ETS PRAXIS

Measuring the Power of Learning.®

The *Praxis*® Study Companion

Earth and Space Sciences: Content Knowledge

5571

www.ets.org/praxis

Welcome to *The Praxis® Study Companion*

Prepare to Show What You Know

You have been working to acquire the knowledge and skills you need for your teaching career. Now you are ready to demonstrate your abilities by taking a *Praxis®* test.

Using the *Praxis® Study Companion* is a smart way to prepare for the test so you can do your best on test day. This guide can help keep you on track and make the most efficient use of your study time.

The Study Companion contains practical information and helpful tools, including:

- An overview of the *Praxis* tests
- Specific information on the *Praxis* test you are taking
- A template study plan
- Study topics
- Practice questions and explanations of correct answers
- Test-taking tips and strategies
- Frequently asked questions
- Links to more detailed information

So where should you start? Begin by reviewing this guide in its entirety and note those sections that you need to revisit. Then you can create your own personalized study plan and schedule based on your individual needs and how much time you have before test day.

Keep in mind that study habits are individual. There are many different ways to successfully prepare for your test. Some people study better on their own, while others prefer a group dynamic. You may have more energy early in the day, but another test taker may concentrate better in the evening. So use this guide to develop the approach that works best for you.

Your teaching career begins with preparation. Good luck!

Know What to Expect

Which tests should I take?

Each state or agency that uses the *Praxis* tests sets its own requirements for which test or tests you must take for the teaching area you wish to pursue.

Before you register for a test, confirm your state or agency's testing requirements at www.ets.org/praxis/states.

How are the *Praxis* tests given?

Praxis tests are given on computer. Other formats are available for test takers approved for accommodations (see page 41).

What should I expect when taking the test on computer?

When taking the test on computer, you can expect to be asked to provide proper identification at the test center. Once admitted, you will be given the opportunity to learn how the computer interface works (how to answer questions, how to skip questions, how to go back to questions you skipped, etc.) before the testing time begins. Watch the What to Expect on Test Day video to see what the experience is like.

Where and when are the *Praxis* tests offered?

You can select the test center that is most convenient for you. The *Praxis* tests are administered through an international network of test centers, which includes Prometric® Testing Centers, some universities, and other locations throughout the world.

Testing schedules may differ, so see the *Praxis* web site for more detailed test registration information at www.ets.org/praxis/register.

Table of Contents

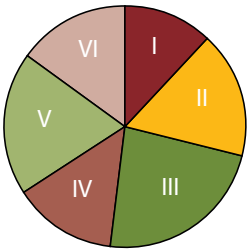
The Praxis® Study Companion guides you through the steps to success

1. Learn About Your Test

Learn about the specific test you will be taking

Earth and Space Sciences: Content Knowledge (5571)

Test at a Glance	
Test Name	Earth and Space Sciences: Content Knowledge
Test Code	5571
Time	2.5 hours
Number of Questions	125
Format	Selected-response questions
Test Delivery	Computer delivered



Content Categories		Approximate Number of Questions	Approximate Percentage of Examination
I.	Basic Principles and Processes	15	12%
II.	Tectonics and Internal Earth Processes	21	17%
III.	Earth Materials and Surface Processes	29	23%
IV.	History of the Earth and its Life-Forms	17	14%
V.	Earth's Atmosphere and Hydrosphere	24	19%
VI.	Astronomy	19	15%

About This Test

The Earth and Space Sciences: Content Knowledge test is designed to measure the knowledge and competencies necessary for a beginning teacher of secondary school Earth and Space Science. Examinees have typically completed or nearly completed a bachelor's degree program with appropriate coursework in Earth and Space Science topics and education. This test may contain some questions that will not count toward your score.

The development of the test questions and the construction of the test reflect the National Science Education Standards (NSES) and the National Science Teacher Association (NSTA) standards and recognize that there are conceptual and procedural schemes that unify the various scientific disciplines. These fundamental concepts and processes (systems, models, constancy and change, equilibrium, form and function) are useful in understanding the natural world. Insofar as possible, then, the test questions have the primary objective of evaluating the content areas by using questions that focus on conceptual understanding, critical thinking, and problem solving in science. The test content is developed and reviewed in collaboration with practicing high school earth and space science teachers, teacher-educators, and higher education content specialists to keep the test updated and representative of current standards.

The 125 selected-response questions include concepts, terms, phenomena, methods, applications, data analysis, and problem solving in Earth and Space Science, and include an understanding of the impact of science and technology on the environment and human affairs. The topics are typically those covered in introductory college-level earth and space science courses, although some questions of a more advanced nature are

included, because secondary school teachers must understand the subject matter from a more advanced viewpoint than that presented to their students. The test covers the six broad content areas of basic scientific principles and processes, tectonics and internal Earth processes, Earth materials and surface processes, history of the Earth and its life-forms, Earth's atmosphere and hydrosphere, and astronomy.

Examinees will not need to use calculators in taking this test. The periodic table of the elements is available as a Help screen, along with a table of information that presents various physical constants and a few conversion factors among SI units. Whenever necessary, additional values of physical constants are included with the text of a question.

Test Specifications

Test specifications in this chapter describe the knowledge and skills measured by the test. Study topics to help you prepare to answer test questions can be found on page 31.

I. Basic Scientific Principles and Processes

A. Science Methodology, Techniques, and History

1. Scientific inquiry methods
   a. Observations, hypotheses, experiments, conclusions, theories, models, and laws
   b. Experimental design, including variables, controls, and sources of error
   c. Scientific knowledge is consistent with evidence, subject to change
2. Collect, evaluate, process, interpret, and report data
   a. Units of measurement
   b. Scale (orders of magnitude), uncertainty in measurement, accuracy versus precision
   c. Appropriate calculations and conversions
   d. Scientific notation and significant figures
   e. Organization and presentation of data
   f. Interpretation of data using inductive and deductive reasoning processes
3. Interpret and draw conclusions from models and data presented in various forms
   a. Trends in data
   b. Maps (e.g., geologic, topographic, weather)
   c. Models (e.g., Earth systems, solar system)
   d. Map projections
   e. Tables, graphs, charts, and cross sections
4. Use materials and equipment in the laboratory and the field safely and appropriately
   a. Preparation, use, storage, and disposal of materials
   b. Use and calibration of equipment
   c. Safety procedures
   d. Value and limitations of investigative technology
      – computer as a tool (e.g., modeling, Internet)
      – data gathering and collection of evidence (e.g., ground-based versus space-based telescope)
5. Ocean and space exploration and the use of various technologies to gather data
   a. Satellites, space probes, remote sensing
   b. Telescopes, spectroscopy
   c. Search for water and life on other planets
   d. Submersibles, research ships, sonar
6. Historical roots of the Earth and Space Sciences
   a. How current concepts in Earth and Space Science developed over time
   b. Major historical figures and their contributions

B. Basic Principles of Matter and Energy

1. Structure of matter
   a. Atoms, molecules, ions, elements, and compounds
   b. Mixtures, solutions, and precipitates
   c. Solids, liquids, gases, plasmas
   d. Kinetic molecular theory of gases and the ideal gas laws
2. Relationships between energy and matter
   a. Conservation of matter in chemical processes
   b. Conservation of energy
   c. Forms of energy
   d. Methods of thermal energy transfer
   e. Specific heat capacity
   f. Energy required for phase transitions
   g. Temperature scales
   h. Thermal expansion and contraction
3. Nuclear reactions
   a. Radioactive decay processes (e.g., isotopes, half-life)
   b. Fusion and fission
   c. Heat production in nuclear reactions

4. Biological, chemical, and physical processes
    a. Chemical and physical properties and changes (e.g., solubility, pH, oxidation, phase changes)
    b. Chemical bonding
    c. Wave properties and phenomena (e.g., wavelength, frequency, amplitude, reflection, refraction)
    d. Electromagnetic spectrum (e.g., visible, infrared, ultraviolet, gamma)
    e. Photosynthesis and respiration
    f. Forces and motion (e.g., gravity, friction)

C. Science, Technology, and Society

1. Impact of science and technological advancements on the environment
    a. Interrelationships between humans and the hydrosphere (e.g., water pollution and treatment, acid rain, impact of sea level rise on populations, availability of water resources, irrigation, desalinization)
    b. Interrelationships between humans and the atmosphere (e.g., air pollution, greenhouse gases, importance of UV absorption by stratospheric ozone, ozone layer depletion)
    c. Impact of human activity on the natural fluctuations in global systems (e.g., rate of climate change, rate of sea level change, rate of depletion of aquifers)
2. Issues associated with the use of various energy sources
    a. Renewable and nonrenewable energy sources
    b. Energy conservation
    c. Pros and cons of power production based on various types of sources, such as fossil fuel, nuclear, hydro, solar, wind, and geothermal
3. Issues associated with the use and extraction of various Earth resources
    a. Mining-related effects
    b. Increased erosion
    c. Deforestation
    d. Degradation of soils (e.g., agricultural practices)
4. Importance of Earth and Space Sciences to everyday life
    a. Conservation of resources (e.g., recycling, sustainable technology)
    b. Waste management
    c. Technology (e.g., satellites, GPS)
    d. Human health (e.g., radon in basements of homes)
    e. Identification and prediction of natural hazards (e.g., tsunamis, earthquakes, hurricanes, coastal erosion)

II. Tectonics and Internal Earth Processes

1. Theory of plate tectonics and its supporting evidence
    a. Plate movement
    b. Convergent, divergent, and transform boundaries
    c. Hot spots
    d. Potential driving forces (e.g., mantle convection)
    e. Seismic, magnetic, fossil, and other evidence for plate tectonics
    f. Geographic features (e.g., trenches, mountains, rift zones)
2. Deformation of Earth's crust and resulting features
    a. Folds and faults
    b. Mountain building and rifting
    c. Compression, tension, and shear stresses
    d. Isostasy (e.g., postglacial rebound)
3. Characteristics of earthquakes and how they provide information about Earth's interior
    a. Distribution and types (deep versus shallow)
    b. Magnitude and intensity
    c. Seismic waves and seismograms
    d. Epicenter, focus
    e. Causes of earthquakes
4. Layered structure of Earth and related processes
    a. Characteristics and composition of the crust, mantle, and core
    b. Properties of the lithosphere and asthenosphere
    c. Evidence from seismic waves
    d. Shape and size of Earth
    e. Magnetic field and geomagnetic reversals

5. Volcanic characteristics and processes
    a. How volcanoes are formed
    b. Features of volcanoes (e.g., vent, magma chamber) and eruptive products (e.g., pyroclastics, gases)
    c. Types of volcanoes and their characteristics
    d. Distribution (e.g., ring of fire, hot spots)

III. Earth Materials and Surface Processes

1. Identification of minerals
    a. Definition of a mineral
    b. Physical properties (e.g., density, streak, cleavage, luster, crystal structure)
    c. Identification tools (e.g., Mohs' hardness scale)
2. Cycling of Earth materials
    a. Rock cycle
    b. Water cycle
    c. Carbon cycle
3. Characteristics and formation of igneous, sedimentary, and metamorphic rocks
    a. Rock identification and classification
    b. Formation and characteristics of the following:
        – intrusive and extrusive igneous rock
        – clastic, chemical, and biological sedimentary rocks
        – regional and contact metamorphic rocks
4. Earth's surface changes over time
    a. Chemical and physical weathering
    b. Erosion and deposition
    c. Uplift
    d. Interaction between the biosphere and the geosphere (e.g., weathering caused by plants, nutrient uptake from soil by plants)
    e. Interaction between the hydrosphere and the geosphere (e.g., cave formation, ocean salinity, streams, and drainage systems)
    f. Processes of soil formation and resulting characteristics (e.g., soil profiles, factors such as geology, climate, time)

