ACT - Science

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SAMPLE SCIENCE TEST QUESTIONS

Click on the letter choices to determine if you have the correct answer and for question explanations.
(An actual ACT Assessment Science Test contains 40 questions to be answered in 35 minutes.)

DIRECTIONS: The passage in this test is followed by several questions. After reading the passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passage as often as necessary.

You are NOT permitted to use a calculator on this test.

Abandoned cornfields have been the sites of investigations concerning *ecological succession*, the orderly progression of changes in the plant and/or animal life of an area over time (see Figure 1).

(Note: The plants are ordered according to their appearance during ecological succession.)

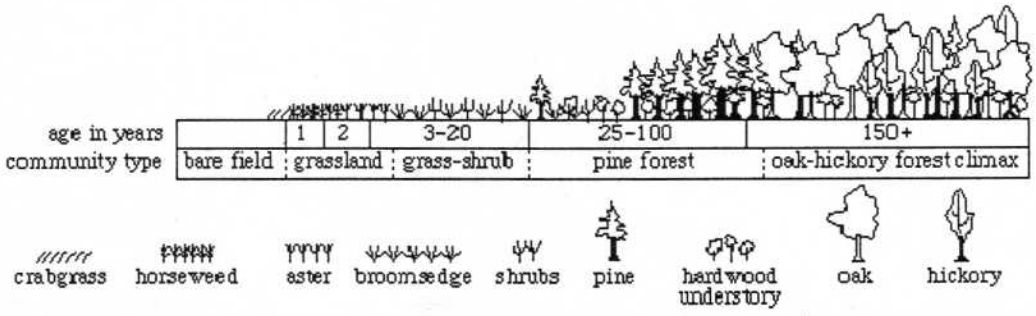


Figure 1

During the early stages of succession, the principal *community* (living unit) that dominates is the *pioneer community*. Pioneer plants are depicted in Figure 2.

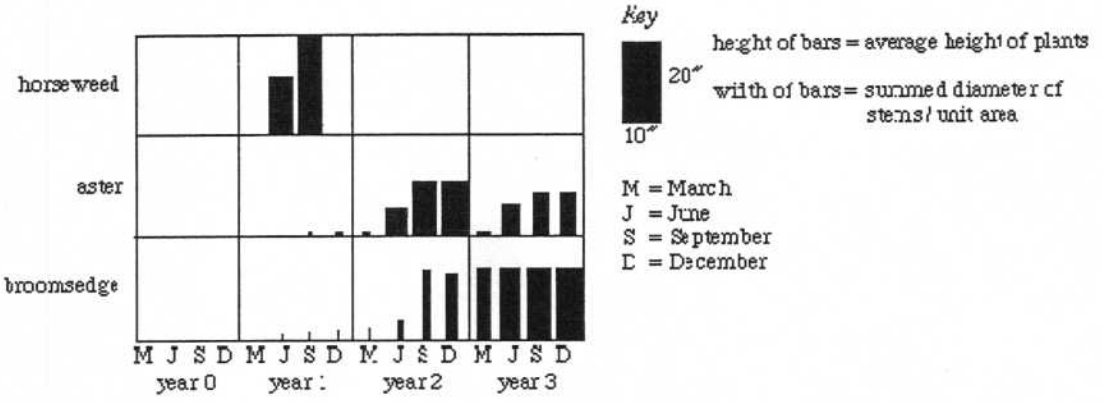


Figure 2

The final stage of ecological succession is characterized by the presence of the *climax community*, the oak-hickory forest. Figure 3 depicts the gradual change from pine to hardwoods.

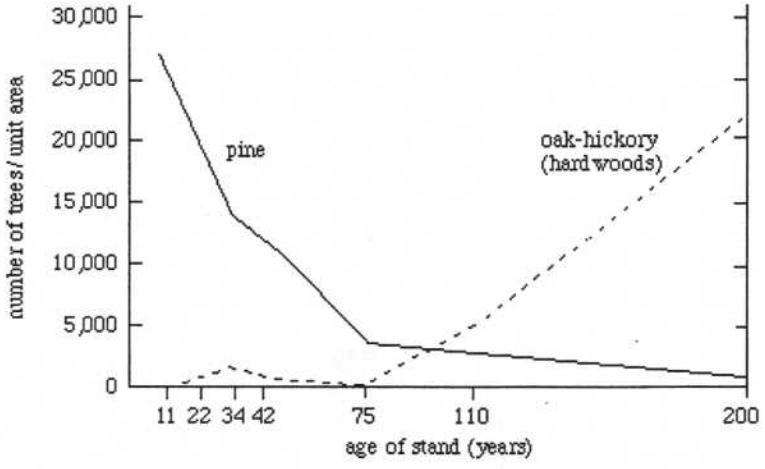


Figure 3

Figures adapted from Eugene P. Odum, *Fundamentals of Ecology*. ©1971 by Saunders College Publishing/Holt, Rinehart, and Winston, Inc.

