Grade12

January 1

2008

1st ster

General Revision

1- Genetics

True/False
Indicate whether the sentence or statement is true or false.

____ 1. Genetics is the branch of biology that involves the study of how different traits are transmitted from one generation to the next.

____ 2. Mendel discovered predictable patterns in the inheritance of traits.

____ 3. Garden peas are difficult to grow because they mature slowly.

____ 4. The mating of garden-pea flowers can be easily controlled because the male and female reproductive parts are enclosed within the same flower.

____ 5. When Mendel cross-pollinated two varieties from the P generation that exhibited contrasting traits, he called the offspring the second filial, or F_2, generation.

____ 6. Mendel's initial experiments were monohybrid crosses.

____ 7. In Mendel's experiments, the recessive traits appeared in the F_2 generation in approximately 25 percent of the plants.

____ 8. A dominant allele masks the effect of a recessive allele.

____ 9. Individuals must exhibit a trait in order for it to appear in their offspring.

____ 10. The allele for a recessive trait is usually represented by a capital letter.

____ 11. Heterozygous individuals have two of the same alleles for a particular gene.

____ 12. In heterozygous individuals, only the recessive allele is expressed.

____ 13. The law of segregation states that two or more pairs of alleles separate independently of one another during gamete formation.

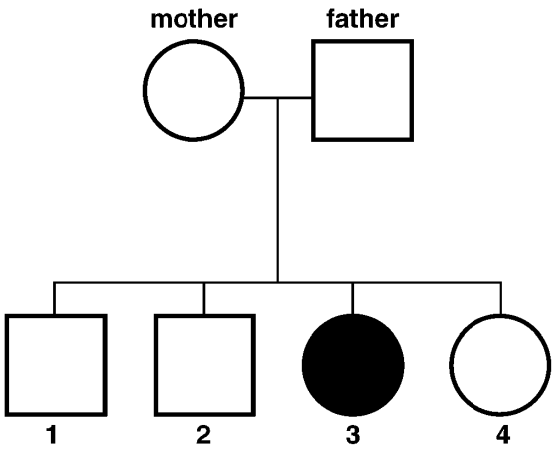
____ 14. A Punnett square represents the phenotype of an organism.

____ 15. If the offspring of a test cross all have the dominant trait, then the genotype of the individual being tested is homozygous.

____ 16. Probability is the likelihood that a certain event will occur.

____ 17. The expression of sex-linked genes is controlled by hormones.

____ 18. An autosomal trait will occur with equal frequency in both males and females.



____ 19. Refer to the illustration above. The father listed in the pedigree is most likely heterozygous for the

____ 20. Refer to the illustration above. Child #3 probably has a homozygous recessive phenotype.

____ 21. Refer to the illustration above. The trait indicated in the pedigree is sex-linked.

____ 22. In codominance, two dominant alleles are expressed at the same time.

____ 23. All genes have only two alleles.

____ 24. The only way a mutation in a recessive gene can show up in a child born to two normal parents is for both parents to be heterozygous.

____ 25. Hemophilia is caused by a mutated allele that produces a defective form of the protein hemoglobin.

____ 26. Cystic fibrosis is a genetic disorder caused by a defective chloride-ion transport protein.

____ 27. Genetic counselors often help people with a family history of genetic disorders.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

____ 28. The passing of traits from parents to offspring is called

development. c. genetics. a.
maturation. d. heredity. b.

____ 29. The difference between Mendel's experiments in the area of heredity and those done by earlier researchers was that

earlier researchers did not have microscopes. a.
earlier researchers used detailed and numerical procedures. b.
Mendel expressed the results of his experiments in terms of numbers. c.
Mendel used pea plants with both purple and white flowers. d.

____ 30. The scientific study of heredity is called

genetics c. meiosis a.
pollination d. crossing-over b.

____ 31. The “father” of genetics was

Gregor Mendel. c. A. Knight a.
None of the above d. Hans Krebs. b.

____ 32. Mendel obtained his P generation by allowing the plants to

assort independently. c. self-pollinate. a.
segregate. d. cross-pollinate. b.

____ 33. Step 1 of Mendel's garden pea experiment, allowing each variety of garden pea to self-pollinate for several generations, produced the

P generation. c. F_1 generation. a.
P_1 generation. d. F_2 generation. b.

____ 34. $F_2 : F_1 ::$

$F_1 : P$. c. $P : F_1$ a.
dominant trait : recessive trait d. $F_1 : F_2$ b.

____ 35. Mendel's law of segregation states that

pairs of alleles are dependent on one another when separation occurs during gamete formation. a.
pairs of alleles separate independently of one another after gamete formation. b.
each pair of alleles remains together when gametes are formed. c.
the two alleles for a trait separate when gametes are formed. d.

____ 36. Garden peas

are difficult to grow. a.
mature quickly. b.
produce few offspring. c.
are not good subjects for studying heredity. d.

____ 37. The phenotype of an organism

represents its genetic composition. a.
is the physical appearance of a trait. b.
occurs only in dominant pure organisms. c.

cannot be seen. d.

____ 38. If an individual possesses two recessive alleles for the same trait, the individual is said to be
heterozygous for the trait. c. homozygous for the trait. a.
mutated. d. haploid for the trait. b.

____ 39. A genetic trait that appears in every generation of offspring is called
recessive. c. dominant. a.
superior. d. phenotypic. b.

____ 40. An individual heterozygous for a trait and an individual homozygous recessive for the trait are crossed and produce many offspring that are
of three different phenotypes. c. all the same genotype. a.
all the same phenotype. d. of two different phenotypes. b.

____ 41. Tallness (*T*) is dominant to shortness (*t*) in pea plants. Which of the following represents a genotype of a pea plant that is heterozygous for tallness?
Tt c. *T* a.
tt d. *TT* b.

____ 42. homozygous : heterozygous ::
probability : predicting chances c. heterozygous : *Bb* a.
factor : gene d. dominant : recessive b.

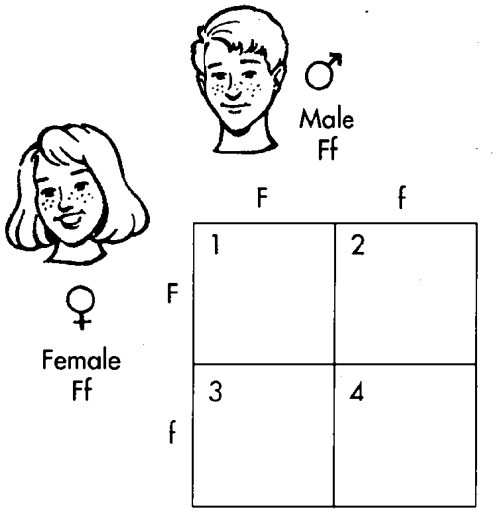
____ 43. Mendel's finding that the inheritance of one trait had no effect on the inheritance of another became known as the
law of separate convenience. c. law of dominance. a.
law of independent assortment. d. law of universal inheritance. b.

____ 44. The discovery of chromosomes provided a link between the first law of heredity that stemmed from Mendel's work and
mitosis. c. pollination. a.
meiosis. d. inheritance. b.

____ 45. A 3:1 ratio of tall to short pea plants appearing in the F_2 generation lends support to the law of
mutation. c. recessiveness. a.
crossing-over. d. segregation. b.

____ 46. The law of segregation states that
alleles of a gene separate from each other during meiosis. a.
different alleles of a gene can never be found in the same organism. b.
each gene of an organism ends up in a different gamete. c.
each gene is found on a different molecule of DNA. d.

In humans, having freckles (F) is dominant to not having freckles (f). The inheritance of these traits can be studied using a Punnett square similar to the one shown below.



____ 47. Refer to the illustration above. The child represented in box 1 in the Punnett square would
be heterozygous for freckles. c. be homozygous for freckles. a.

not have freckles. d. have an extra freckles chromosome. b.

____ 48. Refer to the illustration above. The parents shown in the Punnett square could have children with a phenotype ratio of

3:1. c. 1:2:1. a.
2:2. d. 4:0. b.

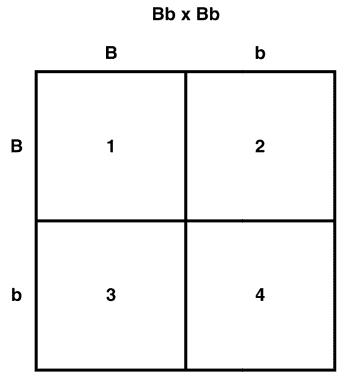
____ 49. Refer to the illustration above. Which box in the Punnett square represents a child who does *not* have freckles?

box 3 c. box 1 a.
box 4 d. box 2 b.

____ 50. Refer to the illustration above. The child in box 3 of the Punnett square has the genotype

ff. c. *FF*. a.
None of the above d. *Ff*. b.

In rabbits, black fur (B) is dominant to brown fur (b). Consider the following cross between two rabbits.



____ 51. Refer to the illustration above. The device shown, which is used to determine the probable outcome of genetic crosses, is called a

genetic graph. c. Mendelian box. a.
phenotypic paradox. d. Punnett square. b.

____ 52. Refer to the illustration above. Both of the parents in the cross are

homozygous dominant. c. black. a.
homozygous recessive. d. brown. b.

____ 53. Refer to the illustration above. The phenotype of the offspring indicated by box 3 would be

a mixture of brown and black. c. brown. a.
None of the above d. black. b.