IV. History of the Earth and its Life-Forms

1. Rocks are used to determine geologic time and provide a record of Earth's history
    a. Principle of uniformitarianism (e.g., definition, applications, limitations)
    b. Principles of relative age dating including:
        – principle of original horizontality
        – principle of superposition
        – principle of cross-cutting relationships
        – principle of fossil succession
        – stratigraphic correlation
        – unconformities
    c. Principles of absolute (radiometric) age dating
    d. Geologic time scale (e.g., Earth's age, scope of time)
2. Fossil record as evidence of the origin and development of life
    a. Origin of major groups of life-forms
    b. Fossilization methods
    c. Mass extinctions
    d. Fossil evidence for major divisions of the geologic time scale
3. Theories of Earth's formation and development of its systems including the history of the following:
    a. Earth's atmosphere
    b. Earth's hydrosphere
    c. Earth's landmasses

V. Earth's Atmosphere and Hydrosphere

1. Unusual properties of water and effect on Earth systems
    a. Density changes (e.g., ice floats in water)
    b. Excellent solvent
    c. High specific heat and heat of vaporization
    d. Exists as solid, liquid, and gas on Earth
2. Water cycle and the energy transfers involved
    a. Phase changes (e.g., vaporization, condensation, sublimation)
    b. General structure of the water cycle
    c. Distribution of water on Earth

3. Basic structure and composition of the atmosphere
    a. Chemical composition
    b. Various layers and their physical properties (e.g., stratosphere, troposphere, thermosphere)
    c. Interaction of the atmosphere with hydrosphere/biosphere/geosphere (e.g., respiration, transpiration, photosynthesis, nitrogen fixation, evaporation, precipitation, effect of the atmosphere on weathering)
4. Basic physical principles and processes involved in meteorology
    a. Variations in atmospheric temperature, pressure, and density
    b. Energy budget (e.g., energy absorption and reflection)
    c. Processes involving greenhouse gases
    d. Circulation, Coriolis effect
    e. Cloud formation
    f. Origin of wind
    g. Absolute and relative humidity
    h. Dew point and frost point
    i. Daily/seasonal/annual variations in meteorology (e.g., sea breezes, monsoons, El Niño)
5. Development and movement of weather systems
    a. Cloud types
    b. Formation of various types of precipitation
    c. Air masses, fronts, storms, and severe weather such as hurricanes and tornados
    d. Development and movement of weather patterns
    e. Interpretation of atmospheric data (e.g., dew point, isobars)
    f. Fundamentals of weather forecasting
6. Factors and processes that influence climate and lead to climate zones
    a. Effects of the following:
        – latitude, geographical location, and elevation
        – atmospheric circulation (e.g., trade winds, jet stream)
        – ocean circulation
    b. Characteristics and locations of climate zones
    c. Effect of the Earth's tilt on seasons
7. Effects of natural phenomena on climate change
    a. Volcanic eruptions
    b. Asteroid impacts
    c. Variations in solar radiation
8. Characteristics and processes of surface water and groundwater
    a. Streams (e.g., erosion, deposition, channel migration)
    b. Lakes and wetlands
    c. Geysers and springs
    d. Groundwater, aquifers, water table
    e. Runoff and infiltration
    f. Porosity and permeability
    g. Hazards (e.g., flooding, sinkholes)
    h. Human interactions (e.g., wells, levees, diversion for irrigation, saltwater intrusion)
9. Characteristics of glaciers and polar ice and how they move and change over time
    a. Characteristics of continental and mountain glaciers
    b. Glacial-interglacial cycles, advance and retreat
    c. Depositional and erosional features
    d. Icebergs
    e. Sea ice
10. Physical and chemical characteristics and processes of the oceans
    a. Salinity, temperature, and density
    b. Surface currents, deep-ocean circulation
    c. El Niño, La Niña
    d. Wave formation
    e. Seafloor topography
11. Interrelationships between the oceans and the solid Earth
    a. Tidal effects (e.g., tidal range, tidal patterns)
    b. Wave effects (e.g., coastal erosional and depositional processes)
    c. Tsunamis
    d. Island formation and change (e.g., barrier islands, volcanic islands, atolls)
    e. Hydrothermal vents
    f. Estuaries (e.g., characteristics, formation)
    g. Marine sediments (e.g., origin, rate of deposition)
    h. Sea level changes

12. Interrelationships between the hydrosphere and the biosphere/atmosphere
    a. Light penetration and photosynthesizers in oceans
    b. Upwelling of nutrients
    c. Coral reefs
    d. Organisms around hydrothermal vents

VI. Astronomy

1. Earth's motions and their characteristics and consequences
    a. Rotation and revolution
    b. Time zones
    c. Effect of axial tilt (e.g., seasons, solstices, and equinoxes)
    d. Long-term changes in Earth's motions
2. Relationships within the Earth-Moon-Sun system
    a. Tides (e.g., causes, cycles, spring, neap)
    b. Eclipses (solar, lunar)
    c. Phases of the Moon
    d. Effect of solar wind on Earth
3. Characteristics of the components of our solar system and how they formed
    a. Laws of motion
    b. Theories of the formation of the solar system
    c. Location, orbits, and characteristics of the planets
    d. Structure and characteristics of the Sun
    e. Structure, characteristics, and orbit of the Earth's moon
    f. Natural satellites
    g. Characteristics of asteroids, meteoroids, comets, dwarf/minor planets
4. Characteristics of stars and the processes that occur within them
    a. Stages in the life cycle of stars (e.g., protostar, main sequence, white dwarf, supernova)
    b. Color, temperature, apparent brightness, and luminosity, including Hertzsprung-Russell diagram
    c. Formation of elements (e.g., carbon, iron)
5. Characteristics of the Milky Way and other galaxies
    a. Structure and classification of galaxies (e.g., spiral, elliptical)
    b. Relative distances and motions
    c. Supermassive black holes
    d. Dark matter
6. Theories and observations that relate to the origin and development of the universe
    a. Theories about the origin of the universe
    b. Redshift and background radiation

2. Familiarize Yourself with Test Questions

Become comfortable with the types of questions you'll find on the Praxis *tests*

The *Praxis* assessments include a variety of question types: constructed response (for which you write a response of your own); selected response, for which you select one or more answers from a list of choices or make another kind of selection (e.g., by clicking on a sentence in a text or by clicking on part of a graphic); and numeric entry, for which you enter a numeric value in an answer field. You may be familiar with these question formats from taking other standardized tests. If not, familiarize yourself with them so you don't spend time during the test figuring out how to answer them.

Understanding Computer-Delivered Questions

Questions on computer-delivered tests are interactive in the sense that you answer by selecting an option or entering text on the screen. If you see a format you are not familiar with, read the directions carefully. The directions always give clear instructions on how you are expected to respond.

For most questions, you respond by clicking an oval to select a single answer from a list of answer choices.

However, interactive question types may also ask you to respond by:

- **Clicking more than one oval** to select answers from a list of choices.
- **Typing in an entry box.** When the answer is a number, you may be asked to enter a numerical answer. Some questions may have more than one place to enter a response.
- **Clicking check boxes.** You may be asked to click check boxes instead of an oval when more than one choice within a set of answers can be selected.
- **Clicking parts of a graphic.** In some questions, you will select your answers by clicking on a location (or locations) on a graphic such as a map or chart, as opposed to choosing your answer from a list.
- **Clicking on sentences.** In questions with reading passages, you may be asked to choose your answers by clicking on a sentence (or sentences) within the reading passage.
- **Dragging and dropping answer choices into targets on the screen.** You may be asked to select answers from a list of choices and drag your answers to the appropriate location in a table, paragraph of text or graphic.
- **Selecting answer choices from a drop-down menu.** You may be asked to choose answers by selecting choices from a drop-down menu (e.g., to complete a sentence).

Remember that with every question you will get clear instructions.

Perhaps the best way to understand computer-delivered questions is to view the Computer-delivered Testing Demonstration on the Praxis web site to learn how a computer-delivered test works and see examples of some types of questions you may encounter.

Understanding Selected-Response Questions

Many selected-response questions begin with the phrase "which of the following." Take a look at this example:

Which of the following is a flavor made from beans?

(A) Strawberry

(B) Cherry

(C) Vanilla

(D) Mint

How would you answer this question?

All of the answer choices are flavors. Your job is to decide which of the flavors is the one made from beans.

Try following these steps to select the correct answer.

1) **Limit your answer to the choices given.** You may know that chocolate and coffee are also flavors made from beans, but they are not listed. Rather than thinking of other possible answers, focus only on the choices given ("which of the following").

2) **Eliminate incorrect answers.** You may know that strawberry and cherry flavors are made from fruit and that mint flavor is made from a plant. That leaves vanilla as the only possible answer.

3) **Verify your answer.** You can substitute "vanilla" for the phrase "which of the following" and turn the question into this statement: "Vanilla is a flavor made from beans." This will help you be sure that your answer is correct. If you're still uncertain, try substituting the other choices to see if they make sense. You may want to use this technique as you answer selected-response questions on the practice tests.

Try a more challenging example

The vanilla bean question is pretty straightforward, but you'll find that more challenging questions have a similar structure. For example:

Entries in outlines are generally arranged according to which of the following relationships of ideas?

(A) Literal and inferential

(B) Concrete and abstract

(C) Linear and recursive

(D) Main and subordinate

You'll notice that this example also contains the phrase "which of the following." This phrase helps you determine that your answer will be a "relationship of ideas" from the choices provided. You are supposed to find the choice that describes how entries, or ideas, in outlines are related.

Sometimes it helps to put the question in your own words. Here, you could paraphrase the question in this way: "How are outlines usually organized?" Since the ideas in outlines usually appear as main ideas and subordinate ideas, the answer is (D).

QUICK TIP: Don't be intimidated by words you may not understand. It might be easy to be thrown by words like "recursive" or "inferential." Read carefully to understand the question and look for an answer that fits. An outline is something you are probably familiar with and expect to teach to your students. So slow down, and use what you know.

Watch out for selected-response questions containing "NOT," "LEAST," and "EXCEPT"

This type of question asks you to select the choice that does not fit. You must be very careful because it is easy to forget that you are selecting the negative. This question type is used in situations in which there are several good solutions or ways to approach something, but also a clearly wrong way.

How to approach questions about graphs, tables, or reading passages

When answering questions about graphs, tables, or reading passages, provide only the information that the questions ask for. In the case of a map or graph, you might want to read the questions first, and then look at the map or graph. In the case of a long reading passage, you might want to go ahead and read the passage first, noting places you think are important, and then answer the questions. Again, the important thing is to be sure you answer the questions as they refer to the material presented. So read the questions carefully.

How to approach unfamiliar formats

New question formats are developed from time to time to find new ways of assessing knowledge. Tests may include audio and video components, such as a movie clip or animation, instead of a map or reading passage. Other tests may allow you to zoom in on details in a graphic or picture.

Tests may also include interactive questions. These questions take advantage of technology to assess knowledge and skills in ways that standard selected-response questions cannot. If you see a format you are not familiar with, **read the directions carefully**. The directions always give clear instructions on how you are expected to respond.

QUICK TIP: Don't make the questions more difficult than they are. Don't read for hidden meanings or tricks. There are no trick questions on *Praxis* tests. They are intended to be serious, straightforward tests of your knowledge.

Understanding Constructed-Response Questions

Constructed-response questions require you to demonstrate your knowledge in a subject area by creating your own response to particular topics. Essays and short-answer questions are types of constructed-response questions.

For example, an essay question might present you with a topic and ask you to discuss the extent to which you agree or disagree with the opinion stated. You must support your position with specific reasons and examples from your own experience, observations, or reading.

Take a look at a few sample essay topics:

- "Celebrities have a tremendous influence on the young, and for that reason, they have a responsibility to act as role models."
- "We are constantly bombarded by advertisements—on television and radio, in newspapers and magazines, on highway signs, and the sides of buses. They have become too pervasive. It's time to put limits on advertising."
- "Advances in computer technology have made the classroom unnecessary, since students and teachers are able to communicate with one another from computer terminals at home or at work."

Keep these things in mind when you respond to a constructed-response question

1) **Answer the question accurately.** Analyze what each part of the question is asking you to do. If the question asks you to describe or discuss, you should provide more than just a list.

