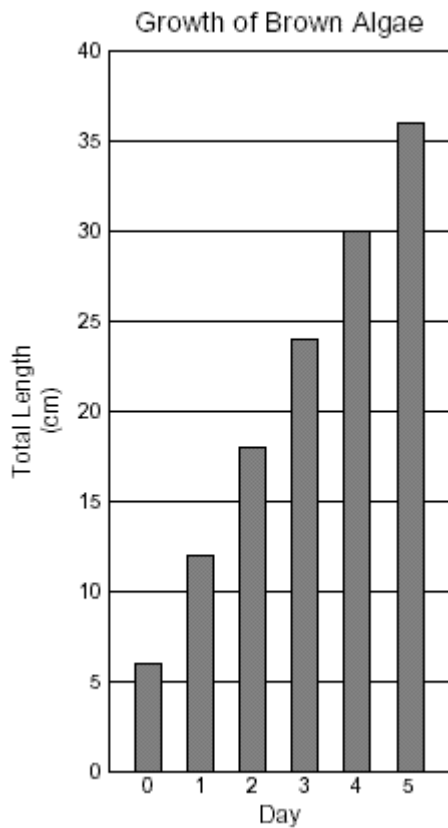


# BIOLOGY COMPETENCY EXAM REVIEW QUESTIONS

## SCIENTIFIC METHOD

1. To observe a skin cell through a microscope at its highest magnification, you should first
- A use the coarse adjustment and the lowest power lens to focus, then switch to the highest power lens
  - B use the highest magnification and the fine adjustment until the object is in focus
  - C use the fine adjustment and lowest power lens to focus the object, then switch to the highest power lens
  - D use the highest power and the coarse adjustment until the object is in focus

2.



According to these data, what is the average growth rate for this type of brown algae?

- A. 6 cm/day
- B. 7 cm/day
- C. 8 cm/day
- D. 9 cm/day

3. A scientist is testing the efficiency of various microwaves by measuring the temperature of water after being heated at high power for one minute. The temperature measured in this test is an example of

- A a controlled variable
- B an independent variable
- C qualitative data
- D quantitative data

4. A biologist is using a microscope to observe a very small organism with the low-power 10X lens. If the biologist switches to the 40X lens, how will the appearance of this organism change?

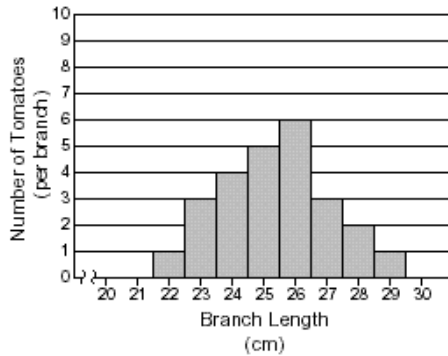
- A It will appear 4 times larger.
- B It will appear 40 times larger.
- C It will appear 50 times larger.
- D It will appear 400 times larger.

5.

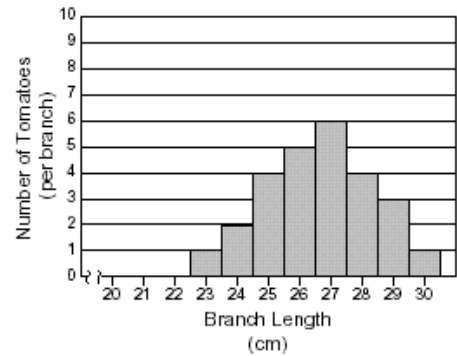
Does the Length of a Tomato Plant Branch Affect Productivity?

The chart to the left shows the number of tomatoes produced by branches of different lengths. Which of the graphs below best represents these data?

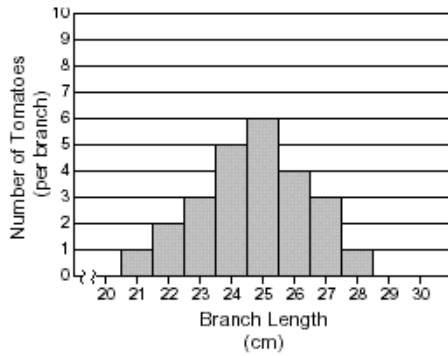
Branch Length (cm)	Number of Tomatoes (per branch)
22	1
23	2
24	3
25	5
26	6
27	4
28	3
29	1



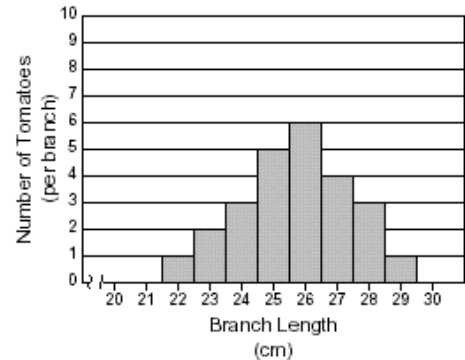
A.



B.



C.



D.

6.

Sunflower Blossoms in a Meadow

Day	Time	Closed Buds (%)	Open Blossoms (%)
1	6:00 A.M.	100	0
	12:00 NOON	85	15
	6:00 P.M.	70	30
2	6:00 A.M.	55	45
	12:00 NOON	40	60
	6:00 P.M.	25	??

The chart shows the periodic increases in the percent of open sunflower blossoms found in a meadow. If this trend continues, what percent of the sunflowers will have open blossoms by 6:00 P.M. on the second day?

- A. 70%      B. 75%      C. 85%      D. 90%

**Q**

Nutrition Facts	
Serving Size 1 package	
Servings Per Container 1	
Amount Per Serving	
Calories 60	Calories from Fat 18
% Daily Value	
Total Fat 2g	3*
Saturated Fat 1.5g	7*
Cholesterol less than 30mg	10*
Sodium 750mg	31*
Total Carbohydrate 9g	3*
Dietary Fiber 1g	4*
Sugars 1g	
Protein 2g	
Vitamin A 2%	Vitamin C 0%
Calcium 4%	Iron 2%

**S**

Nutrition Facts	
Serving Size 1 package	
Servings Per Container 1	
Amount Per Serving	
Calories 140	Calories from Fat 60
% Daily Value	
Total Fat 7g	11%
Saturated Fat 1.5g	7%
Cholesterol 5mg	2%
Sodium 170mg	7%
Total Carbohydrate 18g	6%
Dietary Fiber 1g	4%
Sugars less than 1g	
Protein 2g	
Vitamin A 0%	Vitamin C 0%
Calcium 2%	Iron 2%

**R**

Nutrition Facts	
Serving Size 1 package	
Servings Per Container 1	
Amount Per Serving	
Calories 150	Calories from Fat 90
% Daily Value	
Total Fat 10g	16*
Saturated Fat 2.5g	14*
Cholesterol 30mg	10*
Sodium 120mg	5*
Total Carbohydrate 15g	5*
Dietary Fiber less than 1g	4*
Sugars 0g	
Protein 2g	
Vitamin A 0%	Vitamin C 10%
Calcium 2%	Iron 2%

**T**

Nutrition Facts	
Serving Size 1 package	
Servings Per Container 1	
Amount Per Serving	
Calories 150	Calories from Fat 81
% Daily Value	
Total Fat 9g	14%
Saturated Fat 2.5g	13%
Cholesterol 2mg	1%
Sodium 24mg	1%
Total Carbohydrate 16g	5%
Dietary Fiber 0g	0%
Sugars 1g	
Protein 2g	
Vitamin A 0%	Vitamin C 0%
Calcium 2%	Iron 0%

7.

