



## SECTION 2

### SAMPLE QUESTIONS

This section of the Georgia Assessments for the Certification of Educators® (GACE™) Preparation Guide provides sample selected-response questions with an annotated answer key for you to review as part of your preparation for the test. The sample selected-response questions are designed to illustrate the nature of the test questions. Work through the questions carefully before referring to the annotated answer key, which follows the sample selected-response questions. The answer key provides the correct response to each question, describes why each correct response is the best answer, and lists the objective within the test framework to which each question is linked.

Please note that a periodic table and a set of definitions and physical constants are provided for this test. Please refer to these materials as needed in responding to the sample test questions and assignments. These materials are located in the Assessment Reference Materials section at the end of this preparation guide.

A scientific calculator may be used for this test as needed in responding to the sample test questions and assignments. Please refer to the current GACE registration bulletin for information about the use of calculators at the test administration.

## Section 2: Sample Questions

### QUESTIONS

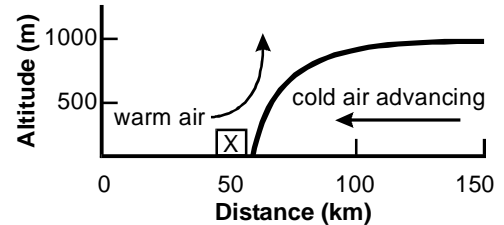
1. A person observes the night sky at the same time each night and from the same location. Over the course of the year, the person notes that the positions of the stars in the night sky change in a regular manner. This observation is best explained by which of the following factors?

- A. the revolution of the earth around the sun
- B. the tilt of the earth's axis
- C. the position of the earth relative to the Milky Way galaxy
- D. the rotation of the earth on its axis

2. Which of the following will occur when water is removed from an aquifer at a rate that exceeds the recharge rate?

- A. The aquifer will cover a larger geographic area.
- B. The level of the water in the aquifer will be lower.
- C. The water in the aquifer will contain fewer sediments.
- D. The average temperature of the water in the aquifer will decrease.

3. Use the diagram below to answer the question that follows.



The diagram above depicts the passage of a cold front. As the cold air mass approaches the location marked with an X on the diagram, which of the following weather conditions are likely to be experienced at this location?

- A. light winds and drizzle
- B. rising pressure and clearing skies
- C. strong winds and thunderstorms
- D. steady pressure and fog

4. The volcanoes of the Pacific Northwest were created as the result of which of the following geologic processes?

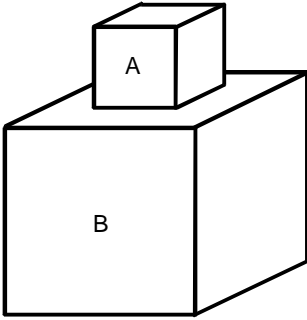
- A. the collision of an oceanic plate with a continental plate, resulting in uplifted mountains
- B. the rifting of a continental plate along a fault zone
- C. the subduction and subsequent melting of an oceanic plate beneath a continental plate
- D. the movement of a continental plate over a hot spot

5. Which of the following factors is most important in deciding where to place a passive solar heating system on a building?
- A. the average number of cloudy days per year
  - B. seasonal variations in the number of daytime hours
  - C. the difference between summer and winter temperatures
  - D. daily and annual changes in the position of the sun in the sky
6. Humans, chimpanzees, and leopards are members of the animal kingdom. Which of the following levels of classification would distinguish a leopard from either a human or a chimpanzee?
- A. phylum
  - B. class
  - C. order
  - D. family
7. Which of the following is a major characteristic that distinguishes plants and animals?
- A. Animal tissue is organized into larger structures called systems.
  - B. Plant cells are covered by a rigid cell wall composed of cellulose.
  - C. Animals obtain physical support from cellular structures.
  - D. Plant tissue does not heal after being damaged.
8. Two pea plants that have purple flowers are crossed. Although 75 percent of the offspring are purple, 25 percent are white. Which of the following best explains why some of the offspring of the two purple-flowered pea plants have white flowers?
- A. The pigments that produce purple flowers can be masked by the pigments for white color.
  - B. Flower color is not determined solely by the genetic makeup of the parents.
  - C. The purple-flowered parents are heterozygous for flower color and white color is a recessive trait.
  - D. Flower color is a sex-linked genetic trait that is located on the Y chromosome.