2) **Answer the question completely.** If a question asks you to do three distinct things in your response, you should cover all three things for the best score. Otherwise, no matter how well you write, you will not be awarded full credit.

3) **Answer the question that is asked.** Do not change the question or challenge the basis of the question. You will receive no credit or a low score if you answer another question or if you state, for example, that there is no possible answer.

4) **Give a thorough and detailed response.** You must demonstrate that you have a thorough understanding of the subject matter. However, your response should be straightforward and not filled with unnecessary information.

5) **Reread your response.** Check that you have written what you thought you wrote. Be sure not to leave sentences unfinished or omit clarifying information.

QUICK TIP: You may find that it helps to take notes on scratch paper so that you don't miss any details. Then you'll be sure to have all the information you need to answer the question.

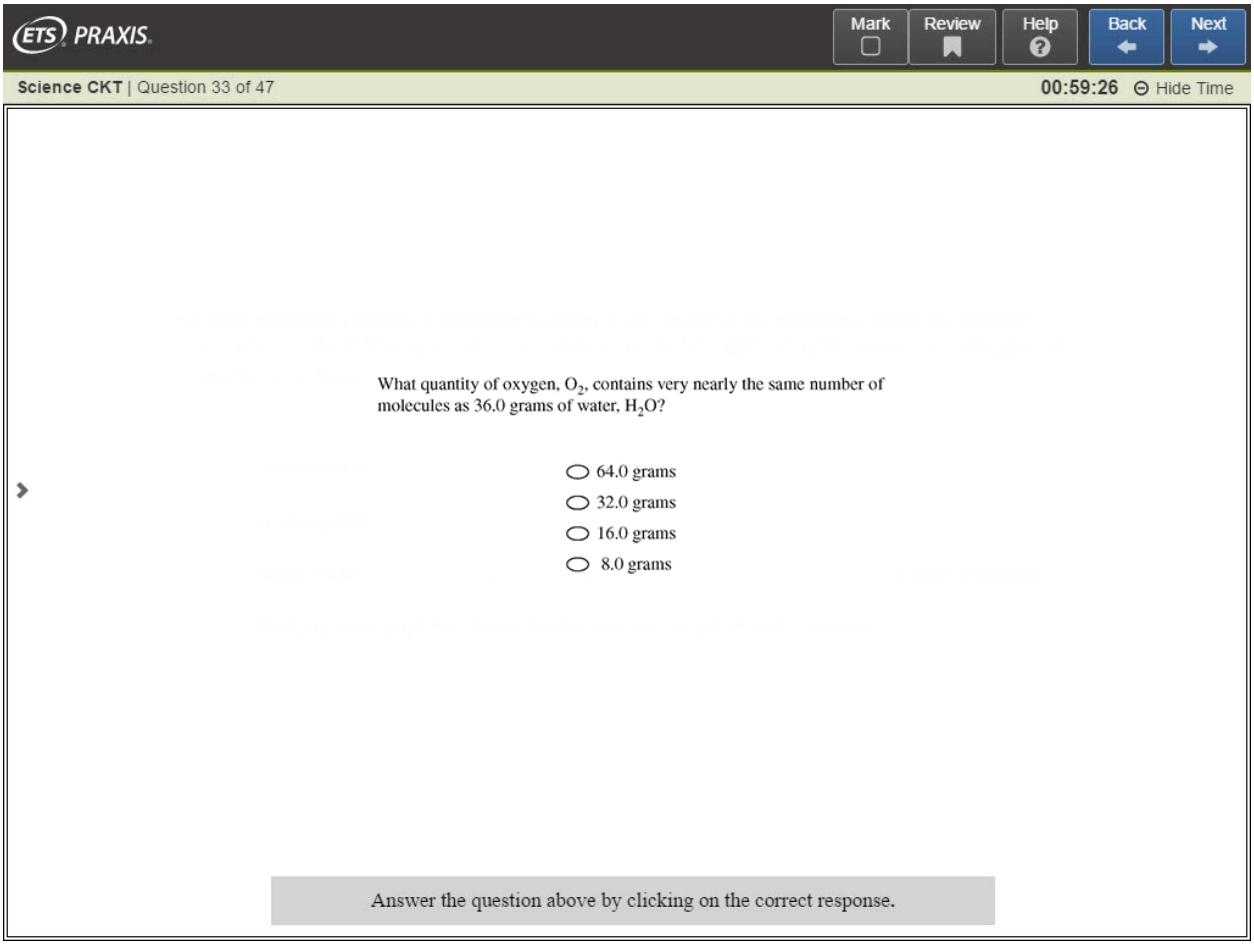
For tests that have constructed-response questions, more detailed information can be found on page 5.

3. Practice with Sample Test Questions

Answer practice questions and find explanations for correct answers

Computer Delivery

This test is available via computer delivery. The following sample question provides a preview of an actual screen used in a computer-delivered test. For the purposes of this Study Companion, the sample questions are shown as they would appear in a paper-delivered test.



Sample Test Questions

The sample questions that follow illustrate the kinds of questions on the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

Directions: Each of the questions or statements below is followed by four suggested answers or completions. Select the one that is best in each case.

1. Place the following steps of the scientific method in the order a scientist would follow.

   Analyze data

   Perform an experiment

   Formulate a question

   Form a conclusion

   Form a hypothesis

   First step ☐

   ☐

   ☐

   ☐

   Last step ☐

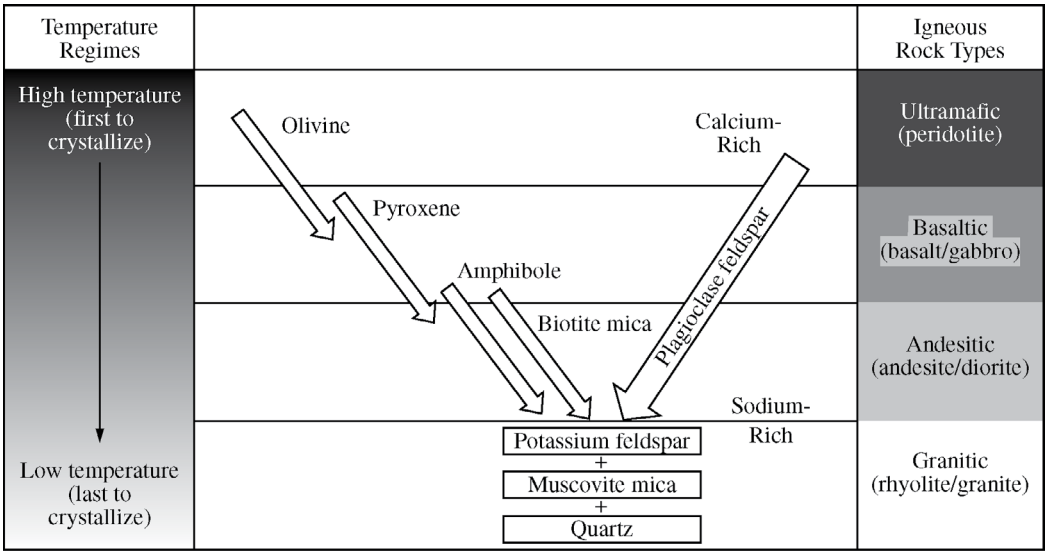
2. Using the chart below, which of the following explains why a plagioclase crystal in an igneous rock is calcium rich in the center but becomes progressively higher in sodium content toward the edges?

   (A) Calcium-rich plagioclase crystals need more oxygen to form, and sodium-rich plagioclase crystals need less oxygen.

   (B) Calcium-rich plagioclase crystals contain more olivine, and sodium-rich plagioclase crystals contain quartz.

   (C) Calcium-rich plagioclase crystals are usually found in basalt, and sodium-rich plagioclase crystals are usually found in granite.

   (D) Calcium-rich plagioclase crystallizes at higher temperatures, and sodium-rich plagioclase crystallizes at lower temperatures.



3. The Burgess Shale is a rock formation in Canada that has a large number of fossils from the Cambrian period preserved in exquisite detail. Many primitive members of modern phyla, including arthropods, mollusks, and chordates, can be found among the fossils exposed in this region. Based on these fossils, it can be concluded that most of the modern groups of animal life first appeared roughly

   (A) 3 billion years ago

   (B) 540 million years ago

   (C) 65 million years ago

   (D) 200,000 years ago

4. A well on the side of a hill penetrates the water table at an elevation of 550 feet above sea level. If someone plans to drill on the top of the hill, where would the water table most likely be found?

   (A) The water table would be found at sea level.

   (B) The water table would be found at an elevation lower than 550 feet above sea level but above sea level.

   (C) The water table would be found at an elevation higher than 550 feet above sea level but many feet below the land surface.

   (D) The water table would intersect with the land surface at the top of the hill, forming a spring.

5. Which of the following types of stress dominates at divergent boundaries?

   (A) Compressional

   (B) Left-lateral shear

   (C) Right-lateral shear

   (D) Tensional

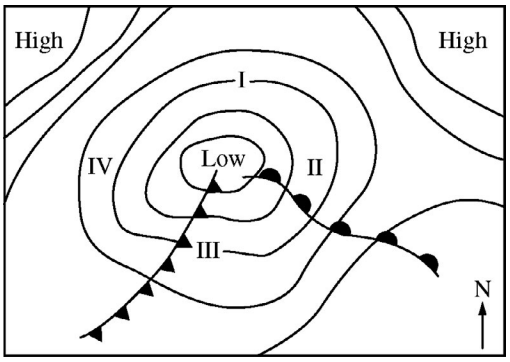
6. Which of the following rocks would most likely form from the metamorphism of a shale?

   (A) Granite

   (B) Quartzite

   (C) Schist

   (D) Marble



7. The map above shows a midlatitude low-pressure cell with accompanying fronts in the Northern Hemisphere. Which of the following statements about this weather system is most likely true?

   (A) The absolute humidity of the surface air at station Ⅰ is higher than that at station Ⅲ.

   (B) The surface wind at station Ⅱ is coming from the west.

   (C) The wind at station Ⅲ will shift in a counterclockwise direction as the system moves eastward.

   (D) The atmospheric pressure at station Ⅳ is higher than at stations Ⅰ, Ⅱ, or Ⅲ.

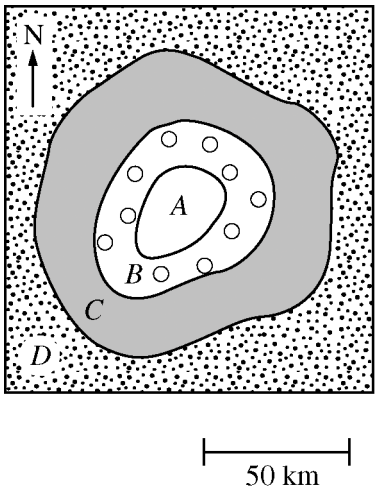
8. Which of the following has provided evidence that the Sun's atmosphere contains sodium atoms?

   (A) Absorption lines in the solar spectrum are consistent with the presence of sodium.

   (B) Stars with the same spectral class as the Sun are made mostly of sodium.

   (C) Solar samples returned to Earth by the Voyager spacecraft contained sodium.

