

TEACHER'S BOOKLET

SCIENCE SAMPLE ANSWER KEY



FCAT Sample Test Materials

These sample test materials are designed to help students prepare to answer FCAT questions. These materials introduce them to the kinds of questions they will answer when they take FCAT and include hints for responding to the different kinds of FCAT questions. The FCAT Science sample test materials for Grade 8 are composed of the books described below:

- Sample Test and Answer Book**
Includes a science sample test, a sample answer book, and instructions for completing the sample test. (Copies are available for all students in the tested grade.)
 - Sample Answer Key**
Includes answers and explanations for the questions in the sample test. (Copies are available for classroom teachers only.)
- = This book

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FCAT Science Sample Answer Key



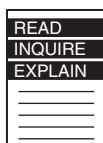
This book contains answers to the FCAT Science sample test questions. It also gives the *Sunshine State Standards* benchmark assessed by each item on the sample test. In addition, answer strategies or possible approaches to answering the questions are provided. Students may use approaches other than these and still receive credit if they also obtain a correct answer. For multiple-choice items, the reason an answer choice is incorrect (distractor rationale) is also provided.

Multiple-choice and gridded-response items are scored by awarding one point for each correct answer. The “Read, Inquire, Explain” questions allow partial credit for some answers, even if they are not 100 percent correct. Answers will be scored and points will be given based on the completeness and correctness of the answers. If a portion of an answer is correct, a portion of the points may be awarded. The scoring rubrics for the short-response questions and the extended-response questions are printed on pages 2 and 3 of this book.



Rubric for Short-Response Questions

- 2 points A score of two indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, in a scientifically sound manner. When required, student explanations and/or interpretations are clear and complete. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.
- 1 point A score of one indicates that the student has provided a response that is only partially correct. For example, the student may arrive at an acceptable conclusion or provide an adequate interpretation, but may demonstrate some misunderstanding of the underlying scientific concepts and/or procedures. Conversely, a student may arrive at an unacceptable conclusion or provide a faulty interpretation, but could have applied appropriate and scientifically sound concepts and/or procedures.
- 0 points A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, contain clear misunderstandings of the underlying scientific concepts and/or procedures, or may be incorrect.



Rubric for Extended-Response Questions

- 4 points** A score of four indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, used scientifically sound procedures, and provided clear and complete explanations and interpretations.
- The response may contain minor flaws that do not detract from a demonstration of a thorough understanding.
- 3 points** A score of three indicates that the student has demonstrated an understanding of the scientific concepts and/or procedures embodied in the task. The student's response to the task is essentially correct, but the scientific procedures, explanations, and/or interpretations provided are not thorough.
- The response may contain minor flaws that reflect inattentiveness or indicate some misunderstanding of the underlying scientific concepts and/or procedures.
- 2 points** A score of two indicates that the student has demonstrated only a partial understanding of the scientific concepts and/or procedures embodied in the task. Although the student may have arrived at an acceptable conclusion or provided an adequate interpretation of the task, the student's work lacks an essential understanding of the underlying scientific concepts and/or procedures.
- The response may contain errors related to misunderstanding important aspects of the task, misuse of scientific procedures/processes, or faulty interpretations of results.
- 1 point** A score of one indicates that the student has demonstrated a very limited understanding of the scientific concepts and/or procedures embodied in the task. The student's response is incomplete and exhibits many flaws. Although the student's response has addressed some of the conditions of the task, the student has reached an inadequate conclusion and/or provided reasoning that is faulty or incomplete.
- The response exhibits many flaws or may be incomplete.
- 0 points** A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, contain clear misunderstandings of the underlying scientific concepts and/or procedures, or may be incorrect.

1 The correct answer is A (gold).

Strand: A—The Nature of Matter

Benchmark: SC.A.1.3.1 The student identifies various ways in which substances differ (e.g., mass, volume, shape, density, texture, and reaction to temperature and light). (Also assesses SC.A.1.3.2 understands the difference between weight and mass; and SC.A.1.3.6 knows that equal volumes of different substances may have different masses.)

