Florida Teacher Certification Examinations

Test Information Guide

for

Middle Grades General Science 5–9

FLORIDA DEPARTMENT OF EDUCATION
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Fourth Edition

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Florida Department of Education

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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 Middle Grades General Science 5–9 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 Middle Grades General Science 5–9 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"
  - — Watch
- 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 Middle Grades General Science 5–9 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	**Conceptual and quantitative knowledge of the structure and behavior of matter**	**14%**
1	Analyze the physical and chemical properties of matter (e.g., mass, volume, density, chemical reactivity).	
2	Distinguish between the states of matter.	
3	Apply knowledge of the gas laws.	
4	Identify the major discoveries in the development of the atomic theory.	
5	Identify the characteristics of elements, compounds, and mixtures.	
6	Apply knowledge of symbols, formulas, and equations for common elements and compounds (e.g., acids, bases, salts, carbon compounds) and their reactions.	
7	Identify characteristics and functions of the components of an atom.	
8	Identify chemical or physical properties of elements based on their placement on the periodic table.	
9	Identify characteristics of types of chemical bonding (e.g., covalent, ionic, metallic, hydrogen).	
10	Identify types of chemical reactions and their characteristics.	

Skills (1-10)

Table of Competencies, Skills, and Approximate Percentages of Questions

Competency/Skill			**Approx. %**
1	**Conceptual and quantitative knowledge of the structure and behavior of matter**		**14%**
	1	Analyze the physical and chemical properties of matter (e.g., mass, volume, density, chemical reactivity).	
	2	Distinguish between the states of matter.	
	3	Apply knowledge of the gas laws.	
	4	Identify the major discoveries in the development of the atomic theory.	
	5	Identify the characteristics of elements, compounds, and mixtures.	
	6	Apply knowledge of symbols, formulas, and equations for common elements and compounds (e.g., acids, bases, salts, carbon compounds) and their reactions.	
	7	Identify characteristics and functions of the components of an atom.	
	8	Identify chemical or physical properties of elements based on their placement on the periodic table.	
	9	Identify characteristics of types of chemical bonding (e.g., covalent, ionic, metallic, hydrogen).	
	10	Identify types of chemical reactions and their characteristics.	
2	**Conceptual and quantitative knowledge of forces and motion**		**13%**
	1	Differentiate between the types and characteristics of contact forces and forces acting at a distance, and their interactions.	
	2	Identify applications of Newton's laws of motion.	
	3	Solve problems involving force or motion.	
	4	Identify types, characteristics, and properties of waves.	
	5	Analyze characteristics of wave phenomena (e.g., intensity, refraction, interference, Doppler effect, wave-particle duality) as they apply to real-world situations.	
	6	Identify origins, characteristics, and examples of electricity.	
	7	Identify types of magnets and characteristics of magnetic fields.	
	8	Apply knowledge of magnets and magnetic fields to real-world situations (e.g., generators, solenoids).	
	9	Identify characteristics of motion as they apply to real-world situations (e.g., speed, velocity, acceleration, linear and angular momentum).	

Competency/Skill		Approx. %
3	**Conceptual and quantitative knowledge of energy and its effects**	**12%**
1	Differentiate between forms of energy and their transformations.	
2	Relate energy to transitions between states of matter.	
3	Distinguish between temperature, heat, and thermal energy.	
4	Distinguish between the types of thermal energy transfer (e.g., radiation, conduction, convection).	
5	Apply the laws of thermodynamics to real-world situations.	
6	Differentiate between potential and kinetic energy.	
7	Identify characteristics of nuclear reactions.	
8	Identify the regions of the electromagnetic spectrum and energy associated with each.	
9	Identify the use of light and optics in real-world applications (e.g., optical instruments, communication).	
10	Solve problems involving energy, work, power, mechanical advantage, and efficiency.	
11	Apply the laws of conservation of mass and energy to chemical reactions, nuclear reactions, physical processes, and biological processes.	
12	Identify types, characteristics, and measurements of electrical quantities.	
13	Apply knowledge of currents, circuits, conductors, insulators, and resistors to real-world situations.	
14	Solve mathematical problems involving current, voltage, resistance, power, and energy in direct current (DC) circuits.	
4	**Knowledge of Earth and the processes that affect it**	**13%**
1	Relate surface and subsurface geologic processes to the movement of tectonic plates.	
2	Trace the development of the theory of continental drift to the current theory of plate tectonics.	
3	Relate the characteristics of geologic structures to the mechanisms by which they are formed.	
4	Identify the evidence used to define geologic eras (e.g., geologic events, biotic factors, abiotic factors).	
5	Apply methods for determining geologic age (e.g., law of superposition, radioactive decay, relative dating).	