   (D) The Sun gives off energy produced by the nuclear fusion of sodium in its core



9. The geologic map above, from an area with low topographic relief, shows four rock units, labeled *A* through *D*, from oldest to youngest. What structure is represented on the map?
   (A) Basin
   (B) Dome
   (C) Anticline
   (D) Syncline

10. Normally, S-P arrival intervals from a minimum of how many seismic stations are required to uniquely locate the epicenter of an earthquake?
   (A) 1
   (B) 2
   (C) 3
   (D) 4

11. The atmospheric concentration of which of the following gases is most likely to be directly affected by widespread deforestation?
   (A) Carbon dioxide
   (B) Ozone
   (C) Nitrous oxide
   (D) Argon

12. Which of the following states that geological processes and natural laws that operate now have operated in the past?
   (A) The evolutionary theory
   (B) The law of superposition
   (C) The law of thermodynamics
   (D) The principle of uniformitarianism

13. Water's high heat capacity allows it to
   (A) change density significantly as its temperature changes
   (B) gain and lose large amounts of heat without significantly changing the temperature of the water
   (C) conduct sound efficiently without significant loss of velocity as the sound waves travel long distances
   (D) cause the ocean's surface temperature to fluctuate rapidly as the seasons change

14. Astronomers have proposed that the solar system formed from a vast rotating cloud of gas and dust. This explanation is known as which of the following?
   (A) Kepler's laws
   (B) Big bang theory
   (C) Cosmic string theory
   (D) Nebular hypothesis

15. Which of the following has provided the most information about the structure of Earth's core, mantle, and lower crust?
   (A) Measurement of the intensity and fluctuations of Earth's magnetic field
   (B) Examination of flowing lava
   (C) Collection of samples from deep boreholes drilled into Earth
   (D) Studies of the speeds and travel paths of seismic waves passing through Earth

16. Which of the following structures is most susceptible to damage by acid precipitation?
   (A) A monument made of granite
   (B) A roof made of slate
   (C) A tombstone made of marble
   (D) A statue made of gabbro

17. Which of the following best helps explain why some localities have normally large tidal ranges (up to 60 feet) and others have one- to two-foot tidal ranges?

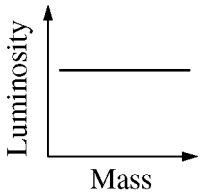
    (A) The position of the Sun is different at different localities.

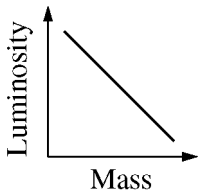
    (B) The Coriolis effect and rotation of Earth tend to enhance tidal flow in the higher latitudes.

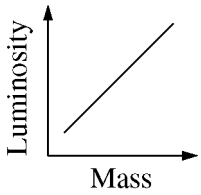
    (C) Ocean floor topography and the shape of the coastline serve to amplify tidal flow at specific localities.

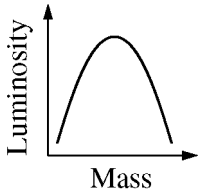
    (D) Trade winds push the water into large tidal bulges near rocky shorelines.

18. Which of the following graphs best shows the relationship between mass and luminosity for main sequence stars? (Axes for all graphs have logarithmic scales.)

    (A)
    

    (B)
    

    (C)
    

    (D)
    

19. Which of the following states of matter is characterized by a closely packed arrangement of particles, resulting in a stable, definite shape and definite volume?

    (A) Solid

    (B) Liquid

    (C) Gas

    (D) Plasma

20. Which of the following is most likely to result from a collision between a continental lithospheric plate and an oceanic lithospheric plate?

    (A) A chain of coastal volcanic mountains

    (B) A magnetic reversal

    (C) A mid-oceanic ridge

    (D) A transform fault

21. The dissolved salts in Earth's oceans are principally derived from

    (A) marine biological activity

    (B) atmospheric deposition

    (C) the weathering of continental rocks

    (D) the eruptions of undersea hot-spot volcanoes

22. Which of the following sequences of events is consistent with the presence of a layer of sandstone in bedrock just above a layer of shale?

    (A) A volcano erupted, sending lava out over a layer of shale. The lava cooled and hardened into sandstone.

    (B) The water level of a large lake lowered. A beach then formed where previously there had been lake bottom.

    (C) One-celled organisms developed a colony on the seafloor. Shells made by these organisms accumulated and lithified, forming the sandstone.

    (D) Mud was deposited and lithified. Subsequent contact metamorphism resulted in localized recrystallization of the shale into sandstone.

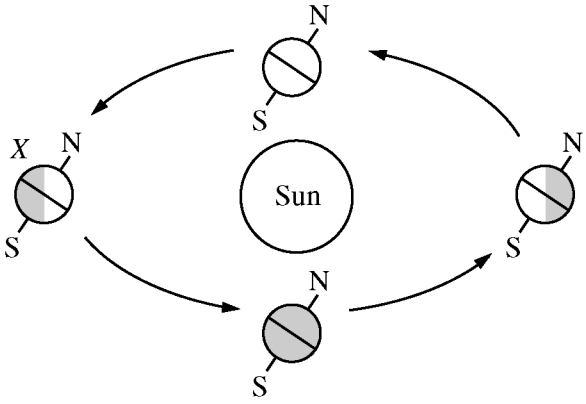
23. Which TWO of the following are correct statements about cloud formation?

    (A) Clouds are formed from small water droplets or ice crystals.

    (B) Clouds form as humidity decreases.

    (C) Clouds often form when air rises and cools.

    (D) Clouds typically form as air masses sink to the ground



24. In the illustration above of Earth's orbit about the Sun, which of the following is most likely true of Earth at location X?

    (A) The spring equinox occurs.

    (B) The fall equinox occurs.

    (C) The winter solstice occurs in the Northern Hemisphere

    (D) The summer solstice occurs in the Northern Hemisphere.

25. Which of the following best helps explain why volcanoes tend to form along subduction zones?

    (A) Rock material carried deep below Earth's surface results in material melting and rising to the surface.

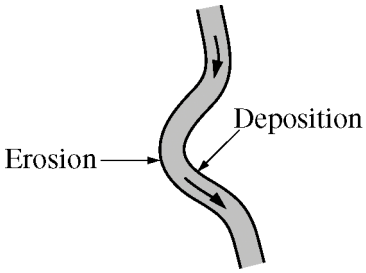
    (B) Two plates pull away from each other, and magma oozes out.

    (C) The friction resulting from the collision of two continents causes rock to melt.

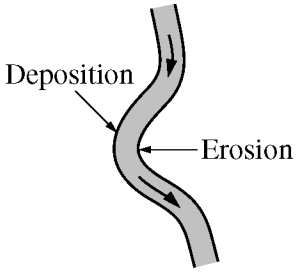
    (D) There is a row of hot spots at these boundaries.

26. Which of the following diagrams best shows where erosion and deposition take place on a river meander?

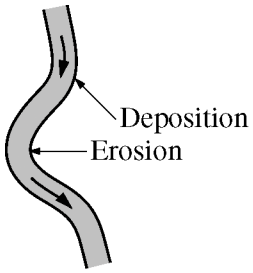
    (A)



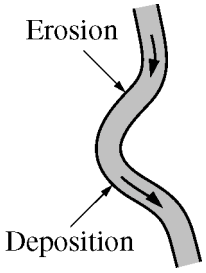
    (B)



    (C)



    (D)



27. During which of the following processes within the hydrologic cycle do water molecules absorb energy?

    (A) Formation of ice from water

    (B) Formation of a cloud from water vapor

    (C) Runoff along the land surface

    (D) Evaporation from the ocean surface

28. As seen from Earth, the Moon goes through a series of phases due to changes in which of the following?

    (A) The amount of the Moon's surface that is in Earth's shadow

    (B) The amount of the illuminated side of the Moon that can be seen from Earth

    (C) The part of the Moon that faces Earth as the Moon rotates on its axis

    (D) The tilt of the Moon on its axis

29. Which of the following activities is likely to have the greatest impact on biodiversity?

    (A) Copper mining in Chile

    (B) Soil erosion on the slopes of the Rocky Mountains

    (C) Large-scale deforestation of the Amazon or Congo basin tropical forests

    (D) Increased use of ethanol fuels in the United States

30. Which of the following lists includes minerals only?

    (A) Granite, gabbro, diorite, quartz, feldspar

    (B) Gold, quartz, topaz, diamond, corundum

    (C) Gneiss, schist, phyllite, chlorite, mica

    (D) Coal, chert, limestone, dolomite, halite

31. Which of the following lists the gases that were most likely the largest components of Earth's early atmosphere?

    (A) N_2 and O_3

    (B) C_2H_4 and O_2

    (C) Ne, Ar, Kr, and Rn

    (D) N_2, H_2O, CO_2, CH_4, and NH_3

Answers to Sample Questions

1. The correct order of steps in the scientific method is formulate a question; form a testable hypothesis; perform an experiment or use a computational model to test the hypothesis; analyze the data from the experiment or model; form a conclusion about whether the data support the hypothesis.

2. The correct answer is (D). The chart shows that calcium-rich plagioclase will crystallize at higher temperatures and, therefore, before sodium-rich plagioclase, which will crystallize at lower temperatures. Since the crystals grow outward as the magma cools, the center of the plagioclase feldspar crystal will form first at higher temperatures and the edges will crystallize last at lower temperatures.

3. The correct answer is (B). The Cambrian period began approximately 540 million years ago. The early period is notable for the rapid increase in biodiversity, known as the Cambrian explosion, that included the first members of many modern animal phyla.

4. The correct answer is (C). The water table, which is the upper surface of the zone of saturation, often follows the topography of the land surface to some extent. Thus, the well drilled at the top of the hill is likely to intersect the water table at an elevation higher than 550 feet above sea level.

5. The correct answer is (D). Tensional stress dominates at divergent boundaries, where two plates are moving away from each other in opposite directions. Tensional stress produces normal faults.

6. The correct answer is (C). Schist is a foliated metamorphic rock derived from shale. Granite is an igneous rock, quartzite is a metamorphic rock derived from quartz sandstone, and marble is a metamorphic rock derived from limestone.

7. The correct answer is (D). The atmospheric pressure, as contoured on the map with isobars, is higher at station IV than at stations I, II, or III. The other statements are not true.

8. The correct answer is (A). The chemical composition of the Sun's atmosphere has been inferred primarily from absorption lines observed in the solar spectrum.

9. The correct answer is (B). Domes are geological features that result from upward-acting pressure that produces an uplifted portion of the crust that dips downward on all sides. After the area has been eroded and there is low topographic relief, the area of the dome is characterized by concentric strata that grow progressively older from the outside to the inside, with the oldest rocks exposed at the center.

10. The correct answer is (C). The arrival interval recorded at one station for a seismic event only provides the distance (not direction) from the station to the epicenter of the event. A circle with the appropriate radius around the station indicates possible locations of the epicenter. Circles around the two stations typically intersect at two points. Only with three or more stations will the circles intersect at a single point.

11. The correct answer is (A). Deforestation is most likely to result in an increase in the concentration of carbon dioxide, which is a trace gas in Earth's atmosphere. Forests are natural carbon sinks. Through photosynthesis, they transform carbon dioxide into biomass. Deforestation not only decreases the amount of carbon dioxide in the atmosphere that can be sequestered by photosynthesis, but methods of deforestation, such as slash and burn, release carbon (as carbon dioxide) that has been stored as biomass.

12. The correct answer is (D). James Hutton introduced the principle of uniformitarianism, the concept that the geological processes and natural laws that operate today also operated in the geologic past. The geological forces and processes that we observe today have been at work for a very long time.

13. The correct answer is (B). Water can absorb or release large amounts of heat without significantly changing the temperature of the water. Freshwater has a specific heat capacity of 4.18 J/g°C, which is significantly higher than the heat capacity of air or land. This difference helps explain the moderating effect of the ocean on the climate of coastal regions and the formation of sea and land breezes.

14. The correct answer is (D). The nebular hypothesis is a model of planetary system formation. A rotating cloud of gas and dust collapses to form a young star and protoplanetary disk. As the disk cools, planetesimals undergo accretion and collisions to form the inner terrestrial planets. Beyond the frost line, protoplanets composed of ices accrete gases, forming the massive outer gas and ice giants.

15. The correct answer is (D). The structure of Earth has been inferred indirectly based on the movement of the different kinds of seismic waves through different parts of Earth. P waves and S waves travel at different speeds and can pass through different Earth materials. When they move from one material to another material, they are reflected or refracted. The speed and actions of these waves are used to determine characteristics of the different layers of Earth. For example, P waves can travel through solids and liquids, slowing in liquids, while S waves can only travel through solids. Since S

waves are eliminated and P waves slow down at the outer core, it is inferred that the outer core acts as a liquid; since P waves speed up in the inner core, it is inferred that it is solid.

16. The correct answer is (C). Marble would be particularly susceptible to acid rain because it is composed primarily of the mineral calcite, which readily dissolves in acid. The other materials, which contain mostly silicate minerals, would also be affected but over a longer period of time.