People with heart conditions are often required to limit their salt intake. According to these labels, which food should a person on a low-salt diet choose?

- A. Q
- B. R
- C. S
- D. T**

8. A student wants to determine the effect of a certain brand of liquid fertilizer on the growth of ivy. Ivy plants of the same length are planted in the same amount of soil in three identical containers. To one container, 5 mL of the fertilizer is added; in the second container, 10 mL of the fertilizer is added; and in the third container no fertilizer is added. The containers are placed in front of the same window. The length of the ivy is measured every five days, and the observations are recorded in a data table. What was the independent variable in this experiment?

- A. The amount of fertilizer added**
- B. The amount of growth measured
- C. The type of plant used
- D. The type of container used

9.

According to this information, the sex of developing sea turtles is determined by

- A. clutch size
- B. incubation temperature**
- C. available seawater
- D. sand composition

Determining Sex in Developing Sea Turtles						
Turtle Group	Clutch Size	Incubation Temperature (°C)	Available Seawater (mL)	Sand Composition	Hatching Results	
					Male (%)	Female (%)
P	100	27	1000	Quartz	0	100
Q	100	27	1000	Feldspar	0	100
R	100	29	1000	Quartz	46	54
S	100	29	1000	Feldspar	43	57
T	100	31	1000	Quartz	54	46
W	100	31	1000	Feldspar	57	43
X	100	33	1000	Quartz	100	0
Y	100	33	1000	Feldspar	100	0

**Respiration Rate of a Growing Yeast Culture**

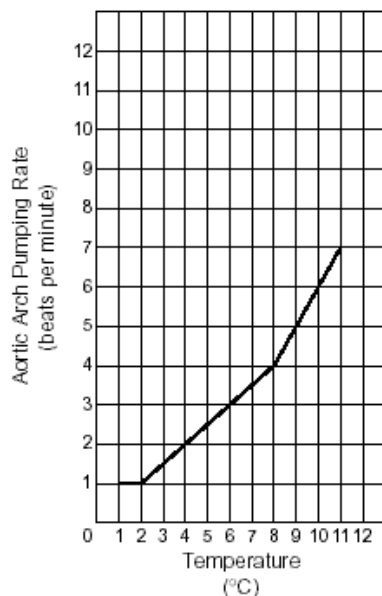
Time (min)	Number of Bubbles per Minute
0	0
1	7
2	10
3	14
4	19
5	24
6	31
7	39
8	48
9	58
10	??

10.

The chart shows the results of growing a yeast culture in a 10% fructose solution. The number of bubbles produced each minute was used as an indication of the yeast respiration rate. If all other factors remain constant, after 10 minutes the respiration rate will most likely be

- A. 61 bubbles per minute
- B. 64 bubbles per minute
- C. 69 bubbles per minute
- D. 78 bubbles per minute

The Effects of Environmental Temperature on the Pumping Rate of an Earthworm's Aortic Arches



11.

The graph shows the relationship between environmental temperature and the pumping rate of an earthworm's aortic arches. If this trend continues, what will most likely be the earthworm's pumping rate at an environmental temperature of 12°C?

- A. 7 beats per minute
- B. 8 beats per minute
- C. 9 beats per minute
- D. 10 beats per minute

12. Adam experiments with anole lizards that can change color, depending on their environment. Adam places a green anole lizard on a brown background and a brown anole lizard on a green background. Adam knows that the brown lizard should turn green and the green lizard should turn brown, but neither of the lizards changed color. What may have caused Adam's results?

- A Their color changing may be affected by something else besides the background color, such as fear or temperature.
- B They may have to move to the new background on their own rather than being placed there.
- C They may need more time in which to change color.
- D The colors of the background may not have been appropriate for these lizards.

## CHEMISTRY

13. Sodium chloride (table salt) is an example of

- A an element
- B a radioactive isotope
- C a chemical compound
- D a chemical formula

14. Which of these molecules are used to store energy in living things?

- A carbohydrates and lipids
- B carbohydrates and proteins
- C lipids and proteins
- D lipids and nucleic acids

15. Which statement explains what happens when two atoms form a chemical bond?

- A The atoms fit together like a lock and key.
- B The atoms combine into a new, larger atom.
- C The atoms share or transfer electrons.
- D The atoms have like charges that stick together.

16.

What percent of this fertilizer has compounds containing potassium (K)?

- A. 0.2%
- B. 4.0%
- C. 6.0%
- D. 10.0%

<b>Texas Bright</b>		<b>Lawn Fertilizer</b>	
		<b>10-4-6</b>	
Guaranteed Analysis			
Total Nitrogen (N)	.....	10.0%	
Water-insoluble nitrogen	.....	1.6%	
Nitrogen from ammonia	.....	3.1%	
Nitrogen from urea	.....	5.5%	
Available Phosphoric Acid (H <sub>3</sub> PO <sub>4</sub> )	.....	4.0%	
Soluble Potash (K <sub>2</sub> CO <sub>3</sub> )	.....	6.0%	
Iron (Fe)	.....	0.2%	

17. Water (H<sub>2</sub>O) is an example of a molecule whose atoms are held together by which of the following?

- A covalent bonds
- B ionic bonds
- C metallic bonds
- D hydrogen bonds

18. What is the main inorganic solvent in cells?

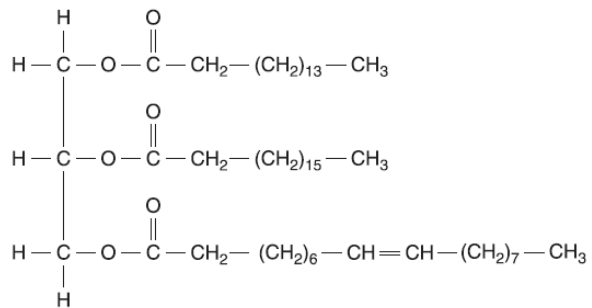
- A alcohol
- B carbon
- C salt
- D water**

19. Individuals who lack lactase are unable to break down the sugar lactose. Which term best describes lactase?

- A. enzyme**
- B. fatty acid
- C. lipid
- D. starch

20. The diagram right represents a fat molecule  
A fat molecule belongs to which category of organic molecules?

- A. proteins
- B. lipids**
- C. nucleic acids
- D. carbohydrates



21. Lemurs' bodies are adapted to efficiently store energy for times when food is scarce. This adaptation may help to explain how lemur ancestors survived the trip across the Mozambique Channel from mainland Africa to Madagascar. Which of the following types of molecules are primarily used for long term energy storage in the lemur?