1. On the basis of the data presented in Figure 1, approximately 80 years after the abandonment of cropland, the land would contain:

A. pine seedlings only.
B. oak-hickory hardwood forests only.
C. early invading species like horseweed, aster, and broomsedge.
D. large pine trees with an understory of hardwood trees.

4. Given the information in Figure 1, which of the following conclusions concerning ecological succession in an abandoned cornfield is most correct?

F. Succession in an abandoned cornfield begins on bare rock.
G. Succession is characterized by the replacement of one plant community by another until a climax community has been achieved.
H. The height of the plants in the

2. According to the information in Figure 3, a 150-year-old climax community would contain oak and hickory trees with a density of approximately:

F. 3,000 trees per unit area.
G. 5,000 trees per unit area.
H. 15,000 trees per unit area.
J. 20,000 trees per unit area.

3. On the basis of the data depicting the gradual change from pine forest to an oak-hickory forest, after 100 years, as the density of the pine trees:

A. increases, the density of the oak-hickory trees increases.
B. increases, the density of the oak-hickory trees decreases.
C. decreases, the density of the oak-hickory trees increases.
D. decreases, the density of the oak-hickory trees decreases.

communities decreases as succession progresses to the climax stage.
J. The plant species change continuously during succession, but the change is more rapid in the later stages than in the earlier stages.

5. According to Figure 2, pioneer plant(s) showing a progressive increase in summed diameter of stems per unit area over the course of several years of succession is(are):

A. horseweed only.
B. broomsedge only.
C. aster and broomsedge only.
D. horseweed, aster, and broomsedge

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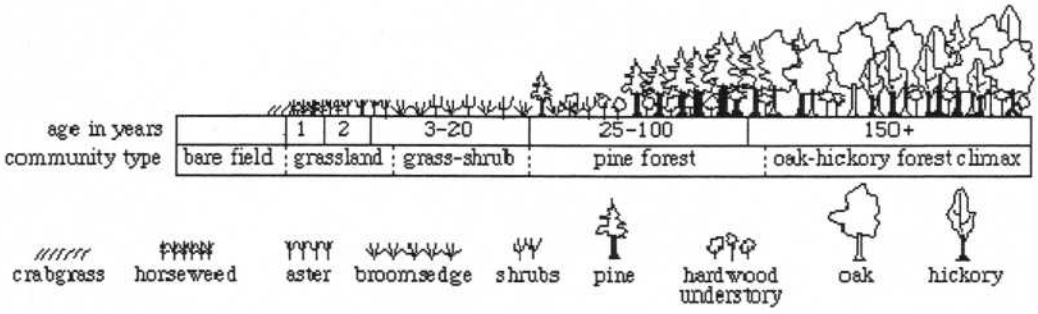


Figure 1

During the early stages of succession, the principal *community* (living unit) that dominates is the *pioneer community*. Pioneer plants are depicted in Figure 2.

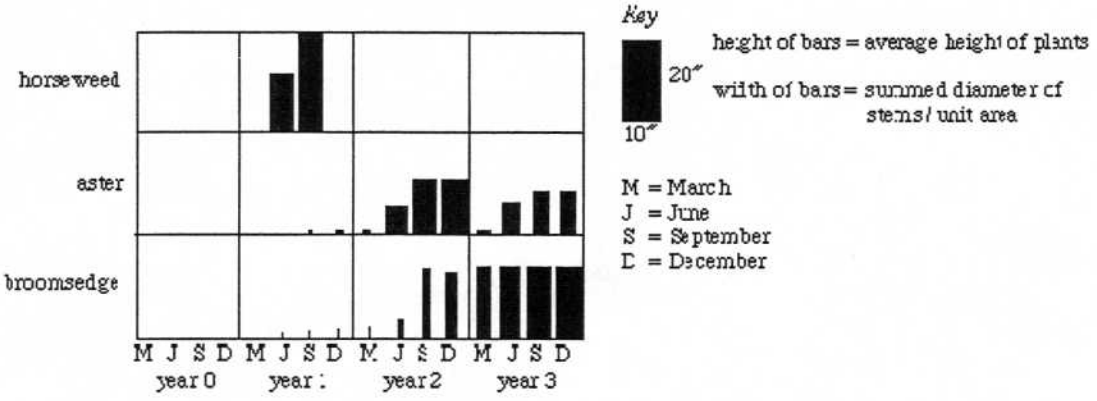


Figure 2

The final stage of ecological succession is characterized by the presence of the *climax community*, the oak-hickory forest. Figure 3 depicts the gradual change from pine to hardwoods.