17. The correct answer is (C). The configuration of ocean basins and the shape of the coastline can affect the tides, causing phenomena such as standing waves and resonance. The extreme tidal range typical of localities in the Bay of Fundy is a well-known example of the influence of ocean floor topography and coastline shape on tides.

18. The correct answer is (C). For stars on the main sequence, the relationship of mass to luminosity is that the more massive a main sequence star is, the higher its surface temperature and the more luminous it is

19. The correct answer is (A). Solids are characterized by a closely packed arrangement of particles that results in a stable, definite shape and definite volume.

20. The correct answer is (A). The collision of a continental plate with an oceanic plate results in the denser oceanic plate being subducted beneath the continental plate. The surface features formed typically include an offshore trench and a chain of coastal volcanic mountains.

21. The correct answer is (C). The salinity of Earth's oceans is attributed primarily to dissolved salts produced by the weathering of continental rocks and transported to the oceans by rivers. The other choices list plausible sources of salts, but they are all insignificant compared with the continental source.

22. The correct answer is (B). Shale is a fine-grained sedimentary rock made of clay-sized particles. Sandstone is a sedimentary rock made of sand-sized particles. For sandstone to form on top of shale, a change in the environment must have occurred from one that would allow the deposition of clay (such as a lake bed) to one that would allow the deposition of sand (such as a beach).

23. The correct answers are (A) and (C). Clouds typically form when air rises and cools below the dew point. The water vapor condenses on small particles (nuclei) to form water droplets or ice crystals.

24. The correct answer is (D). When Earth is at location *X*, the Northern Hemisphere receives the most direct rays of the Sun and experiences the greatest number of daylight hours. Under these conditions, it is approximately the first day of summer in the Northern Hemisphere.

25. The correct answer is (A). As the rock material in the subducting plate sinks deeper, the pressure and temperature increase, causing the rock to release water. The water moves upward into the hot overlying mantle, lowering the melting point of the rock. The resulting magma rises, producing volcanoes along the subduction zone.

26. The correct answer is (A). The bends in rivers are called meanders. Meanders grow by erosion on the outside of the bends and by deposition on the inside of the bends because the current is faster on the outside than on the inside.

27. The correct answer is (D). Evaporation is an endothermic process in which water molecules absorb energy and undergo a phase change from a liquid to a gas.

28. The correct answer is (B). The Moon does not emit its own light but reflects light received from the Sun. It is the position of Earth and Moon relative to the Sun that determines the phase of the Moon. The half of the Moon that faces the Sun is always lighted (except during a lunar eclipse), and the phases that are seen from Earth are determined by how much of the lighted half is visible.

29. The correct answer is (C). Biodiversity refers to the richness of living systems as a function of genetic variation within and among species in an ecosystem, a biome, or on Earth. The tropical rain forest biome has tremendous species richness and thus tremendous biodiversity. Large-scale deforestation would destroy the habitats of more species than would the other choices.

30. The correct answer is (B). A mineral has a specific composition or range of compositions with a highly ordered arrangement of atoms. Gold and diamond are native elements. Quartz and topaz are silicates, and corundum is an oxide.

31. The correct answer is (D). It is believed that as Earth cooled, the gases dissolved in molten rock were gradually released, which is a process called outgassing. Therefore, the early atmosphere was believed to be made up largely of gases similar to those released by volcanic eruptions (e.g., H_2O and CO_2). It is believed that free oxygen was not abundant in the atmosphere until after the evolution of photosynthetic organisms.

4. Determine Your Strategy for Success

Set clear goals and deadlines so your test preparation is focused and efficient

Effective *Praxis* test preparation doesn't just happen. You'll want to set clear goals and deadlines for yourself along the way. Otherwise, you may not feel ready and confident on test day.

1) Learn what the test covers.

You may have heard that there are several different versions of the same test. It's true. You may take one version of the test and your friend may take a different version a few months later. Each test has different questions covering the same subject area, but both versions of the test measure the same skills and content knowledge.

You'll find specific information on the test you're taking on page 5, which outlines the content categories that the test measures and what percentage of the test covers each topic. Visit www.ets.org/praxis/testprep for information on other *Praxis* tests.

2) Assess how well you know the content.

Research shows that test takers tend to overestimate their preparedness—this is why some test takers assume they did well and then find out they did not pass.

The *Praxis* tests are demanding enough to require serious review of likely content, and the longer you've been away from the content, the more preparation you will most likely need. If it has been longer than a few months since you've studied your content area, make a concerted effort to prepare.

3) Collect study materials.

Gathering and organizing your materials for review are critical steps in preparing for the *Praxis* tests. Consider the following reference sources as you plan your study:

- Did you take a course in which the content area was covered? If yes, do you still have your books or your notes?
- Does your local library have a high school-level textbook in this area? Does your college library have a good introductory college-level textbook in this area?

Practice materials are available for purchase for many *Praxis* tests at www.ets.org/praxis/testprep. Test preparation materials include sample questions and answers with explanations.

4) Plan and organize your time.

You can begin to plan and organize your time while you are still collecting materials. Allow yourself plenty of review time to avoid cramming new material at the end. Here are a few tips:

- Choose a test date far enough in the future to leave you plenty of preparation time. Test dates can be found at www.ets.org/praxis/register/dates_centers.
- Work backward from that date to figure out how much time you will need for review.
- Set a realistic schedule—and stick to it.

5) Practice explaining the key concepts.

Praxis tests with constructed-response questions assess your ability to explain material effectively. As a teacher, you'll need to be able to explain concepts and processes to students in a clear, understandable way. What are the major concepts you will be required to teach? Can you explain them in your own words accurately, completely, and clearly? Practice explaining these concepts to test your ability to effectively explain what you know.

6) Understand how questions will be scored.

Scoring information can be found on page 44.

7) Develop a study plan.

A study plan provides a road map to prepare for the *Praxis* tests. It can help you understand what skills and knowledge are covered on the test and where to focus your attention. Use the study plan template on page 29 to organize your efforts.

And most important—get started!

Would a Study Group Work for You?

Using this guide as part of a study group

People who have a lot of studying to do sometimes find it helpful to form a study group with others who are working toward the same goal. Study groups give members opportunities to ask questions and get detailed answers. In a group, some members usually have a better understanding of certain topics, while others in the group may be better at other topics. As members take turns explaining concepts to one another, everyone builds self-confidence.

If the group encounters a question that none of the members can answer well, the group can go to a teacher or other expert and get answers efficiently. Because study groups schedule regular meetings, members study in a more disciplined fashion. They also gain emotional support. The group should be large enough so that multiple people can contribute different kinds of knowledge, but small enough so that it stays focused. Often, three to six members is a good size.

Here are some ways to use this guide as part of a study group:

- **Plan the group's study program.** Parts of the study plan template, beginning on page 29 can help to structure your group's study program. By filling out the first five columns and sharing the worksheets, everyone will learn more about your group's mix of abilities and about the resources, such as textbooks, that members can share with the group. In the sixth column ("Dates I will study the content"), you can create an overall schedule for your group's study program.
- **Plan individual group sessions.** At the end of each session, the group should decide what specific topics will be covered at the next meeting and who will present each topic. Use the topic headings and subheadings in the Test at a Glance table on page 5 to select topics, and then select practice questions, beginning on page 15.
- **Prepare your presentation for the group.** When it's your turn to present, prepare something that is more than a lecture. Write two or three original questions to pose to the group. Practicing writing actual questions can help you better understand the topics covered on the test as well as the types of questions you will encounter on the test. It will also give other members of the group extra practice at answering questions.

- **Take a practice test together.** The idea of a practice test is to simulate an actual administration of the test, so scheduling a test session with the group will add to the realism and may also help boost everyone's confidence. Remember, complete the practice test using only the time that will be allotted for that test on your administration day.
- **Learn from the results of the practice test.** Review the results of the practice test, including the number of questions answered correctly in each content category. For tests that contain constructed-response questions, look at the Sample Test Questions section, which also contain sample responses to those questions and shows how they were scored. Then try to follow the same guidelines that the test scorers use.
- **Be as critical as you can.** You're not doing your study partner(s) any favors by letting them get away with an answer that does not cover all parts of the question adequately.
- **Be specific.** Write comments that are as detailed as the comments about the sample responses. Indicate where and how your study partner(s) are doing an inadequate job of answering the question. Writing notes in the margins of the answer sheet may also help.
- **Be supportive.** Include comments that point out what your study partner(s) got right.

Then plan one or more study sessions based on aspects of the questions on which group members performed poorly. For example, each group member might be responsible for rewriting one paragraph of a response in which someone else did an inadequate job.

Whether you decide to study alone or with a group, remember that the best way to prepare is to have an organized plan. The plan should set goals based on specific topics and skills that you need to learn, and it should commit you to a realistic set of deadlines for meeting those goals. Then you need to discipline yourself to stick with your plan and accomplish your goals on schedule.

5. Develop Your Study Plan

Develop a personalized study plan and schedule

Planning your study time is important because it will help ensure that you review all content areas covered on the test. Use the sample study plan below as a guide. It shows a plan for the *Core Academic Skills for Educators: Reading* test. Following that is a study plan template that you can fill out to create your own plan. Use the "Learn about Your Test" and "Test Specifications" information beginning on page 5 to help complete it.

Use this worksheet to:
1. **Define Content Areas:** List the most important content areas for your test as defined in chapter 1.
2. **Determine Strengths and Weaknesses:** Identify your strengths and weaknesses in each content area.
3. **Identify Resources:** Identify the books, courses, and other resources you plan to use for each content area.
4. **Study:** Create and commit to a schedule that provides for regular study periods.

Praxis Test Name (Test Code): Core Academic Skills for Educators: Reading (5712)
Test Date: 9/15/15

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Key Ideas and Details						
Close reading	Draw inferences and implications from the directly stated content of a reading selection	3	Middle school English textbook	College library, middle school teacher	7/15/15	7/15/15
Determining Ideas	Identify summaries or paraphrases of the main idea or primary purpose of a reading selection	3	Middle school English textbook	College library, middle school teacher	7/17/15	7/17/15
Determining Ideas	Identify summaries or paraphrases of the supporting ideas and specific details in a reading selection	3	Middle and high school English textbook	College library, middle and high school teachers	7/20/15	7/21/15
Craft, Structure, and Language Skills						
Interpreting tone	Determine the author's attitude toward material discussed in a reading selection	4	Middle and high school English textbook	College library, middle and high school teachers	7/25/15	7/26/15
Analysis of structure	Identify key transition words and phrases in a reading selection and how they are used	3	Middle and high school English textbook, dictionary	College library, middle and high school teachers	7/25/15	7/27/15
Analysis of structure	Identify how a reading selection is organized in terms of cause/effect, compare/contrast, problem/solution, etc.	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Author's purpose	Determine the role that an idea, reference, or piece of information plays in an author's discussion or argument	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15

(continued on next page)

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed
Language in different contexts	Determine whether information presented in a reading selection is presented as fact or opinion	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Contextual meaning	Identify the meanings of words as they are used in the context of a reading selection	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/1/15	8/1/15
Figurative Language	Understand figurative language and nuances in word meanings	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/8/15	8/8/15
Vocabulary range	Understand a range of words and phrases sufficient for reading at the college and career readiness level	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/15/15	8/17/15
Integration of Knowledge and Ideas						
Diverse media and formats	Analyze content presented in diverse media and formats, including visually and quantitatively, as well as in words	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/22/15	8/24/15
Evaluation of arguments	Identify the relationship among ideas presented in a reading selection	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/24/15	8/24/15
Evaluation of arguments	Determine whether evidence strengthens, weakens, or is relevant to the arguments in a reading selection	3	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/27/15	8/27/15
Evaluation of arguments	Determine the logical assumptions upon which an argument or conclusion is based	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/28/15	8/30/15
Evaluation of arguments	Draw conclusions from material presented in a reading selection	5	High school textbook, college course notes	College library, course notes, high school teacher, college professor	8/30/15	8/31/15
Comparison of texts	Recognize or predict ideas or situations that are extensions of or similar to what has been presented in a reading selection	4	High school textbook, college course notes	College library, course notes, high school teacher, college professor	9/3/15	9/4/15
Comparison of texts	Apply ideas presented in a reading selection to other situations	2	High school textbook, college course notes	College library, course notes, high school teacher, college professor	9/5/15	9/6/15

My Study Plan

Use this worksheet to:

1. **Define Content Areas:** List the most important content areas for your test as defined in chapter 1.
2. **Determine Strengths and Weaknesses:** Identify your strengths and weaknesses in each content area.
3. **Identify Resources:** Identify the books, courses, and other resources you plan to use for each content area.
4. **Study:** Create and commit to a schedule that provides for regular study periods.