- A. Lipids**
- B. Monosaccharides
- C. Nucleic acids
- D. Proteins

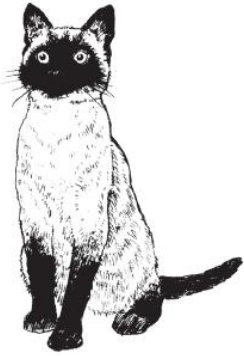
22. Which of the following best explains why enzymes are necessary for many cellular reactions?

- A. Enzymes supply the oxygen necessary for the reactions.
- B. Enzymes change reactants from solid to liquid during the reactions.
- C. The reactions take up too much space in the cell if enzymes are missing.
- D. The reactions are too slow to meet the needs of the cell if enzymes are missing.**

24. Athletes are often concerned with the question of how much protein they need in their diets because of the requirement of growing muscles for protein. Just as muscles need the basic building block of protein, protein itself has basic building blocks also. Which of the following are the basic building blocks of protein?

- A nitrates
- B amino acids**
- C monosaccharides
- D nucleotides

25. The illustration below shows a Siamese cat.



In Siamese cats, an enzyme determines the color of the fur. On the cooler places of the body, the enzyme causes darker fur. On the warmer parts of the body, the enzyme does not function. Which of the following statements best explains how temperature affects this enzyme?

- A. Cooler temperatures denature the enzyme.
- B. Cooler temperatures cause more enzyme production.
- C. The enzyme is active in a specific temperature range.
- D. Heat allows the enzyme to break down white pigment.

## CELLS AND CELL TRANSPORT

26. Homeostasis is the maintenance of stable conditions within the body. Which of the following is a method of maintaining homeostasis in the human body?

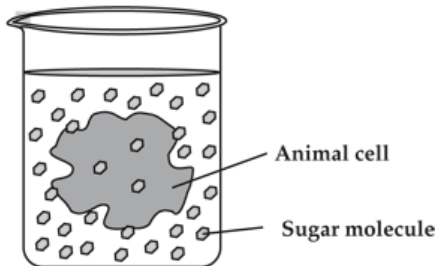
- A working in air conditioning
- B shivering when cold
- C eating balanced meals
- D sleeping regularly

27. The assembly of proteins in a cell takes place in the

- A nucleus
- B vacuoles
- C cytoplasm
- D mitochondria

28. The diagram below shows an animal cell in a beaker containing a solution of sugar and water. The cell membrane is permeable only to water.

ANIMAL CELL IN SUGAR AND WATER SOLUTION



Which statement describes the relationship between the animal cell and the contents of the beaker? (next page)

- A. There is a higher concentration of water inside the cell than outside the cell.
- B. There is a higher concentration of sugar inside the cell than outside the cell.
- C. There is an equal concentration of water inside the cell as outside the cell.
- D. There is an equal concentration of sugar inside the cell as outside the cell.

**29. Which of the following examples illustrates osmosis?**

- A** Water leaves the tubules of the kidney in response to the hypertonic fluid surrounding the tubules.
- B Digestive enzymes are excreted into the small intestine.
- C White blood cells consume pathogens and cell debris at the site of an infection.
- D Calcium is pumped inside a muscle cell after the muscle completes its contraction.

**30. Which of the following “organisms” is considered to be an exception to the cell theory?**

- A bacteria
- B** viruses
- C amoeba
- D yeast

**31. If placed in a hypertonic solution, a plant cell will**

- A swell
- B burst
- C** shrink in size
- D remain constant in size

**32. Unlike prokaryotic cells, eukaryotic cells have the capacity to**

- A** assemble into multicellular organisms
- B establish symbiotic relationships with other organisms
- C obtain energy from the Sun
- D store genetic information in the form of DNA

**33. If an animal cell is placed in distilled water, it will swell and burst. The bursting of the cell is a result of which biological process?**

- A. active transport
- B. enzyme activity
- C. osmosis**
- D. respiration

**34. Placing wilted lettuce in cold water will make it crisp again. Which statement best describes what happens to restore the lettuce to its original condition?**

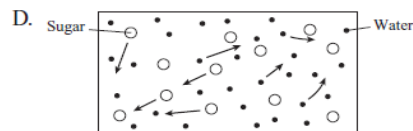
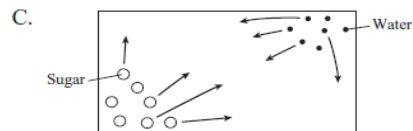
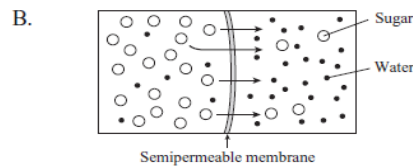
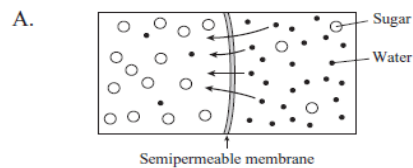
- A. water left the lettuce cells by diffusion
- B. water entered the cells of the lettuce by osmosis**
- C. osmosis caused salts to enter the lettuce cells
- D. salt in the leaf caused water to leave the cells

**35. A student is making a model to demonstrate how cells respond to solutions with varying concentrations of salt and water. She soaked a kidney bean in distilled water until it started to swell. For the demonstration, she wants to put the swollen bean in a solution that would cause the bean to shrivel. In what kind of solution should she put the swollen bean?**

- A acidic
- B basic
- C** hypertonic
- D hypotonic



36. Which of the diagrams below best represents the net movement of molecules in osmosis? **A**



37. Frog experiments have shown that cells that are more differentiated than others are, \_\_\_\_\_ produce fully developed adults.

