



**California
Subject
Examinations for
Teachers®**

TEST GUIDE

**AGRICULTURE
SUBTEST I**

**Sample Questions and Responses
and Scoring Information**

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Sample Test Questions for CSET: Agriculture Subtest I

Below is a set of multiple-choice questions and constructed-response questions that are similar to the questions you will see on Subtest I of CSET: Agriculture. You are encouraged to respond to the questions without looking at the responses provided in the next section. Record your responses on a sheet of paper and compare them with the provided responses.

1. Incorporating organic matter into a sandy loam soil would likely have which of the following effects?
 - A. The availability to plants of phosphorus in the soil would be reduced.
 - B. The soil would be more likely to compact under the weight of agricultural machinery.
 - C. The number and variety of bacteria and fungi in the soil would be reduced.
 - D. The ability of the soil to retain irrigation water or rainwater would be increased.
2. Red coloration of a soil indicates that the soil is most likely to be:
 - A. highly alkaline.
 - B. poorly drained.
 - C. highly fertile.
 - D. high in iron.
3. Which of the following is one advantage of using an organic fertilizer such as dried sheep manure rather than an inorganic fertilizer such as ammonium nitrate?
 - A. Organic fertilizers are more concentrated than inorganic fertilizers and can be applied at lower levels.
 - B. Availability of nutrients for use by the plants is more rapid in organic fertilizers than it is in inorganic fertilizers.
 - C. Equipment for transporting and spreading organic fertilizers is less specialized and expensive than that needed for inorganic fertilizers.
 - D. Nutrients in organic fertilizers are released slowly and are less likely to damage roots than nutrients in inorganic fertilizers.
4. In California, the total value of which of the following vegetable crops is greatest?
 - A. lettuce
 - B. carrot
 - C. onion
 - D. squash

5. Which of the following is an example of an active meristematic tissue in plants?
- A. sclerenchyma
 - B. cambium
 - C. epidermis
 - D. cork
6. Which of the following describes an appropriate technique for commercially propagating chimeras, i.e., plants with spontaneous somatic-cell mutations that gives rise to a plant exhibiting a new characteristic for the variety?
- A. crossing the chimera with a normal plant of the same variety
 - B. stimulating haploid female germ cells taken from the chimera to divide without being fertilized
 - C. taking stem cuttings from the chimera and its descendents
 - D. crossing first-generation plants grown from stem cuttings taken from the chimera
7. Which of the following plant diseases is most commonly transmitted by leafhoppers?
- A. powdery mildew of cucurbits
 - B. verticillium wilt of tomatoes
 - C. mosaic of lettuce
 - D. late blight of potatoes
8. Which of the following is the most common source of contamination of fresh fruits and vegetables with human disease-causing bacteria, viruses, and other pathogens?
- A. incorporation of animal manure into the soil as fertilizer before planting of the crop
 - B. improper use of chemical pesticides and herbicides on the product before harvest
 - C. failure to follow proper sanitary procedures by pickers and handlers of the product
 - D. contact with pest insects such as grasshoppers and aphids during the growing season
9. Which of the following accurately describes the role of restriction enzymes in genetic engineering?
- A. cutting sequences of double-strand DNA into fragments
 - B. opening holes in the membranes of target cells
 - C. making multiple copies of gene sequences of single-strand DNA
 - D. removing the nucleus of a cell and replacing it with another

10. Which of the following is the most important advantage of using microtubes rather than overhead sprinklers to automatically irrigate greenhouse plants?
- A. decreased buildup of salts in the potting medium
 - B. decreased capital and installation costs
 - C. decreased likelihood of the spread of disease
 - D. decreased labor and maintenance costs
11. Pinching back the growing tips of flowering plants to encourage branching will also have which of the following effects?
- A. Flowers will be larger in size and brighter in color.
 - B. Plants will flower earlier, before they are fully grown.
 - C. Flowers will last a longer time after they are cut.
 - D. Plants will produce a larger number of smaller flowers.
12. Which of the following landscape plants is most suitably propagated by division?
- A. juniper
 - B. agapanthus
 - C. azalea
 - D. clematis
13. A high school student plans to earn money by preparing neighbors' vegetable and flower gardens for planting in the spring. The student owns a small truck and hand tools such as shovels and rakes and has signed up fifteen customers during the winter. At this point, the most appropriate piece of equipment for the student to purchase would be a:
- A. broadcast spreader.
 - B. small tractor with disk harrow.
 - C. rear-tined rototiller.
 - D. small tractor with spring-tooth harrow.
14. When preparing cut flowers for arrangements, stems should be recut under water in order to prevent:
- A. infection of the cut by airborne bacteria.
 - B. air bubbles from entering the stem.
 - C. drying out of the bark and tissues of the stem.
 - D. loss of sap contained in the stem.
15. In floral design, which of the following are complementary colors?
- A. yellow and purple
 - B. green and blue
 - C. yellow and orange
 - D. red and purple

16. **Use the information below to complete the exercise that follows.**

Imagine that you are the manager of a farm that specializes in the production of strawberries.