Competency/Skill		**Approx. %**
6	Interpret various charts and models (e.g., topographic, geologic, weather).	
7	Identify the characteristics of ocean currents and how they influence weather patterns.	
8	Identify characteristics of Florida's geology and its formation.	
9	Identify the major processes of formation and properties of rocks, minerals, and fossils.	
10	Distinguish between the processes of weathering, erosion, and deposition and their products.	
11	Identify the characteristics and functions of the atmospheric layers.	
12	Relate atmospheric conditions to weather.	
13	Identify the factors that contribute to the climate of a geographic area.	
14	Identify the movement of water in the hydrologic cycle, including sources of water, types of precipitation, and causes of condensation.	
15	Analyze ways in which earth and water interact (e.g., soil absorption, runoff, leaching, groundwater, karst topography).	
16	Identify various forms of water storage (e.g., aquifers, reservoirs, watersheds).	
17	Analyze interactions between the atmosphere, geosphere, hydrosphere, biosphere, and cryosphere and the effects of these interactions.	
5	**Knowledge of space science**	**6%**
1	Identify consequences of Earth's motions and orientation (e.g., seasons, tides, lunar phases).	
2	Identify the properties of stars and the factors that affect their evolutionary patterns.	
3	Identify devices and techniques for collecting and analyzing data about stars and other celestial objects.	
4	Explain the role of space exploration and its impact on technological advancements.	
5	Identify the components of the solar system (e.g., Kuiper belt, Oort cloud), their characteristics, how they interact (e.g., solar winds, impacts, gravitational attraction), and how they evolve.	
6	Evaluate celestial objects in order to determine formation, age, location, characteristics, and evolution.	

Competency/Skill		Approx. %
6	**Knowledge of processes of life**	**14%**
1	Identify the relationship between biological and chemical processes (e.g., cellular respiration, ATP energy transfer) necessary for life.	
2	Compare prokaryotes and eukaryotes.	
3	Relate cell organelles to their functions.	
4	Identify the sequence of events, the significance of the process, and the consequences of irregularities during mitosis and meiosis.	
5	Apply principles of Mendelian genetics to monohybrid and dihybrid crosses and crosses involving linked genes.	
6	Apply principles of human genetics, including relationships between genotypes and phenotypes and causes and effects of disorders.	
7	Analyze the genetic code and the roles of DNA and RNA in replication and protein synthesis.	
8	Classify organisms based on the levels of biological taxonomy.	
9	Identify characteristics of viruses, bacteria, protists, and fungi.	
10	Differentiate between structures and processes of plant and animal cells and their organelles.	
11	Identify plant structures and their functions.	
12	Identify the major steps of plant processes (e.g., photosynthesis, respiration, electron transport, transpiration, reproduction).	
13	Identify the processes of animal physiology (e.g., digestion, respiration).	
14	Identify the structures of the organs and organ systems of various kinds of animals, including humans.	
15	Analyze behaviors or adaptations of animals and plants that enable them to survive.	
16	Interpret cell theory and how its discovery relates to the process of science.	
17	Identify how evolution is supported by the fossil record, comparative anatomy, embryology, biogeography, molecular biology, genetics, and observed change.	
18	Evaluate the roles of adaptation, genetic variation, mutation, and extinction in natural selection.	
19	Interpret the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.	