____ 54. Refer to the illustration above. The genotypic ratio of the F1 generation would be

1:3. c. 1:1 a.
1:2:1. d. 3:1. b.

____ 55. What is the expected genotypic ratio resulting from a homozygous dominant × heterozygous monohybrid cross?

1:2:1 c. 1:0 a.
1:3:1 d. 1:1 b.

____ 56. What is the expected genotypic ratio resulting from a heterozygous × heterozygous monohybrid cross?

1:2 c. 1:2:1 a.
1:0 d. 1:3:1 b.

____ 57. What is the expected phenotypic ratio resulting from a homozygous dominant × heterozygous monohybrid cross?

2:1 c. 1:3:1 a.
1:0 d. 1:2:1 b.

____ 58. The unknown genotype of an individual with a dominant phenotype can be determined using

probability c. a ratio. a.
a test cross. d. a dihybrid cross. b.

____ 59. What is the probability that the offspring of a homozygous dominant individual and a homozygous recessive individual will exhibit the dominant phenotype?

a. 0.66
b. 1.0
c. 0.25
d. 0.5

____ 60. A trait that occurs in 450 individuals out of a total of 1,800 individuals occurs with a probability of

a. 0.50.
b. 0.75.
c. 0.04
d. 0.25.

____ 61. If a characteristic is sex-linked, it

a. can never occur in females.
b. is always fatal.
c. occurs most commonly in males.
d. occurs only in females.

____ 62. Since the allele for colorblindness is located on the X chromosome, colorblindness

a. is sex-linked.
b. None of the above
c. cannot be inherited.
d. occurs only in adults.

____ 63. A diagram in which several generations of a family and the occurrence of certain genetic characteristics are shown is called a

a. pedigree.
b. family karyotype.
c. Punnett square.
d. monohybrid cross.

____ 64. In humans, the risks of passing on a genetic disorder to offspring can be assessed by

a. prenatal testing.
b. All of the above
c. analysis of a pedigree.
d. genetic counseling.

____ 65. How many different phenotypes can be produced by a pair of codominant alleles?

a. 3
b. 4
c. 1
d. 2

____ 66. Which of the following traits is controlled by multiple alleles in humans?

a. hemophilia
b. Huntington's disease
c. sickle cell anemia
d. blood type

____ 67. What would be the blood type of a person who inherited an *A* allele from one parent and an *O* allele from the other?

a. type AB
b. type O
c. type A
d. type B

____ 68. A change in a gene due to damage or being copied incorrectly is called

a. segregation.
b. a mutation.
c. evolution.
d. meiosis.

____ 69. Which of the following describes hemophilia?

a. sex-linked trait
b. codominant trait
c. multiple-allele trait
d. dominant trait

____ 70. Both sickle-cell anemia and hemophilia

a. are caused by genes coding for defective protein.
b. are seen in homozygous dominant individuals.
c. provide resistance to malaria infections.
d. are extremely common throughout the world.

____ 71. Genetic counseling is a process that

a. helps identify parents at risk for having children with genetic defects.
b. assists parents in deciding whether or not to have children.
c. uses a family pedigree.
d. All of the above

____ 72. Which of the following is an example of gene technology?

a. A genetic counselor studies a pedigree.
b. A student studies the colors of flowers in pea plants.
c. A geneticist explains the inheritance of albinism using a Punnett square.
d. A physician transfers a normal gene into the DNA of a person with a genetic disease.

Completion

Complete each sentence or statement.

73. The patterns that Mendel discovered form the basis of _____, the branch of biology that deals with heredity.

74. The passing of traits from parents to offspring is called _____.

75. A reproductive process in which fertilization occurs within a single plant is _____ _____.

76. The transferring of pollen between plants is called _____-_____.

77. A(n) _____ cross is a cross that involves one pair of contrasting traits.

78. Mendel called the offspring of the P generation the _____ generation.

79. In Mendel's experiments, a trait that disappeared in the F_1 generation but reappeared in the F_2 generation was always a(n) _____ trait.

80. A trait that is not expressed in the F_1 generation resulting from the crossbreeding of two genetically different, true-breeding organisms is called _____.

81. Different forms of a particular gene are called _____.

82. In heterozygous individuals, only the _____ allele is expressed.

83. An organism that has two identical alleles for a trait is called _____.

84. An organism's _____ refers to the set of alleles it has inherited.

85. The external appearance of an organism as determined by what alleles are present is _____.

86. The statement that the members of each pair of alleles separate when gametes are formed is known as the law of _____.

87. The principle that states that alleles of different genes separate independently of one another during gamete formation is the law of _____ _____.

In pea plants, tallness (T) is dominant to shortness (t). Crosses between plants with these traits can be analyzed using a Punnett square similar to the one shown below.

t	T	
2	1	T
4	3	t

88. Refer to the illustration above. The parents shown in the Punnett square could have offspring with a genotypic ratio of _____.

89. Refer to the illustration above. Box 2 and box _____ in the Punnett square represent plants that would be heterozygous for the trait for tallness.

90. Refer to the illustration above. The phenotype of the plant that would be represented in box 4 of the Punnett square would be _____.

91. Refer to the illustration above. The genotype of both parents shown in the Punnett square above is _____.

92. If some of the offspring of a test cross have the recessive trait, then the genotype of the individual being tested is _____.

93. The likelihood that a specific event will occur is called _____.

94. A trait that is determined by a gene that is only found on the X chromosome is said to be _____-_____.

95. Identifying patterns of inheritance within a family over several generations is possible by studying a diagram called a(n) _____.

96. A situation in which two dominant alleles are expressed at the same time is called _____.

97. A trait controlled by three or more alleles is said to have _____ _____.

98. A phenomenon in which a heterozygous individual has a phenotype that is intermediate between the phenotypes of its two homozygous parents is called _____ _____.

99. A change in an organism's DNA is called a(n) _____.

100. A person who is heterozygous for a recessive disorder is called a(n) _____.

101. A genetic disorder resulting in defective blood clotting is _____.

102. Fragile blood cells with an irregular shape that may block blood vessels is a symptom of a genetic disease known as _____ _____ _____.

103. It may be possible to cure genetic disorders through the use of _____ technology.

Problem

104. In tomato plants, tallness is dominant over dwarfness, and hairy stems are dominant over hairless stems. True-breeding (homozygous) plants that are tall and have hairy stems are available. True-breeding (homozygous) plants that are dwarf and have hairless stems are also available. Design an experiment to determine whether the genes for height and hairiness of the stem are on the same or different chromosomes. Explain how you will be able to determine from the results whether the genes are on the same or different chromosomes.

Essay

105. Briefly discuss the reasons that Mendel chose the pea plant, *Pisum sativum*, as the organism to study in his experiments.

106. Describe pollination in pea plants.

107. In what ways did Mendel's methods help ensure his success in unraveling the mechanics of heredity?

108. Describe how genotype and phenotype are related.

109. Explain what is meant by homozygous and heterozygous.

110. What hypotheses did Gregor Mendel develop based on his observations of pea plants?

111. Describe Mendel's principle of independent assortment.

112. What are three ways to express the probability of an event that occurs 500 times out of 2,000 total trials?

113. In humans, colorblindness is a recessive, sex-linked trait. What is the likelihood that the children of a woman heterozygous for colorblindness and a man with normal color vision will be colorblind? Explain your answer.

114. Discuss the inheritance pattern that would be seen in a pedigree designed to study a recessive sex-linked characteristic.

115. Describe what is meant by multiple alleles, and give an example.

116. All of the offspring resulting from a cross between a red snapdragon and a white snapdragon are pink. What is the possible explanation for this?

clasical genetics
Answer Section

TRUE/FALSE

1.	ANS:	T	DIF:	I	OBJ: 8.1.1
2.	ANS:	T	DIF:	I	OBJ: 8.1.1
3.	ANS:	F	DIF:	I	OBJ: 8.1.2
4.	ANS:	T	DIF:	I	OBJ: 8.1.2
5.	ANS:	F	DIF:	I	OBJ: 8.1.3
6.	ANS:	T	DIF:	I	OBJ: 8.1.3
7.	ANS:	T	DIF:	I	OBJ: 8.1.4
8.	ANS:	T	DIF:	I	OBJ: 8.2.1
9.	ANS:	F	DIF:	I	OBJ: 8.2.1
10.	ANS:	F	DIF:	I	OBJ: 8.2.2
11.	ANS:	F	DIF:	I	OBJ: 8.2.2
12.	ANS:	F	DIF:	I	OBJ: 8.2.2
13.	ANS:	F	DIF:	I	OBJ: 8.2.3
14.	ANS:	F	DIF:	I	OBJ: 8.3.1
15.	ANS:	T	DIF:	I	OBJ: 8.3.2
16.	ANS:	T	DIF:	I	OBJ: 8.3.3
17.	ANS:	F	DIF:	I	OBJ: 8.3.4
18.	ANS:	T	DIF:	I	OBJ: 8.3.4
19.	ANS:	T	DIF:	II	OBJ: 8.3.4
20.	ANS:	T	DIF:	II	OBJ: 8.3.4
21.	ANS:	F	DIF:	II	OBJ: 8.3.4
22.	ANS:	T	DIF:	I	OBJ: 8.4.1
23.	ANS:	F	DIF:	I	OBJ: 8.4.1
24.	ANS:	T	DIF:	I	OBJ: 8.4.2
25.	ANS:	F	DIF:	I	OBJ: 8.4.3
26.	ANS:	T	DIF:	I	OBJ: 8.4.3
27.	ANS:	T	DIF:	I	OBJ: 8.4.4