The density equation $\left(D = \frac{m}{V}\right)$ is needed to answer this question. D is density in grams per cubic centimeter $\frac{\text{g}}{\text{cm}^3}$, m is mass in grams (g), and V is volume in cubic centimeters (cm^3). In this question, the density of each metal cube can be determined from the mass given in the table and the volume accompanying each picture. The densities can then be compared to determine that gold has the greatest density with $\frac{19.3 \text{ g}}{\text{cm}^3}$.

$$\text{For gold, } D = \frac{m}{V} = \frac{96.5 \text{ g}}{5.0 \text{ cm}^3} = \frac{19.3 \text{ g}}{\text{cm}^3}$$

Distractor Rationale

$$\text{B. For lead, } D = \frac{m}{V} = \frac{110.0 \text{ g}}{10.0 \text{ cm}^3} = \frac{11.0 \text{ g}}{\text{cm}^3}$$

$$\text{C. For iron, } D = \frac{m}{V} = \frac{158.0 \text{ g}}{20.0 \text{ cm}^3} = \frac{7.9 \text{ g}}{\text{cm}^3}$$

$$\text{D. For aluminum, } D = \frac{m}{V} = \frac{108.0 \text{ g}}{40.0 \text{ cm}^3} = \frac{2.7 \text{ g}}{\text{cm}^3}$$

2 The correct answer is F (electron).

Strand: A—The Nature of Matter

Benchmark: SC.A.2.3.2 The student knows the general properties of the atom (a massive nucleus of neutral neutrons and positive protons surrounded by a cloud of negative electrons) and accepts that single atoms are not visible.

An understanding of subatomic particles is needed to answer this question. Atoms are made of smaller particles called protons, neutrons, and electrons. The nucleus of an atom consists of the protons and neutrons. Neutrons are neutral, and protons have a positive charge. The electrons are the smallest particles in an atom and are located in the space outside of the nucleus. Electrons have a negative charge and a mass of 9.11×10^{-31} kilograms (kg).

Distractor Rationale

- G. Neutrons are one of the larger subatomic particles with a mass of 1.67×10^{-27} kg.
- H. The nucleus is composed of protons and neutrons, the two larger subatomic particles.
- I. Protons are one of the larger subatomic particles with a mass of 1.67×10^{-27} kg.

3 The correct answer is D (refraction).

Strand: B—Energy

Benchmark: SC.B.1.3.6 The student knows the properties of waves (e.g., frequency, wavelength, and amplitude); that each wave consists of a number of crests and troughs; and the effects of different media on waves. (Also assesses SC.C.1.3.2 knows that vibrations in materials set up wave disturbances that spread away from the source [e.g., sound and earthquake waves].)

An understanding of how light waves are affected when they pass through different media is needed to answer this question. Refraction is the change in direction of light waves as they pass from one medium to another. Refraction occurs because of a change in the speed of light. In the picture, the actual location of the fish is different from the image of the fish because of the change in the speed of light as it passes from the air to the water.

Distractor Rationale

- A. Amplitude is the measure of the height or energy of the wave, not the change in speed of light.
- B. Diffraction is a property of light that refers to the bending of light around an object.
- C. Reflection is also a property of light. It occurs when the light bounces back from a reflective surface.

4 The correct answer is F (3).

Strand: C—Force and Motion

Benchmark: SC.C.2.3.4 The student knows that simple machines can be used to change the direction or size of a force.

An understanding of the ideal mechanical advantage (IMA) equation is needed to solve this problem. IMA indicates how much a machine would multiply the effort force (the force that is applied) if there were no friction. $IMA = \frac{d}{h}$, where d is the distance over which the force is applied and h is the height the object is raised since no other forces are involved.

$$IMA = \frac{d}{h} = \frac{6}{2} = 3$$

Distractor Rationale

- G. The weight of the box is 5 times the length of the inclined plane $\left(\frac{30}{6} = 5\right)$.
- H. The length of the inclined plane multiplied by the height of the inclined plane equals 12 $(6 \times 2 = 12)$.
- I. The weight of the box times the length of the inclined plane divided by the height of the ramp equals 90 $\left(30 \times \frac{6}{2}\right)$.

5 The correct answer is 1176 newtons (1176 N).



Strand: C—Force and Motion

Benchmark: SC.C.2.3.6 The student explains and shows the ways in which a net force (i.e., the sum of all acting forces) can act on an object (e.g., speeding up an object traveling in the same direction as the net force, slowing down an object traveling in the direction opposite of the net force). (Also assesses SC.C.2.3.2 knows common contact forces; SC.C.2.3.3 knows that if more than one force acts on an object, then the forces can reinforce or cancel each other, depending on their direction and magnitude; and SC.C.2.3.5 understands that an object in motion will continue at a constant speed and in a straight line until acted upon by a force and that an object at rest will remain at rest until acted upon by a force.)

Knowledge of how forces act together to provide a net force on an object and knowledge of Newton’s laws are needed to answer this question. The net force exerted on the stage is the sum of the force exerted by each boy, or $588\text{ N} + 588\text{ N} = 1176\text{ N}$.

According to Newton’s laws, the stage must exert an equal and opposite force on the boys. This force would be equal to the total force exerted on the stage by both boys, or 1176 N.