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9. The extended use of antibiotics by an individual can disrupt digestion. This phenomenon typically results from:
- A. the acidic condition in the stomach that develops over time.
  - B. the destruction of beneficial bacteria in the stomach.
  - C. the chemical neutralization of enzymes in the stomach.
  - D. the accumulation of gas in the stomach.
10. According to the theory of evolution, which of the following processes leads to adaptive changes in the genetic makeup of a species over time?
- A. Genetic differences among individuals in a population make some individuals more likely to survive and reproduce than others.
  - B. Physical changes in individuals that are caused by environmental conditions are passed on to their offspring through their genes.
  - C. Environmental changes produce mutations in the genes of individuals that help their offspring survive and reproduce.
  - D. Populations of individuals with relatively low mutation rates eventually replace populations that have unstable genetic material.
11. While carbon is a nonmetal and lead is a metal, they are both in Group 14 (IVA) of the Periodic Table. Which of the following accounts for the differences in the properties of these two elements?
- A. the average atomic mass
  - B. the number of valence electrons
  - C. the average atomic radius
  - D. the number of isotopes
12. Which of the following is an example of a nuclear reaction?
- A.  $2\text{S}_2\text{O}_2^{3-} + \text{I}_2 \longrightarrow \text{S}_4\text{O}_2^{6-} + 2\text{I}^-$
  - B.  $\text{Cu}(s) \longrightarrow \text{Cu}^{2+} + 2e^-$
  - C.  $\text{U} + 6\text{F}_2 \longrightarrow \text{UF}_6$
  - D.  ${}^2_1\text{H} + {}^2_1\text{H} \longrightarrow {}^3_2\text{He} + {}^1_0n$

13. Use the diagram below to answer the question that follows.



Small metal cube A is placed on top of the larger metal cube B as shown in the diagram above. Thermal energy will be transferred from cube A to cube B if cube A has a greater:

- A. mass.
- B. thermal conductivity.
- C. specific heat.
- D. temperature.
14. The velocity of a 10 kg object moving in a straight line increases from 2 m/s to 10 m/s during a 4-second time period. What is the magnitude of the net force acting on the object?
- A. 20 N
- B. 40 N
- C. 80 N
- D. 100 N

15. Which of the following is an application of the bending of light as it passes from one medium to another?
- A. using a plane mirror to form a virtual and upright image
- B. using a concave mirror to form a real and inverted image
- C. using a magnifying glass to produce a magnified image of an object
- D. using a pinhole camera to observe an eclipse of the sun
16. Which of the following best describes the shape of the magnetic field generated by a current-carrying copper wire?
- A. concentric circles that are centered on the wire
- B. straight lines that point away from the wire
- C. undulating waves that are parallel to the wire
- D. parallel lines that lie within the physical boundaries of the wire

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17. A researcher records how long it takes a sugar cube to dissolve in 200 mL of water. She stirs the sugar and water with a spoon until the sugar has completely dissolved. The researcher repeats the experiment, this time starting with a crushed sugar cube, and then compares the two sets of data. Which of the following is the dependent variable in this experiment?

- A. the amount of water used to dissolve the sugar
- B. the time it takes for the sugar to dissolve in the water
- C. the temperature of the water after the sugar has dissolved
- D. the size of the spoon used to mix the sugar and water together

18. A scientist wants to measure the density of an irregularly shaped mineral sample that is approximately the size of a quarter. Which of the following pieces of equipment would allow the scientist to most accurately accomplish this task?

- A. a graduated cylinder filled with water and an electronic scale
- B. a caliper and a spring scale
- C. a set of graded sieves and an electronic scale
- D. a balance scale and a micrometer

19. Use the table below to answer the question that follows.

Trial	Value Measured (m/s <sup>2</sup> )
1	9.012
2	9.020
3	9.022
4	9.021

A researcher conducts an experiment to measure the acceleration due to gravity. The measurement data obtained for four trials are shown in the table above. If the actual value is 9.8 m/s<sup>2</sup>, which of the following statements about the measurements is true?

- A. The measurements are neither precise nor accurate.
- B. The measurements are both precise and accurate.
- C. The measurements are accurate but not precise.
- D. The measurements are precise but not accurate.

20. Scientists use models primarily to help them perform which of the following tasks?

- A. developing experimental procedures
- B. collecting data on observable natural phenomena
- C. simulating complex systems
- D. determining appropriate equipment to use for an experiment

## ANNOTATED ANSWER KEY

For question	The correct response is	Reason	Test Objective
1	A	Over the course of a year, the position of the stars in the night sky as viewed from a particular location on the earth changes because the earth faces different parts of the universe as it orbits the sun.	0001
2	B	The recharge rate is the rate at which water seeps into an aquifer from overlying soils, adjacent sedimentary deposits, and bedrock springs. When water withdrawn from an aquifer by pumping exceeds this rate of recharge, the level of the water in the aquifer will drop.	0002
3	C	As the denser cold air mass associated with a cold front pushes into warm air, the cold air forces the warm air upward, typically producing thunderstorms and associated windy conditions.	0003
4	C	The many volcanoes in the Pacific Northwest have formed as a result of the subduction of an oceanic plate beneath the margin of the North American continental plate. The subducted oceanic plate melts beneath the margin of the continent and forms plumes of magma that rise to the surface and erupt, producing volcanoes.	0004
5	D	The amount of solar energy that will be captured by a passive solar heating system is directly related to the angle at which sunlight strikes the solar collector. Although the sun's pathway across the sky changes over the course of a year, in the United States the arc the sun makes between sunrise and sunset is always in the southern half of the sky. For this reason, a passive solar collector should be inclined toward the south at an angle designed to capture the most direct sunlight.	0005
6	C	Although humans, chimpanzees, and leopards all have backbones (phylum Chordata) and are all mammals (class Mammalia), the chimpanzees and humans are members of the order Primates, while the leopard is a member of the order Carnivora.	0006
7	B	Plant cells are surrounded by a rigid cell wall composed of cellulose, while animal cells do not have a cell wall. The cell wall helps provide structural support for plants.	0007