Using your knowledge of crop production methods, write a response in which you:

- identify two soil characteristics that are optimal for successful production of this crop;
- describe a primary method for harvesting this crop; and
- identify at least one concern related to harvesting and handling this crop.

17. **Use the information below to complete the exercise that follows.**

Imagine that you are designing an irrigation system for a turfgrass (sod) farm on sandy loam soil.

Using your knowledge of irrigation systems, write a response in which you:

- identify an appropriate system to use in this situation;
- discuss two advantages of the system you have identified; and
- discuss one potential disadvantage of the system you have identified.

18. **Use the information below to complete the exercise that follows.**

Imagine that you are the manager of a greenhouse that produces a variety of bedding, flowering, and foliage plants for sale to the public.

Using your knowledge of greenhouse management, write a response in which you describe how you would apply an integrated approach that combines various methods (e.g., chemical, biological, cultural) to control aphids in the greenhouse. In your response:

- describe two strategies for controlling this pest; and
- explain why you believe each strategy will be effective in controlling this pest.

Annotated Responses to Sample Multiple-Choice Questions for CSET: Agriculture Subtest I

Plant and Soil Science

1. **Correct Response: D.** (SMR Code: 1.1) Fresh organic matter and humus, which is a product of the decay of organic matter, absorb water like a sponge. Both fresh organic matter and humus can hold about six times their own weight in water. In addition, the small particles of humus have a large surface area to which water molecules tend to cling.
2. **Correct Response: D.** (SMR Code: 1.1) Iron is a common element in soil. Oxidation of iron produces compounds, such as ferric oxide (hematite), that are red in color. Well-drained soils that are high in iron are typically red or reddish-brown in color.
3. **Correct Response: D.** (SMR Code: 1.2) Organic matter, such as animal manure, contains complex carbon compounds in long chains. Plant nutrients, such as nitrogen, are part of these chains. These chains are broken down and the nutrients slowly liberated in soluble form by the process of decay. Nutrients in organic fertilizers, therefore, are released slowly and continuously as the fertilizers decay. Chemical fertilizers are highly soluble and attract water from the immediate environment, including adjacent plant roots, which can cause damage to the roots.
4. **Correct Response: A.** (SMR Code: 1.3) Recent statistics show that more acreage is sown to lettuce in California than to any other vegetable crop and that the lettuce crop in California is worth roughly three times that of carrots, eight times that of onions, and thirty times that of squash.
5. **Correct Response: B.** (SMR Code: 1.3) Vascular cambium and cork cambium, also known as the lateral meristems, are two layers of actively dividing cells that produce growth in girth of the stems and roots of plants. Vascular cambium produces new xylem on its inside surface and new phloem on its outside surface, while cork cambium produces the bark that forms the protective covering of old stems and roots.
6. **Correct Response: C.** (SMR Code: 1.4) Since chimeras arise from somatic-cell mutations, they will not breed true from seed and must be propagated by cloning the parts of the plant that contain the somatic-cell mutation. This restricts propagation to vegetative methods such as stem cuttings or tissue culture of a somatic cell that contains the mutation.
7. **Correct Response: C.** (SMR Code: 1.5) Leafhoppers are sapsucking insects that are relatives of aphids. Leafhoppers transmit a wide variety of disease pathogens among plants, including the virus that causes mosaic in several crop species. Insects are not implicated as important vectors of powdery mildew, verticillium wilt, or late blight.
8. **Correct Response: C.** (SMR Code: 1.5) A large number of human pathogens (e.g., *Shigella*, *Salmonella*, *E. coli*, enteroviruses, amoebas) may be found on fruits and vegetables. These pathogens generally cause gastric disturbances such as nausea, vomiting, or diarrhea. Pathogens are transmitted from person to person by a fecal-oral route when an infected person fails to wash his or her hands before handling fruits and vegetables and deposits pathogens on the food, which are then ingested by the consumer.