MULTIPLE CHOICE

28.	ANS:	B	DIF:	I	OBJ: 8.1.1
29.	ANS:	C	DIF:	I	OBJ: 8.1.1
30.	ANS:	C	DIF:	I	OBJ: 8.1.1
31.	ANS:	C	DIF:	I	OBJ: 8.1.1
32.	ANS:	A	DIF:	I	OBJ: 8.1.3
33.	ANS:	A	DIF:	I	OBJ: 8.1.3
34.	ANS:	C	DIF:	II	OBJ: 8.1.3
35.	ANS:	D	DIF:	I	OBJ: 8.2.3
36.	ANS:	B	DIF:	I	OBJ: 8.1.2
37.	ANS:	B	DIF:	I	OBJ: 8.2.2
38.	ANS:	B	DIF:	I	OBJ: 8.2.2
39.	ANS:	A	DIF:	I	OBJ: 8.2.2
40.	ANS:	B	DIF:	I	OBJ: 8.2.2
41.	ANS:	C	DIF:	I	OBJ: 8.2.2
42.	ANS:	C	DIF:	II	OBJ: 8.2.2
43.	ANS:	D	DIF:	I	OBJ: 8.2.3
44.	ANS:	D	DIF:	I	OBJ: 8.2.3
45.	ANS:	C	DIF:	I	OBJ: 8.2.3
46.	ANS:	A	DIF:	I	OBJ: 8.2.3

47. ANS: A DIF: II OBJ: 8.3.1
48. ANS: C DIF: II OBJ: 8.3.1
49. ANS: D DIF: II OBJ: 8.3.1
50. ANS: B DIF: II OBJ: 8.3.1
51. ANS: B DIF: II OBJ: 8.3.1
52. ANS: A DIF: II OBJ: 8.3.1
53. ANS: B DIF: II OBJ: 8.3.1
54. ANS: D DIF: II OBJ: 8.3.1
55. ANS: B DIF: II OBJ: 8.3.1
56. ANS: A DIF: II OBJ: 8.3.1
57. ANS: D DIF: II OBJ: 8.3.1
58. ANS: D DIF: I OBJ: 8.3.2
59. ANS: D DIF: II OBJ: 8.3.3
60. ANS: B DIF: II OBJ: 8.3.3
61. ANS: A DIF: I OBJ: 8.3.4
62. ANS: C DIF: I OBJ: 8.3.4
63. ANS: C DIF: I OBJ: 8.3.4
64. ANS: D DIF: I OBJ: 8.3.4
65. ANS: C DIF: II OBJ: 8.4.1
66. ANS: B DIF: I OBJ: 8.4.1
67. ANS: A DIF: II OBJ: 8.4.1
68. ANS: D DIF: I OBJ: 8.4.2
69. ANS: C DIF: I OBJ: 8.4.3
70. ANS: A DIF: I OBJ: 8.4.3
71. ANS: D DIF: I OBJ: 8.4.4
72. ANS: D DIF: II OBJ: 8.4.4

COMPLETION

73. ANS: genetics

DIF: I OBJ: 8.1.1
74. ANS: heredity

DIF: I OBJ: 8.1.1
75. ANS: self-pollination

DIF: I OBJ: 8.1.2
76. ANS: cross-pollination

DIF: I OBJ: 8.1.2
77. ANS: monohybrid

DIF: I OBJ: 8.1.3
78. ANS: F_1

DIF: I OBJ: 8.1.3
79. ANS: Recessive

DIF: II OBJ: 8.1.4
80. ANS: recessive

DIF: I OBJ: 8.2.1
81. ANS: alleles

DIF: I OBJ: 8.2.1

82. ANS: dominant

DIF: I OBJ: 8.2.2

83. ANS: homozygous

DIF: I OBJ: 8.2.2

84. ANS: genotype

DIF: I OBJ: 8.2.2

85. ANS: phenotype

DIF: I OBJ: 8.2.2

86. ANS: segregation

DIF: I OBJ: 8.2.3

87. ANS: independent assortment

DIF: I OBJ: 8.2.3

88. ANS: 1:2:1

DIF: II OBJ: 8.3.1

89. ANS: 3

DIF: II OBJ: 8.3.1

90. ANS: short

DIF: II OBJ: 8.3.1

91. ANS: *Tt*

DIF: II OBJ: 8.3.1

92. ANS: heterozygous

DIF: I OBJ: 8.3.1

93. ANS: probability

DIF: I OBJ: 8.3.3

94. ANS: sex-linked

DIF: I OBJ: 8.3.4

95. ANS: pedigree

DIF: I OBJ: 8.3.4

96. ANS: codominance

DIF: I OBJ: 8.4.1

97. ANS: multiple alleles

DIF: I OBJ: 8.4.1

98. ANS: incomplete dominance

DIF: II OBJ: 8.4.1

99. ANS: mutation

DIF: I OBJ: 8.4.2

100. ANS: carrier

DIF: I OBJ: 8.4.2

101. ANS: hemophilia

DIF: I OBJ: 8.4.3

102. ANS: sickle cell anemia

DIF: II OBJ: 8.4.3

103. ANS: gene

DIF: I OBJ: 8.4.4

PROBLEM

104. ANS:

The experiment should be designed to produce F_1 plants that are then allowed to pollinate each others' flowers and produce an F_2 generation of plants. If the F_2 generation has four different phenotypes present in approximate proportions of $9/16$ tall and hairy, $3/16$ tall and hairless, $3/16$ dwarf and hairy, and $1/16$ dwarf and hairless, then the student can conclude that the genes for height and hairiness are on different chromosomes. If the F_2 generation has only two different phenotypes present in approximate proportions of 3/4 tall and hairy and $1/4$ dwarf and hairless, then the student can conclude that the genes for height and hairiness are on the same chromosome. The student could also conclude that the genes are located very close to each other on the chromosome. If the F_2 generation has four different phenotypes with the tall and hairless types composing less than $3/16$ of the total number and the dwarf and hairy types composing less than $3/16$ of the total number, then the student could conclude that the genes for height and hairiness are on the same chromosome but not located adjacent to each other.

DIF: III OBJ: 8.3.1

ESSAY

105. ANS:

The pea plant, *Pisum sativum*, is an ideal organism for genetic studies for several reasons. There are a number of traits that are easily identified and tracked from generation to generation. Each of these traits has two forms, one of which regularly disappears and reappears in alternate generations. Also, this species is easy to grow and matures quickly. Finally, gametes of both sexes are found in the same flower, so cross-pollination is easy to accomplish by removing the anthers from some flowers and transferring pollen from others to the remaining pistils.

DIF: III OBJ: 8.1.2

106. ANS:

The reproductive structures of seed plants are located inside the flowers. In pea plants, each flower has both male and female structures. The male reproductive parts, the anthers, produce pollen grains that contain sperm. The female reproductive structure produces the egg. The tip of the female structure is called the stigma. Pollination is the transfer of pollen from anthers to stigma.

DIF: III OBJ: 8.1.2

107. ANS:

Mendel's choice of plants to study was fortunate since pea plants displayed several traits in contrasting forms. His use of large numbers of samples allowed the gathering of statistically significant amounts of data. In addition, he kept very careful records and used logical, orderly methods that minimized the possibility of errors.

DIF: III OBJ: 8.1.3

108. ANS:

The genetic makeup of an organism is its genotype. The external appearance of an organism is its phenotype. The phenotype of an organism is determined to a large degree by the genotype of the organism. Environmental factors and other factors can influence the phenotype of an organism.

DIF: III OBJ: 8.2.2

109. ANS:

When both alleles of a pair are the same, an organism is said to be homozygous for that characteristic. An organism may be homozygous dominant or homozygous recessive. A pea plant that is homozygous dominant for height will have the genotype *TT*. A pea plant that is homozygous recessive for height will have the genotype *tt*. When the two alleles in the pair are not the same—for example, when the genotype is *Tt*—the organism is heterozygous for that characteristic.

DIF: III OBJ: 8.2.2

110. ANS:

1. For each inherited trait, an individual has two copies of the gene-one from each parent.
2. There are alternative versions of genes (which Mendel called factors).
3. When two different alleles occur together, one of them may be completely expressed, while the other may have no observable effect on the organism's appearance.
4. When gametes are formed, the alleles for each gene in an individual separate independently of one another. Thus, gametes carry only one allele for each inherited trait. When gametes unite during fertilization, each gamete contributes one allele.

DIF: III OBJ: 8.2.1

111. ANS:

From his work on pea plants, Mendel concluded that factors for different characteristics are not connected. He stated the principle of independent assortment: Factors for different characteristics are distributed to reproductive cells independently.

DIF: III OBJ: 8.2.3

112. ANS:

The general formula for probability is $\frac{\text{number of one kind of event}}{\text{number of all events}}$

This may be expressed as a ratio ($\frac{500}{2,000}$, or), as a decimal (0.25), or as a percentage (25 percent).

DIF: III OBJ: 8.3.3

113. ANS:

Since all the female offspring receive the normal allele for vision from the father, all female offspring will have normal color vision, although half of them will receive the recessive allele from the mother and thus be carriers. Since all of the male offspring receive the Y chromosome from the father, it is the X chromosome they receive from the mother that will determine whether or not they are colorblind. Since the mother is heterozygous, male offspring will have a 50 percent chance of being colorblind.