	1	1	7	6
	/	/	/	
	○	○	○	○
0	0	0	0	0
1	●	●	○	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	●
7	7	7	●	7
8	8	8	8	8
9	9	9	9	9

6 The correct answer is C (gravity).

Strand: D—Processes that Shape the Earth

Benchmark: SC.D.1.3.1 The student knows that mechanical and chemical activities shape and reshape the Earth's land surface by eroding rock and soil in some areas and depositing them in other areas, sometimes in seasonal layers.

Knowledge of erosion and its causes is needed to answer this question. Landslides are a form of mechanical erosion that occurs when gravity acts on materials that make up Earth's surface. Landslides occur when rocks, dirt, and other materials are pulled down hills or slopes because of the force of gravity.

Distractor Rationale

- A. Adhesion is a type of attachment, not a major cause of landslides or erosion.
- B. Friction would prevent the landslide from occurring. Landslides occur when the force of gravity overcomes the force of friction.
- D. Magnetism is a property of materials in Earth's crust, but it is not a force that causes landslides or erosion.

7 The correct answer is 6.5 km/s.



Strand: D—Processes that Shape the Earth

Benchmark: SC.D.1.3.5 The student understands concepts of time and size relating to the interaction of Earth’s processes (e.g., lightning striking in a split second as opposed to the shifting of the Earth’s plates altering the landscape, distance between atoms measured in Angstrom units as opposed to distance between stars measured in light-years).

An understanding of the speed of waves traveling through Earth’s surface is needed to answer this question. Primary (P) waves result from earthquakes, travel through Earth’s crust, and can be detected far from their origin. The speed of P-waves can be determined using the equation for average speed, $v = \frac{d}{t}$, where v is average speed, d is distance in kilometers (km), and t is the time needed for travel in seconds (s). In this question, the P-waves traveled 24.7 km in 3.80 s.

$$v = \frac{24.7 \text{ km}}{3.80 \text{ s}} = \frac{6.5 \text{ km}}{\text{s}}$$

		6	.	5
	0	0	0	
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

8 The correct answer is H (waning crescent).

Strand: E—Earth and Space

Benchmark: SC.E.1.3.1 The student understands the vast size of our Solar System and the relationship of the planets and their satellites. (Also assesses SC.E.1.3.2 knows that available data from various satellite probes show the similarities and differences among planets and their moons in the Solar System.)

Knowledge of the relative positions of the Sun, Earth, and the Moon during lunar phases is needed to answer this question. According to the diagram, a person would observe part of the dark side of the Moon and part of the illuminated side of the Moon. This corresponds to the waning crescent phase.

Distractor Rationale

- E. A new moon would be seen when the Moon is between the Sun and Earth.
- G. A waxing gibbous moon would be seen when the Moon is on the opposite side of Earth from the Sun.
- I. A first quarter moon would be seen when the Sun, the Moon, and Earth form a right angle.

- 9 The correct answer is D (contraction and relaxation).

Strand: F—Processes of Life

Benchmark: SC.F.1.3.1 The student understands that living things are composed of major systems that function in reproduction, growth, maintenance, and regulation.

Knowledge of the function of muscles in body systems is needed to answer this question. Muscles are part of the muscular system and function by contraction and relaxation.

Distractor Rationale

- A. The respiratory system is associated with air exchange.
- B. Growth and repair are performed by the interaction of several systems. The muscles are not a large contributor to those processes.
- C. Muscles are associated with energy use, but energy production occurs in the mitochondria within the cells throughout the body.

10 The correct answer is G (protection).

Strand: F—Processes of Life

Benchmark: SC.F.1.3.1 The student understands that living things are composed of major systems that function in reproduction, growth, maintenance, and regulation.

Knowledge of the epidermis in humans and the cuticle in plant leaves is needed to answer this question. The skin and the cuticle both cover the outer portion of the organisms and act as a defense against disease and dehydration. The skin and the cuticle are used for protection; they regulate materials that may enter and leave the body or the leaf.

Distractor Rationale

- E. Oxidation is a chemical process that occurs during growth, but it is not the primary function of the skin and cuticle.
- H. Respiration is the process of metabolizing sugar to produce energy in plants and breathing in animals.
- I. Variation is achieved in plants and animals during sexual reproduction. This is a function of the reproductive system, not the epidermis.

11 The correct answer is shown below.



Strand: F—Processes of Life

Benchmark: SC.F.2.3.2 The student knows that the variation in each species is due to the exchange and interaction of genetic information as it is passed from parent to offspring.

Example of a Top-Score Response

An understanding of how Punnett squares are used to predict how genetic information is passed from parents to offspring is needed to answer this question. A Punnett square shows the genotypes of the offspring from the two parents, Bb and Bb. Each offspring will receive one allele from each parent. The Punnett square below shows the four possible combinations of alleles. The offspring have genotypes BB, Bb, Bb, and bb.

