

# **PRAXIS Secondary Education Biology Content Sheet**

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Department of Science Education  
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- i. Cells and Processes, Including Genetics
  - a. Basic structure and function of cells and their organelles
  - b. Structure and function of cell membranes (e.g., phospholipid bilayer, passive and active transport, homeostasis)
  - c. Structure and function of eukaryotic cell organelles
  - d. Structure and function of prokaryotic cell organelles
  - e. Levels of organization (cells, tissues, organs, organ systems)
  - f. Major features of common animal cell types (e.g., blood, muscle, nerve, epithelial, gamete)
  - g. Prokaryotes (eubacteria and archaea) and eukaryotes (animals, plants, fungi, protists)
  - h. Key aspects of cell reproduction and division
    - i. Cell cycle phases
    - j. Mitosis
    - k. Meiosis
    - l. Cytokinesis
  - m. Binary fission
  - n. Basic biochemistry of life
  - o. Aerobic and anaerobic cellular respiration
  - p. Photosynthesis
  - q. Biological molecules (e.g., nucleic acids, carbohydrates, proteins, lipids)
  - r. Basic genetics and protein synthesis
  - s. Structure, function, and replication of DNA and structure and function of RNA
  - t. Central dogma: transcription and translation
  - u. Chromosomes, genes, alleles
  - v. Dominant and recessive traits
  - w. Mendelian inheritance (e.g., genotype, phenotype, use of Punnett squares, sex-linked traits, pedigrees, probability)
  - x. Non-Mendelian inheritance (e.g., incomplete dominance, codominance)
  - y. Mutations, chromosomal abnormalities, and common genetic disorders, genetic counseling
  
- ii. Evolution, Diversity of Life, and Ecology
  - a. Theory and key mechanisms of evolution
  - b. Natural selection as the mechanism of evolution (e.g., adaptations and reproductive fitness)
  - c. Speciation, extinction, and selection pressures

- d. Supporting evidence (e.g., fossil record, comparative amino acid and nucleotide sequences, homologous structures, embryology)
  - e. Artificial selection, contemporary evolution (rapid microevolution)
  - f. Genetic diversity (e.g., mutation, sexual reproduction, genetic drift)
  - g. Organismal classification and relationships
  - h. Use and interpretation of cladograms and phylogenetic trees
  - i. Defining characteristics of prokaryotes, animals, plants, fungi, and protists
  - j. Basic structures of plants and plant growth
  - k. Structure and function of roots, leaves, and stems (e.g., stomata, xylem, phloem) in vascular plants
  - l. Asexual (budding) and sexual reproduction (flowers, fruit, seeds, spores)
  - m. Relationship between photosynthesis and growth
  - n. Responses to stimuli (e.g., light, temperature, water, gravity)
  - o. Basic structure and function of animal systems
  - p. Homeostasis and response to stimuli; negative and positive feedback loops
  - q. Exchange with the environment (e.g., respiratory, circulatory, nervous, endocrine, excretory, and digestive systems)
  - r. Reproduction, development, and growth
  - s. Immune system and disease (e.g., antibodies, vaccines, autoimmune disorders)
  - t. Key aspects of ecology
  - u. Hierarchical structure of the biosphere (e.g., organisms, populations, communities, ecosystems, biomes)
  - v. Intraspecific relationships (e.g., competition and altruism)
  - w. Interspecific relationships (e.g., symbiotic relationships including mutualism, parasitism, and commensalism; predation)
  - x. Influence of biotic and abiotic components of an ecosystem on populations (e.g., niche, resource availability, limiting factors, population growth and carrying capacity, critical population size)
  - y. Ecosystem function and stability (e.g., energy flow; biodiversity; ecological succession; phenology; water, nitrogen, and carbon cycles)
- iii. Ecosystem disturbances and change
- a. Climate change
  - b. Ocean acidification
  - c. Cascading effects such as loss of pollinators; keystone species; invasive species