DIF: III OBJ: 8.3.4

114. ANS:

Sex-linked characteristics are carried on alleles on the X chromosome. As a result, sex-linked recessive traits are rarely seen in a female, unless she is the offspring of an affected male and a female who is a carrier or is affected. Males born to a female who is either a carrier or affected may inherit the sex-linked allele. If the female is affected, both of her X chromosomes will possess the gene under study, and the male is sure to inherit it. If she is a carrier, only one of her X chromosomes will possess the sex-linked allele, and the male will have a 50-50 chance of inheriting this gene. Since the male has only one X chromosome, he will not have a dominant allele in his genotype to counteract the effect of the sex-linked allele.

DIF: III OBJ: 8.3.4

115. ANS:

Some traits are determined by more than two alleles. When three or more alleles control a trait, it is said to have multiple alleles. For example, the trait of blood type in humans is determined by multiple alleles.

DIF: III OBJ: 8.4.1

116. ANS:

Incomplete dominance is the phenomenon that occurs when two or more alleles influence a phenotype. In other words, the offspring displays a trait that is intermediate to a trait exhibited by each parent.

DIF: III OBJ: 8.4.1

2- Population Explosion

True/False

Indicate whether the sentence or statement is true or false.

____ 1. The study of demographics helps predict changes in the size of a population.

____ 2. Very small populations are less likely to become extinct than larger populations.

____ 3. Wastes tend to accumulate in the environment as a population reaches the carrying capacity.

____ 4. Populations of *K*-strategists grow rapidly, while *r*-strategist populations grow slowly.

____ 5. The Hardy-Weinberg principle states that the proportions of recessive and dominant alleles in a population fluctuate randomly from generation to generation.

____ 6. Mutations are so common that they are the major cause of changes in allele frequencies within a population.

____ 7. Natural selection acts on phenotypes, not genotypes.

____ 8. Natural selection always eliminates any genetic disorders from a population, regardless of the frequency of the gene that is responsible for a disorder.

____ 9. Directional selection results in the range of phenotypes shifting toward one extreme.

____ 10. In stabilizing selection, the range of phenotypes becomes wider.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

____ 11. Which of the following does *not* represent a population?
a. all the robins in Austin, Texas
b. all the grass frogs in the pond of Central Park, New York City
c. all the birds in Chicago, Illinois
d. all the earthworms in Yosemite National Park

____ 12. Because individuals in a population usually tend to produce more than one offspring,
a. populations tend to increase in size.
b. populations remain stable in size.
c. individuals tend to die quickly.
d. the number of individuals declines rapidly.

____ 13. All of the following are problems arising from inbreeding, except
a. production of a genetically uniform population.
b. increases in the diversity within a population.
c. increased chance of homozygous recessive alleles occurring.
d. reduction of a population's ability to adapt to environmental changes.

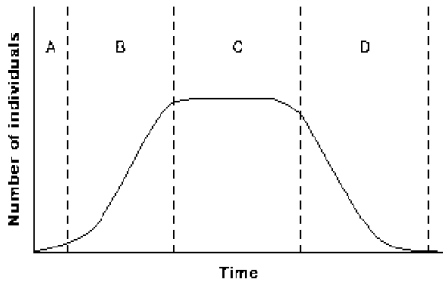
____ 14. Demographic studies of populations must take into consideration
a. population size.
b. population density.
c. population dispersion.
d. All of the above

____ 15. Regarding population dispersion patterns, which of the following is an *inappropriate* pairing?
a. randomly spaced — chance
b. evenly spaced — regular intervals
c. clumped — clusters
d. dispersive — randomly distributed

____ 16. population density : number of individuals in a given area ::
a. population : an area where organisms live
b. logistic growth : how populations grow in nature
c. logistic growth curve : exponential rate of growth
d. population size : population density

____ 17. As a population reaches its carrying capacity, there is an increase in competition for
a. food.
b. shelter.
c. mates.
d. All of the above

Population Growth Over Time



____ 18. Refer to the illustration above. Which time period shows exponential growth of the population?
a. period A
b. period B
c. period C
d. period D

____ 19. Refer to the illustration above. During which time period are the birth rate and death rate equal?
a. period A
b. period B
c. period C
d. period D

____ 20. Refer to the illustration above. The rate of growth of a population is represented by r. During which time period will $r = 0$?
a. period A
b. period B
c. period C
d. period D

____ 21. Refer to the illustration above. The time period during which r (the rate of growth of a population) would have a negative value is
a. period A.
b. period B.
c. period C.
d. period D.

____ 22. birth and death rates : constant on exponential growth curve ::
a. birth rates : equal to death rates
b. *r*-strategists : equal to *K*-strategists
c. birth and death rates : not constant on logistic growth curve
d. exponential models : same as logistic models

____ 23. Environments that are unpredictable and rapidly changing tend to support populations of
a. *Q*-strategists.
b. *K*-strategists.
c. *N*-strategists.
d. *r*-strategists.

____ 24. All of the following are true of *r*-strategists *except*
a. early maturation and reproduction.
b. little parental care.
c. few offspring.
d. small offspring.

____ 25. Which of the following are *r*-strategists?
a. redwoods
b. dandelions
c. whales
d. humans

____ 26. Which of the following are *inappropriately* paired?
a. *K*-strategists — reproduce late in life
b. *K*-strategists — minimal parental care
c. *r*-strategists — reproduce early in life
d. *r*-strategists — mature quickly

____ 27. bacteria : *r*-strategists ::
a. gorillas : *K*-strategists
b. insects : *K*-strategists
c. annual plants : *K*-strategists
d. rhinoceroses : *r*-strategists

____ 28. In 1908, Hardy and Weinberg independently demonstrated that
a. *r*- and *K*-strategist populations are actually the same.
b. recessive alleles replace dominant alleles in a population over long periods of time.
c. dominant alleles do not replace recessive alleles in a population.
d. recessive alleles are usually more common than dominant alleles.

____ 29. Actual proportions of homozygotes and heterozygotes can differ from Hardy-Weinberg predictions because of
a. the occurrence of mutations.
b. nonrandom mating among individuals.

c. genetic drift within the population.
d. All of the above

____ 30. The movement of alleles into or out of a population due to migration is called
a. mutation.
b. gene flow.
c. nonrandom mating.
d. natural selection.

____ 31. Inbreeding
a. is a form of random mating.
b. causes mutations to occur.
c. increases the proportion of heterozygotes.
d. increases the proportion of homozygotes.

____ 32. nonrandom mating : increasing proportion of homozygotes ::
a. migration of individuals : gene flow
b. mutation : major change in allele frequencies
c. Hardy-Weinberg equation : natural selection
d. inbreeding : frequency of alleles

____ 33. homozygous : heterozygous ::
a. heterozygous : *Bb*
b. probability : predicting chances
c. dominant : recessive
d. factor : gene

____ 34. Natural selection acts
a. only on heterozygous genotypes.
b. only on recessive alleles.
c. on phenotypes that are expressed.
d. on all mutations.

____ 35. Directional selection tends to eliminate
a. both extremes in a range of phenotypes.
b. one extreme in a range of phenotypes.
c. intermediate phenotypes.
d. None of the above; it causes new phenotypes to form.

____ 36. The range of phenotypes shifts toward one extreme in
a. stabilizing selection.
b. disruptive selection.
c. directional selection.
d. polygenic selection.

Completion
Complete each sentence or statement.

37. A(n) _____ consists of all the individuals of a particular species in a particular place.

38. The statistical study of all populations is called _____.

39. Population density refers to how many _____ are present in a particular location.

40. The way in which members of a population are arranged in a given area is referred to as _____.

41. A population _____ is a hypothetical population that has key characteristics of the real population being studied.

42. The difference between the birth rate and death rate of a population is the _____ _____.

43. The _____ _____ is the population size that can be sustained by an environment.

44. Species that are _____-strategists tend to have periods of exponential growth followed by sudden crashes in population size.

45. Small population sizes and slow population growth are typical of organisms that are _____-strategists.

46. Stable and predictable environments are commonly inhabited by populations of organisms that are _____-strategists.

47. Alternative versions of genes are called _____.

48. The movement of individuals from one population to another is called _____.

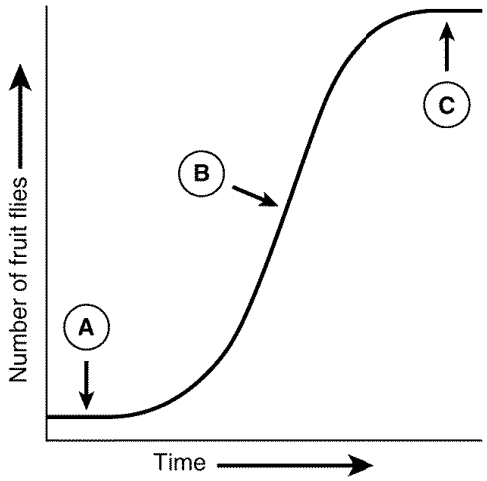
49. Migration results in _____ _____.

50. A characteristic influenced by several genes is called a(n) _____ trait.

51. When the range of phenotypes becomes narrower, increasing the number of individuals with characteristics near the middle of the range, this is called _____ _____.

Essay

The graph below depicts the growth of a population of fruit flies over time.



52. Would a density-dependent limiting factor have a greater impact on the population at point A, B, or C on the curve? Why?

53. Why does the population stop increasing after it reaches the point on the curve labeled C?

54. Name one density-independent limiting factor that could affect this population of fruit flies. Would you expect this limiting factor to have a greater impact on the population at any particular point on the curve, and if so, which one?

