

CLEP® Biology

... At a Glance

Description of the Examination

The Biology examination covers material that is usually taught in a one-year college general biology course. The subject matter tested covers the broad field of the biological sciences, organized into three major areas: molecular and cellular biology, organismal biology, and population biology. The examination gives approximately equal weight to these three areas.

The examination contains approximately 115 questions to be answered in 90 minutes. Some of these are pretest questions that will not be scored.

Knowledge and Skills Required

Questions on the Biology examination require candidates to demonstrate the following abilities in the approximate proportions indicated.

- Knowledge of facts, principles and processes of biology.
- Understanding the means by which information is collected, how it is interpreted, how one hypothesizes from available information, how one draws conclusions and makes further predictions.
- Understanding that science is a human endeavor with social consequences.

The subject matter of the Biology examination is drawn from the following topics. The percentages next to the main topics indicate the approximate percentage of exam questions on that topic.

33% Molecular and Cellular Biology

Chemical composition of organisms

- Simple chemical reactions and bonds
- Properties of water
- Chemical structure of carbohydrates, lipids, proteins, nucleic acids
- Origin of life

Chemical composition of organisms

- Structure and function of cell organelles
- Properties of cell membranes
- Comparison of prokaryotic and eukaryotic cells

Enzymes

- Enzyme-substrate complex
- Roles of coenzymes
- Inorganic cofactors
- Inhibition and regulation

Energy transformations

- Glycolysis, respiration, anaerobic pathways
- Photosynthesis

Cell division

- Structure of chromosomes
- Mitosis, meiosis and cytokinesis in plants and animals

Chemical nature of the gene

- Watson-Crick model of nucleic acids
- DNA replication
- Mutations
- Control of protein synthesis: transcription, translation, posttranscriptional processing
- Structural and regulatory genes
- Transformation
- Viruses

34% Organismal Biology

Structure and function in plants with emphasis on angiosperms

- Root, stem, leaf, flower, seed, fruit
- Water and mineral absorption and transport
- Food translocation and storage

Plant reproduction and development

- Alternation of generations in ferns, conifers and flowering plants
- Gamete formation and fertilization
- Growth and development: hormonal control
- Tropisms and photoperiodicity

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Structure and function in animals with emphasis on vertebrates

- Major systems (e.g., digestive, gas exchange, skeletal, nervous, circulatory, excretory, immune)
- Homeostatic mechanisms
- Hormonal control in homeostasis and reproduction

Animal reproduction and development

- Gamete formation, fertilization
- Cleavage, gastrulation, germ layer formation, differentiation of organ systems
- Experimental analysis of vertebrate development
- Extraembryonic membranes of vertebrates
- Formation and function of the mammalian placenta
- Blood circulation in the human embryo

Principles of heredity

- Mendelian inheritance (dominance, segregation, independent assortment)
- Chromosomal basis of inheritance
- Linkage, including sex linked
- Polygenic inheritance (height, skin color)
- Multiple alleles (human blood groups)

33% Population Biology

Principles of ecology

- Energy flow and productivity in ecosystems
- Biogeochemical cycles
- Population growth and regulation (natality, mortality, competition, migration, density, *r*- and *K*-selection)
- Community structure, growth, regulation (major biomes and succession)
- Habitat (biotic and abiotic factors)
- Concept of niche
- Island biogeography
- Evolutionary ecology (life history strategies, altruism, kin selection)

Principles of evolution

- History of evolutionary concepts
- Concepts of natural selection (differential

reproduction, mutation, Hardy-Weinberg equilibrium, speciation, punctuated equilibrium)

- Adaptive radiation
- Major features of plant and animal evolution
- Concepts of homology and analogy
- Convergence, extinction, balanced polymorphism, genetic drift
- Classification of living organisms
- Evolutionary history of humans

Principles of behavior

- Stereotyped, learned social behavior
- Societies (insects, birds, primates)

Social biology

- Human population growth (age composition, birth and fertility rates, theory of demographic transition)
- Human intervention in the natural world (management of resources, environmental pollution)
- Biomedical progress (control of human reproduction, genetic engineering)

Study Resources

Most textbooks used in biology courses cover the topics in the outline above, but the approaches to certain topics and the emphases given to them may differ. To prepare for the Biology exam, it is advisable to study one or more college textbooks, which can be found in most college bookstores.

A recent survey conducted by CLEP® found that the following textbooks are among those used by college faculty who teach the equivalent course. Most of these have companion websites with practice test questions and other study resources. HINT: When selecting a textbook, check the table of contents against the Knowledge and Skills required for this test.