An explanation similar to the one provided below would receive full credit.

Part A

	B	b
B	BB	Bb
b	Bb	bb

Part B *Percent of black-furred offspring 25%.*

Each of the offspring with the B allele will have black fur. Three of the four possible genotypes of the offspring have the B allele and black fur (BB, Bb, and Bb). One of these (BB) will produce only black-furred offspring in the next generation; therefore, the answer is one out of four, or 25%.

To receive full credit for this question (2 points), the response should include a correctly drawn and completed Punnett square for Part A (as shown), the correct percent of black-furred offspring, and an explanation of how this percent was determined for Part B. Partially correct answers will receive a score of 1 point.

12 The correct answer is A (How energy flows between organisms).

Strand: G—How Living Things Interact With Their Environment

Benchmark: SC.G.1.3.4 The student knows that the interactions of organisms with each other and with the nonliving parts of their environments result in the flow of energy and the cycling of matter throughout the system. (Also assesses SC.G.1.3.1 knows that viruses depend on other living things; and SC.G.1.3.5 knows that life is maintained by a continuous input of energy from the sun and by the recycling of the atoms that make up the molecules of living organisms.)

An understanding of the flow of energy through food chains is needed to answer this question. Producers are always at the beginning of a food chain because they are able to use the Sun's light to make sugars. In the food chain in the diagram, the flowers are the producers. As the butterfly feeds on the nectar and pollen from the flowers, it obtains energy from the sugars in the plant. In the same way, the bird eats the butterfly and obtains energy from it. Energy flows from the Sun through the producer to each consumer. At each step, some of the energy is released into the environment as heat.

Distractor Rationale

- B.** Since energy is released to the environment along the food chain, the amount of energy decreases, not increases, along the food chain.
- C.** The producer receives energy from the Sun. The direction of the arrows in the diagram indicates the energy transfers from the producer to the consumers.
- D.** Energy is used and released to the environment along the food chain.

- 13** The correct answer is H (New information allows scientists to modify earlier ideas).

Strand: H—The Nature of Science

Benchmark: SC.H.1.3.1 The student knows that scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.

An understanding of how scientific knowledge is constantly being modified as new information becomes available over time is necessary to answer this question.

John Dalton’s model of the atom was based on the information available to scientists at the time. Since then, new discoveries and technologies have allowed scientists to better view and understand the way atoms work. New information allows scientists to modify early models.

Distractor Rationale

- F. Scientists have traditionally followed scientific methods of investigation, which require them to be accurate in their reporting.
- G. Computer-generated art has allowed scientists to represent data in different ways; however, computers are not the reason that we discover new things.
- I. Scientists are usually open to new ideas. Many times, discoveries have been made because a scientist was willing to look at what was not being studied rather than what was.

- 14** The correct answer is B (the precision of the measuring devices).

Strand: H—The Nature of Science

Benchmark: SC.H.1.3.4 The student knows that accurate record keeping, openness, and replication are essential to maintaining an investigator's credibility with other scientists and society. (Also assesses SC.H.1.3.7 knows that when similar investigations give different results, the scientific challenge is to verify whether the differences are significant by further study.)

Knowledge of the reasons for variations in scientific data is needed to answer this question. The two sets of data are very similar. Three of the second trial measurements are higher than the first, one is equal to the first, and one is lower. Since the type of equipment used to determine these forces is not discussed, the precision of the measuring devices is the most likely cause of the variations.

Distractor Rationale

- A. The speed at which the masses are pulled will not affect the force.
- C. Air resistance depends on the shape, size, and speed of an object, not its mass.
- D. Decreasing the surface friction would reduce the force, but only the 1100 gram mass took less force to move it in the second trial.

15 The correct answer is shown below.



Strand: H—The Nature of Science

Benchmark: SC.H.1.3.5 The student knows that a change in one or more variables may alter the outcome of an investigation.

Example of a Top-Score Response

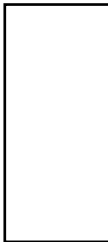
An understanding of the roles of variables and the effect of changing variables in investigations is needed to answer this question.

An explanation similar to the one provided below would receive full credit.

Part A Victoria should vary the type of laundry detergent. She should use different types of detergent since this is the variable she is investigating.

Part B Victoria should keep the amount of detergent, the type of container, the type of fabric, the time of washing, the temperature of the water, and the type of stain the same. It is important to keep all of these variables the same so that she can draw a valid conclusion about the effectiveness of the type of detergent she tested.

To receive full credit (4 points), responses should include an identification of the variable being tested (type of detergent) and a list of variables that should be kept constant. Partially correct answers will receive a score of 1, 2, or 3 points.



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