55. Contrast exponential growth with logistical growth by completing the chart.

Criteria	**Exponential Population Growth**	**Logistic Population Growth**
Graph of Growth Rate		
Assumptions		
Birth and death Rates		

56. Explain the difference between *r*-strategist and *K*-strategist populations.

57. Distinguish between the two types of natural selection acting on polygenic traits.

2

Answer Section

TRUE/FALSE

1.	ANS:	T	DIF: I	OBJ:	15.1.1
2.	ANS:	F	DIF: I	OBJ:	15.1.1
3.	ANS:	T	DIF: I	OBJ:	15.1.2
4.	ANS:	F	DIF: I	OBJ:	15.1.3
5.	ANS:	F	DIF: I	OBJ:	15.2.1
6.	ANS:	F	DIF: I	OBJ:	15.2.2
7.	ANS:	T	DIF: I	OBJ:	15.2.3
8.	ANS:	F	DIF: I	OBJ:	15.2.3
9.	ANS:	T	DIF: I	OBJ:	15.2.4
10.	ANS:	F	DIF: I	OBJ:	15.2.4

MULTIPLE CHOICE

11.	ANS:	C	DIF: I	OBJ:	15.1.1
12.	ANS:	A	DIF: I	OBJ:	15.1.1
13.	ANS:	B	DIF: II	OBJ:	15.1.1
14.	ANS:	D	DIF: I	OBJ:	15.1.1
15.	ANS:	D	DIF: I	OBJ:	15.1.1
16.	ANS:	B	DIF: III	OBJ:	15.1.1
17.	ANS:	D	DIF: I	OBJ:	15.1.2
18.	ANS:	B	DIF: II	OBJ:	15.1.2
19.	ANS:	C	DIF: II	OBJ:	15.1.2
20.	ANS:	C	DIF: II	OBJ:	15.1.2
21.	ANS:	D	DIF: II	OBJ:	15.1.2
22.	ANS:	C	DIF: II	OBJ:	15.1.2
23.	ANS:	D	DIF: I	OBJ:	15.1.3
24.	ANS:	C	DIF: I	OBJ:	15.1.3
25.	ANS:	B	DIF: I	OBJ:	15.1.3
26.	ANS:	B	DIF: I	OBJ:	15.1.3
27.	ANS:	A	DIF: II	OBJ:	15.1.3
28.	ANS:	C	DIF: II	OBJ:	15.2.1
29.	ANS:	D	DIF: I	OBJ:	15.2.1
30.	ANS:	B	DIF: I	OBJ:	15.2.2
31.	ANS:	D	DIF: I	OBJ:	15.2.2
32.	ANS:	A	DIF: III	OBJ:	15.2.2
33.	ANS:	C	DIF: III	OBJ:	15.2.2
34.	ANS:	C	DIF: I	OBJ:	15.2.3
35.	ANS:	B	DIF: I	OBJ:	15.2.4
36.	ANS:	C	DIF: I	OBJ:	15.2.4

COMPLETION

37. ANS: population

DIF: I OBJ: 15.1.1

38. ANS: demography

DIF: I OBJ: 15.1.1

39. ANS: individuals

DIF: I OBJ: 15.1.1

40. ANS: dispersion

DIF: I OBJ: 15.1.1

41. ANS: model

DIF: I OBJ: 15.1.2

42. ANS: growth rate

DIF: I OBJ: 15.1.2

43. ANS: carrying capacity

DIF: I OBJ: 15.1.2

44. ANS: *r*

DIF: I OBJ: 15.1.3

45. ANS: *K*

DIF: I OBJ: 15.1.3

46. ANS: *K*

DIF: I OBJ: 15.1.3

47. ANS: alleles

DIF: I OBJ: 15.2.1

48. ANS: migration

DIF: I OBJ: 15.2.2

49. ANS: gene flow

DIF: I OBJ: 15.2.2

50. ANS: polygenic

DIF: I OBJ: 15.2.3

51. ANS: stabilizing selection

DIF: II OBJ: 15.2.4

ESSAY

52. ANS:

It would have the greatest impact on the population at point C. This is because point C on the curve indicates the greatest population density. Density-dependent limiting factors impact populations more as they increase in size.

DIF: III OBJ: 15.1.1

53. ANS:

The population has reached the carrying capacity of the ecosystem in which it lives. The ecosystem cannot support any more flies than this number over time.

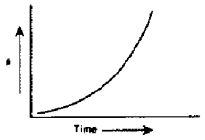
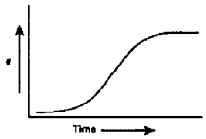
DIF: III OBJ: 15.1.2

54. ANS:

A number of abiotic factors would be suitable answers: temperature extremes (for example, freezing), floods, hurricanes, fires, and volcanic eruptions. Such limiting factors would not be expected to have a greater impact on the population at any particular point on the curve.

DIF: III OBJ: 15.1.2

55. ANS:

Criteria	Exponential Population Growth	Logistic Population Growth
Graph of Growth Rate		
Assumptions	unlimited resources	resources limit population growth; stabilizes at the carrying capacity
Birth and death Rates	constant—rates do not change	vary with population size

DIF: III OBJ: 15.1.2

56. ANS:

These two types of populations differ in their rates of maturation and reproduction, the amount of parental care of offspring, and the type of environments that they inhabit. Species that are *r*-strategists mature quickly, reproduce in large numbers, and invest little energy in care of their offspring. This adapts them for unpredictable, rapidly changing environments. *K*-strategists tend to be larger organisms that mature more gradually and exhibit parental care of a smaller number of offspring. *K*-strategists are found in more stable environments.

DIF: III OBJ: 15.1.3

57. ANS:

Directional selection tends to eliminate individuals in a population that are at one or the other extreme of the range of phenotypes. Stabilizing selection narrows the range of individuals to those in the middle of the range.

DIF: III OBJ: 15.2.4

3- Representing data:

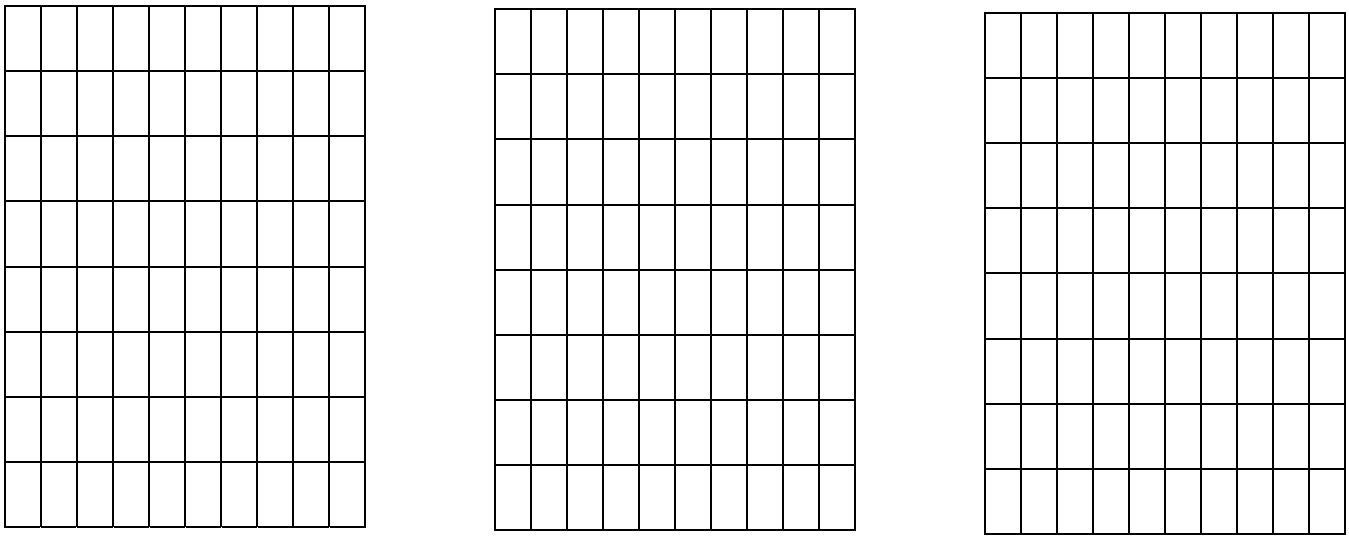
1- Create frequency table and represent it as:

1- Histogram
2- Broken line
3- Curved line

2	4	3	2	4	6	8	4	3
5	9	6	7	7	7	3	4	9
5	9	3	4	7	6	9	9	5
5	6	2	8	6	6	5	3	5
3	5	4	4	4	5	6	7	1
4	2	1	1	1	3	4	5	1
5	3	7	7	7	8	9	1	4
6	4	9	7	6	5	2	1	3

Interval	0-	2-	4-	6-	8-(10)
Frequency					

Interval	0-	2-	4-	6-	8-(10)
Frequency					



2- Create frequency table and represent it as:

1- Histogram
2- Broken line
3- Curved line

12	24	23	12	14	26	28	24	13
15	29	26	27	17	7	23	14	7
25	29	23	24	17	6	29	19	25
15	16	22	28	16	6	5	13	25
23	15	24	14	14	5	6	27	21
14	12	21	11	11	23	4	15	21
15	13	27	17	17	28	29	21	24
26	14	29	17	16	25	22	12	23

3- Create frequency table and represent it as:

1- Histogram
2- Broken line

3- Curved line

32	34	33	32	34	36	38	34	3
35	39	36	37	37	37	33	34	39
35	39	33	34	37	36	39	39	35
35	36	32	38	36	36	35	33	35
33	35	34	34	34	35	36	37	31
34	32	31	31	31	33	34	35	31
35	33	37	37	37	38	39	31	34
36	34	39	37	36	35	32	31	33

4- Create frequency table and represent it as:

1- Histogram
2- Broken line
3- Curved line

folder	Scrapfile	File	Binder	Fdesk	Sandwatch	K.board	Mouse	Modem

Answer the following questions:

1st question: Read the passage below and answer the questions that follow.

