Florida Teacher Certification Examinations

Test Information Guide

for

Biology 6–12

FLORIDA DEPARTMENT OF EDUCATION
www.fldoe.org

Fourth Edition

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1 Test and Test Information Guide Development

Teacher Certification Testing

Since 1980, Florida teacher certification candidates have been required to pass the Florida Teacher Certification Examinations (FTCE), which has consisted of tests in reading, writing, mathematics, and professional knowledge. The 1986 Florida Legislature modified the testing program by also requiring teacher candidates to pass a test in the subject area in which they wish to be certified. In addition, the Legislature substituted the Florida College-Level Academic Skills Test (CLAST) for the reading, writing, and mathematics portions of the FTCE. The 2000 Florida Legislature replaced the CLAST with the General Knowledge Test, effective July 1, 2002.

The subject area knowledge tested on the Biology 6–12 examination was identified and validated by committees of content specialists from within the state of Florida. Committee members included public school teachers, district supervisors, and college faculty with expertise in this field. Committee members were selected on the basis of recommendations by district superintendents, public school principals, deans of education, experts in the field, and other organizations. In developing the test, the committees used an extensive literature review, interviews with selected public school teachers, a large-scale survey of teachers, pilot tests, and their own professional judgment.

Role of the Test Information Guide

The purpose of this test information guide is to help candidates taking the subject area test in Biology 6–12 prepare effectively for the examination. The guide was designed to familiarize prospective test takers with various aspects of the examination, including the content that is covered and the way it is represented. The guide should enable candidates to direct their study and to focus on relevant material for review.

This test information guide is intended primarily for use by certification candidates, who may be students in a college or university teacher-preparation program, teachers with provisional certification, teachers seeking certification in an additional subject area, or persons making a career change to public school teaching. Candidates may have studied and worked in Florida or may be from out of state.

College or university faculty may also use the guide to prepare students for certification, and inservice trainers may find the guide useful for helping previously certified teachers prepare for recertification or multiple certification.

This test information guide is not intended as an all-inclusive source of subject area knowledge, nor is it a substitute for college course work in the subject area. The sample questions are representative of the content of the actual test; however, they are not actual test questions from an actual test form. Instead, the guide is intended to help candidates prepare for the subject area test by presenting an overview of the content and format of the examination.

2 Preparation for the Test

The following outline may help you to prepare for the examination. Adapt these suggestions to suit your own study habits and the time you have available for review.

Overview

- **Look over the organization of the test information guide.**

  Section 1 discusses the development of the test and test information guide.
  Section 2 (this section) outlines test preparation steps.
  Section 3 offers strategies for taking the test.
  Section 4 presents information about the content and structure of the test.
  Section 5 lists question formats and includes sample test questions.
  Section 6 provides an annotated bibliography of general references you may find useful in your review.
  Section 7 identifies a source of further information.

Self-Assessment

- **Decide which content areas you should review.**

  Section 4 includes the competencies and skills used to develop this subject area test and the approximate proportion of test questions from each competency area.

Review

- **Study according to your needs.**

  Review all of the competencies and concentrate on areas with which you are least familiar.

Practice

- **Acquaint yourself with the format of the examination.**

  Section 5 describes types of questions you may find on the examination.

- **Answer sample test questions.**

  Section 5 gives you an opportunity to test yourself with sample test questions and provides an answer key and information regarding the competency to which each question is linked.

Final preparation

- **Review test-taking advice.**

  Section 3 includes suggestions for improving your performance on the examination.

- **Refer to field-specific references.**

  Section 6 includes an annotated bibliography listing general references keyed to the competencies and skills used to develop this subject area test.

3 Test-Taking Advice

- Go into the examination prepared, alert, and well rested.
- Complete your travel arrangements prior to the examination date. Plan to arrive early so that you can locate the parking facilities and examination room without rushing.
- Dress comfortably and bring a sweater or jacket in case the room is too cool.
- Take the following with you to the test site:
  - — Admission ticket
  - — Proper identification as described in "Identification Policy"
- There are many strategies for taking a test and different techniques for dealing with different types of questions. Nevertheless, you may find the following general suggestions useful.
  - — Read each question and all the response options carefully before selecting your answer. Pay attention to all of the details.
  - — Go through the entire test once and answer all the questions you are reasonably certain about. Then go back and tackle the questions that require more thought.
  - — When you are not certain of the right answer, eliminate as many options as you can and choose the response that seems best. It is to your advantage to answer all the questions on the test, even if you are uncertain about some of your choices.
  - — After completing the examination, go back and check every question. Verify that you have answered all of the questions and that your responses are correctly entered.