- A. unable to
- B. less likely to
- C. more likely to**
- D. always able to

38. A student's heart rate is 72 beats per minute at rest. After exercising, the student's heart rate is 112 beats per minute. After 20 minutes of rest, it is back to 72 beats per minute. This series of events illustrates

- A respiration
- B extrapolation
- C homeostasis**
- D excretion

### PHOTOSYNTHESIS/ RESPIRATION

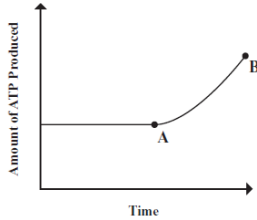
39. The major source of the oxygen that is released into the atmosphere is

- A cellular respiration
- B photosynthesis**
- C automobile exhaust
- D the weathering of rocks

40. Which of these statements is true of cellular respiration?

- A It breaks down glucose to release stored energy.**
- B It makes oxygen from energy and carbon dioxide.
- C It helps plants carry out photosynthesis.
- D It occurs only in nonphotosynthetic organisms.

41. The graph below shows the amount of ATP produced in a cell during a period of time.



According to the graph, which of the following processes must have increased between points A and B?

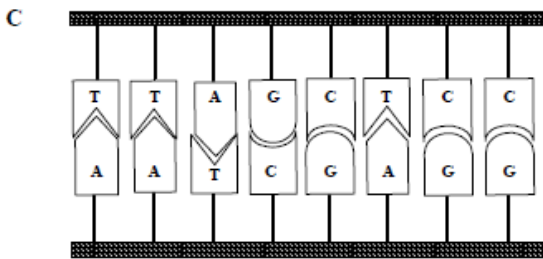
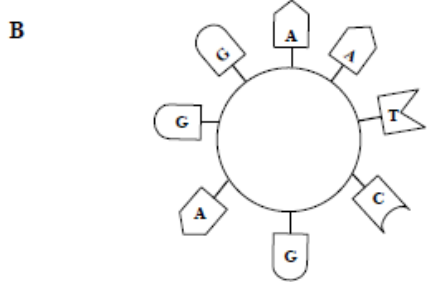
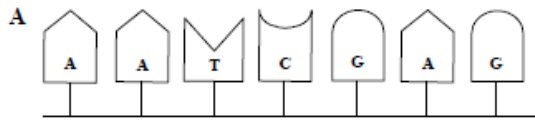
- A. cellular respiration
- B. cytokinesis
- C. DNA replication
- D. meiosis

## DNA

42. Changes to an organism's DNA can cause unexpected traits to be expressed in its offspring. DNA in an individual's gametes will most likely be altered before being passed to offspring if exposed to
- A x-rays
  - B loud sounds
  - C magnetic fields
  - D extreme temperatures
43. DNA and RNA are nucleic acids. A characteristic of RNA is that it
- A remains in the chromosomes in the nucleus
  - B is involved in translating information in DNA into proteins
  - C undergoes crossing-over during meiosis
  - D is replicated during the process of mitosis
44. ATG is a DNA triplet that codes for an amino acid. Which mRNA codon will pair with the ATG triplet?
- A ATG
  - B GTU
  - C TAC
  - D UAC
45. Which of the following best describes the result of a mutation in an organism's DNA?
- A. The mutation may produce a zygote.
  - B. The mutation may cause phenotypic change.
  - C. The mutation causes damage when it occurs.
  - D. The mutation creates entirely new organisms.
46. It has been observed that the proportions of adenine and thymine bases in a DNA molecule are equal, as are the proportions of cytosine and guanine. This is BEST explained by
- A helical base structure
  - B antiparallel base arrangement
  - C identical base substitution
  - D complementary base pairing

47.

33 Which of the following correctly shows the shape of a DNA molecule?



48. Hereditary information is determined by molecules of

- A carbohydrates
- B lipids
- C nucleotides**
- D proteins

49. An inheritable mutation may occur if an organism has a change in its

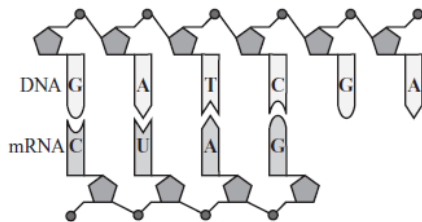
- A. appendages
- B. internal organs
- C. DNA structure
- D. ATP production rates

## PROTEIN SYNTHESIS/ GENE EXPRESSION

50. Which of the following shows how information is transformed to make a protein?

- A DNA → RNA → protein
- B gene → chromosome → protein
- C cell respiration → ATP → protein
- D ATP → amino acid → protein

51. The diagram below shows a strand of DNA matched to a strand of messenger RNA. What process does this diagram represent?



- A. mutation
- B. respiration
- C. transcription
- D. translation

52. Which relationship is *most similar* to the relationship below?

tRNA : ribosome

- A. book : publisher
- B. truck : factory
- C. key : lock
- D. baker : pie

53. Fireflies produce light inside their bodies. The enzyme luciferase is involved in the reaction that produces the light. Scientists have isolated the luciferase gene. A scientist inserts the luciferase gene into the DNA of cells from another organism. If these cells produce light, the scientist knows that which of the following occurred?

- A. The luciferase gene mutated inside the cells.
- B. The luciferase gene was transcribed and translated.
- C. The luciferase gene destroyed the original genes of the cells.
- D. The luciferase gene moved from the nucleus to the endoplasmic reticulum.

## CELL DIVISION

54. Why is it important for the cells of multi-cellular organisms to undergo mitosis?

- A. Mitosis allows for reproduction with male and female gametes.
- B. Mitosis increases variation within an organism.
- C. Mitosis produces cells that are different from the original dividing cell.
- D. Mitosis produces identical cells to the original dividing cell

55. Sexual reproduction provides for what to occur?

- A. cloning
- B. budding
- C. genetic stability
- D. genetic variation

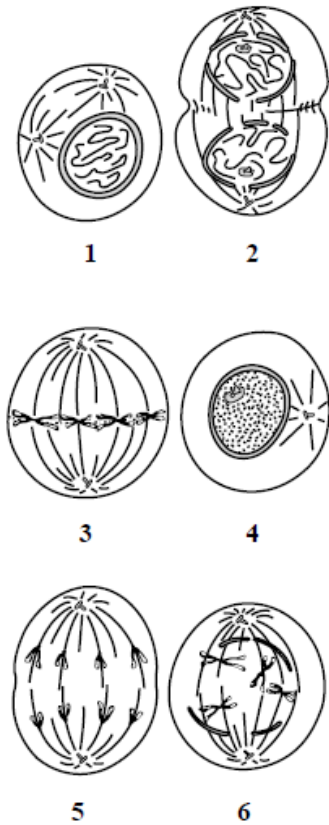
56. A haploid cell ( $1n$ ) unites with another  $1n$  cell to form a diploid cell ( $2n$ ). Which process is taking place?