Energy from the sun enters an ecosystem when a plant uses sunlight to make sugar molecules by a process called photosynthesis. During photosynthesis, plants, algae, and some bacteria capture solar energy. Solar energy drives a series of chemical reactions that require carbon dioxide and water. The result of photosynthesis is the production of sugar molecules known as carbohydrates. Carbohydrates are energy-rich molecules which organisms use to carry out daily activities. As organisms consume food and use energy from carbohydrates, the energy travels from one organism to another. Plants produce carbohydrates in their leaves. When an animal eats a plant, some energy is transferred from the plant to the animal. Organisms use this energy to move, grow, and reproduce..

1. Plants, algae, and some bacteria capture …… during photosynthesis.

a. solar energy c. carbon dioxide

b. carbohydrates d. organisms

2. The chemical reactions driven by solar energy require

a. carbon dioxide and water. c. organisms and water.

b. plants and algae. d. carbon dioxide and sugar molecules.

3. During photosynthesis, plants make

a. carbohydrates. c. water.

b. carbon dioxide. d. None of the above

4. Where does the production of carbohydrates in a plant take place?

a. in the carbohydrates c. in the ecosystem

b. in the leaves d. in the stems

2nd question: VOCABULARY DEVELOPMENT

Read each question and write the answer in the space provided.

5. Energy-rich molecules that organisms use to carry out daily activities are

……

……

6. The process by which a plant uses sunlight to make sugar molecules is called

……

……

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Sequence the statements below to show the steps in the process of energy production and consumption. Write "1" on the line in front of the first step, "2" on the line in front of the second step, and so on.

7. Photosynthesis produces carbohydrates.
8. Plants, algae, and some bacteria capture solar energy.
9. Energy is transferred from one organism to another.
10. Solar energy drives a series of chemical reactions.
11. Other organisms consume carbohydrates found in plants, algae, and some bacteria.

The Cycling of Materials

Read the passage below and answer the questions that follow.

When we burn fossil fuels, we release carbon into the atmosphere. The carbon returns to the atmosphere as carbon dioxide. Cars, factories, and power plants rely on these fossil fuels to operate. In the year 2000, vehicles were the source of one-third of all carbon dioxide emitted in the United States. All together, about 6 billion metric tons of carbon a year are released into the atmosphere as carbon dioxide. Natural burning of wood or forest fires combined with the burning of fossil fuels make up this 6 billion metric tons. About half of this carbon dioxide remains in the atmosphere, so over a period of years, the amount of carbon dioxide in the atmosphere has steadily increased.

Increased levels of carbon dioxide may contribute to global warming, which is an overall increase in the temperature of the Earth. What happens Lo the carbon dioxide that, is not absorbed by the atmosphere? Scientists estimate that over a billion metric tons of carbon dioxide dissolves into the ocean, which is a carbon sink. Plants probably absorb the remaining carbon dioxide.

3rd question : Read each question and write the answer in the space provided.

1. What do most cars, factories, and power plants rely on to operate?
2. In what form does carbon return to the atmosphere after it is released from the burning of fossil fuels?
3. One-third of the United States' carbon consumption is used to operate what?
4. How many tons of carbon are released into Earth's atmosphere every year?
5. Why does the author mention the United States in the fourth sentence?

VOCABULARY DEVELOPMENT

4th question: In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

6. Global warming

a. is carbon dioxide that dissolves into the ocean.

b. is an overall increase in the temperature of Earth.

c. is caused by natural burning of wood and forest fires.

d. makes up half of Earth's atmosphere.

7. Which of the following statements is true about fossil fuels, carbon, and carbon dioxide?

a. Carbon dioxide returns to the atmosphere as carbon when fossil fuels are burned.

b. Fossil fuels return to the atmosphere as carbon dioxide when carbon is burned.

c. Carbon returns to the atmosphere as carbon dioxide when fossil fuels are burned.

d. none of the above

RECOGNIZING CAUSE AND EFFECT

5th question: Read each question and write the answer in the space provided.

8. What three things cause carbon to be released into the atmosphere as carbon dioxide?

9. What is one effect of increased levels of carbon dioxide in the atmosphere?

How Ecosystems Change

Read the passage below and answer the questions that follow.

Another example of secondary succession is old-field succession, which occurs when farmland is abandoned. When a farmer stops cultivating a field, grasses and weeds quickly grow and cover the abandoned land. The pioneer grasses and weeds grow rapidly and produce many seeds to cover large areas.

Then, over time, taller plants such as perennial grasses grow in the area. These plants shade the ground, which keeps light from the shorter pioneer plants. The long roots of the taller plants also absorb most of the water in the soil and deprive the pioneer plants of adequate water to survive. The pioneer plants soon die from lack of sunlight, and water. As succession continues, the taller plants are deprived of light and water by growing trees. Finally, slower-growing trees such as oaks, hickories, beeches, and maples take over the area and block out the sunlight to the smaller trees. After about a century, the land can return to the climax community that existed before the farmers cleared it to plant crops.

6th question: Read each question and write the answer in the space provided.

1. What type of succession is old-field succession?

2. Summarize what happens to a field when a fanner stops cultivating it.
3. What key terms are used in this passage?
4. Define the terms you identified in the previous question.

SEQUENCING INFORMATION

7th question: Sequence the statements below to show the steps in old-field succession. Write "1" on the line in front of the first step, "2" on the line in front of the second step, and so on.

5. Taller plants grow in the area and shade the ground.

6. A climax community exists.

7. Pioneer grasses and weeds grow and produce many seeds.

8. A farmer stops cultivating a field.

9. Trees grow and shade the taller plants.

10. The taller plants die.

11. The pioneer plants die.

12. Slower-growing trees shade the smaller trees.

RECOGNIZING CAUSE AND EFFECT

8th question : Read each question and write the answer in the space provided.

13. What causes pioneer grasses and weeds that have grown in an abandoned field to die?

14. What happens after a farmer abandons a field and the stages of old-field succession take place?

ANALOGIES

9th question Mark the letter of the pair of terms that best completes the analogy shown. An analogy is a relationship between two pairs of words or phrases written as a : b :: c : d. The symbol : is read "is to," and the symbol :: is read "as."

1. Producer: consumer::

a. car: driver
b. factory : shopper
c. deer: wolf

d. photosynthesis: decomposition

2. Herbivores: omnivores::

a. photosynthesis: respiration
b. elephant: ocean
c. fruit: bird
d. deer: bear

3. Carbon dioxide: carbon cycle ::

a. fertilizer : phosphorus cycle
b. atmospheric nitrogen : nitrogen cycle
c. decomposers : carbon cycle
d. limestone : carbon cycle

4. Deep ocean: hydrogen sulfide::

a. sunlight: deep ocean
b. darkness: sunlight
c. surface : carbon dioxide
d. photosynthesis: sunlight

5. oxygen : cellular respiration ::

a. cup: saucer
b. carbon dioxide : photosynthesis
c. plants: adaptation
d. needle : thread

6. Climax forest: clear-cut forest::

a. plants: animals
b. food web : food chain
c. sun : fire
d. full: empty

INTERPRETING OBSERVATIONS

10th question: Read the following passage, and then answer the questions below.

Your family is considering buying a house near a nature preserve that has been established to maintain a portion of the original ecosystem. You attend a meeting in which the developer is explaining the plans for the project. One woman in the audience complains that she does not like the natural prairie grasses on the nature preserve. She wants the grasses removed and replanted with an imported grass. A man in the audience suggests that exotic animals on the preserve would make it more beautiful. One woman proposes that the developer construct a playground in the center of the preserve and build a paved road to it she wants picnic tables set up throughout the preserve for family picnics.

7. What would be your response to the woman who wants to replace the native grasses?

……
……

8. What would be your response to the man who wants exotic animals placed on the site?

……
……

9. What would be your response to the woman who wants to put a playground on the site?

……
……

AGREE OR DISAGREE

11th question: Agree or disagree with the following statements, and support your answer.

10. There would be no life on Earth without the sun.

11. Our activities do not affect the carbon cycle.

12. A severe drought in a grassland will reduce the number of consumers in the entire energy pyramid.

REFINING CONCEPTS

12th question: The statements below challenge you to refine your understanding of concepts covered in the chapter. Think carefully, and answer the questions that follow.

13. Explain why the difference between primary and secondary succession is not always clear.

14. Explain what you think would happen to the phosphorus, carbon, and nitrogen cycles if the sun were to burn out.

15. Energy pyramids are useful for describing the energy losses in a food chain. Describe an energy pyramid for a group of organisms in your area.