9. **Correct Response: A.** (SMR Code: 1.6) Genetic engineering involves inserting a fragment of DNA from one organism into the genome of an unrelated organism. After the target fragment has been identified, it must be removed from the DNA sequence of the donor. Restriction enzymes are derived from bacteria and cut double-strand DNA within or near specific areas called recognition sequences. Different restriction enzymes will cut the DNA at different points in the sequence.

Ornamental Horticulture

10. **Correct Response: C.** (SMR Code: 2.1) The use of overhead sprinklers tends to raise the humidity in a greenhouse. Increased humidity enhances the survival and dispersal of pathogens, especially fungi, that can cause disease (e.g., powdery mildew). Microtube irrigation does not cause elevated humidity and thus is less likely to produce a favorable environment for the spread of these diseases.
11. **Correct Response: D.** (SMR Code: 2.1) Pinching back the growing tips of a plant will cause dormant lateral shoots to begin growing. This will delay the crop while the lateral shoots grow but will produce a larger number of flowering shoots and a larger number of flowers. Since the energy of the plant must be divided among more flowers, each flower will be smaller in size than those that would normally be produced on a plant that was not pinched.
12. **Correct Response: B.** (SMR Code: 2.2) Plants that naturally reproduce and spread by underground vegetative growth (e.g., stolons, bulbs, root crowns, tubers) are most suitable to propagate by division. Members of the genus *Agapanthus*, or lily of the Nile, form tubers that can be divided to start new plants every few years.
13. **Correct Response: C.** (SMR Code: 2.2) Individuals who wish to plant a garden usually want the soil turned over as early as possible in spring. With fifteen customers and limited time, the student needs to purchase a piece of equipment that will allow her to prepare her customers' gardens in a timely manner. At the same time, since her business is still small and she is preparing family plots for vegetables and flowers, she should not purchase equipment that is larger and more expensive than is necessary. A rear-tined rototiller is relatively inexpensive, maneuverable, versatile enough to prepare large and small gardens, and easily transported with the truck that she presently owns.
14. **Correct Response: B.** (SMR Code: 2.3) One reason for the premature aging of cut flowers is blockage of the vascular channels in the stem with air. This prevents water from rising through the stem to the flower. Flower stems should always be recut to provide a fresh, unblocked surface before being arranged in a vase. Cutting the stems under water will prevent air from entering and blocking water transmission through the stem.
15. **Correct Response: A.** (SMR Code: 2.3) Complementary colors are those that are opposite one another on the color wheel. Yellow and purple are opposite one another on the color wheel and are therefore complementary colors.

Examples of Responses to Sample Constructed-Response Questions for CSET: Agriculture Subtest I

Plant and Soil Science

Question #16 (Strong Response)

For successful production of strawberries, the optimal soil would be a sandy loam, free of diseases, with good drainage and a neutral or slightly acidic or alkaline pH.

Harvesting of strawberries must be done by hand. Growers may hire paid pickers, may open their fields to consumers who will pick their own, or may use a combination of these two methods.

Strawberries are a fragile fruit, with a brief period of optimal ripeness for harvesting and a short shelf life. Because of this and the need for handpicking, the farm manager must coordinate the hiring of pickers and the transportation to market carefully. The berries must be harvested carefully to prevent bruising and be kept cool and dry on the way to market.

Question #16 (Weak Response)

Strawberries are a popular fruit with a strong demand from individual consumers, restaurants, and food production companies. It is important that the soil be appropriate, with adequate rainfall, sun, and fertilization.

Picking of the fruit must be done quickly and carefully to get the berries to market as soon as possible, and provide a return on the farmer's investment.

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Question #16 (Weak Response) *continued*

The berries must be handled with care and packed in an attractive manner to present an appealing appearance to consumers. Containers must be purchased ahead of time in standard sizes, either pints or quarts. Usually the most attractive berries are placed on the top of the container.

Question #17 (Strong Response)

The irrigation system I would choose for a turfgrass farm on sandy loam would be impact sprinklers. These would provide even water coverage in a controlled manner. The amount of water could be regulated to match the rate of absorption by the soil. This would allow watering to the proper depth, which would promote strong root growth. The equipment is portable and could be transported to different fields. Also, the equipment could be easily adapted for fertigation.

On the other hand, the initial cost of the equipment would be relatively high compared to a flood irrigation system, and there would be labor costs associated with moving the equipment to different fields. Also, there could be substantial loss of water through evaporation, a serious problem if water supplies are not plentiful.