4 Competencies and Skills and Test Blueprint

The table on the following pages lists the competencies and skills used as the basis for the Biology 6–12 examination. These competencies and skills represent the knowledge that teams of teachers, subject area specialists, and district-level educators have determined to be important for beginning teachers. This table could serve as a checklist for assessing your familiarity with each of the areas covered by the test. The competencies and skills should help you organize your review. The test blueprint indicates the approximate percentage of test questions that will cover the specific competency on the exam.

Competencies are broad areas of content knowledge.

Skills identify specific behaviors that demonstrate the competencies.

Percentages indicate the approximate proportion of test questions that represent the competencies on the test.

The following excerpt illustrates the components of the table.

Competency

Approximate percentage of total test questions (test blueprint)

Competency/Skill		**Approx. %**
1	**Knowledge of the investigative processes of science**	**18%**
1	Identify components, proper use, and care of light microscopes.	
2	Distinguish between the types of microscopy (e.g., scanning electron microscopy, transmission electron microscopy, phase contrast) and their applications.	
3	Identify proper techniques for common laboratory procedures (e.g., dissecting; preserving, staining, and mounting microscope specimens; preparing laboratory solutions; using chromatography; performing gel electrophoresis).	
4	Identify proper techniques for field studies (e.g., site selection, sampling, transects, collecting techniques, environmental measurements).	
5	Select appropriate uses of common laboratory procedures (e.g., polymerase chain reaction, chromatography, spectrophotometry, centrifugation, gel electrophoresis).	
6	Calculate measurements in the appropriate metric units.	
7	Differentiate between assumptions, inferences, observations, hypotheses, conclusions, theories, and laws.	
8	Interpret empirical data (e.g., charts, graphs, tables, diagrams).	
9	Differentiate the characteristics and methodologies of scientific and nonscientific knowledge.	
10	Identify relationships between the variables and possible outcomes of a specific experiment.	

Skills (1-10)

Table of Competencies, Skills, and Approximate Percentages of Questions

Competency/Skill		Approx. %
1	**Knowledge of the investigative processes of science**	**18%**
1	Identify components, proper use, and care of light microscopes.	
2	Distinguish between the types of microscopy (e.g., scanning electron microscopy, transmission electron microscopy, phase contrast) and their applications.	
3	Identify proper techniques for common laboratory procedures (e.g., dissecting; preserving, staining, and mounting microscope specimens; preparing laboratory solutions; using chromatography; performing gel electrophoresis).	
4	Identify proper techniques for field studies (e.g., site selection, sampling, transects, collecting techniques, environmental measurements).	
5	Select appropriate uses of common laboratory procedures (e.g., polymerase chain reaction, chromatography, spectrophotometry, centrifugation, gel electrophoresis).	
6	Calculate measurements in the appropriate metric units.	
7	Differentiate between assumptions, inferences, observations, hypotheses, conclusions, theories, and laws.	
8	Interpret empirical data (e.g., charts, graphs, tables, diagrams).	
9	Differentiate the characteristics and methodologies of scientific and nonscientific knowledge.	
10	Identify relationships between the variables and possible outcomes of a specific experiment.	
11	Relate the validity and reliability of scientific knowledge to reproducibility, statistical significance, technological limitations, bias, and types of error.	
12	Identify the development of biological theories and knowledge through important historical events, creative endeavors of diverse individuals, and experimental evidence.	
13	Differentiate between qualitative and quantitative data in experimental, observational, and modeling methods of research.	
14	Determine the elements of a well-designed and controlled experiment.	
15	Identify evidence of the dynamic nature of science in the face of new scientific information.	