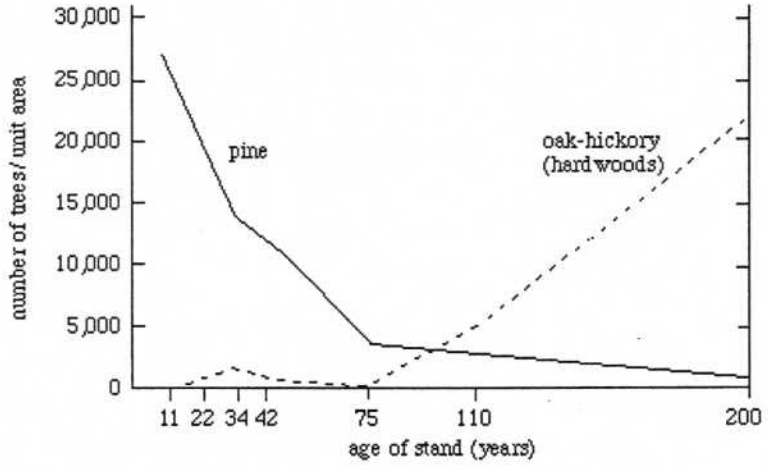


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1. On the basis of the data presented in Figure 1, approximately 80 years after the abandonment of cropland, the land would contain:

A. pine seedlings only.
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C. early invading species like horseweed, aster, and broomsedge.
D. large pine trees with an understory of hardwood trees.

4. Given the information in Figure 1, which of the following conclusions concerning ecological succession in an abandoned cornfield is most correct?

F. Succession in an abandoned cornfield begins on bare rock.
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F. 3,000 trees per unit area.
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J. 20,000 trees per unit area.

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A. increases, the density of the oak-hickory trees increases.
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communities decreases as succession progresses to the climax stage.
J. The plant species change continuously during succession, but the change is more rapid in the later stages than in the earlier stages.

5. According to Figure 2, pioneer plant(s) showing a progressive increase in summed diameter of stems per unit area over the course of several years of succession is(are):

A. horseweed only.
B. broomsedge only.
C. aster and broomsedge only.
D. horseweed, aster, and broomsedge

ACT Assessment Sample Question Answer Key and Question Explanations

Set 1: Science – ANSWERS

1. The best answer is D. Figure 1 indicates the community type that was present at various times following abandonment.

A. *pine seedlings only.* Incorrect. According to Figure 1, 80 years after abandonment, the land contained a pine forest. Since a pine forest includes mature pine trees, answer A is incorrect.

B. *oak-hickory hardwood forests only.* Incorrect. According to Figure 1, oak-hickory hardwood forests do not begin to appear until 100 years after abandonment. Therefore they would not be present 80 years after abandonment.

C. *early invading species like horseweed, aster, and broomsedge.* Incorrect. According to Figure 1, early invading species like horseweed, aster, and broomsedge begin to appear in the first few years following abandonment. However, they disappear by Year 25. Therefore they would not be present 80 years after abandonment.

D. *large pine trees with an understory of hardwood trees.* Correct. According to Figure 1, 80 years after abandonment, a pine forest existed on the abandoned land and a hardwood understory was also present. Thus, D is the correct answer.

2. The best answer is H. Figure 3 indicates the number of trees that are present as a function of the age of a stand for both pine trees and oak-hickory trees.

F. *3,000 trees per unit area.* Incorrect. According to Figure 3, the oak-hickory trees reach a density of 3,000 trees per unit area when the stand is approximately 90 years old. After 90 years, the density continues to increase, reaching a density of approximately 15,000 trees per unit area at Year 150.

G. *5,000 trees per unit area.* Incorrect. According to Figure 3, the oak-hickory trees reach a density of 5,000 trees per unit area when the stand is approximately 110 years old. After 110 years, the density continues to increase, reaching a density of approximately 15,000 trees per unit area at Year 150.