Competency/Skill			Approx. %
7	**Knowledge of the effects of physical and biological factors on the environment**		**10%**
	1	Identify components and sequences of biogeochemical cycles (e.g., carbon, oxygen, hydrogen, nitrogen).	
	2	Identify issues related to the development, use, and conservation of natural resources.	
	3	Evaluate environmental factors and their impact on the adaptation and survival rates of organisms.	
	4	Identify the major characteristics of world biomes and communities, including succession and interrelationships of organisms.	
	5	Identify how biotic and abiotic factors influence ecosystems.	
	6	Analyze interactions between microorganisms and the environment.	
	7	Identify the effects of homeostasis on the survivability of an organism.	
	8	Relate the interactions of biotic and abiotic factors to the flow of energy and biomass within a system.	
	9	Analyze the relationship between natural factors and human activities as they affect Florida's ecosystems.	
8	**Knowledge of the science learning environment**		**5%**
	1	Identify legal and ethical requirements for proper use, care, handling, and disposal of organisms.	
	2	Identify the safe and appropriate techniques used in the preparation, storage, dispensing, and supervision of materials used in science instruction.	
	3	Identify appropriate substitutions for materials and activities necessary for effective science instruction.	
	4	Identify the federal and state legal requirements for safe preparation, use, storage, and disposal of chemicals and other materials.	
	5	Use multiple assessment tools and strategies to identify and address student misconceptions.	
	6	Select appropriate strategies for teaching scientific inquiry.	
	7	Identify appropriate technological tools that facilitate the learning of science.	

Competency/Skill		**Approx. %**
9	**Knowledge of process skills and application of scientific inquiry**	**13%**
1	Apply appropriate scientific process skills to observe and analyze natural phenomena and communicate findings.	
2	Apply scientific inquiry, including scientific methods, to investigations.	
3	Apply knowledge of mathematics and technology to scientific investigation.	
4	Compare the methods used in the pursuit of a scientific explanation as applied in different fields of science such as geology, astronomy, physics, and biology.	
5	Identify the traits of scientists and how they affect the development of scientific knowledge.	
6	Identify the assumptions of scientific knowledge (e.g., durable, open to change).	
7	Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation.	
8	Evaluate the impact of the historical and cultural development of science on the advancement of scientific knowledge.	
9	Compare the development, use, benefits, and limitations of theories, laws, hypotheses, and models.	
10	Analyze the interdependence between scientific knowledge and economic, political, social, and ethical concerns.	

5 Test Format and Sample Questions

The Middle Grades General Science 5–9 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 10, page 18
Graphics Examine a drawing or a diagram and select the response option that best answers the question.	Question 17, page 20
Sentence completion Select the response option that best completes the sentence.	Question 18, page 20
Direct question Choose the response option that best answers the question.	Question 22, page 21
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 28, 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. A gas is at standard temperature and pressure. If the volume is doubled and the temperature is held constant, the pressure of the gas is
   A. halved.
   B. doubled.
   C. tripled.
   D. squared.

2. Which of the following models calculates energy levels and determines the number of electrons orbiting the nucleus of an atom?
   A. the Bohr model
   B. the Dalton model
   C. the Rutherford model
   D. the Thomson model

3. Element X exists as a diatomic molecule and is not hydrogen.

   Where on the periodic table is element X located?
   A. the right side
   B. the left side
   C. the middle
   D. the bottom

4. Which of the following statements exemplifies Newton's first law of motion?
   A. A bumper car will reverse direction when it collides with another car.
   B. A gust of wind from the north will push a pile of leaves south.
   C. A hockey puck gliding on ice will continue moving until friction slows it.
   D. A baseball thrown across a field will fall in an arc to the ground.