Competency/Skill		**Approx. %**
16	Identify patterns (e.g., circadian rhythms, migration, succession, cycles) at the level of organisms, populations, or ecosystems that govern the occurrence of natural events.	
2	**Knowledge of the interactions between science, technology, and society**	**4%**
1	Analyze the ethical, legal, economic, and social implications of current scientific research and practices (e.g., reproductive and life-sustaining technologies, genetic basis for behavior, population growth and control, government and business influences on biotechnology, cloning, genomics, genetic engineering).	
2	Analyze environmental challenges (e.g., ozone depletion, pollution, climate change, health effects) that may result from scientific and technological advances.	
3	Analyze the effects (e.g., multidrug resistance, rapid transmission across international boundaries) of globalization on the spread and treatment of pathogens and invasive species.	
4	Identify pertinent legislation and national guidelines (e.g., National Association of Biology Teachers, International Society of Environmental Forensics, Occupational Safety and Health Administration chemical safety guidelines, material safety data sheets) regarding laboratory safety, hazardous materials, experimentation, and the use and handling of organisms in the classroom.	
3	**Knowledge of the chemical processes of living things**	**14%**
1	Identify the structures, functions, and importance of inorganic and organic compounds (e.g., water, mineral salts, carbohydrates, lipids, proteins, nucleic acids) in cells.	
2	Apply the laws of thermodynamics to living systems, including the role of enzymes in biological reactions.	
3	Predict the effects of changes in pH, temperature, substrate concentration, and enzyme concentration on reaction rate.	
4	Identify substrates, products, and relationships in aerobic respiration (e.g., glycolysis, the Krebs cycle, electron transport), including metabolism of carbohydrates, fats, and amino acids, and in anaerobic respiration (e.g., alcoholic fermentation, lactic acid fermentation).	
5	Compare end products and energy yields of anaerobic and aerobic respiration.	

Competency/Skill		**Approx. %**
6	Identify the raw materials and products of C_3 photosynthesis, as well as factors that affect the rate of light-dependent reactions and the Calvin cycle.	
7	Identify key differences between C_3, C_4, and CAM photosynthesis, and the evolutionary and ecological significance of these pathways.	
8	Analyze the role of chemiosmosis in photosynthesis and respiration.	
9	Compare heterotrophy and autotrophy and the roles of these processes in the environment.	
10	Evaluate the components and roles of the antigen-antibody reaction.	
11	Compare active and passive immunity.	
12	Evaluate the roles of cell recognition (e.g., cell-to-cell signaling, autoimmune diseases, tissue rejection, cancer, pollen or stigma-style interaction) in normal and abnormal cell activity.	
13	Identify the effect of environmental factors on the biochemistry of living things (e.g., ultraviolet light effects on melanin and vitamin D production).	
14	Identify the roles of ATP and ADP in cellular processes.	
15	Compare chemosynthetic and photosynthetic processes and the roles of organisms using these processes in the ecosystem.	
16	Identify cell-to-cell communication (e.g., electrical, chemical) in living things.	
17	Identify specific and nonspecific immune responses to vaccines and inoculations.	
4	**Knowledge of the interactions between cell structure and cell function**	**7%**
1	Identify the major scientists and events that contributed to the development of the cell theory.	
2	Distinguish between the major structural characteristics of prokaryotic and eukaryotic cells.	
3	Relate the structure of cell organelles to their functions.	
4	Differentiate the events of each phase of the cell cycle (e.g., G1, S, G2, M) and the regulatory mechanisms of the cycle.	
5	Compare the mechanisms and results of nuclear division (i.e., karyokinesis) and cell division (i.e., cytokinesis) in plant and animal cells.	
6	Compare characteristics of the major taxa (e.g., domains, kingdoms, phyla), including cellular characteristics.	

Competency/Skill		Approx. %
7	Evaluate the relationships between the structures and functions of cell membrane components.	
8	Compare active and passive cellular transport mechanisms.	
5	**Knowledge of genetic principles, processes, and applications**	**11%**
1	Evaluate the relationships between structure and function in nucleic acids.	
2	Sequence the principal events of DNA replication.	
3	Sequence the principal events of protein synthesis.	
4	Distinguish between the functions of DNA and RNA.	
5	Distinguish between the regulatory systems for prokaryotic and eukaryotic protein synthesis.	
6	Identify proper techniques for recombinant DNA technology (e.g., Southern blotting, creation of transgenic organisms, gene splicing, mitochondrial DNA isolation).	
7	Evaluate possible effects of environmental and genetic influences (e.g., viruses, oncogenes, carcinogenic agents, mutagenic agents, epigenetic factors) on gene structure and expression.	
8	Analyze the processes and products of meiosis in plants, animals, and fungi.	
9	Identify Mendelian laws of inheritance, their relationship to chromosomes, and related terminology.	
10	Analyze applications of probability and statistical analysis (e.g., chi-square, Punnett square) in genetics.	
11	Analyze various patterns of inheritance (e.g., sex-linked, sex-influenced, sex-limited, incomplete dominance, codominance, autosomal linkage, multiple alleles, polygenic inheritance).	
12	Identify the causes of genetic disorders (e.g., point mutation, nondisjunction, aneuploidy, translocation, deletion, insertion, inversion, duplication).	
13	Identify the effect of a mutation in a DNA sequence on the products of protein synthesis.	
6	**Knowledge of the structural and functional diversity of viruses and prokaryotic organisms**	**4%**
1	Distinguish the structure and function of viruses and prokaryotic organisms.	