16. Explain the importance of lichens to primary succession.

17. Explain how a clover is part of the carbon, nitrogen, and phosphorus cycles.

A. photosynthesis
B. rabbit and coyote
C. fossil fuels
D. producers
E. food Web
F. consumers
G. atmospheric CO2
H. energy pyramid
I. algal bloom
J. atmospheric N2
K. food chain
L. old-field succession
M. nitrogen-fixing bacteria

13th question : MATCHING

In the space provided, write the letter of the term or phrase that best matches the description.

l. Two types of consumers ----

2. A diagram showing the many feeding relationships that are in an ecosystem -----

3. The process in which energy from the sun is used by plants to make sugar molecules ------

4. Illustrates the loss 01 energy from one trophic level to the next --

5. Organisms that get their energy by eating other organisms --------

6. Stored carbon from the remains of plants and animals that died millions of years ago ---------

7. Organisms that make their own food ---------

8. Change that occurs on an abandoned farm ---------

9. A part of the carbon cycle ----------

10. Results from excessive use of fertilizers ---------

11. Organisms that transform atmospheric nitrogen into usable nitrogen compounds ----------

12. Part, of the nitrogen cycle ----------

13. Transfer of energy from one organism to another ---------

14th question :M C Q :

14. What are the first organisms to colonize any newly available area called?

a. climax species
b. ferns
c. pioneer species
d. mosses

.15. Which of the following is a producer that breaks down rock?

a. pioneer producer
b. fungal species
c. algae
d. lichen

16. Humans are affecting the balance of the carbon cycle by

a. burning fossil fuels.
b. using carbonates at an
alarming rate,
c. using fertilizers.
d. replanting the rain
forests.

. 17. What is a pattern of change that occurs on a surface where an ecosystem has previously existed?

a. primary succession
b. secondary succession
c. tertiary succession
d. climax community

18. What do deep-ocean bacteria use to make their food?

a. the sun
b. hydrogen sulfide
c. carbon dioxide
d. sugar molecules

19. Which of the following is an herbivore?

a. cow
b. lion
c. bear
d. grass

20. Which of the following is a producer?

a. oak tree
b. raccoon
c. cockroach
d. human

21. Which of the following is a process in the cell whereby glucose and oxygen produce carbon dioxide, water, and energy?

a. photosynthesis
b. cellular respiration
c. synthesis
d. decomposition

22. Which of the following organisms would be found at the top of an energy pyramid?

a. alga
b. krill
c. leopard seal
d. killer whale

23. Humans usually get the phosphorus that their bodies need from

a. eating plants and annuals
that contain phosphorus.
b. mining.
c. food additives.
d. drinking water.

15th question :ANALOGIES

Mark the letter of the pair of terms that best completes the analogy shown. An analogy is a relationship between two pairs of words or phrases written as a : b :: c : d. The symbol : is read "is to," and the symbol :: is read "as."

1. Producer: consumer::

a. car: driver
b. factory : shopper
c. deer: wolf
d. photosynthesis: decomposition

2. Herbivores: omnivores::

a. photosynthesis: respiration
b. elephant: ocean
c. fruit: bird
d. deer: bear

3. Carbon dioxide: carbon cycle ::

a. fertilizer : phosphorus cycle
b. atmospheric nitrogen : nitrogen cycle
c. decomposers : carbon cycle
d. limestone : carbon cycle

4. Deep ocean: hydrogen sulfide::

a. sunlight: deep ocean
b. darkness: sunlight
c. surface : carbon dioxide
d. photosynthesis: sunlight

5. Oxygen: cellular respiration ::

a. cup: saucer
b. carbon dioxide : photosynthesis
c. plants: adaptation
d. needle : thread

6. Climax forest: clear-cut forest::

a. plants: animals
b. food web : food chain
c. sun : fire
d. full: empty

16th question : INTERPRETING OBSERVATIONS

Read the following passage, and then answer the questions below.

Your family is considering buying a house near a nature preserve that has been established to maintain a portion of the original ecosystem. You attend a meeting in which the developer is explaining the plans for the project. One woman in the audience complains that she does not like the natural prairie grasses on the nature preserve. She wants the grasses removed and replanted with an imported grass. A man in the audience suggests that exotic animals on the preserve would make it more beautiful. One woman proposes that the developer construct a playground in the center of the preserve and build a paved road to it she wants picnic tables set up throughout the preserve for family picnics.

7. What would be your response to the woman who wants to replace the native grasses?

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8. What would be your response to the man who wants exotic animals placed on the site?

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Extra credit question:

Communities and Biomes

WORD LIST				
APHOTICZONE		AQUATICBIOMES		BIOME
CLIMAXCOMMUNITY		COMMUNITY		DESERT
ESTUARY		FRESHWATERBIOME		GRASSLAND
INTERTIDALZONE		LIMITINGFACTOR		MARINEBIOMES
PERMAFROST		PLANKTON		PRIMARYSUCCESSION
TEMPERATEFOREST		TROPICALRAINFOREST		TAIGA

TUNDRA				

Best Luck and always remember to do your best to be the bes.

For more details mr_ayman@yahoo.com

MATCHING

In the space provided, write the letter of the term or phrase that best matches the description.

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b. elephant: ocean

c. fruit: bird

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a. fertilizer : phosphorus cycle

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a. sunlight: deep ocean

b. darkness: sunlight

c. surface : carbon dioxide

d. photosynthesis: sunlight

5. oxygen : cellular respiration ::

a. cup: saucer

b. carbon dioxide : photosynthesis

c. plants: adaptation

d. needle : thread

6. climax forest: clear-cut forest::

a. plants: animals

b. food web : food chain

c. sun : fire

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INTERPRETING OBSERVATIONS

Read the following passage, and then answer the questions below.

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8. What would be your response to the man who wants exotic animals placed on the site?

……
……

9. What would be your response to the woman who wants to put a playground on the site?

……
……
……
……

AGREE OR DISAGREE

Agree or disagree with the following statements, and support your answer.

10. There would be no life on Earth without the sun.

11. Our activities do not affect the carbon cycle.

12. A severe drought in a grassland will reduce the number of consumers in the entire energy pyramid.

REFINING CONCEPTS

The statements below challenge you to refine your understanding of concepts covered in the chapter. Think carefully, and answer the questions that follow.

13. Explain why the difference between primary and secondary succession is not always clear.

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16. Explain the importance of lichens to primary succession.

17. Explain how a clover is part of the carbon, nitrogen, and phosphorus cycles.

Energy Flow in Ecosystems

Read the passage below and answer the questions that follow.

Energy from the sun enters an ecosystem when a plant uses sunlight to make sugar molecules by a process called *photosynthesis.* During photosynthesis, plants, algae, and some bacteria capture solar energy. Solar

energy drives a series of chemical reactions that require carbon dioxide and water. The result of photosynthesis is the production of sugar molecules known as *carbohydrates.* Carbohydrates are energy-rich molecules which organisms use to carry out daily activities. As organisms consume food and use energy from carbohydrates, the energy travels from one organism to another. Plants produce carbohydrates in their leaves. When an animal eats a plant, some energy is transferred from the plant to the animal. Organisms use this energy to move, grow, and reproduce.

IDENTIFYING MAIN IDEAS

One reading skill is the ability to identify the main idea of a passage. The main idea is the main focus or key idea. Frequently a main idea is accompanied by supporting information that offers detailed facts about main ideas.

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

1. Plants, algae, and some bacteria capture …… during photosynthesis.

a. solar energy c. carbon dioxide

b. carbohydrates d. organisms

2. The chemical reactions driven by solar energy require

a. carbon dioxide and water. c. organisms and water.

b. plants and algae. d. carbon dioxide and sugar molecules.

3. During photosynthesis, plants make

a. carbohydrates. c. water.

b. carbon dioxide. d. None of the above

4. Where does the production of carbohydrates in a plant take place?

a. in the carbohydrates c. in the ecosystem

b. in the leaves d. in the stems

VOCABULARY DEVELOPMENT

Read each question and write the answer in the space provided.

5. Energy-rich molecules that organisms use to carry out daily activities are

6. The process by which a plant uses sunlight to make sugar molecules is called

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Sequence the statements below to show the steps in the process of energy production and consumption. Write "1" on the line in front of the first step, "2" on the line in front of the second step, and so on.

7. Photosynthesis produces carbohydrates.

8. Plants, algae, and some bacteria capture solar energy.

9. Energy is transferred from one organism to another.

10. Solar energy drives a series of chemical reactions.

11. Other organisms consume carbohydrates found in plants, algae, and some bacteria.

The Cycling of Materials

Read the passage below and answer the questions that follow.

When we burn fossil fuels, we release carbon into the atmosphere. The carbon returns to the atmosphere as carbon dioxide. Cars, factories, and power plants rely on these fossil fuels to operate. In the year 2000, vehicles were the source of one-third of all carbon dioxide emitted in the United States. All together, about 6 billion metric tons of carbon a year are released into the atmosphere as carbon dioxide. Natural burning of wood or forest fires combined with the burning of fossil fuels make up this 6 billion metric tons. About half of this carbon dioxide remains in the atmosphere, so over a period of years, the amount of carbon dioxide in the atmosphere has steadily increased.

Increased levels of carbon dioxide may contribute to global warming, which is an overall increase in the temperature of the Earth. What happens Lo the carbon dioxide that, is not absorbed by the atmosphere? Scientists estimate that over a billion metric tons of carbon dioxide dissolves into the ocean, which is a carbon sink. Plants probably absorb the remaining carbon dioxide.

IDENTIFYING MAIN IDEAS

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panied by supporting information that offers detailed facts about main ideas.

Read each question and write the answer in the space provided.