- A mitosis
- B asexual reproduction
- C sexual reproduction
- D cloning

57. C

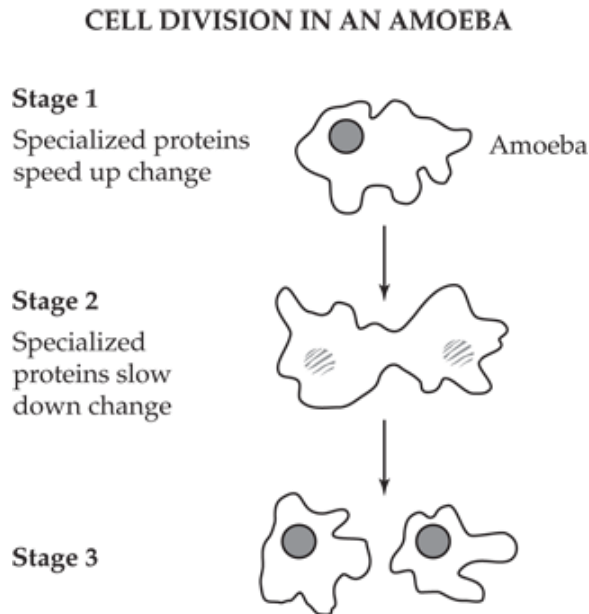
11 Which of the following correctly lists the phases of the cell cycle starting with the interphase?

Phases of the Cell Division Cycle



- A 4, 1, 2, 3, 6, 5
- B 4, 6, 1, 5, 2, 3
- C 4, 1, 6, 3, 5, 2
- D 4, 1, 5, 6, 3, 2

59. The diagram below shows stages of cell division of an amoeba, a unicellular organism.



Scientists have found that the rate of division in amoebas is controlled. Scientists believe that the transition from stage 2 to stage 3 is slowed by proteins. The additional time seems to help the amoeba change coding errors caused during DNA replication.

How does the chromosome number of the amoeba in stage 1 compare to an amoeba in stage 3?

- A. half the number of chromosomes
- B. twice the number of chromosomes
- C. the same number of chromosomes
- D. four times the number of chromosomes

60. (Same Diagram) Scientists have found that the rate of division in amoebas is controlled. Scientists believe that the transition from stage 2 to stage 3 is slowed by proteins. The additional time seems to help the amoeba change coding errors caused during DNA replication. Which of these is most likely to be found in amoebas that do not have a sufficient delay between stage 2 and stage 3?

- A. mutations
- B. competition
- C. pH imbalances
- D. Selection pressures

61. The population of elephant seals dropped to fewer than 100 animals in the 1890s due to overhunting. The seals are now protected, and the population has increased to nearly 10,000 animals. Meiosis can help variability in a population by

- A forming daughter cells identical to the parent cell
- B introducing new alleles into the population
- C recombining the population's alleles in different ways
- D preventing mutated traits from being passed on

## GENETICS

62. In Mendel's experiments with a single trait, the trait that disappeared in the first generation and reappeared in the next generation is called the

- A homozygous trait
- B dominant trait
- C recessive trait
- D heterozygous trait

63. In rabbits, black fur (B) is dominant over brown fur (b). If one parent rabbit is heterozygous (Bb) and the other parent rabbit is homozygous brown(bb), what is the probability of producing an offspring with brown fur? Make a Punnett square to determine your answer.

50%

64. In fruit flies, the gray body color (G) is dominant to the ebony body color (g). What is the genotypic ratio of the offspring of a heterozygous gray female and an ebony male?

- A 25% Gg, 75% gg
- B 50% Gg, 50% gg
- C 75% gray, 25% ebony
- D 100% gray

65. Earlobe shape is a human trait. Some people have free earlobes while others have attached earlobes. Two parents with free earlobes have four children. Three children have free earlobes and one child has attached earlobes. If these parents have another child, what is the probability that the child will have attached earlobes?

- A 25%
- B 50%
- C 75%
- D 100%

66. In humans, a widow's peak is dominant over a continuous hairline. Mary's father has a widow's peak, but Mary and her mother have a continuous hairline. What is the genotype of Mary's father?

- A HH
- B Hh
- C hh
- D cannot be determined

67. Most sex-linked, recessive traits—including hemophilia and color blindness—appear in males. This phenomenon is *best* explained by which statement?

- A Males have an X chromosome with dominant genes.
- B Most of the genes on the X and Y chromosomes of males are recessive.
- C In males, the recessive sex-linked genes appear only on the Y chromosome.
- D In males, the Y chromosome lacks the genes needed to mask the recessive genes on the X chromosome.

68. In genetics research, what is the purpose of a test cross?

A to determine the phenotypes of the parents

**B to determine the genotypes of the parents**

C to determine whether or not two parents could produce viable offspring

D to determine how many offspring can be produced by two parents

69. A couple has five children, all with blood type A. The mother's blood type is O, and the father's blood type is A. Based on this information, which describes the *most probable* genotype of the father?

A diploid

B haploid

C heterozygous

**D homozygous**

70. A karyotype of a human female shows that she has only one sex chromosome. Which genotype would represent her genetic condition?

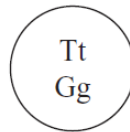
**A XO**

B XXX

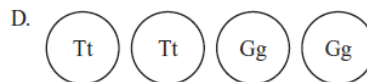
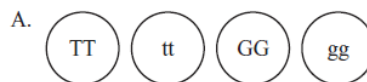
C XY

D XYY

71. The diagram below represents a cell. The letters in the diagram represent alleles for two different genetic traits.



According to Mendel's law of independent assortment, which of the following shows all of the allele combinations expected in gametes produced by this cell? **C**



72. A rare genetic condition causes dwarfism and immunodeficiencies. Which of the following is the most likely cause of this condition?