Competency/Skill		**Approx. %**
2	Identify the effects of viruses (e.g., AIDS, influenza, measles, feline leukemia, some human cancers) and prokaryotes (e.g., tuberculosis, bubonic plague, cholera) on organisms.	
3	Relate the structures and functions (e.g., morphology, motility, reproduction and growth, metabolic diversity) of prokaryotes to their behavior and identification.	
4	Differentiate the major types of bacterial genetic recombination (i.e., transduction, transformation, conjugation).	
5	Relate microbial processes and products to their uses in biotechnology.	
7	**Knowledge of the structural and functional diversity of protists, fungi, and plants**	**8%**
1	Identify major types of protists, fungi, and plants.	
2	Identify the positive and negative effects of protists, fungi, and plants on other living things.	
3	Relate the structures of specialized plant tissues to their functions.	
4	Relate the characteristics of vascular and nonvascular plants to adaptations allowing these organisms to broaden their ecological niches.	
5	Identify the functions of the major organs of angiosperms and gymnosperms and the survival advantages associated with those organs.	
6	Compare the structures of monocots and dicots (e.g., seeds, vascular bundles, venation, flower parts).	
7	Relate the major mechanisms (e.g., transport, storage, water conservation, reproduction, transpiration) in plants to environmental stimuli.	
8	Analyze the role of major plant growth regulators (e.g., auxins, gibberellins, ethylene).	
9	Identify methods of reproduction in plants.	
10	Analyze patterns of alternation of generations in plants, fungi, and algae.	
8	**Knowledge of the structural and functional diversity of animals**	**13%**
1	Relate the structures of animal tissue types (e.g., epithelial, connective, muscle, nervous) to their functions.	
2	Characterize major animal body plans (e.g., symmetry, coelomic character, embryonic origin).	

Competency/Skill		**Approx. %**
3	Identify the stages, sequence, and processes of differentiation in embryological development for representative animal phyla.	
4	Relate the structures of circulatory and lymphatic systems to their functions.	
5	Relate the structures of excretory and digestive systems to their functions.	
6	Relate the structures of endocrine and nervous systems to their functions.	
7	Relate the structures of integumentary and musculoskeletal systems to their functions.	
8	Relate the structures of reproductive systems to their functions.	
9	Relate the structures of respiratory systems to their functions.	
10	Analyze how body systems contribute to the human immune response.	
11	Analyze the interconnectedness of animal organ systems.	
12	Analyze the effects of positive and negative feedback loops in human systems (e.g., vertebrate hormones, fight or flight).	
13	Identify aspects of animal social behavior (e.g., communication and signals, dominance hierarchy, territoriality, aggression, courtship, innate and learned behavior).	
9	**Knowledge of ecological principles and processes**	**11%**
1	Distinguish between individuals, populations, communities, ecosystems, biomes, and the biosphere.	
2	Analyze the relationship between organisms (e.g., producers, consumers, decomposers) and their trophic levels.	
3	Identify processes, components, and roles of organisms in the hydrologic, carbon, nitrogen, and phosphorous cycles.	
4	Analyze patterns of energy flow in an ecosystem.	
5	Evaluate factors that affect population composition, growth, size, and geographic distribution.	
6	Classify examples of species interactions (e.g., competition, predation, parasitism, mutualism, commensalism).	
7	Distinguish between primary and secondary succession in biotic communities.	
8	Analyze the costs and benefits of managing renewable and nonrenewable resources.	