Audesirk, Audesirk and Byers, *Biology: Life on Earth with Physiology* (Benjamin Cummings)

Brooker, Widmaier, Graham and Stiling, *Biology* (McGraw-Hill)

Cain et al., *Discover Biology* (W.W. Norton)

Campbell and Reece, *Biology* (Benjamin Cummings)

Campbell, Reece, Taylor, Simon and Dickey, *Biology: Concepts and Connections* (Benjamin Cummings)

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Enger et al., <i>Concepts in Biology</i> (McGraw-Hill)
Freeman, <i>Biological Science</i> (Benjamin Cummings)
Lewis et al., <i>Life</i> (McGraw-Hill)
Mader and Windelspecht, <i>Essentials of Biology</i> (McGraw-Hill)
Raven et al., <i>Biology</i> (McGraw-Hill)
Russell, Hertz and McMillan, <i>Biology: The Dynamic Science</i> (Brooks/Cole)
Sadava et al., <i>Life: The Science of Biology</i> (W.H. Freeman)
Solomon et al., <i>Biology</i> (Brooks/Cole)
Starr, <i>Biology: Concepts and Applications</i> (Brooks/Cole)
Tobin and Dusheck, <i>Asking About Life</i> (Brooks/Cole)

In addition, the following resources, compiled by CLEP test development committee and staff members, may help you study for your exam. However, none of these sources are designed specifically to provide preparation for a CLEP exam. The College Board has no control over their content and cannot vouch for accuracy:

Eastern Connecticut State University: AP Biology Training Links

<http://www.xmarks.com/site/www.easternct.edu/personal/faculty/cowlese/apbio.html>

Estrella Mountain Community College: Online Biology Book

<http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookTOC.html>

Hippocampus: Biology

<http://www.hippocampus.org/Biology>

University of Arizona: The Biology Project

<http://www.biology.arizona.edu/>

University of California, Berkeley: Webcast lectures for Biology 1A and 1B

<http://webcast.berkeley.edu/courses.php>

Visit www.collegeboard.com/clepprep for additional Biology resources. You can also find suggestions for exam preparation in Chapter IV of the *CLEP Official Study Guide*. In addition, many college faculty post their course materials on their schools' websites.

Sample Test Questions

The following sample questions do not appear on an actual CLEP examination. They are intended to give potential test-takers an indication of the format and difficulty level of the examination and to provide content for practice and review. For more sample questions and info about the test, see the *CLEP Official Study Guide*.

1. Chromosomes are located in a nucleus in which of the following?
 - I. Viruses
 - II. Prokaryotes
 - III. Eukaryotes
 - A. I only
 - B. II only
 - C. III only
 - D. I and II only
 - E. II and III only
2. Meiosis of a diploid cell results in
 - A. one tetraploid cell
 - B. two diploid cells
 - C. two haploid cells
 - D. four haploid cells
 - E. four diploid cells
3. Neurotransmitters contained in vesicles enter the synapse through
 - A. binary fission
 - B. translocation
 - C. diffusion
 - D. exocytosis
 - E. endocytosis
4. Which of the following pairs of organisms have the closest evolutionary relationship?
 - I. *Bacillus thuringiensis*
 - II. *Telmatobius peruvianus*
 - III. *Bacillus cereus*

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- IV. *Cereus peruvianus*
V. *Mesoplodon peruvianus*
5. Which of the following best describes the primary function of chlorophyll in an organism?
- It is the primary hydrogen acceptor in glycolysis.
 - It is the storage form of starch in plants.
 - It enables transpiration in woody plants.
 - It provides nutrients to cells by circulating through the vascular tissue.
 - It absorbs light energy to power oxygen production.
- 6–7 Students in a biology class designed an experiment to measure the effects of the environment on transpiration. The data are shown in the table below.
- | Environmental Condition | Water Loss (mL/m ² /hr) |
|-------------------------|------------------------------------|
| Standard room | 4 |
| Bright light | 6 |
| Wind | 8 |
| Misting around plant | 2 |
| Polluted environment | 3 |
8. Human blood pressure data, such as 120/82, provide which of the following kinds of information?
- The force needed to open the heart valves
 - The force of the atrial contractions
 - The pressure of the blood against the walls of the arteries
 - The pressure of the blood as it travels in veins
 - The rate of blood flow in the aorta
9. Which of the following kinds of organisms are best adapted to habitats that are frequently subject to unpredictable and severe environmental fluctuations?
- Organisms with very specific diets
 - Ectothermic organisms
 - Top predators
 - Keystone species
 - r-selected organisms

Credit Recommendations

The American Council on Education has recommended that colleges grant 6 credits for a score of 50, which is equivalent to a course grade of C, on the CLEP Biology exam. Each college, however, is responsible for setting its own policy. For candidates with satisfactory scores on the CLEP Biology examination, colleges may grant credit toward fulfillment of a distribution requirement, or for a particular course that matches the exam in content. Check with your school to find out the score it requires for granting credit, the number of credit hours granted and the course that can be bypassed with a passing score.

- Answers to Sample Questions: 1-C; 2-D; 3-D; 4-B; 5- E; 6-A; 7-E; 8-C; 9-E
6. Which of the conditions served as the control?
- Standard room
 - Bright light
 - Wind
 - Misting around plant
 - Polluted environment
7. Based on the results of the experiment, water movement through plants occurs most rapidly under which of the following conditions?
- A cloudy day
 - A bright light

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