5. What force is affected when the distance between two objects remains the same and the mass of each object is doubled?
   A. gravity
   B. electromagnetic force
   C. velocity
   D. frictional force

6. There are two electrons in the outer energy level of calcium and six electrons in the outer energy level of oxygen. What type of bond would form between calcium and oxygen?
   A. ionic
   B. covalent
   C. metallic
   D. nuclear

7. A change in the frequency of wave motion resulting from the motion of the sender or the receiver is called the
   A. Adams effect.
   B. Boyles effect.
   C. Doppler effect.
   D. Einstein effect.

8. If a machine allows a 600 N weight to be lifted with an effort of only 100 N, what is the mechanical advantage of the machine?
   A. 0.17
   B. 0.6
   C. 1.7
   D. 6.0

9. A roller coaster car has the greatest amount of potential energy
   A. as it travels down a hill.
   B. as it travels up a hill.
   C. at the top of a hill.
   D. at the bottom of a hill.

10. Several bulbs are lit in an electric circuit. When one bulb is removed, all of the bulbs go out. Identify the type of circuit that is described.
    A. complete
    B. parallel
    C. series
    D. short

11. The Ring of Fire in the Pacific Ocean is associated with which of the following tectonic features?
    A. transform fault lines
    B. subduction zones
    C. fracture zones
    D. spreading centers

12. The mangrove swamps within Florida's Everglades National Park are important because they serve to
    A. build up a detritus food source for land mammals.
    B. create a valuable nursery habitat for fish and shellfish.
    C. establish a temperate zone in the region.
    D. desalinate the ocean water in the estuary.

13. Which of the following is fueled by the release of latent heat as water vapor condenses over warm ocean water?
    A. a midlatitude cyclone
    B. a tornado
    C. a high-pressure system
    D. a hurricane

14. The mass of a main-sequence star is proportional to its
    A. luminosity.
    B. temperature.
    C. diameter.
    D. spectrum.

15. Which of the following instruments is used to identify the composition of stars?
    A. gas chromatograph
    B. spectroscope
    C. reflecting telescope
    D. microscope

16. Oxygen is required by organisms because it reacts with
    A. carbon dioxide to release energy.
    B. carbon dioxide to store energy.
    C. glucose to store energy.
    D. glucose to release energy.

17. Based on the following Punnett square, what percentage of offspring would be expected to have a heterozygous genotype?

	R	r
R	RR	Rr
r	Rr	rr

A. 25%
B. 50%
C. 75%
D. 100%

18. RNA is produced from DNA in the process of
A. transcription.
B. translation.
C. replication.
D. synthesis.

19. Which system regulates body activities by producing chemical messengers in glands?
A. nervous
B. immune
C. excretory
D. endocrine

20. The Galapagos Islands provided Charles Darwin with the opportunity to observe various environments within close proximity. He noticed that the tortoises on each island varied in neck length and shell type. Hood Island, where the vegetation is sparse, had tortoises with long necks and shells that were curved around the legs and neck, allowing for greater mobility. On Isabela Island, where the vegetation is abundant and closer to the ground, the tortoises had shorter necks and dome-shaped shells. Evolution by natural selection in this scenario has occurred because of
A. inheritance of acquired traits.
B. geographic isolation.
C. geological change.
D. climate stability.

21. Which of the following biogeochemical cycles depends on a symbiotic relationship between two species?
    A. water
    B. phosphorus
    C. carbon
    D. nitrogen

22. Which of the following is a renewable source of energy?
    A. propane
    B. coal
    C. biomass
    D. oil

23. Viceroy, king, and monarch butterflies have similar appearances. Although only the monarch is poisonous, most birds avoid all three species. Which type of adaptation is exemplified by the butterflies in this situation?
    A. mimicry
    B. camouflage
    C. competition
    D. avoidance

24. A snake feeds on a mouse that has eaten seeds. What trophic level does the mouse represent in this situation?
    A. primary producer
    B. secondary producer
    C. primary consumer
    D. secondary consumer

25. A student brings to school a lizard that was found on the school bus. Which of the following is the greatest student safety concern?
    A. allergic reaction
    B. rabies
    C. poisonous bites
    D. salmonella

26. The information about toxic chemicals and hazards that schools must make available to teachers can be found in
    A. material safety data sheets.
    B. Occupational Safety and Health Administration codes.
    C. National Institutes of Health guidelines.
    D. fire safety codes.