Competency/Skill		**Approx. %**
9	Evaluate the effects of human population size, resource use, and technology on environmental quality.	
10	Evaluate the consequences of loss of biodiversity.	
11	Characterize the biotic and abiotic components that define Florida's ecosystems (e.g., freshwater, marine, estuary, terrestrial).	
10	**Knowledge of evolutionary mechanisms**	**10%**
1	Compare the current theory of evolution by natural selection with previous scientific theories of evolution (e.g., Lamarck, Darwin).	
2	Analyze exceptions to and limitations of the biological species concept.	
3	Compare systems of classification (e.g., classical taxonomy, phenetics, cladistics).	
4	Apply a taxonomic (e.g., dichotomous) key to a set of objects.	
5	Analyze variation within a species along an environmental cline.	
6	Identify factors affecting speciation (e.g., mutation, recombination, types of isolation, sexual reproduction and selection, genetic drift, plate tectonics, geographic distribution).	
7	Evaluate the roles of mutation, recombination, isolation, sexual reproduction and selection, genetic drift, plate tectonics, and geographic distribution in evolution.	
8	Compare the concepts of punctuated equilibrium and gradualism.	
9	Interpret examples of evidence for evolutionary theory (e.g., molecular, morphological, embryological, paleontological).	
10	Analyze aspects of modern scientific theories (e.g., primitive precell, endosymbiotic) on the origin and early evolution of life on Earth.	
11	Differentiate patterns of evolutionary change (e.g., coevolution, convergent evolution, divergent evolution, parallel evolution) as they relate to major taxa.	
12	Apply the Hardy-Weinberg equilibrium, using the formula and assumptions, to predict changes in genotypic frequencies in a population.	
13	Identify basic trends in hominid evolution from early ancestors to modern humans.	

5 Test Format and Sample Questions

The Biology 6–12 subject area test consists of approximately 120 multiple-choice questions. You will have two and one-half hours to complete the test.

Each question will contain four response options, and you will indicate your answer by selecting **A**, **B**, **C**, or **D**.

The table below presents types of questions on the examination and refers you to a sample question of each type.

Type of Question	Sample Question
Command Select the best response option.	Question 2, page 17
Scenario Examine a situation, problem, or case study. Then answer a question, make a diagnosis, or recommend a course of action by selecting the best response option.	Question 6, page 18
Sentence completion Select the response option that best completes the sentence.	Question 15, page 19
Direct question Choose the response option that best answers the question.	Question 29, page 22

Sample Questions

The following questions represent both the form and content of questions on the examination. These questions will acquaint you with the general format of the examination; however, these sample questions do not cover all of the competencies and skills that are tested and will only approximate the degree of examination difficulty.

An answer key follows at the end of the sample questions. The answer key includes information regarding the competency to which each question is linked.

DIRECTIONS: Read each question and select the best response.

1. Which sequence of events best describes a common scientific research methodology?
   A. hypothesize, experiment, observe, analyze
   B. observe, hypothesize, experiment, analyze
   C. hypothesize, observe, analyze, experiment
   D. observe, experiment, hypothesize, analyze

2. Biology students performed an experiment to determine the effect of temperature on heart rate in the crustacean *Daphnia*. Each group of students exposed *Daphnia* to varying temperatures from 0 °C to 30 °C and measured the number of heartbeats per minute for three *Daphnia* after 1 minute of exposure to each temperature. An average was taken for the three *Daphnia* at each temperature. Identify the independent variable for this experiment.
   A. heart rate
   B. temperature
   C. number of crustaceans
   D. length of exposure

3. To be effective, a simple experiment must
   A. occur in a research laboratory.
   B. stand alone without replication.
   C. manipulate one variable at a time.
   D. validate the hypothesis being tested.

4. Which of the following types of data is considered quantitative?
   A. plant height
   B. flower color
   C. bird species
   D. fish gender

5. Farmers currently use genetically enhanced varieties of seed because these varieties
   A. provide greater resistance to disease and pests.
   B. yield crops that require less labor to harvest.
   C. reduce soil loss on erosion-prone land.
   D. increase biodiversity in native populations.

6. A student finds a bat sleeping on the ground outside the school and asks to bring it inside to show the class. The teacher should deny this request and caution everyone to stay away from the bat because bats are
   A. very aggressive and are likely to attack anyone who comes close.
   B. colonial animals and are likely to kill any bat that has a human scent on it.
   C. highly excitable and are likely to die if they are handled by humans.
   D. often carriers of rabies and are likely to bite if they are infected with this disease.

7. Which of the following participants in chemical reactions are most likely to be regenerated and not appear in the net reactions?
   A. reactants
   B. intermediates
   C. products
   D. catalysts

8. NAD^+ functions in the citric acid cycle as a(an)
   A. enzyme.
   B. hydrogen acceptor.
   C. cytochrome.
   D. supplier of energy.