A. a parasitic infection

**B. a mutation in DNA**

C. a bacterial disease

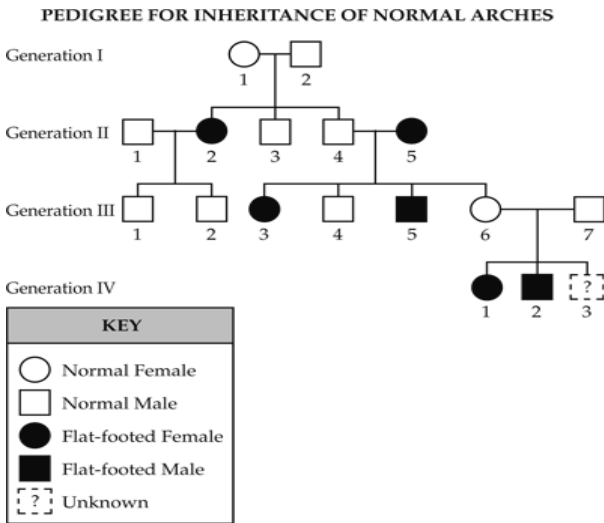
D. an excess of ATP



73. Which of the following genetic conditions results from a problem with segregation?
- A. **Trisomy 16:** a condition caused when a zygote receives three copies of chromosome 16
  - B. **Huntington's disease:** a condition caused when a zygote receives a mutated dominant allele
  - C. **Hemophilia:** a condition caused when a zygote receives an X chromosome with a recessive allele
  - D. **Sickle cell anemia:** a condition caused when a zygote receives a recessive allele for hemoglobin from each parent
74. Two spotted leopards produce a litter of four cubs. Three of the cubs are spotted and one is solid black. The black coat is probably what type of trait?
- A. dominant
  - B. **recessive**
  - C. polygenic
  - D. sex-linked
75. A young patient is diagnosed with the genetic disorder lactose intolerance, which results in the inability to digest milk products due to a missing enzyme called lactase. What is most likely the cause of lactose intolerance in this patient?
- A. The patient is allergic to milk
  - B. The patient stopped consuming milk products
  - C. A disease destroyed the lining of the patient's small intestine
  - D. **A mutation occurred in the gene that is responsible for producing lactase**
76. Which of the following is an example of codominance in genetic traits?
- A. A tall pea plant and a short pea plant produce tall pea plants.
  - B. **An orange cat and a black cat produce an orange-and-black kitten.**
  - C. A blue-eyed man and a brown-eyed woman produce a blue-eyed child.
  - D. A color-blind woman and a man with normal vision produce a color-blind son
77. One kind of chromosomal mutation can occur during meiosis when a pair of chromosomes that carry genes for the same trait fail to separate. Which of these represents the sex chromosomes of a male organism when this type of chromosomal mutation has occurred?
- A. **XXY**
  - B. XX
  - C. XY
  - D. XXX
78. A pair of laboratory mice are crossed to obtain offspring. Three alleles found in the female gamete are ABC. Three alleles found in the male gamete are Abc. Which of these is a possible combination of alleles for the offspring produced by these mice?
- A. AaBbCc
  - B. AABbCc
  - C. aabbcc
  - D. **AABbCc**
79. One parent is homozygous dominant for brown hair (BB). The other parent is heterozygous for brown hair (Bb). What is the probability that the offspring will have brown hair?
- A. **100%**
  - B. 75%
  - C. 50%
  - D. 25%

80.

In humans, the allele for having feet with normal arches is dominant (A). The allele for flat feet is recessive (a). The pedigree below shows the occurrence of normal arches and flat feet in four generations of a family. In the pedigree, individuals are identified by the generation and individual numbers. For example, Individual 2 in Generation I is identified as I-2.



Which of these individuals in the pedigree is a male with the genotype aa?

- A. Individual I-1
- B. Individual II-2
- C. Individual III-2
- D. Individual III-5**

Individuals III-6 and III-7 have two children and are expecting a third child. Their two children have flat feet. What is the chance that the third child will have normal arches?

- A. 25%
- B. 50%
- C. 75%**
- D. 100%

81.

Which of these Punnett squares shows the cross between Individual II-4 and Individual II-5?

**B**

- A.
 

	A	A
A		
a		
- B.
 

	A	a
a		
a		
- C.
 

	A	a
A		
a		
- D.
 

	A	A
a		
a		

## EVOLUTION

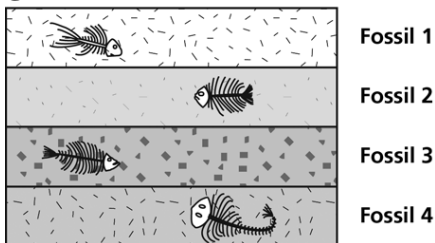
82. Variation within species was important to the development of Darwin's theory of evolution. Which statement does individual variation help explain?

- A Resources become limited over long periods of time.
- B Populations often increase rapidly and without warning.
- C Competition is fierce among members of different species.
- D Some organisms survive and reproduce better than others.**

83. Which could be considered biochemical evidence of an evolutionary relationship?

- A absence of vestigial structures
- B presence of embryonic gill slits
- C similar anatomical structures
- D presence of identical proteins**

84. The diagram below shows four fossils in different sedimentary rock layers. Which fossil is the youngest?



- A Fossil 1**
- B Fossil 2
- C Fossil 3
- D Fossil 4

85. Which is the *best* evidence of an evolutionary relationship between two organisms?

- A similarity in behavior
- B similarity in DNA**
- C similarity in habitat
- D similarity in niche

86. A local scientist has studied the population distribution of a species of snail that lives on the sandy beaches of an island. The island experiences a volcanic eruption. The data from the scientist's study of the snail population is summarized below.

Time Reference	Percentage of Black Snails	Percentage of Light Brown Snails
prior to volcanic eruption	9%	91%
one year after eruption	84%	16%
five years after eruption	91%	9%
ten years after eruption	75%	25%
fifteen years after eruption	51%	49%

87. Prior to the volcanic eruption, which of the following could explain why the percentage of black snails was so much lower than the percentage of light brown snails?

- A The black color made them more likely to find food successfully.
- B The allele for black color is lethal in the homozygous condition.
- C The black snails were easier for predators to locate on the light-colored beach.
- D The light brown snails were better than the black snails at using all the available resources.

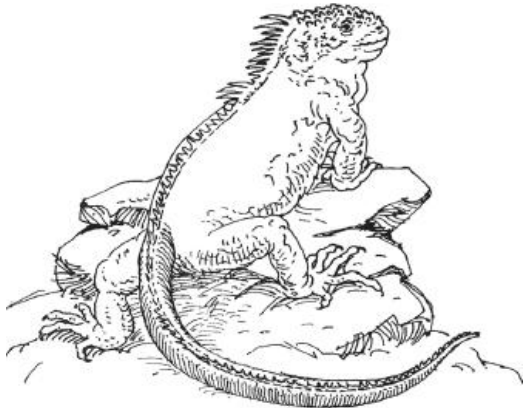
88. Scientists have concluded that snakes evolved from an ancestor with legs. Which of the following statements provides the best evidence for this conclusion?

- A. Most species of snakes live on land.
- B. Snakes move extremely fast to catch their prey.
- C. Snakes have a well-developed backbone and muscular system.
- D. Some species of snakes have limb buds during their embryonic development.

89. Which of the following best explains how the fossil record provides evidence that evolution has occurred?

- A. It indicates that forms of life existed on Earth at least 3.5 billion years ago.
- B. It indicates the exact cause of structural and behavioral adaptations of organisms.
- C. It shows how the embryos of many different vertebrate species are very similar.
- D. It shows that the form and structure of groups of organisms have changed over time.