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For question	The correct response is	Reason	Test Objective
8	C	The genetic information that codes the flower color of pea plants exists as a pair of matching genes called alleles that are inherited from the parents. With some traits, such as the flower color of pea plants, the allele inherited from one parent can be dominant over the allele inherited from the other parent. In that case, the color coded by the dominant allele is expressed, while the color of the other, recessive, allele is masked. If both parents carry one dominant and one recessive copy of the allele, they are referred to as heterozygous. In that case, 3/4 of their offspring will express the dominant color allele, while 1/4 will have both copies of the recessive allele and will express the color associated with the recessive allele.	0008
9	B	Antibiotics are effective at killing pathogenic bacteria that cause illness; however, most antibiotics do not discriminate between beneficial bacteria living in the body and bacteria that are causing illness. As a result, extended use of antibiotics can disrupt the functioning of the beneficial bacteria that live in the digestive tract and that aid in digestion.	0009
10	A	According to the theory of evolution, the genetic changes that occur in a particular species over many generations result from the reproductive success of some individuals in a population as compared with other individuals in the population. As time goes on, the genes that confer reproductive success will become more prevalent than the genes that do not confer a reproductive advantage.	0010
11	C	Within Group 14 (IVA), carbon is in the second period of the Periodic Table, while lead is in the sixth period. There is a gradual increase in the atomic radii of the different types of atoms in Group 14 (IVA) between period 2 and period 6.	0011
12	D	A nuclear reaction involves a nuclear change, in which new substances are formed by changes in the identity of an atom. During the fusing of smaller hydrogen nuclei to produce a larger helium nucleus, a great deal of energy is released along with a neutron.	0012
13	D	Temperature is a measure of the average kinetic energy of the particles in a substance or material. When two substances are in contact, the substance with the greater temperature will transfer thermal energy to the substance with a lower temperature until the two substances reach thermal equilibrium.	0013

For question	The correct response is	Reason	Test Objective
14	A	The force acting on an object is the product of the object's mass and its acceleration ( $F = ma$ ). The first step to solving this problem is to determine the acceleration of the object. The acceleration is equal to the change in velocity over time: $a = \frac{v_2 - v_1}{t}$ , where $v_2 = 10$ m/s, $v_1 = 2$ m/s, and $t = 4$ s. Substituting in these values gives the equation $a = \frac{10 \text{ m/s} - 2 \text{ m/s}}{4 \text{ s}} = 2 \text{ m/s}^2$ . Substituting this value for acceleration into the equation $F = ma$ gives the value of the force acting on the object. $F = 10 \text{ kg} \cdot 2 \text{ m/s}^2$ , or $F = 20$ N.	0014
15	C	As light reflected from an object passes through a lens that is convex on both sides, the light is bent or refracted as it passes from the air to the glass and back to the air. The way in which this type of lens bends the light produces a magnified image of the object.	0015
16	A	When electric current exists in a conductive wire, the movement of charge produces a magnetic field. The field lines associated with this magnetic field form concentric circles centered on the wire.	0016
17	B	The variable that is manipulated by the researcher, the condition of the sugar, is the independent variable that determines the value of the dependent variable, the time it takes for the sugar to dissolve.	0017
18	A	To measure the density of an irregularly shaped mineral sample, the sample should first be submerged in a graduated cylinder that contains a measured amount of water to determine the amount of water that is displaced by the mineral. The amount of water displaced by the mineral sample will give an accurate value for the volume of the sample. Determining the mass of the sample with an electronic scale and then dividing its mass by its volume will give the sample's density.	0018
19	D	Precision is the degree of refinement of a measurement. For example, the number of decimal places used to record the value for a particular measurement indicates the assumed precision of the measuring device and the resulting measurement. Accuracy is the extent to which a measurement matches an accepted standard or value. Since the measurements are made to three decimal places, they are precise; however, since the values do not match the accepted value for gravitational acceleration, they are not accurate.	0019

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For question	The correct response is	Reason	Test Objective
20	C	Models are used by scientists to simulate complex systems that are difficult to study. Scientists have used models to study a variety of complex systems, such as world climates, ocean currents, and the conditions that exist within stars. Because of their size and complexity, these systems are impossible to manipulate and difficult to study with direct observation. By simulating these systems with models, scientists can test hypotheses about the systems and make predictions about how they will behave when certain variables change.	0020