9. What is the most likely effect on plant tissue of an excess of sodium chloride in soil?
   A. depletion of oxygen
   B. denaturation of enzymes
   C. alteration of lipid structures
   D. creation of water deficit

10. Chemosynthetic microbes provide the foundation for biological colonization of
    A. deep-sea vents.
    B. coral reefs.
    C. tidal pools.
    D. mud flats.

11. White blood cells that engulf and destroy bacteria in the human body have structures containing hydrolytic enzymes that digest the bacteria. These structures are called
    A. microtubules.
    B. lysosomes.
    C. vacuoles.
    D. plastids.

12. Which of the following activities occurs during cytokinesis?
    A. The cell plate divides an animal cell into two cells.
    B. The cleavage furrow divides a plant cell into two cells.
    C. The cleavage furrow divides a bacterium into two cells.
    D. The cell plate divides a plant cell into two cells.

13. Nutrient ions are present in the groundwater in lower concentrations than they are in cells of plant root hairs. What process is responsible for moving the ions across the cell membrane?
    A. cytoplasmic streaming
    B. diffusion
    C. osmosis
    D. active transport

14. In human blood types, a person with both the A allele and the B allele will have type AB blood that has antibodies reflecting the presence of both alleles; therefore, the A and B alleles show
    A. codominance.
    B. incomplete dominance.
    C. a pleiotropic effect.
    D. a polygenic effect.

15. A genetic disorder caused by the movement of a segment of chromosome 22 to chromosome 9 is an example of a(an)
    A. duplication.
    B. inversion.
    C. translocation.
    D. deletion.

16. The characteristic unique to a virus when compared to a bacterium is that the virus
    A. transfers genetic material through conjugation.
    B. contains a circular chromosome of DNA.
    C. changes its genotype through transformation.
    D. requires a host cell for reproduction.

17. Which of the following infections is caused by a retrovirus?
    A. hepatitis B
    B. smallpox
    C. HIV/AIDS
    D. herpes simplex

18. The introduction of genetic material by an infectious bacteriophage is called
    A. conjugation.
    B. conduction.
    C. transduction.
    D. transformation.

19. Dormancy in seeds is likely to be advantageous for which of the following reasons?
    A. It allows the embryo more time to absorb food stored in the seed.
    B. It allows the seed to pass through animal digestive systems unharmed.
    C. It increases the chances that water can be absorbed by the seed over a longer period of time.
    D. It increases the chances that the seed will germinate under conditions favorable for the growth of the seedling.

20. Plants with thick cuticles and sunken stomata are most likely to occur in environments characterized by a(an)
    A. shortage of sunlight.
    B. shortage of water.
    C. abundance of herbivores.
    D. abundance of soil organisms.

21. Fruits contribute to the success of angiosperms by
    A. nourishing developing embryos.
    B. facilitating dispersal of seeds.
    C. attracting insects as pollinators.
    D. protecting sperm and eggs.

22. Which of the following glands is both endocrine and exocrine?
    A. thyroid
    B. pancreas
    C. pituitary
    D. adrenal

23. Which of the following vitamins helps regulate the blood calcium level?
    A. A
    B. B
    C. C
    D. D

24. Exaggerated and stylized grooming, preening, and food-gathering behaviors of birds are elaborate communications related to
    A. selecting a nest.
    B. preparing for migration.
    C. fledging young.
    D. courting a mate.

25. Within which level of organization can gene flow occur?
    A. community
    B. phylum
    C. species
    D. ecosystem

26. Which of the following groups consists entirely of ways that carbon is released into the atmosphere?
    A. forest fires, transpiration, cellular respiration
    B. photosynthesis, nitrogen fixation, organic decomposition
    C. forest fires, cellular respiration, volcanic eruptions
    D. photosynthesis, nitrification, burning of fossil fuels

27. Which of the following associations of a plant with its habitat is an example of secondary succession?
    A. lichen . . . bare rock
    B. liverwort . . . glacial morraine
    C. weed . . . abandoned field
    D. moss . . . volcanic debris

28. Florida's cypress forests are being depleted mainly due to
    A. logging for the production of mulch for landscaping.
    B. water diversion projects for floodwater management.
    C. mining phosphate for the production of commercial fertilizer.
    D. nature-based tourism for increased revenue.