Praxis Test Name (Test Code): _____

Test Date: _____

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for this content?	Where can I find the resources I need?	Dates I will study this content	Date completed

(continued on next page)

Content covered	Description of content	How well do I know the content? (scale 1–5)	What resources do I have/need for the content?	Where can I find the resources I need?	Dates I will study the content	Date completed

6. Review Study Topics

Detailed study topics with questions for discussion

Using the Study Topics That Follow

The Earth and Space Sciences: Content Knowledge test is designed to measure the knowledge and skills necessary for a beginning teacher.

This chapter is intended to help you organize your preparation for the test and to give you a clear indication of the depth and breadth of the knowledge required for success on the test.

Virtually all accredited programs address the topics covered by the test; however, you are not expected to be an expert on all aspects of the topics that follow.

You are likely to find that the topics below are covered by most introductory textbooks. Consult materials and resources, including lecture and laboratory notes, from all your coursework. You should be able to match up specific topics and subtopics with what you have covered in your courses.

Try not to be overwhelmed by the volume and scope of content knowledge in this guide. Although a specific term may not seem familiar as you see it here, you might find you can understand it when applied to a real-life situation. Many of the items on the actual test will provide you with a context to apply to these topics or terms.

Discussion Areas

Interspersed throughout the study topics are discussion areas, presented as open-ended questions or statements. These discussion areas are intended to help test your knowledge of fundamental concepts and your ability to apply those concepts to situations in the classroom or the real world. Most of the areas require you to combine several pieces of knowledge to formulate an integrated understanding and response. If you spend time on these areas, you will gain increased understanding and facility with the subject matter covered on the test. You may want to discuss these areas and your answers with a teacher or mentor.

Note that this study companion *does **not** provide answers for the discussion area questions*, but thinking about the answers to them will help improve your understanding of fundamental concepts and will probably help you answer a broad range of questions on the test.

Study Topics

An overview of the areas covered on the test, along with their subareas, follows.

I. Basic Scientific Principles and Processes

A. Science Methodology, Techniques, and History

1. Scientific inquiry methods
   a. observations, hypotheses, experiments, conclusions, theories, models, and laws
   b. experimental design, including variables, controls, and sources of error
   c. scientific knowledge is consistent with evidence, subject to change
2. Collect, evaluate, process, interpret, and report data
   a. units of measurement
   b. scale (orders of magnitude), uncertainty in measurement, accuracy versus precision
   c. appropriate calculations and conversions
   d. scientific notation and significant figures
   e. organization and presentation of data
   f. interpretation of data using inductive and deductive reasoning processes
3. Interpret and draw conclusions from models and data presented in various forms
   a. trends in data
   b. maps (e.g., geologic, topographic, weather)
   c. models (e.g., Earth systems, solar system)
   d. map projections
   e. tables, graphs, charts, and cross sections
4. Use materials and equipment in the laboratory and the field safely and appropriately
   a. preparation, use, storage, and disposal of materials
   b. use and calibration of equipment
   c. safety procedures
   d. value and limitations of investigative technology
      – computer as a tool (e.g., modeling, Internet)
      – data gathering and collection of evidence (e.g., ground-based versus space-based telescope)
5. Ocean and space exploration and the use of various technologies to gather data
   a. satellites, space probes, remote sensing
   b. telescopes, spectroscopy
   c. search for water and life on other planets
   d. submersibles, research ships, sonar
6. Historical roots of the Earth and Space Sciences
   a. how current concepts in Earth and Space Science developed over time
   b. major historical figures and their contributions

B. Basic Principles of Matter and Energy

1. Structure of matter
   a. atoms, molecules, ions, elements, and compounds
   b. mixtures, solutions, and precipitates
   c. solids, liquids, gases, plasmas
   d. kinetic molecular theory of gases and the ideal gas laws
2. Relationships between energy and matter
   a. conservation of matter in chemical processes
   b. conservation of energy
   c. forms of energy
   d. methods of thermal energy transfer
   e. specific heat capacity
   f. energy required for phase transitions
   g. temperature scales
   h. thermal expansion and contraction
3. Nuclear reactions
   a. radioactive decay processes (e.g., isotopes, half-life)
   b. fusion and fission
   c. heat production in nuclear reactions
4. Biological, chemical, and physical processes
   a. chemical and physical properties and changes (e.g., solubility, pH, oxidation, phase changes)
   b. chemical bonding
   c. wave properties and phenomena (e.g., wavelength, frequency, amplitude, reflection, refraction)
   d. electromagnetic spectrum (e.g., visible, infrared, ultraviolet, gamma)
   e. photosynthesis and respiration
   f. forces and motion (e.g., gravity, friction)

C. Science, Technology, and Society

1. Impact of science and technological advancements on the environment
   a. interrelationships between humans and the hydrosphere (e.g., water pollution and treatment, acid rain, impact of sea level rise on populations, availability of water resources, irrigation, desalinization)
   b. interrelationships between humans and the atmosphere (e.g., air pollution, greenhouse gases, importance of UV absorption by stratospheric ozone, ozone layer depletion)
   c. impact of human activity on the natural fluctuations in global systems (e.g., rate of climate change, rate of sea level change, rate of depletion of aquifers)
2. Issues associated with the use of various energy sources
   a. renewable and nonrenewable energy sources
   b. energy conservation
   c. pros and cons of power production based on various types of sources, such as fossil fuel, nuclear, hydro, solar, wind, and geothermal
3. Issues associated with the use and extraction of various Earth resources
   a. mining-related effects
   b. increased erosion
   c. deforestation
   d. degradation of soils (e.g., agricultural practices)
4. Importance of Earth and Space Sciences to everyday life
   a. conservation of resources (e.g., recycling, sustainable technology)
   b. waste management
   c. technology (e.g., satellites, GPS)
   d. human health (e.g., radon in basements of homes)
   e. identification and prediction of natural hazards (e.g., tsunamis, earthquakes, hurricanes, coastal erosion)

Discussion areas: Basic Scientific Principles and Processes

- How would you use a topographic map to lay out a trail of least difficulty when hiking from one place to another? How would you determine steepness, direction, and distance?
- What is the greenhouse effect and how does it relate to the issue of climate change?
- Would you consider resources removed from Earth renewable or nonrenewable?

II. Tectonics and Internal Earth Processes

1. Theory of plate tectonics and its supporting evidence
   a. plate movement
   b. convergent, divergent, and transform boundaries
   c. hot spots
   d. potential driving forces (e.g., mantle convection)
   e. seismic, magnetic, fossil, and other evidence for plate tectonics
   f. geographic features (e.g., trenches, mountains, rift zones)
2. Deformation of Earth's crust and resulting features
   a. folds and faults
   b. mountain building and rifting
   c. compression, tension, and shear stresses
   d. isostasy (e.g., postglacial rebound)
3. Characteristics of earthquakes and how they provide information about Earth's interior
   a. distribution and types (deep versus shallow)
   b. magnitude and intensity
   c. seismic waves and seismograms
   d. epicenter, focus
   e. causes of earthquakes
4. Layered structure of Earth and related processes
   a. characteristics and composition of the crust, mantle, and core
   b. properties of the lithosphere and asthenosphere
   c. evidence from seismic waves
   d. shape and size of Earth
   e. magnetic field and geomagnetic reversals

5. Volcanic characteristics and processes
   a. how volcanoes are formed
   b. features of volcanoes (e.g., vent, magma chamber) and eruptive products (e.g., pyroclastics, gases)
   c. types of volcanoes and their characteristics
   d. distribution (e.g., ring of fire, hot spots)

Discussion areas: Tectonics and Internal Earth Processes

- What causes the motion of tectonic plates?
- Why do earthquakes occur much more frequently in some places than in others?
- How are the locations of volcanoes related to plate tectonics?
- How is paleomagnetism used to determine rates of seafloor spreading?
- Have the continents always been where they are located today?
- What features on Earth's surface exhibit the influence of extension, compression, and shear?
- Many mountains in the eastern United States consist of eroded anticlines and synclines. How did the original folds form and what is responsible for the appearance of the land surface today?
- Mountain ranges in the western United States, such as the Teton Range of Wyoming and the Sierra Nevadas of California, exhibit block faulting. Explain the origin of these structures.
- How do seismologists locate the epicenter of an earthquake?
- How do seismic waves provide information about the structure and physical characteristics of the Earth?
- How do oil companies use seismology to locate possible oil deposits prior to test drilling?
- What are the characteristics of Earth's internal layers?
- Explain the role of Earth's magnetic field in the concept of paleomagnetism.

III. Earth Materials and Surface Processes

1. Identification of minerals
   a. definition of a mineral
   b. physical properties (e.g., density, streak, cleavage, luster, crystal structure)
   c. identification tools (e.g., Mohs' hardness scale)
2. Cycling of Earth materials
   a. rock cycle
   b. water cycle
   c. carbon cycle
3. Characteristics and formation of igneous, sedimentary, and metamorphic rocks
   a. rock identification and classification
   b. formation and characteristics of the following:
      – intrusive and extrusive igneous rock
      – clastic, chemical, and biological sedimentary rocks
      – regional and contact metamorphic rocks
4. Earth's surface changes over time
   a. chemical and physical weathering
   b. erosion and deposition
   c. uplift
   d. interaction between the biosphere and the geosphere (e.g., weathering caused by plants, nutrient uptake from soil by plants)
   e. interaction between the hydrosphere and the geosphere (e.g., cave formation, ocean salinity, streams, and drainage systems)
   f. processes of soil formation and resulting characteristics (e.g., soil profiles, factors such as geology, climate, time)

Discussion areas: Earth Materials and Surface Processes

- How are color, streak, hardness, cleavage, specific gravity, and luster used to identify minerals? What is the acid test? What minerals does it test for?
- What is a likely crystallization sequence of silicate minerals in a cooling magma chamber?
- How are texture and composition used to identify an igneous rock?
- How does gneiss form?
- What is the origin of marble, and what is its composition? Would it fizz with the acid test? Why or why not?

- What is regional metamorphism? How do the rocks of a given region indicate the intensity of the pressure? What is contact metamorphism?
- Why do we see horizons within Earth's regolith?
- How are soil types related to climate?

IV. History of the Earth and its Life-Forms

1. Rocks are used to determine geologic time and provide a record of Earth's history
   a. principle of uniformitarianism (e.g., definition, applications, limitations)
   b. principles of relative age dating including:
      – principle of original horizontality
      – principle of superposition
      – principle of cross-cutting relationships
      – principle of fossil succession
      – stratigraphic correlation
      – unconformities
   c. principles of absolute (radiometric) age dating
   d. geologic time scale (e.g., Earth's age, scope of time)
2. Fossil record as evidence of the origin and development of life
   a. origin of major groups of life-forms
   b. fossilization methods
   c. mass extinctions
   d. fossil evidence for major divisions of the geologic time scale
3. Theories of Earth's formation and development of its systems including the history of the following:
   a. Earth's atmosphere
   b. Earth's hydrosphere
   c. Earth's landmasses

Discussion areas: History of the Earth and its Life-Forms

- Where are the oldest rock layers in the walls of the Grand Canyon? How do historical geologists know these are the oldest?
- How might you correlate rock layers from the north wall of the Grand Canyon with rock layers from the south wall?
- What is radioactive dating and how is it used?
- How is the fossil record used to infer the evolution of life forms?