27. A group of students has been studying eclipses. Which of the following would be the most effective way to assess the students' understanding of the interrelations of the eclipses and the relative positions of the Earth, Moon, and Sun?
    A. concept map
    B. Venn diagram
    C. demonstration model
    D. expository essay

28. A company that wanted to determine the effectiveness of its antiseptic gargle had 100 people examined by a doctor. Then, for one year, each person was checked once a month for an inflamed throat. At the end of the year, the total number of inflamed throats was tallied. For the next year, the same 100 people gargled each day with the company's antiseptic gargle. Each was checked monthly. The total number of inflamed throats at the end of the second year was 21% fewer than the number at the end of the first year. What is the major flaw in the design of this study?
    A. The sample size was too large.
    B. There was no control group.
    C. The two-year time period of the study was too short.
    D. There should have been additional brands of gargle included.

29. Although scientific knowledge is durable and robust, it is also
    A. highly subjective.
    B. recognized as static.
    C. open to change.
    D. associated with philosophy.

30. Students in a beginning chemistry class frequently use computer simulations to work with volatile substances. What is the best reason for using these simulations?
    A. Models of dangerous activities are safer.
    B. Exercises are completed more quickly.
    C. Students get better, more reliable results.
    D. Virtual labs provide hands-on experience.

Answer Key

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

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. Albin, E. F., & Chamberlain, F. (2004). *Earth science m ade simple.* New York: Broadway Books.

Breaks the discipline of Earth science into four major areas: geology, oceanography, meteorology, and planetary science. Includes interactive experiments and a glossary. Useful for review of competency 4.

2. American Association for the Advancement of Science. (1993). *Benchmarks for science literacy.* Washington, DC: AAAS. Retrieved December 17, 2008, from http://www.Project2061.org/publications/bsl/online/index.php

Focusing on the understanding and interconnection of key concepts rather than rote memorization of terms and isolated facts, *Benchmarks* advocates building a lasting understanding of science and related fields. Applicable chapters include The Nature of Science, The Nature of Mathematics, The Nature of Technology, The Designed World, Historical Perspectives, and Habits of Mind. Useful for review of competency 9.

3. Audesirk, T., Audesirk, G., & Byers, B. E. (2009). *Life on Earth* (5th ed.). San Francisco: Pearson Benjamin Cummings.

Introduces biology through real-world applications and expanded human-interest case studies. Includes extensive coverage of environmental biology and ecology. Useful for review of competencies 6 and 7.

4. Bailer, J., Ramig, J. E., & Ramsey, J. M. (2006). *Teaching science process skills*. Grand Rapids, MI: Frank Schaffer/School Specialty Publishing.

Provides high-interest inquiry-based experiments to develop important science process skills such as observing, hypothesizing, predicting, inferring, and investigating. Includes teacher notes for every activity as well as forms and guidelines for independent student lab work. Useful for review of competency 9.

5. Baker, J. (2007). *50 physics ideas you really need to know*. London: Quercus.

Includes concise overviews of important ideas that form the basis of classical and modern physics. Useful for review of competencies 2 and 3.

6. Bell, R. L., Gess-Newsome, J., Luft, J. (2007). *Technology in the secondary science classroom.* National Science Teachers Association

Presents intriguing new concepts for technology-based teaching strategies that help students learn science concepts. Each chapter includes a summary of current research on the technology's effectiveness in the classroom. Useful for review of competency 8.

7. Brown, T. E., LeMay, H. E., Jr., Bursten, B. E., Murphy, C., & Woodward, P. (2009). *Chemistry: The central science* (11th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Uses innovative pedagogy, functional problem solving, and visuals to teach concepts and skills. Provides comprehensive, accurate, and current examples and exercises. Useful for review of competencies 1 and 3.

