The roles of mitosis and meiosis in sexual reproduction; phases of meiosis I and meiosis II; crossing over and independent assortment; chromosomal abnormalities (translocation, inversion, nondisjunction events).

18. **Mendel and Single Trait Inheritance**

Important definitions; Gregor Mendel; how Mendel tested the blending hypothesis; Mendel's discovery of the segregation of alleles; single trait crosses and their phenotypic and genotypic ratios.

19. **Solving Problems and Multiple Trait Inheritance**

Incomplete dominance, single trait problems are solved; determining genotypes from pedigrees; co-dominance and Landsteiner blood groups.

20. **Multiple Trait Inheritance and Epistasis**

Mendel's test of independent assortment; dihybrid crosses; linked traits; an example of epistasis.

21. **X-Linked Traits, Imprinting, and More**

Sex chromosomes and autosomes; x-linked inheritance problems; interpreting pedigrees; Lyonization and calico cats; imprinting; other factors that modify Mendelian ratios.

22. **Genetic Technology**

Restriction enzymes; probes; gel electrophoresis; DNA fingerprinting and its uses.

23. **More Genetic Technology**

Polymerase chain reaction (PCR) and its uses; gene cloning; recombinant techniques and purpose; stem cells; mammalian cloning.

24. **Origin of Life and Evolution of a Theory**

A review of characteristics of science; defining biological evolution; chemosynthetic theory of life's origins;

the history of evolutionary theory; Charles Darwin.

25. **Modern Theory and Speciation**
Evolutionary forces (random genetic change, natural selection, genetic drift, migration); speciation defined; isolating mechanisms; allopatric, sympatric, and parapatric speciation.
26. **Evidence for a Common Ancestry**
Adaptation; adaptive radiation; punctuated equilibrium; the myth of spontaneous generation; homology; anatomical homology; evidence for mutation and natural selection.
27. **More Evidence and Human Evolution**
Inheritance revisited in the light of evolution; the fossil record; human evolution; biochemical homology; reproductive homology; embryological homology; direct observation; behavioral homology.
28. **Classification and Monerans**
Classification criteria; classification systems; Linnaeus and his hierarchy of classification; phylogenetics; characteristics of the Monera; bacterial shapes; metabolism; the Domain Eubacteria and the Domain Archaea.
29. **Protists, Fungi, and Plant Life Cycles**
Characteristics and examples of Protist divisions; characteristics and examples of Fungal divisions; lichens; plant alternation of generations;
30. **Vascular Tissue and Primitive Plants**
Xylem and transpiration; phloem and translocation; Bryophyte life cycle; fern life cycle; introduction to conifers and seeds.
31. **Advanced Plants**
Conifer life cycle; flower anatomy; anthophyta life cycle; fruits; a comparison of monocot and dicot characteristics.
32. **Animal Diversity, Part I**
Levels of complexity; embryonic development; Phylum Porifera; Phylum Cnidaria.
33. **Animal Diversity, Part II**
Characteristics of the following animal phyla: Ctenophora, Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata, Chordata; characteristics of the following subphyla and vertebrate classes: Cephalochordata, Urochordata, Vertebrata, Agnatha, Placoderma, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves, Mammalia.
34. **Population Dynamics**
Exponential growth; biotic potential; limiting factors; carrying capacity; birth rate; death rate; annual percentage growth rate; doubling time; net migration rate; adjusted growth rate; adjusted doubling time; total fertility rate; age structure diagrams; average marrying age; a comparison of population dynamics within more and less economically developed countries.
35. **Population Control**
Ethical/philosophical considerations relating to population; methods of birth control; slowing population growth; China's one child policy; disease and its historic role in population control.
36. **Ecosystem Structure and Common Biomes**
Biotic and abiotic factors in ecosystems; niche; characteristics of marine and aquatic ecosystems; eutrophication; common biomes; net primary productivity and net biomass.
37. **Chemical Cycling and Succession**
The phosphorus cycle; the nitrogen cycle; the carbon-oxygen cycle; the water cycle; primary and secondary succession; causes of succession; keystone species.
38. **Ecosystem Dynamics and Species Under Siege**
Predator-prey relationships; positive and negative feedback loops; positive and negative synergism; threshold effects; biological magnification; the effect of humanity on natural habitats; characteristics of animals at risk of extinction.
39. **Global Warming and Ozone Depletion**
The Endangered Species Act; albedo and emissivity; greenhouse warming; evidence for global warming;

effects of global warming; greenhouse gases; cooling effects; ozone and its importance; ozone depleting gases; effects of ozone depletion; global depletion of food, energy, and water resources; water pollution; air pollution.