

4



4

SCIENCE REASONING TEST

35 Minutes—40 Questions

DIRECTIONS: This test includes seven passages, each followed by several questions. Read the passage and choose the best answer to each question. After you have selected your answer, fill in the corresponding bubble on your answer sheet. You should refer to the passages as often as necessary when answering the questions. You may NOT use a calculator on this test.

PASSAGE I

A number of different chemical elements are essential for the survival and growth of plants. The *macronutrients*—those nutrients required in the greatest quantity—are nitrogen, phosphorus, and potassium. These macronutrients are only available in the soil and generally come from the decay of other plants. To enrich the soil and make more of these essential nutrients available, many people use fertilizers to supply plants with the nutrients they need to grow faster. Two botanists discuss whether inorganic or organic fertilizers are most optimal for plant growth.

Botanist 1

In addition to carbon, hydrogen, and oxygen available in the water and the air, and other micronutrients, such as sulfur, calcium, and magnesium, plants also need the macronutrients nitrogen, phosphorus, and potassium to thrive. The best way to supply the soil, and thus the plants, with the proper macronutrients is to apply organic fertilizers, as opposed to commercial inorganic fertilizers. Organic nutrients include cow, poultry, horse, and sheep manures. Green manure—a crop that is grown for a specific period of time, then plowed and incorporated into the soil—and compost can also be used. Organic fertilization mimics the natural breakdown of organic material into nutrients for which the plants can use. In other words, organic fertilizer provides a naturally slow release of nutrients as the organic material breaks down in the soil, reducing the likelihood of over-fertilization. Organic fertilizers also improve soil structure in the long term and improve the ability of sandy soils to hold water, which is immensely important in arid climates. Commercial inorganic fertilizers, on the other hand, are often applied too heavily, damaging the roots of the plants. Inorganic fertilizers can also cause chemical imbalances in the soil because they can build up a toxic concentration of salts in the soil.

Botanist 2

Plant growth and survival depends on an adequate supply of essential nutrients that cannot always be found in the soil. Inorganic commercial fertilizers have many benefits over organic fertilizers. The elements in inorganic fertilizers have been thoroughly measured and tested, insuring that each application provides the appropriate amount of

nutrients to the plants, as opposed to the highly variable, and often unknown, nutrient content of organic fertilizers. Organic fertilizers are usually lower in nutrient content than inorganic fertilizers, requiring more of the organic material to be applied to achieve the same level of nutrient delivery acquired from the application of smaller amounts of inorganic material. In addition, characteristics of organic fertilizer require application well in advance of need to ensure that the materials have broken down and can be used by the plant. Inorganic fertilizers, however, once applied, offer immediate availability of nutrients to plants for use. The likelihood of nitrogen depletion is another disadvantage of organic fertilizers. Organic material can cause a temporary depletion of nitrogen in the soil and therefore in the plants that depend on it. Inorganic fertilizer use does not present this problem.

1. According to the passage, plants need the most of which of the following to grow and survive?
 - A. Oxygen
 - B. Fertilizer
 - C. Micronutrients
 - D. Macronutrients
2. Which of the following can be inferred from Botanist 2's viewpoint about organic fertilizers?
 - F. It is impossible to determine the proper amount of inorganic fertilizer to apply.
 - G. The levels of essential macronutrients are closer to those that occur naturally.
 - H. Organic fertilizers are useless in achieving and promoting plant growth.
 - J. Organic fertilizers can reduce the amount of necessary nutrients in the soil.

GO ON TO THE NEXT PAGE.

4



4

3. Botanist 2 would most likely agree with which of the following statements made by Botanist 1?
- A. Inorganic fertilizers can create imbalances in the soil.
 - B. Organic fertilizer slowly releases nutrients into the soil.
 - C. Organic fertilizer should be used in place of inorganic fertilizers.
 - D. Inorganic fertilizer is the best source of micronutrients.
4. Which of the following best describes the difference between the two botanists' opinions?
- F. The effects of putting additional macronutrients in the soil.
 - G. The amount of fertilizer that should be applied.
 - H. The type of fertilizer that is most beneficial to plant growth.
 - J. The type of fertilizer that behaves most like natural nutrient-rich soil.
5. According to Botanist 1, all of the following are true of organic fertilizer EXCEPT:
- A. organic fertilizer is safer for the plant in terms of over-application of fertilizer.
 - B. soil quality is slowly improved over time with the use of organic fertilizer.
 - C. organic fertilizers are less likely than inorganic fertilizers to burn the roots of plants.
 - D. less organic fertilizer can be applied to achieve the same results as those achieved with an inorganic fertilizer.
6. With which of the following statements would both botanists likely agree?
- F. Soil quality does not need to be considered if a nitrogen-rich fertilizer is used to compensate for nutrients not found in the soil.
 - G. Plants require some additional nutrients to reach optimal growth if the nutrients are not available in the soil.
 - H. Plants need only the macronutrients nitrogen, potassium, and phosphorus in order to survive.
 - J. The amount of water, oxygen, and other micronutrients available to plants is less important if the proper amount of fertilizer is applied.
7. Which of the following can be inferred from the passage about inorganic fertilizers?
- A. If improperly applied, they are less likely than organic fertilizers to damage crops.
 - B. Regardless of their application, they are less effective than organic fertilizers.
 - C. If properly applied, they take longer to act than organic fertilizers and are similarly effective.
 - D. If properly applied, they are faster acting than organic fertilizers and are just as effective.

GO ON TO THE NEXT PAGE.