V. Earth's Atmosphere and Hydrosphere

1. Unusual properties of water and effect on Earth systems
   a. density changes (e.g., ice floats in water)
   b. excellent solvent
   c. high specific heat and heat of vaporization
   d. exists as solid, liquid, and gas on Earth
2. Water cycle and the energy transfers involved
   a. phase changes (e.g., vaporization, condensation, sublimation)
   b. general structure of the water cycle
   c. distribution of water on Earth
3. Basic structure and composition of the atmosphere
   a. chemical composition
   b. various layers and their physical properties (e.g., stratosphere, troposphere, thermosphere)
   c. interaction of the atmosphere with hydrosphere/biosphere/geosphere (e.g., respiration, transpiration, photosynthesis, nitrogen fixation, evaporation, precipitation, effect of the atmosphere on weathering)
4. Basic physical principles and processes involved in meteorology
   a. variations in atmospheric temperature, pressure, and density
   b. energy budget (e.g., energy absorption and reflection)
   c. processes involving greenhouse gases
   d. circulation, Coriolis effect
   e. cloud formation
   f. origin of wind
   g. absolute and relative humidity
   h. dew point and frost point
   i. daily/seasonal/annual variations in meteorology (e.g., sea breezes, monsoons, El Niño)
5. Development and movement of weather systems
   a. cloud types
   b. formation of various types of precipitation
   c. air masses, fronts, storms, and severe weather such as hurricanes and tornados
   d. development and movement of weather patterns
   e. interpretation of atmospheric data (e.g., dew point, isobars)
   f. fundamentals of weather forecasting

6. Factors and processes that influence climate and lead to climate zones
   a. effects of the following:
      – latitude, geographical location, and elevation
      – atmospheric circulation (e.g., trade winds, jet stream)
      – ocean circulation
   b. characteristics and locations of climate zones
   c. effect of the Earth's tilt on seasons
7. Effects of natural phenomena on climate change
   a. volcanic eruptions
   b. asteroid impacts
   c. variations in solar radiation
8. Characteristics and processes of surface water and groundwater
   a. streams (e.g., erosion, deposition, channel migration)
   b. lakes and wetlands
   c. geysers and springs
   d. groundwater, aquifers, water table
   e. runoff and infiltration
   f. porosity and permeability
   g. hazards (e.g., flooding, sinkholes)
   h. human interactions (e.g., wells, levees, diversion for irrigation, saltwater intrusion)
9. Characteristics of glaciers and polar ice and how they move and change over time
   a. characteristics of continental and mountain glaciers
   b. glacial-interglacial cycles, advance and retreat
   c. depositional and erosional features
   d. icebergs
   e. sea ice
10. Physical and chemical characteristics and processes of the oceans
    a. salinity, temperature, and density
    b. surface currents, deep-ocean circulation
    c. El Niño, La Niña
    d. wave formation
    e. seafloor topography
11. Interrelationships between the oceans and the solid Earth
    a. tidal effects (e.g., tidal range, tidal patterns)
    b. wave effects (e.g., coastal erosional and depositional processes)
    c. tsunamis
    d. island formation and change (e.g., barrier islands, volcanic islands, atolls)
    e. hydrothermal vents
    f. estuaries (e.g., characteristics, formation)
    g. marine sediments (e.g., origin, rate of deposition)
    h. sea level changes
12. Interrelationships between the hydrosphere and the biosphere/atmosphere
    a. light penetration and photosynthesizers in oceans
    b. upwelling of nutrients
    c. coral reefs
    d. organisms around hydrothermal vents

Discussion areas: Earth's Atmosphere and Hydrosphere

- How does the Sun influence global and local wind patterns?
- What is the relationship between dew point and cloud formation?
- What is the difference between the behavior of the air in a high and the air in a low? What kind of weather is associated with each?
- What happens when a continental polar air mass meets with a maritime tropical air mass?
- How do fronts form?
- How do weather satellites aid in weather forecasting? What kinds of images are available to a forecaster?
- Why do weather systems generally move across the United States from west to east?
- What kinds of weather precede and follow a passing cold front and warm front?
- What influence do latitude, elevation, ocean currents, landforms, and world wind belts have on the climate of a region?
- What part does the angle of the Sun's rays as they strike Earth play in establishing climatic zones?

- How do volcanic eruptions affect both regional and worldwide climate conditions?
- What characteristics make a soil or rock layer permeable or impermeable?
- How does a drainage basin develop?
- What are the stages in the life cycle of a river?
- What influences stream velocity?
- How deeply can a stream erode?
- Under what conditions do glaciers develop?
- What conditions would be necessary for another ice age to occur?
- How does the temperature of seawater vary with depth?
- What is salinity? How is it measured?
- How do oceanographers explain the difference in salinity of ocean water in different locations?
- What causes ocean waters to circulate?
- Explain the movement of ocean bottom currents.
- What are the causes and effects of El Niño?
- What type of sediments would you expect to find in different locations on the seafloor?
- What do core samples of seafloor sediments reveal about the past?
- Why do ocean waves form? Why do these waves break at the shoreline?
- What causes tides?
- Are there two high tides and two low tides in all locations every day? Why or why not?
- What purpose does a groin along the shoreline serve?
- How is upwelling related to wind?

VI. Astronomy

1. Earth's motions and their characteristics and consequences
   a. rotation and revolution
   b. time zones
   c. effect of axial tilt (e.g., seasons, solstices, and equinoxes)
   d. long-term changes in Earth's motions
2. Relationships within the Earth-Moon-Sun system
   a. tides (e.g., causes, cycles, spring, neap)
   b. eclipses (solar, lunar)
   c. phases of the Moon
   d. effect of solar wind on Earth
3. Characteristics of the components of our solar system and how they formed
   a. laws of motion
   b. theories of the formation of the solar system
   c. location, orbits, and characteristics of the planets
   d. structure and characteristics of the Sun
   e. structure, characteristics, and orbit of the Earth's moon
   f. natural satellites
   g. characteristics of asteroids, meteoroids, comets, dwarf/minor planets
4. Characteristics of stars and the processes that occur within them
   a. stages in the life cycle of stars (e.g., protostar, main sequence, white dwarf, supernova)
   b. color, temperature, apparent brightness, and luminosity, including Hertzsprung-Russell diagram
   c. formation of elements (e.g., carbon, iron)
5. Characteristics of the Milky Way and other galaxies
   a. structure and classification of galaxies (e.g., spiral, elliptical)
   b. relative distances and motions
   c. supermassive black holes
   d. dark matter
6. Theories and observations that relate to the origin and development of the universe
   a. theories about the origin of the universe
   b. redshift and background radiation

Discussion areas: Astronomy

- Why does the amount of daylight vary from day to day and from place to place?
- Why were time zones invented? Why was the International Date Line established?
- Why do seasons exist?
- Why does the Moon appear to pass through phases as it completes one revolution around Earth?
- What are the conditions under which solar and lunar eclipses occur?
- How does the gravity of the Sun and Moon affect Earth's oceans?
- What makes a celestial object a member of the solar system?
- Why does the position of a planet as seen from Earth change in relation to the background of stars?
- What is retrograde motion?
- What are the laws of planetary motion?
- Under what systems do astronomers classify the different planets?
- What is the difference between meteors, meteoroids, and meteorites? What is the origin of meteoroids?
- Why are comets referred to as "dirty snowballs"?
- What is the source of the Sun's energy?
- How is a star's color related to its temperature?
- How are dark line spectra used?
- Why do astronomers use the terms apparent magnitude and absolute magnitude when describing the brightness of a star?
- How do stars form? What stages does a star pass through?
- How does the Hertzsprung-Russell diagram help summarize the life cycle of stars?
- How is spectroscopy used to determine the composition of a star?
- What are black holes?
- What is parallax?
- How are Cepheid variable stars used to calculate distances in the universe?
- What units of distance are used in astronomy?
- Why do most astronomers think that the big bang theory is the best explanation for the origin of the universe?

7. Review Smart Tips for Success

Follow test-taking tips developed by experts

Learn from the experts. Take advantage of the following answers to questions you may have and practical tips to help you navigate the *Praxis* test and make the best use of your time.

Should I guess?

Yes. Your score is based on the number of questions you answer correctly, with no penalty or subtraction for an incorrect answer. When you don't know the answer to a question, try to eliminate any obviously wrong answers and then guess at the correct one. Try to pace yourself so that you have enough time to carefully consider every question.

Can I answer the questions in any order?

You can answer the questions in order or skip questions and come back to them later. If you skip a question, you can also mark it so that you can remember to return and answer it later. Remember that questions left unanswered are treated the same as questions answered incorrectly, so it is to your advantage to answer every question.

Are there trick questions on the test?

No. There are no hidden meanings or trick questions. All of the questions on the test ask about subject matter knowledge in a straightforward manner.

Are there answer patterns on the test?

No. You might have heard this myth: the answers on tests follow patterns. Another myth is that there will never be more than two questions in a row with the correct answer in the same position among the choices. Neither myth is true. Select the answer you think is correct based on your knowledge of the subject.

Can I write on the scratch paper I am given?

Yes. You can work out problems on the scratch paper, make notes to yourself, or write anything at all. Your scratch paper will be destroyed after you are finished with it, so use it in any way that is helpful to you. But make sure to select or enter your answers on the computer.

Smart Tips for Taking the Test

1. **Skip the questions you find extremely difficult.** Rather than trying to answer these on your first pass through the test, you may want to leave them blank and mark them so that you can return to them later. Pay attention to the time as you answer the rest of the questions on the test, and try to finish with 10 or 15 minutes remaining so that you can go back over the questions you left blank. Even if you don't know the answer the second time you read the questions, see if you can narrow down the possible answers, and then guess. Your score is based on the number of right answers, so it is to your advantage to answer every question.

2. **Keep track of the time.** The on-screen clock will tell you how much time you have left. You will probably have plenty of time to answer all of the questions, but if you find yourself becoming bogged down, you might decide to move on and come back to any unanswered questions later.

3. **Read all of the possible answers before selecting one.** For questions that require you to select more than one answer, or to make another kind of selection, consider the most likely answers given what the question is asking. Then reread the question to be sure the answer(s) you have given really answer the question. Remember, a question that contains a phrase such as "Which of the following does NOT …" is asking for the one answer that is NOT a correct statement or conclusion.

4. **Check your answers.** If you have extra time left over at the end of the test, look over each question and make sure that you have answered it as you intended. Many test takers make careless mistakes that they could have corrected if they had checked their answers.

5. **Don't worry about your score when you are taking the test.** No one is expected to answer all of the questions correctly. Your score on this test is not analogous to your score on the *GRE*® or other tests. It doesn't matter on the *Praxis* tests whether you score very high or barely pass. If you meet the minimum passing scores for your state and you meet the state's other requirements for obtaining a teaching license, you will receive a license. In other words, what matters is meeting the minimum passing score. You can find passing scores for all states that use the *Praxis* tests at http://www.ets.org/s/praxis/pdf/passing_scores.pdf or on the web site of the state for which you are seeking certification/licensure.

6. **Use your energy to take the test, not to get frustrated by it.** Getting frustrated only increases stress and decreases the likelihood that you will do your best. Highly qualified educators and test development professionals, all with backgrounds in teaching, worked diligently to make the test a fair and valid measure of your knowledge and skills. Your state painstakingly reviewed the test before adopting it as a licensure requirement. The best thing to do is concentrate on answering the questions.

8. Check on Testing Accommodations

See if you qualify for accommodations to take the Praxis *test*

What if English is not my primary language?

Praxis tests are given only in English. If your primary language is not English (PLNE), you may be eligible for extended testing time. For more details, visit www.ets.org/praxis/register/plne_accommodations/.

What if I have a disability or other health-related need?

The following accommodations are available for *Praxis* test takers who meet the Americans with Disabilities Act (ADA) Amendments Act disability requirements:

- Extended testing time
- Additional rest breaks
- Separate testing room
- Writer/recorder of answers
- Test reader
- Sign language interpreter for spoken directions only
- Perkins Brailler
- Braille slate and stylus
- Printed copy of spoken directions
- Oral interpreter
- Audio test
- Braille test
- Large print test book
- Large print answer sheet
- Listening section omitted

For more information on these accommodations, visit www.ets.org/praxis/register/disabilities.