29. Which example best illustrates a mechanism consistent with the process of punctuated equilibrium?
    A. Formation of a polyploid generation leads to a rapid increase of the flower size and seed numbers of a particular species of dandelion.
    B. Slow climatic change causes cold-adapted species to die off as other warm-adapted species migrate into new areas.
    C. Fire kills off most plants in an area and they slowly recolonize the area through succession.
    D. Cyclical drought causes the average leaf size of a species of plant to become smaller for several generations.

30. Stanley Miller and Harold Urey's classic experiments showed that
    A. simple organic compounds could have been produced by lightning and early atmospheric gases.
    B. simple organic compounds could have been formed by the oxidation of inorganic compounds.
    C. complex organic compounds could have been brought to Earth by meteorites.
    D. complex organic compounds could have been formed by submerged volcanoes and deep-sea vents.

Answer Key

Question Number	Correct Response	Competency
1.	B	1
2.	B	1
3.	C	1
4.	A	1
5.	A	2
6.	D	2
7.	D	3
8.	B	3
9.	D	3
10.	A	3
11.	B	4
12.	D	4
13.	D	4
14.	A	5
15.	C	5
16.	D	6
17.	C	6
18.	C	6
19.	D	7
20.	B	7
21.	B	7
22.	B	8
23.	D	8
24.	D	8
25.	C	9
26.	C	9
27.	C	9
28.	A	9
29.	A	10
30.	A	10

6 Annotated Bibliography

The annotated bibliography that follows includes basic references that you may find useful in preparing for the exam. Each resource is keyed to the competencies and skills found in Section 4 of this guide.

This bibliography is representative of the most important and most comprehensive texts as reflected in the competencies and skills. The Florida Department of Education does not endorse these references as the only appropriate sources for review; many comparable texts currently used in teacher preparation programs also cover the competencies and skills that are tested on the exam.

1. Black, J. G. (2008). *Microbiology: Principles and explorations* (7th ed.). Hoboken, NJ: Wiley.

Provides a basic introduction to the study of microbiology, highlighting key concepts. Emphasizes applications and real-life connections. Useful for review of competencies 3, 4, and 6.

2. Campbell, N. A., & Reece, J. B. (2007). *Biology* (8th ed.). San Francisco: Pearson Benjamin Cummings.

A comprehensive advanced resource and review text. Takes a technical approach to biological principles. Figures focus on the experimental process and illustrate important techniques in biology. Useful for review of competencies 1–10.

3. Freeman, S. (2007). *Biological science* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.

Uses evolutionary analysis and molecular biology as unifying themes. Covers topics organized under the following general headings: the origin and early evolution of life, cell functions, gene structure and expression, developmental biology, evolutionary patterns and processes, the diversification of life, how plants work, how animals work, and ecology. Useful for review of competencies 1–10.

4. Goldberg, D. T. (2008). *Barron's AP biology*. Hauppauge, NY: Barron's.

A concise review of biology topics, including biochemistry, the cell, cell respiration, photosynthesis, cell division, heredity, the molecular basis of inheritance, classification, evolution, plants, animal physiology, the human immune system, animal reproduction and development, ecology, and animal behavior. Contains an extensive laboratory section. Useful for review of competencies 1–10.

5. Hyde, D. R. (2009). *Introduction to genetic principles*. Boston: McGraw-Hill.

Emphasizes basic concepts involved in solving genetic problems. Teaches how to manipulate genetic data. Helps make connections between facts and their application. Useful for review of competencies 1, 2, and 5.

6. Kaufman, J. A. (1987). *Laboratory safety guidelines: 40 steps to a safer laboratory*. [Online].

Lists 40 ways to have a safer laboratory. Notes which steps have minimal cost and which require moderate expense. Useful for review of competency 1.

7. Miller, G. T., & Miller, G. T., Jr. (2006). *Living in the environment* (15th ed.). Boston: Cengage Learning.

Focuses on prevention of and solutions to environmental problems. Includes comparative diagrams. Useful for review of competencies 2 and 9.

8. Miller, K. R., & Levine, J. S. (2007). *Biology*. Upper Saddle River, NJ: Pearson Prentice Hall.

Provides a basic introduction to all aspects of biology. Follows the National Science Education Standards. Useful for review of competencies 1–10.

9. Postlethwait, J. H., & Hopson, J. L. (2006). *Modern biology*. Orlando, FL: Holt, Rinehart and Winston.

Takes a phylogenetic approach. Basic presentation of biological concepts within a historical framework. Useful for review of competencies 1–10.

