



## SECTION 4

### TEST II SAMPLE QUESTIONS

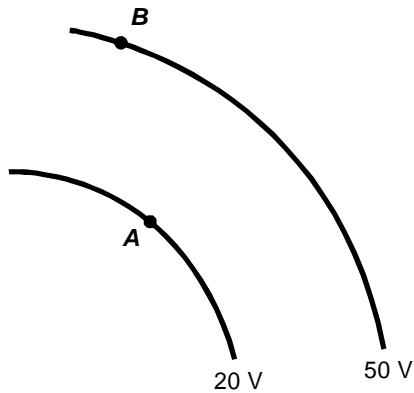
This section of the Georgia Assessments for the Certification of Educators® (GACE™) Preparation Guide provides sample selected-response questions with an annotated answer key for you to review as part of your preparation for the test. The sample selected-response questions are designed to illustrate 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 constants and formulas 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.

## QUESTIONS

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



The diagram above shows two lines of equipotential for an electric field. If a 0.5 C charge is released at point *B*, what is the kinetic energy of the charge at point *A*?

- A. 15 J
- B. 30 J
- C. 60 J
- D. 140 J

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



•  
A

The diagram above represents a cross section of a wire carrying a positive current into the plane of the page. Which of the following vectors represents the direction of the magnetic field at point *A*?

A.



B.



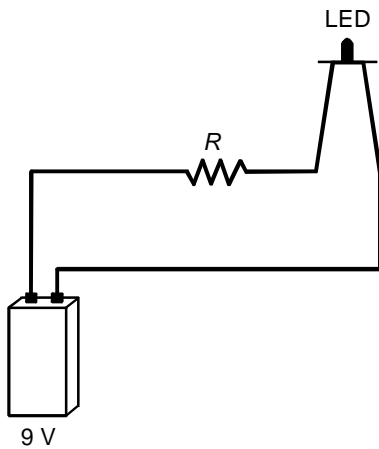
C.



D.



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



The diagram above shows a circuit containing a 9 V battery, an LED, and a resistor. To avoid damage, the LED should be operated at a current of 20 mA and a voltage of 2.0 V. What value resistor should be used for this purpose?

- A. 100  $\Omega$
- B. 350  $\Omega$
- C. 550  $\Omega$
- D. 700  $\Omega$

4. Which of the following phenomena represents the most significant obstacle to the development of the nuclear fusion process in laboratories?
- A. Binding energies per nucleon are smaller for light nuclei than for heavier nuclei.
  - B. Isotopes of hydrogen that contain neutrons occur less frequently than those that contain no neutrons.
  - C. Extreme temperatures are required to provide sufficient energy to overcome the Coulomb force.
  - D. Magnetic force fields are transparent to the gamma region of the electromagnetic spectrum.

#### Section 4: Test II Sample Questions

5. A researcher develops a hypothesis that explains the distribution of energy levels in a semiconductor. Which of the following developments would provide the strongest support for the validity of the researcher's hypothesis?
- A. The hypothesis has the potential to generate several commercially important applications.
  - B. Predictions based on the hypothesis are tested using a different data set and found to be correct.
  - C. A different researcher independently derives a similar hypothesis using the same set of data.
  - D. The methodology used in generating the hypothesis has many applications in other areas of science.
6. The precision of a single scientific measurement depends primarily on which of the following factors?
- A. the capabilities of the measuring instrument
  - B. the existence of standards for the units of measurement
  - C. the units in which the measurement is recorded
  - D. the frequency with which the measuring instrument must be calibrated

## ANNOTATED ANSWER KEY

| For question | The correct response is | Reason  | Test Objective |
|--------------|-------------------------|---|----------------|
| 1            | A                       | The electric potential between two points, A and B, in an electric field is the work done moving a charge from A to B divided by the charge, or $V_{AB} = \frac{W_{AB}}{q}$ . This work is independent of the path taken. If a 0.5 C charge is released from the 50 V line of equipotential, the electric field will do work accelerating the charge toward the 20 V line. By the work-energy theorem, the work done by the field is equal to the change in the kinetic energy of the charge, or $\Delta KE = W_{BA} = qV_{BA} = (0.5 \text{ coulombs})(30 \text{ joules/coulomb}) = 15$ .  | 0008           |
| 2            | D                       | The magnetic field around a current-carrying wire forms circular field lines in a plane perpendicular to the wire. The circles are centered at the center of the wire's cross section. To find the direction of the field lines, apply the right-hand rule by pointing the thumb of the right hand at the "X" in the direction of the current in the wire (into the plane of the page). The curved fingers of the right hand indicate the direction of the magnetic field at any point around the wire. Since point A is directly below the wire on the page, the tips of the curved fingers will point toward the left edge of the page. | 0009           |
| 3            | B                       | According to Kirchoff's second law (conservation of energy), the algebraic sum of the changes in potential around any closed loop of a circuit must be zero. Given that the voltage drop across the LED is 2.0 V, Kirchoff's law yields $9V - IR - 2V = 0$ . The desired current through the LED is 20 mA, which is the same as the current through the resistor. Letting $I = 0.020 \text{ A}$ and solving for $R$ results in $R = \frac{7.0 \text{ V}}{0.020 \text{ A}} = 350 \Omega$ .   | 0010           |
| 4            | C                       | The nuclei of atoms consist of protons and neutrons and therefore have a net positive charge. In order to achieve fusion, the nuclei must have sufficient kinetic energy to overcome the enormous Coulomb repulsive force, which becomes even stronger as the distance between the positive nuclei decreases. Since the kinetic energy is proportional to temperature, the process requires high energies and extreme temperatures that are difficult to maintain in the laboratory.  | 0011           |

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| For question | The correct response is | Reason  | Test Objective |
|--------------|-------------------------|---|----------------|
| 5            | B                       | To determine the validity of a scientific hypothesis, it is necessary to determine how well the hypothesis is supported by experimental data. Using the hypothesis to make predictions and then testing the predictions by collecting and analyzing different sets of data is, of the choices given, the best way to provide support for the validity of the hypothesis.            | 0012           |
| 6            | A                       | The precision of a scientific measurement is the degree of refinement of the measurement. For a single measurement, the precision depends on the capabilities of the measuring instrument. For example, a thermometer that measures to the nearest hundredth of a degree will provide a more precise measurement than a thermometer that measures to the nearest tenth of a degree. | 0013           |