90. The illustration below represents a marine iguana.



The marine iguanas of the Galápagos Islands feed on seaweed and algae. Marine iguanas have flattened tails while other species of iguanas that live inland on the Galápagos and on the South American mainland have rounded tails.

Which of the following best explains this difference in tail shape?

- A. Flattened tails are better for swimming than rounded tails.
- B. Flattened tails move more easily on land than in the ocean.
- C. Flattened tails are harder for predators to grasp than rounded tails.
- D. Flattened tails release heat more rapidly in the ocean than on land.

92. There are two types of modern whales: toothed whales and baleen whales. Baleen whales filter plankton from the water using baleen, plates made of fibrous proteins that grow from the roof of their mouths. The embryos of baleen whales have teeth in their upper jaws. As the embryos develop, the teeth are replaced with baleen. Which of the following conclusions is best supported by this information?

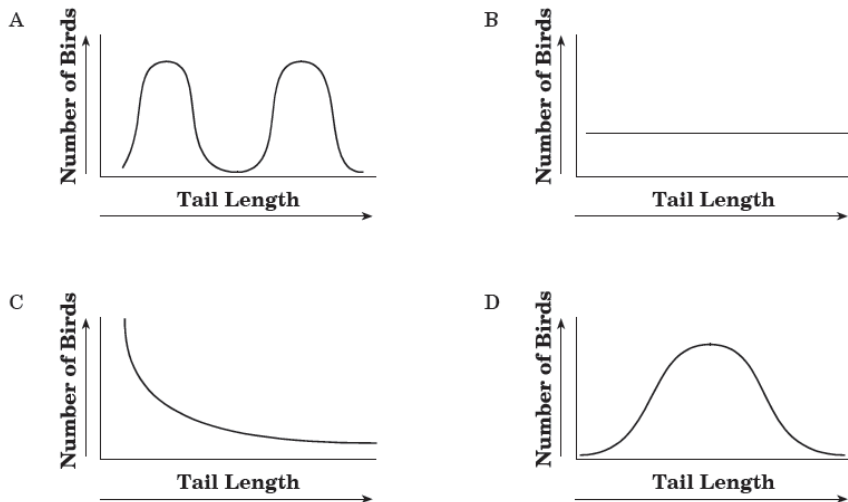
- A. Primitive whales had teeth as adults.
- B. Toothed whales descended from baleen whales.
- C. Baleen whales are evolving into toothed whales.
- D. Descendants of modern baleen whales will have both teeth and baleen as adults

**POPULATIONS**

93. Most individuals of a certain species of bird have medium-length tails, but tail length ranges within the species from very short to very long.



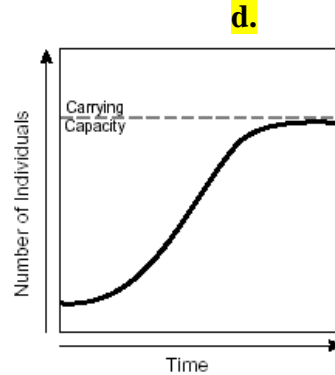
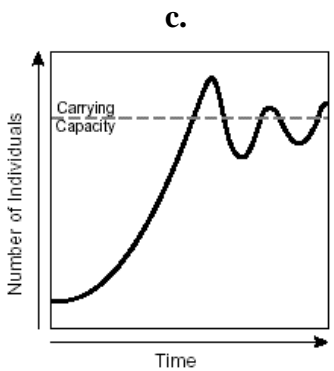
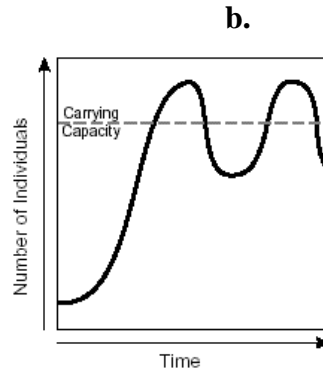
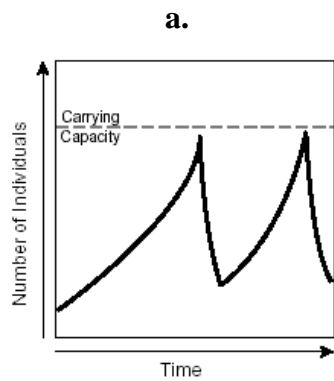
If a new predator arrived that preferred birds with medium-length tails, which graph describes the *most likely* result? **A**



94. A researcher is studying raccoons and skunks. She wants to find out how closely these two mammals are related. Which of these characteristics would be best for her to study?

- A. sequences of DNA
- B. reproductive habits
- C. movement of RNA
- D. physical appearance

95. Which of these graphs shows the most stable population?



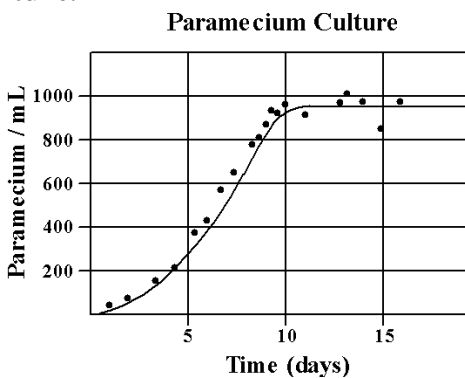
96. What might happen if a population of largemouth bass exceeds its carrying capacity?

- A death rates may decrease
- B death rates may increase**
- C emigration rates may decrease
- D immigration rates may increase

97. Which situation would result in the *greatest* increase in the human population?

- A decreased birth rate and increased death rate
- B increased infant mortality and decreased death rate
- C decreased death rate and increased birth rate**
- D increased birth rate and increased infant mortality

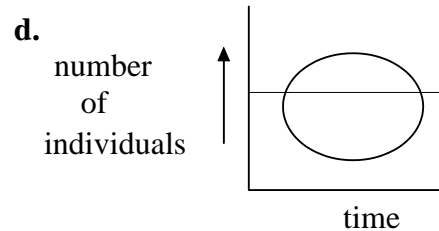
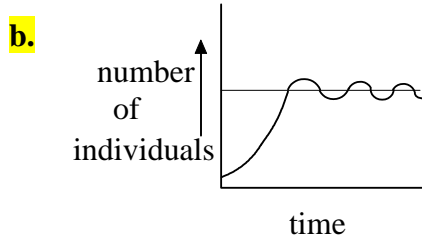
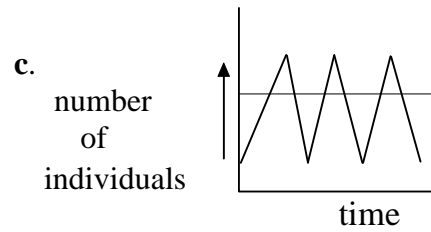
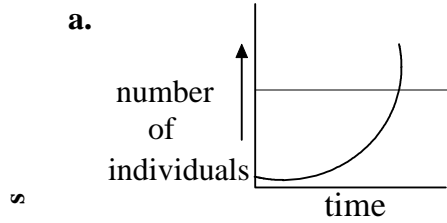
98. The graph shows a growth curve for a population of *Paramecium* grown in a laboratory culture.