10. Raven, P. H., Johnson, G. B., Mason, K. A., Losos, J., & Singer, S. (2007). *Biology* (8th ed.). New York: McGraw-Hill.

Focuses on evolution as a unifying theme. Emphasizes natural selection and the evolutionary process to explain biodiversity. Useful for review of competencies 1–10.

11. Ricklefs, R. E. (2000). *The economy of nature.* New York: W. H. Freeman & Co.

Introduction to major aspects of ecology, from the ecosystem and evolution to population and community. Blends major principles and concepts of natural history with the idea of ecology as a practical science. Useful for review of competencies 9 and 10.

12. Rutherford, F. J., & Ahlgren, A. (1990). *Science for all Americans.* New York: Oxford University Press.

Explores what constitutes scientific literacy in a modern society; the knowledge, skills, and attitudes all students should acquire from their total school experience from kindergarten through high school; and what steps this country must take to begin reforming its system of education in science, mathematics, and technology. Developed as part of Project 2061 and available for free download from the American Association for the Advancement of Science. Useful for review of competency 1.

13. Sadava, D., Heller, H. C., Orians, G. H., Purves, W. K., & Hillis, D. M. (2008). *Life: The science of biology* (8th ed.). New York: W. H. Freeman & Co.

Covers major concepts, including science and the building blocks of life, cells and energy, heredity and the genome, molecular biology, evolution, diversity, flowering plants, animals, and ecology. Useful for review of competencies 1–10.

14. Salisbury, F. B., & Ross, C. W. (1991). *Plant physiology*. Belmont, CA: Wadsworth Publishing.

Provides a broad explanation of plant physiology, covering seed germination, vegetative growth, maturation, and flowering. Accessible presentation of the principles and results of research in the field. Useful for review of competencies 3, 4, and 7.

15. Solomon, E. P., Berg, L. R., & Martin, D. W. (2007). *Biology* (8th ed.). Clifton Park, NJ: Brooks/Cole Cengage Learning.

Provides comprehensive coverage of cell communication, genetics, evolution, diversity, ecology, and other key topics. Useful for review of competencies 1–10.

16. Stern, K. R., Bidlack, J., & Jansky, S. (2007). *Introductory plant biology*. New York: McGraw-Hill.

Emphasizes current ethnobotanical interests while presenting basic botanical principles. Useful for review of competency 7.

17. Tortora, G. J., & Derrickson, B. H. (2008). *Principles of anatomy and physiology* (12th ed.). Hoboken, NJ: Wiley.

Emphasizes the correlations between normal physiology and pathophysiology, normal anatomy and pathology, and homeostasis and homeostatic imbalances. Useful for review of competency 8.

18. U.S. Department of Labor (2006). *Safety and health topics: Laboratories.* [Online].

Provides a safety framework for laboratory and classroom experiments. Useful for review of competency 2.

19. Whitney, E. N., Whitney, E., Means, D. B., & Rudloe, A. (2004). *Priceless Florida: Natural ecosystems and native species.* Sarasota, FL: Pineapple Press.

Includes extensive illustrations and photographs depicting Florida's natural areas. Explores Florida's varied ecological features. Focuses on stewardship of the state's flora, fauna, and landforms. Useful for review of competencies 2 and 9.

20. Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2009). *Prescott's principles of microbiology*. Boston: McGraw-Hill.

Concise, accessible discussion of microbiology. Integrates evolution, ecology, and diversity throughout the text. Includes microbial pathogens in chapters on diversity. Relates organisms' physiological adaptations to their roles as pathogens and makes comparisons between pathogens and phylogenetically similar microbes. Useful for review of competencies 1, 2, 3, 4, 6, 7, 9, and 10.

21. Wright, R. T. (2008). *Environmental science: Toward a sustainable future* (10th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Strives for a balance between pure science and the political, social, and historical perspectives of environmental affairs using six unifying themes: sustainability, science, stewardship, ecosystem capital, policy and politics, and globalization. Useful for review of competencies 2 and 9.

22. Zimmer, C. (2001). *Evolution: The triumph of an idea.* New York: HarperCollins.

Uses a narrative format to chronicle the development of the theory of evolution from Charles Darwin to the Human Genome Project. Useful for review of competencies 2 and 10.

7 Additional Information

Please visit the following Web site to review FTCE registration details and to find additional FTCE information, including test locations and passing scores.

www.fldoe.org/accountability/assessments/postsecondary-assessment/ftce/