H. *15,000 trees per unit area.* Correct. According to Figure 3, the oak-hickory trees reach a density of 13,000 trees per unit area after approximately 150 years and a density of 15,000 trees per unit area after approximately 160 years. Thus, C is the correct answer.

J. *20,000 trees per unit area.* Incorrect. According to Figure 3, the oak-hickory trees do not reach a density of 20,000 trees until approximately Year 190.

3. The best answer is C. Figure 3 depicts the gradual change from pine forest to an oak-hickory forest and is therefore the correct figure to use in answering this question.

A. *increases, the density of the oak-hickory trees increases.* Incorrect. Figure 3 indicates that after 100 years, the density of pine trees steadily decreases from approximately 3,500 trees per unit area at Year 100 to approximately 750 pine trees per unit area by Year 200.

B. *increases, the density of the oak-hickory trees decreases.* Incorrect. Figure 3 indicates that after 100 years, the density of pine trees steadily decreases from approximately 3,500 trees per unit area at Year 100 to approximately 750 pine trees per unit area by Year 200.

C. *decreases, the density of the oak-hickory trees increases.* Correct. Figure 3 indicates that after 100 years, the density of pine trees steadily decreases from approximately 3,500 trees per unit area at Year 100 to approximately 750 pine trees per unit area by Year 200. Likewise, Figure 3 indicates that after 100 years, the density of oak-hickory trees steadily increases from approximately 4,000 trees per unit area to approximately 22,000 trees per unit area by Year 200. Thus, C is correct.

D. *decreases, the density of the oak-hickory trees decreases.* Incorrect. Figure 3 indicates that after 100 years, the density of oak-hickory trees steadily increases from approximately 4,000 trees per unit area to approximately 22,000 trees per unit area by Year 200.

4. The best answer is G. Figure 1 indicates the community type that would be present at various time periods following abandonment. The types of plant species that are present within each community type are also included.

F. *Succession in an abandoned cornfield begins on bare rock.* Incorrect. Figure 1 indicates that succession in an abandoned cornfield begins in a bare field, not on a bare rock.

G. *Succession is characterized by the replacement of one plant community by another until a climax community has been achieved.* Correct. According to Figure 1, over time, the community type changes from a grassland community to a grass-shrub community to a pine forest community and finally to an oak-hickory forest climax. Therefore, based on the information in Figure 1, succession is characterized by the replacement of one plant community by another and this process generally results in the development of an oak-hickory forest climax community.

H. *The height of the plants in the communities decreases as succession progresses to the climax stage.* Incorrect. Figure 1 does not indicate the height of the plants that are found

in the various communities. The picture accompanying the graph suggests, however, that the height of the plants in the communities actually increases.

J. *The plant species change continuously during succession, but the change is more rapid in the later stages than in the earlier stages.* Incorrect. Figure 1 does indicate that the plant species change continuously during succession, however the figure also indicates that the change is more rapid in the early stages than in the later stages. For example, within the first 25 years, crabgrass, horseweed, aster, and broomsedge appear and then are replaced by shrubs. However, the community continues to be dominated by oak-hickory trees for the last 50 years shown in the figure.

5. The best answer is B. Figure 2 indicates the change in the summed diameter of stems per unit over the course of three years of succession. Since the question requires students to look over several years of succession, data from all three years should be considered.

A. *horseweed only.* Incorrect. According to Figure 2, horseweed is only present during Year 1. Thus, horseweed does not show a progressive increase in summed diameter over time.

B. *broomsedge only.* Correct. According to Figure 2, at Year 0 broomsedge is not present. At the end of Year 1, broomsedge has a summed diameter of less than one inch. At the end of Year 2, broomsedge has a summed diameter of approximately 2.5 inches. At the end of Year 3, broomsedge has a summed diameter of approximately 7.0 inches. Thus, there is a progressive increase in the summed diameter of stems per unit area over time.

C. *aster and broomsedge only.* Incorrect. From Year 0 to Year 2, aster does show a progressive increase in the summed diameter of stems per unit area. However, between Year 2 and Year 3, there is a decline in the summed diameter of stems per unit area for aster.

D. *horseweed, aster, and broomsedge.* Incorrect. Neither horseweed nor aster is correct. Horseweed is present only at Year 1. Aster shows a decline in the summed diameter of stems per unit area between Year 2 and Year 3