8. Bybee, R. W., Powell, J. C., & Trowbridge, L. W. (2008). *Teaching secondary school science: Strategies for developing scientific literacy* (9th ed.). Boston: Pearson Allyn & Bacon.

Offers guidance and strategies for teaching physical, biological, and Earth science courses for middle school, junior high, and high school. Useful for review of competencies 8 and 9.

9. Campbell, N. A., & Reece, J. B. (2005). *Biology* (7th ed.). San Francisco: Pearson Benjamin Cummings.

A comprehensive resource and review text. Each chapter is structured around five or six big ideas. Figures focus on the experimental process and illustrate important techniques in biology. Useful for review of competencies 6 and 7.

10. Chang, R. (2009). *Chemistry* (10th ed.). Boston: McGraw-Hill Higher Education.

Balances theory and application by incorporating examples and helping students visualize three-dimensional atomic and molecular structures. Useful for review of competencies 1 and 3.

11. Davis, R. E. (2006). *Modern c hemistry*. Orlando, FL: Holt, Rinehart, & Winston.

Lessons designed to help students recognize the relationship between chemical principles and their real-world importance. Illustrates and expands on chemical concepts that may be difficult to understand or that are not easily visualized. Useful for review of competencies 1 and 3.

12. Dobson, K., Holman, J., & Roberts, M. (2006). *Holt s cience spectrum: P hysical s cience.* Orlando, FL: Holt, Rinehart, & Winston.

Provides an integrated high school introductory physical science program. Brings together chemistry, physics, Earth science, space science, and mathematics through the use of a complete lab strand, cross-disciplinary connections, and thorough review. Useful for review of competencies 1–5.

13. Florida Department of Education, Division of K–12 Public Schools, Bureau of Instruction and Innovation, Curriculum Support Section. *Science laboratory safety support information.* Retrieved April 30, 2008, from www.sunshineconnections.org/strategies/Strategies%20Paperwork%20Reduction/Lab%20Safety%20Prep.doc

Intended to help educators and students identify and examine science classrooms and chemical storage areas and make them as safe as possible. Based on State Board of Education Rules, Florida law, and criteria established by members of the Florida Association of Science Supervisors. Useful for review of competency 8.

14. Florida Department of Education, *Sunshine State Standards,* Retrieved December 17, 2008 from http://www.floridastandards.org/index.asp

This site is the home of the approved new Next Generation Sunshine State Standards. Useful for review of competencies 1–7 and 9.

15. Ford, B. A., & Smith, P. S. (2000). *Project Earth science: Physical oceanography.* Arlington, VA: NSTA Press.

Aims to provide an understanding of the properties that make water unique, so students will get a global view of the marine environment, including the impact of human activities on the oceans. Useful for review of competencies 4 and 7.

16. Freeman, S. (2005). *Biological science* (3rd ed.). San Francisco: Pearson Benjamin Cummings.

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 6 and 7.

17. Gallagher, J. J., (2007). *Teaching science for understanding: A practical guide for middle and high school teachers.* Boston: Pearson Allyn & Bacon.

Based on formal research and on experiences of teachers who have been successful in transforming their classrooms to environments where students learn to understand science and apply it in their own lives. Useful for review of competencies 8 and 9.

18. Hartman, H. J., & Glasgow, N. A. (2002). *Tips for the science teacher: Research-based strategies to help students learn.* Thousand Oaks, CA: Corwin Press.

Explores all facets of a scientific instructional program, including emotional and social aspects of science learning, use of technology and assessments in the classroom, development of students' critical thinking and learning skills, and informal science learning. Useful for review of competencies 8 and 9.

19. Heiserman, D. L. (1992). *Exploring chemical elements and their compounds.* Blue Ridge Summit, PA: Tab Books.

Explains the chemical elements and their properties. Provides historical Information on how each element was discovered. Includes material on the different isotopes of the elements and their chemical compounds. Useful for review of competencies 1 and 9.