1. What do most cars, factories, and power plants rely on to operate?

2. In what form does carbon return to the atmosphere after it is released from the burning of fossil fuels?

3. One-third of the United States' carbon consumption is used to operate what?

4. How many tons of carbon are released into Earth's atmosphere every year?

5. Why does the author mention the United States in the fourth sentence?

VOCABULARY DEVELOPMENT

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

6. Global warming

a. is carbon dioxide that dissolves into the ocean.

b. is an overall increase in the temperature of Earth.

c. is caused by natural burning of wood and forest fires.

d. makes up half of Earth's atmosphere.

7. Which of the following statements is true about fossil fuels, carbon, and carbon dioxide?

a. Carbon dioxide returns to the atmosphere as carbon when fossil fuels are burned.

b. Fossil fuels return to the atmosphere as carbon dioxide when carbon is burned.

c. Carbon returns to the atmosphere as carbon dioxide when fossil fuels are burned.

d. none of the above

RECOGNIZING CAUSE AND EFFECT

Read each question and write the answer in the space provided.

8. What three things cause carbon to be released into the atmosphere as carbon dioxide?

9. What is one effect of increased levels of carbon dioxide in the atmosphere?

Section: How Ecosystems Change

Read the passage below and answer the questions that follow.

Another example of secondary succession is *old-field succession,* which occurs when farmland is abandoned. When a farmer stops cultivating a field, grasses and weeds quickly grow and cover the abandoned land. The pioneer grasses and weeds grow rapidly and produce many seeds to cover large areas.

Then, over time, taller plants such as perennial grasses grow in the area. These plants shade the ground, which keeps light from the shorter pioneer plants. The long roots of the taller plants also absorb most of the water in the soil and deprive the pioneer plants of adequate water to survive. The pioneer plants soon die from lack of sunlight, and water. As succession continues, the taller plants are deprived of light and water by growing trees. Finally, slower-growing trees such as oaks, hickories, beeches, and maples take over the area and block out the sunlight to the smaller trees. After about a century, the land can return to the climax community that existed before the farmers cleared it to plant crops.

IDENTIFYING MAIN IDEAS

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Read each question and write the answer in the space provided.

1. What type of succession is old-field succession?

2. Summarize what happens to a field when a fanner stops cultivating it.

VOCABULARY DEVELOPMENT

Read each question and write the answer in the space provided.

3. What key terms are used in this passage?

4. Define the terms you identified in the previous question.

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Sequence the statements below to show the steps in old-field succession. Write "1" on the line in front of the first step, *"2"* on the line in front of the second step, and so on.

5. Taller plants grow in the area and shade the ground.

6. A climax community exists.

7. Pioneer grasses and weeds grow and produce many seeds.

8. A farmer stops cultivating a field.

9. Trees grow and shade the taller plants.

10. The taller plants die.

11. The pioneer plants die.

12. Slower-growing trees shade the smaller trees.

RECOGNIZING CAUSE AND EFFECT

Read each question and write the answer in the space provided.

15. What causes pioneer grasses and weeds that have grown in an abandoned field to die?

16. What happens after a farmer abandons a field and the stages of old-field succession take place?

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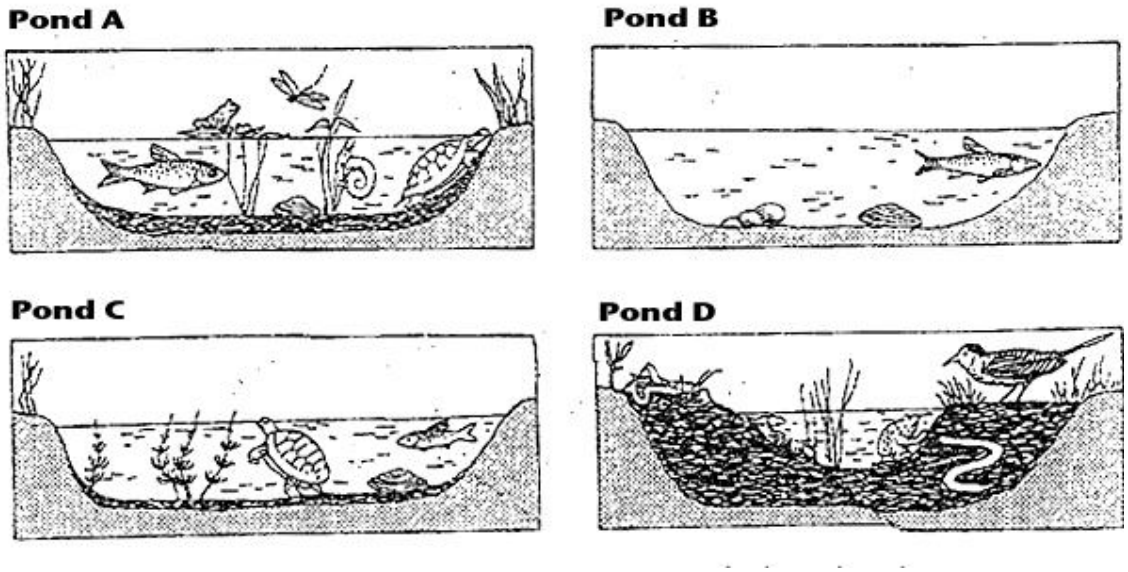
Succession, a series of environmental changes, occurs in all ecosystems. The stages that any ecosystem passes through are predictable. In this activity, you will place the stages of succession of two ecosystems into sequence. You will also describe changes in an ecosystem and make predictions about changes that will take place from one stage of succession to another.

The evolution of a body of water from a lake to a marsh can last for thousands of years. The process cannot be observed directly. Instead, a method can be used to find the links of stages and then to put them together to develop a complete story.

The water level of Lake Michigan was once 18 meters higher than it is today. As the water level fell, land was exposed. Many small lakes or ponds were left behind where there were depressions in the land. Below are illustrations and descriptions of four ponds as they exist today. Use the illustrations and descriptions to answer the questions about the ponds.



Pond A: Cattails, bulrushes, and water lilies grow in the pond. These plants have their roots in the bottom of the pond, but they can reach above the surface of the water. This pond is an ideal habitat for the animals that must climb to the surface for oxygen. Aquatic insect larvae are abundant. They serve as food for larger insects, which in turn are food for crayfish, frogs, salamanders, and turtles.

Pond B: Plankton growth is rich enough to support animals that entered when the pond was connected to the lake. Fish make nests on the sandy bottom. Mussels crawl over the bottom.

Pond C: Decayed bodies of plants and animals form a layer of humus over the bottom of the pond. Chara, a branching green algae, covers the humus. Fish that build nests on the bare bottom have been replaced by those that lay their eggs on the Chara.

Pond D: The pond is so filled with vegetation that there are no longer any large areas of open water. Instead, the pond is filled with grasses. The water dries up during the summer months.

Questions

1. Write the letters of the ponds in order from the youngest, to the oldest.

2. Black bass and bluegill make their nests on sandy bottoms. In which pond would you find them?

3. What will happen to the black bass and blue gill as the floor of the ponds fills with organic debris?

4. Golden shiner and mud minnows lay their eggs on Chara. In which pond would you find them?

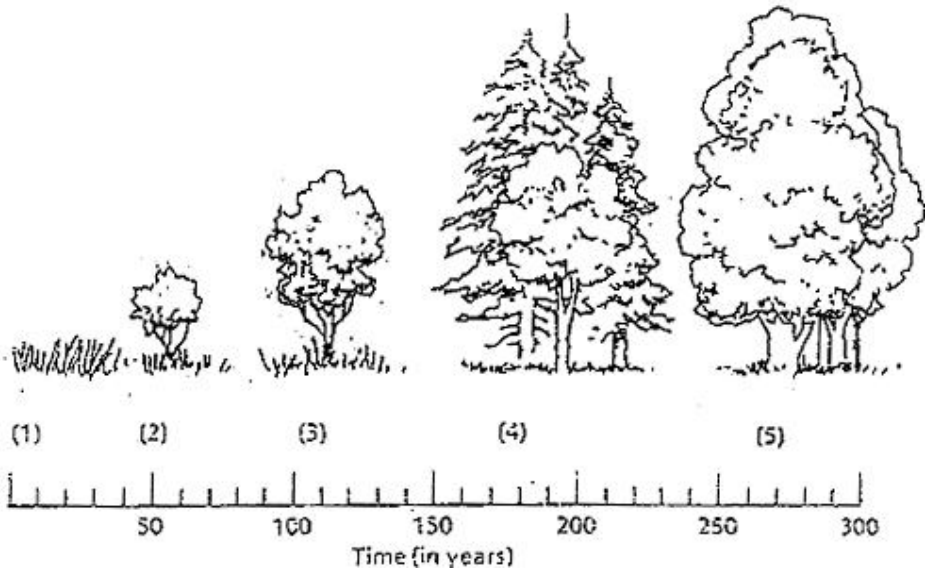
5. Some amphibians and crayfish can withstand periods of dryness by burying themselves in mud. In which pond(s) would they survive?

6. Dragonfly nymphs spend their early stages clinging to submerged plants. Then, they climb to the surface, shed their skins and fly away as dragonflies. Which pond is best suited for dragonflies?

7. In which pond will gill breathing snails be replaced by lung breathing snails that climb to the surface to breathe?

8. Some mussels require a sandy bottom in order to maintain an upright position. In which pond will they die out.

The climax community in the area of Michigan is a beech-maple forest. After the ponds are filled in, the area will undergo another series of stages of succession. This is illustrated below. Briefly explain what is happening in the diagram.



1. _____
_____

2. _____
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3. _____
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4. _____
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5. _____
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