Note: Test takers who have health-related needs requiring them to bring equipment, beverages, or snacks into the testing room or to take extra or extended breaks must request these accommodations by following the procedures described in the *Bulletin Supplement for Test Takers with Disabilities or Health-Related Needs* (PDF), which can be found at https://www.ets.org/s/praxis/pdf/bulletin_supplement_test_takers_with_disabilities_health_needs.pdf.

You can find additional information on available resources for test takers with disabilities or health-related needs at www.ets.org/disabilities.

9. Do Your Best on Test Day

Get ready for test day so you will be calm and confident

You followed your study plan. You prepared for the test. Now it's time to prepare for test day.

Plan to end your review a day or two before the actual test date so you avoid cramming. Take a dry run to the test center so you're sure of the route, traffic conditions, and parking. Most of all, you want to eliminate any unexpected factors that could distract you from your ultimate goal—passing the *Praxis* test!

On the day of the test, you should:

- be well rested
- wear comfortable clothes and dress in layers
- eat before you take the test
- bring an acceptable and valid photo identification with you
- bring an approved calculator only if one is specifically permitted for the test you are taking (see Calculator Use, at http://www.ets.org/praxis/test_day/policies/calculators)
- be prepared to stand in line to check in or to wait while other test takers check in

You can't control the testing situation, but you can control yourself. Stay calm. The supervisors are well trained and make every effort to provide uniform testing conditions, but don't let it bother you if the test doesn't start exactly on time. You will have the allotted amount of time once it does start.

You can think of preparing for this test as training for an athletic event. Once you've trained, prepared, and rested, give it everything you've got.

What items am I restricted from bringing into the test center?

You cannot bring into the test center personal items such as:

- handbags, knapsacks, or briefcases
- water bottles or canned or bottled beverages
- study materials, books, or notes
- pens, pencils, scrap paper, or calculators, unless specifically permitted for the test you are taking (see Calculator Use, at http://www.ets.org/praxis/test_day/policies/calculators)
- any electronic, photographic, recording, or listening devices

Personal items are not allowed in the testing room and will not be available to you during the test or during breaks. You may also be asked to empty your pockets. At some centers, you will be assigned a space to store your belongings, such as handbags and study materials. Some centers do not have secure storage space available, so please plan accordingly.

Test centers assume no responsibility for your personal items.

If you have health-related needs requiring you to bring equipment, beverages or snacks into the testing room or to take extra or extended breaks, you need to request accommodations in advance. Procedures for requesting accommodations are described in the Bulletin Supplement for Test Takers with Disabilities or Health-related Needs (PDF).

Note: All cell phones, smart phones (e.g., Android® devices, iPhones®, etc.), and other electronic, photographic, recording, or listening devices are strictly prohibited from the test center. If you are seen with such a device, you will be dismissed from the test, your test scores will be canceled, and you will forfeit your test fees. If you are seen *using* such a device, the device will be confiscated and inspected. For more information on what you can bring to the test center, visit www.ets.org/praxis/test_day/bring.

Are You Ready?

Complete this checklist to determine whether you are ready to take your test.

- ❒ Do you know the testing requirements for the license or certification you are seeking in the state(s) where you plan to teach?
- ❒ Have you followed all of the test registration procedures?
- ❒ Do you know the topics that will be covered in each test you plan to take?
- ❒ Have you reviewed any textbooks, class notes, and course readings that relate to the topics covered?
- ❒ Do you know how long the test will take and the number of questions it contains?
- ❒ Have you considered how you will pace your work?
- ❒ Are you familiar with the types of questions for your test?
- ❒ Are you familiar with the recommended test-taking strategies?
- ❒ Have you practiced by working through the practice questions in this study companion or in a study guide or practice test?
- ❒ If constructed-response questions are part of your test, do you understand the scoring criteria for these questions?
- ❒ If you are repeating a *Praxis* test, have you analyzed your previous score report to determine areas where additional study and test preparation could be useful?

If you answered "yes" to the questions above, your preparation has paid off. Now take the *Praxis* test, do your best, pass it—and begin your teaching career!

10. Understand Your Scores

Understand how tests are scored and how to interpret your test scores

Of course, passing the *Praxis* test is important to you so you need to understand what your scores mean and what your state requirements are.

What are the score requirements for my state?

States, institutions, and associations that require the tests set their own passing scores. Visit www.ets.org/praxis/states for the most up-to-date information.

If I move to another state, will my new state accept my scores?

The *Praxis* tests are part of a national testing program, meaning that they are required in many states for licensure. The advantage of a national program is that if you move to another state that also requires *Praxis* tests, you can transfer your scores. Each state has specific test requirements and passing scores, which you can find at www.ets.org/praxis/states.

How do I know whether I passed the test?

Your score report will include information on passing scores for the states you identified as recipients of your test results. If you test in a state with automatic score reporting, you will also receive passing score information for that state.

A list of states and their passing scores for each test are available online at www.ets.org/praxis/states.

What your *Praxis* scores mean

You received your score report. Now what does it mean? It's important to interpret your score report correctly and to know what to do if you have questions about your scores.

Visit http://www.ets.org/s/praxis/pdf/sample_score_report.pdf to see a sample score report.
To access *Understanding Your Praxis Scores*, a document that provides additional information on how to read your score report, visit www.ets.org/praxis/scores/understand.

Put your scores in perspective

Your score report indicates:

- Your score and whether you passed
- The range of possible scores
- The raw points available in each content category
- The range of the middle 50 percent of scores on the test

If you have taken the same *Praxis* test or other *Praxis* tests in the last 10 years, your score report also lists the highest score you earned on each test taken.

Content category scores and score interpretation

Questions on the *Praxis* tests are categorized by content. To help you in future study or in preparing to retake the test, your score report shows how many raw points you earned in each content category. Compare your "raw points earned" with the maximum points you could have earned ("raw points available"). The greater the difference, the greater the opportunity to improve your score by further study.

Score scale changes

ETS updates *Praxis* tests on a regular basis to ensure they accurately measure the knowledge and skills that are required for licensure. When tests are updated, the meaning of the score scale may change, so requirements may vary between the new and previous versions. All scores for previous, discontinued tests are valid and reportable for 10 years, provided that your state or licensing agency still accepts them.

These resources may also help you interpret your scores:

- *Understanding Your Praxis Scores* (PDF), found at www.ets.org/praxis/scores/understand
- *The Praxis Passing Scores* (PDF), found at www.ets.org/praxis/scores/understand
- State requirements, found at www.ets.org/praxis/states

Appendix: Other Questions You May Have

Here is some supplemental information that can give you a better understanding of the *Praxis* tests.

What do the *Praxis* tests measure?

The *Praxis* tests measure the specific knowledge and skills that beginning teachers need. The tests do not measure an individual's disposition toward teaching or potential for success, nor do they measure your actual teaching ability. The assessments are designed to be comprehensive and inclusive but are limited to what can be covered in a finite number of questions and question types. Teaching requires many complex skills that are typically measured in other ways, including classroom observation, video recordings, and portfolios.

Ranging from Agriculture to World Languages, there are more than 80 *Praxis* tests, which contain selected-response questions or constructed-response questions, or a combination of both.

Who takes the tests and why?

Some colleges and universities use the *Praxis* Core Academic Skills for Educators tests (Reading, Writing, and Mathematics) to evaluate individuals for entry into teacher education programs. The assessments are generally taken early in your college career. Many states also require Core Academic Skills test scores as part of their teacher licensing process.

Individuals entering the teaching profession take the *Praxis* content and pedagogy tests as part of the teacher licensing and certification process required by many states. In addition, some professional associations and organizations require the *Praxis* Subject Assessments for professional licensing.

Do all states require these tests?

The *Praxis* tests are currently required for teacher licensure in approximately 40 states and United States territories. These tests are also used by several professional licensing agencies and by several hundred colleges and universities. Teacher candidates can test in one state and submit their scores in any other state that requires *Praxis* testing for licensure. You can find details at www.ets.org/praxis/states.

What is licensure/certification?

Licensure in any area—medicine, law, architecture, accounting, cosmetology—is an assurance to the public that the person holding the license possesses sufficient knowledge and skills to perform important occupational activities safely and effectively. In the case of teacher licensing, a license tells the public that the individual has met predefined competency standards for beginning teaching practice.

Because a license makes such a serious claim about its holder, licensure tests are usually quite demanding. In some fields, licensure tests have more than one part and last for more than one day. Candidates for licensure in all fields plan intensive study as part of their professional preparation. Some join study groups, others study alone. But preparing to take a licensure test is, in all cases, a professional activity. Because a licensure exam surveys a broad body of knowledge, preparing for a licensure exam takes planning, discipline, and sustained effort.

Why does my state require the *Praxis* tests?

Your state chose the *Praxis* tests because they assess the breadth and depth of content—called the "domain"—that your state wants its teachers to possess before they begin to teach. The level of content knowledge, reflected in the passing score, is based on recommendations of panels of teachers and teacher educators in

each subject area. The state licensing agency and, in some states, the state legislature ratify the passing scores that have been recommended by panels of teachers.

How were the tests developed?

ETS consulted with practicing teachers and teacher educators around the country during every step of the *Praxis* test development process. First, ETS asked them what knowledge and skills a beginning teacher needs to be effective. Their responses were then ranked in order of importance and reviewed by hundreds of teachers.

After the results were analyzed and consensus was reached, guidelines, or specifications, for the selected-response and constructed-response tests were developed by teachers and teacher educators. Following these guidelines, teachers and professional test developers created test questions that met content requirements and *ETS Standards for Quality and Fairness*.*

When your state adopted the research-based *Praxis* tests, local panels of teachers and teacher educators evaluated each question for its relevance to beginning teachers in your state. During this "validity study," the panel also provided a passing-score recommendation based on how many of the test questions a beginning teacher in your state would be able to answer correctly. Your state's licensing agency determined the final passing-score requirement.

ETS follows well-established industry procedures and standards designed to ensure that the tests measure what they are intended to measure. When you pass the *Praxis* tests your state requires, you are proving that you have the knowledge and skills you need to begin your teaching career.

How are the tests updated to ensure the content remains current?

Praxis tests are reviewed regularly. During the first phase of review, ETS conducts an analysis of relevant state and association standards and of the current test content. State licensure titles and the results of relevant job analyses are also considered. Revised test questions are then produced following the standard test development methodology. National advisory committees may also be convened to review and revise existing test specifications and to evaluate test forms for alignment with the specifications.

How long will it take to receive my scores?

Scores for tests that do not include constructed-response questions are available on screen immediately after the test. Scores for tests that contain constructed-response questions or essays aren't available immediately after the test because of the scoring process involved. Official score reports are available to you and your designated score recipients approximately two to three weeks after the test date for tests delivered continuously, or two to three weeks after the testing window closes for other tests. See the test dates and deadlines calendar at www.ets.org/praxis/register/dates_centers for exact score reporting dates.

Can I access my scores on the web?

All test takers can access their test scores via My *Praxis* Account free of charge for one year from the posting date. This online access replaces the mailing of a paper score report.

The process is easy—simply log into My *Praxis* Account at www.ets.org/praxis and click on your score report. If you do not already have a *Praxis* account, you must create one to view your scores.

Note: You must create a *Praxis* account to access your scores, even if you registered by mail or phone.

**ETS Standards for Quality and Fairness* (2014, Princeton, N.J.) are consistent with the *Standards for Educational and Psychological Testing*, industry standards issued jointly by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (2014, Washington, D.C.).

Your teaching career is worth preparing for, so start today!

Let the *Praxis*® *Study Companion* guide you.

To search for the *Praxis* test prep resources
that meet your specific needs, visit:

www.ets.org/praxis/testprep

To purchase official test prep made by the creators
of the *Praxis* tests, visit the ETS Store:

www.ets.org/praxis/store

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