20. Hewitt, P. G. (2009). *Conceptual physics* (10th ed.). San Francisco: Pearson Addison-Wesley.

Uses analogies and imagery from real-world situations to build a strong conceptual understanding of physical principles ranging from classical mechanics to modern physics. Builds a conceptual framework for the equations and formulas of physics. Useful for review of competencies 2 and 3.

21. Hewitt, P. G., Suchocki, J., & Hewitt, L. A. (2008). *Conceptual physical science* (4th ed.). San Francisco: Pearson Addison-Wesley.

Provides a conceptual overview of basic, essential topics in physics, chemistry, Earth science, and astronomy with optional quantitative analyses. Useful for review of competencies 1–5.

22. Kwan, T., & Texley, J. (2003). *Inquiring safely: A guide for middle school teachers.* Washington, DC: National Science Teachers Association.

Resource from experienced teachers who know both middle school science content and how middle school students behave. Discusses safety concepts in the context of real classrooms and how to teach students to be partners in safety within an inquiry-based science curriculum. Emphasizes a preventive approach to potential hazards. Useful for review of competency 8.

23. Lutgens, F. K., Tarbuck, E. J., & Tasa, D. (2008). *Foundations of Earth science* (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Emphasizes broad, up-to-date coverage of basic topics and principles in geology, oceanography, meteorology, and astronomy. Useful for review of competencies 4 and 5.

24. Marvel, K. (2004). *Astronomy made simple*. New York: Broadway Books.

Provides a complete overview of space science, including current types of telescopes. Useful for review of competency 5.

25. Miller, K. R., & Levine, J. S. (2006). *Biology.* Upper Saddle River, NJ: Pearson Prentice Hall.

Provides an introduction to all aspects of biology. Follows the National Science Education Standards. Useful for review of competencies 6 and 7.

26. Rezba, R. J., Sprague, C. R., Fiel, R. L., Matkins, J. J., & McDonnough, J. T. (2007). *Learning and assessing science process skills.* (5th ed.). Dubuque, IA: Kendall/Hunt Publishing Company.

Contains information about standards alignment and technology. Also contains self-assessment questions, classroom scenarios, and ideas for the classroom. Useful for review of competencies 8 and 9.

27. Tarbuck, E., Lutgens, F., & Tasa, D. (2009). *Earth science* (12th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Offers an overview of the physical environment with balanced, current coverage of geology, oceanography, astronomy, and meteorology. Useful for review of competencies 4 and 5.

28. Trujillo, A. P., & Thurman, H. V. (2008). *Essentials of oceanography* (9th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Presents in-depth discussions of oceanographic concepts. Employs a systems approach that highlights the interdisciplinary relationship that exists between oceanographic phenomena and other Earth systems. Scientific information from geology, chemistry, physics, and biology is incorporated to illustrate how each of these disciplines relates to the ocean. Useful for review of competencies 4 and 7.

29. Victor, E., Kellough, R. D., & Tai, R. H. (2008). *Science K–8: An integrated approach* (11th ed.). Boston: Pearson Allyn & Bacon.

Based on the premise that integrated learning by inquiry is the cornerstone of effective science teaching. Focuses on the four developmental components of both teaching and learning—*why, what, how,* and *how well.* Useful for review of competencies 1–9.

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

Presents a full spectrum of views and information to enable students to evaluate issues and make informed decisions. This book containes a comprehensive table of contents. Useful for review of competencies 4, 6, 7, and 9.

31. Wysession, M., Frank, D., & Yancopoulos, S. (2009). *Physical science: Concepts in action*. Needham, MA: Pearson Prentice Hall.

Helps students make connections between classroom science and daily life. Includes overview of physics, chemistry, Earth and space science explorations and activities to expand students' understanding of science. Useful for review of competencies 1–5 and 9.

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.

http://www.fldoe.org/asp/ftce