Question #17 (Weak Response)

The choice of irrigation system for turf depends on many factors: the type of grass, the amount of rain, the humidity, the temperature, and the wind. Too much water will cause seeds to drown; too little will not allow them to germinate. If the crop is watered too frequently for short periods, the roots will not develop because the water will reach only the top layer of soil.

Whatever system is chosen should provide sufficient water for the plants to thrive, but should not waste water. Water is a valuable commodity and must be preserved with care.

If the right system is used, the turfgrass farm will produce strong, healthy sod that will result in satisfied customers.

Ornamental Horticulture

Question #18 (Strong Response)

To control aphids in a greenhouse, I would use a combination of methods. First, I would take all possible measures to avoid introducing these pests into my greenhouse. I would inspect all stock carefully and reject any that contained aphids, and keep the greenhouse free of weeds or other possible hosts. Second, I would try to maintain an environment that would be hostile to aphids. I would do this by sterilizing equipment between crops, by introducing ladybugs into the greenhouse, and by rinsing plants with soapy water.

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Question #18 (Strong Response) *continued*

The first measures would be effective because they would minimize the number of aphids allowed into the greenhouse, thus preventing them from getting a foothold. Sterilizing equipment would eliminate most or all eggs. Ladybugs are natural predators of aphids. Rinsing cleans the plants without the use of chemicals.

Question #18 (Weak Response)

Aphids are a difficult pest to control. They can cause damage to leaves and can stunt plant growth. They can also transmit plant diseases. The careful greenhouse manager will do whatever is needed to reduce the number of aphids. The damage they do will make plants unfit to sell.

One indication that you may have aphids is the presence of large numbers of ants. Aphids are a food source for ants.

You should check your plants frequently for aphids. You can reduce the number of aphids by washing plants with a strong spray of water. This will knock them off the plants and remove their food source and they will die.

Scoring Information for CSET: Agriculture Subtest I

Responses to the multiple-choice questions are scored electronically. Scores are based on the number of questions answered correctly. There is no penalty for guessing.

There are three constructed-response questions in Subtest I of CSET: Agriculture. Each of these constructed-response questions is designed so that a response can be completed within a short amount of time—approximately 10–15 minutes. Responses to the constructed-response questions are scored by qualified California educators using focused holistic scoring. Scorers will judge the overall effectiveness of your responses while focusing on the performance characteristics that have been identified as important for this subtest (see below). Each response will be assigned a score based on an approved scoring scale (see page 15).

Your performance on the subtest will be evaluated against a standard determined by the California Commission on Teacher Credentialing based on professional judgments and recommendations of California educators.

Performance Characteristics for CSET: Agriculture Subtest I

The following performance characteristics will guide the scoring of responses to the constructed-response questions on CSET: Agriculture Subtest I.

PURPOSE	The extent to which the response addresses the constructed-response assignment's charge in relation to relevant CSET subject matter requirements.
SUBJECT MATTER KNOWLEDGE	The application of accurate subject matter knowledge as described in the relevant CSET subject matter requirements.
SUPPORT	The appropriateness and quality of the supporting evidence in relation to relevant CSET subject matter requirements.

Scoring Scale for CSET: Agriculture Subtest I

Scores will be assigned to each response to the constructed-response questions on CSET: Agriculture Subtest I according to the following scoring scale.

SCORE POINT	SCORE POINT DESCRIPTION
3	<p>The "3" response reflects a command of the relevant knowledge and skills as defined in the subject matter requirements for CSET: Agriculture.</p> <ul style="list-style-type: none"> • The purpose of the assignment is fully achieved. • There is an accurate application of relevant subject matter knowledge. • There is appropriate and specific relevant supporting evidence.
2	<p>The "2" response reflects a general command of the relevant knowledge and skills as defined in the subject matter requirements for CSET: Agriculture.</p> <ul style="list-style-type: none"> • The purpose of the assignment is largely achieved. • There is a largely accurate application of relevant subject matter knowledge. • There is acceptable relevant supporting evidence.
1	<p>The "1" response reflects a limited or no command of the relevant knowledge and skills as defined in the subject matter requirements for CSET: Agriculture.</p> <ul style="list-style-type: none"> • The purpose of the assignment is only partially or not achieved. • There is limited or no application of relevant subject matter knowledge. • There is little or no relevant supporting evidence.
U	<p>The "U" (Unscorable) is assigned to a response that is unrelated to the assignment, illegible, primarily in a language other than English, or does not contain a sufficient amount of original work to score.</p>
B	<p>The "B" (Blank) is assigned to a response that is blank.</p>