What is the approximate carrying capacity for this population of *Paramecium* under these conditions?

- A 500 *Paramecium*/mL
- B 700 *Paramecium*/mL
- C 900 *Paramecium*/mL**
- D 1100 *Paramecium*/mL

99. An undisturbed deer population grows until its carrying capacity is reached. Which of the graphs below BEST resembles this deer population?



100. A plant nursery only grew one type of tomato plant. All of their tomato plants died from the same disease. What was *most likely* true of the tomato plant population?

- A They had a lot of resistance to disease.
- B They had a few plants that were resistant to the disease.
- C They had too much variation in their genes.
- D They had little variation in their genes.**

## ECOLOGY

101. Which of these can help farmers counteract the negative effects on their soil?

- A contour planting**
- B insect predators
- C large-scale irrigation
- D expensive fertilizers

102. In the carbon cycle, atmospheric carbon dioxide is converted into organic material by which process?

- A cellular respiration
- B decomposition
- C photosynthesis**
- D transpiration

103. Silt and nutrients from eroding farmland flow into a lake. As a result, which will *most likely* increase first?

- A fish population
- B shore vegetation
- C algae growth**
- D dissolved oxygen

104. A community is studied and several interactions are observed and recorded.

Type of Interaction	Effect on Organism X	Effect on Organism Y
A	Harms	Harms
B	Benefits	Harms
C	Benefits	No effects
D	Benefits	Benefits

Which type of interaction could illustrate the process of mutualism?

A interaction A

B interaction B

C interaction C

D interaction D

105. Predators often feed on weak or sick animals in an ecosystem. The role of the predator is described as its

A community

B habitat

C niche

D population

106. Organisms in an ecosystem are linked together by which of the following?

A geochemical pathways

B greenhouse effects

C food webs

D water cycles

107. Humans have had a tremendous impact on the environment. What has caused an increase in the amount of acid rain?

A use of chlorofluorocarbons

B use of pesticides

C coal burning power plants

D nuclear power plants

109. A.I. Oparin and J.B.S. Haldane each suggested that Earth's oceans once contained large amounts of organic molecules that eventually gave rise to precells. What is Oparin and Haldane's idea historically known as?

A big bang theory

B cell theory

C primordial soup model

D evolutionary model

110. Which of the following environmental changes can cause an increase in the rates of reactions in cells?

A increased temperature

B decreased enzyme concentrations

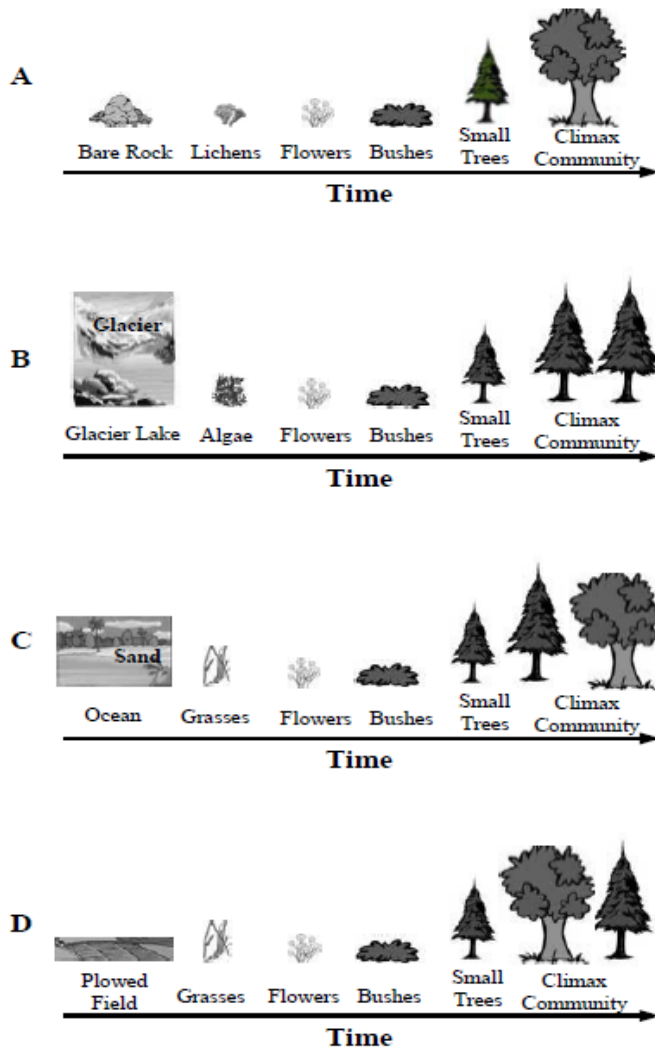
C increase activation energy requirement

D decreased diffusion rate



111. **D**

71 Which of the diagrams below shows an example of secondary succession in an ecosystem?

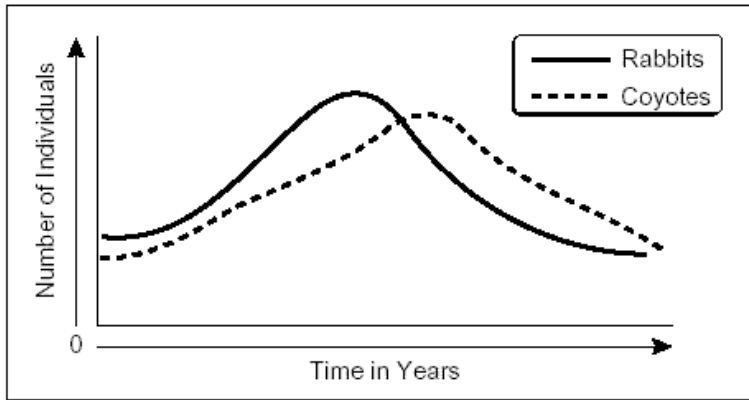


112. Bacteria living in nodules on the roots of legumes have the ability to fix atmospheric nitrogen into a water-soluble form that plants can use. The bacteria absorb sugar from the plants' roots. Which describes the relationship between the bacteria and the legume plants?

- A commensalism
- B mutualism**
- C parasitism
- D predation

113. Which of the following would most likely happen if grasses and shrubs were removed from a rural New Jersey ecosystem?

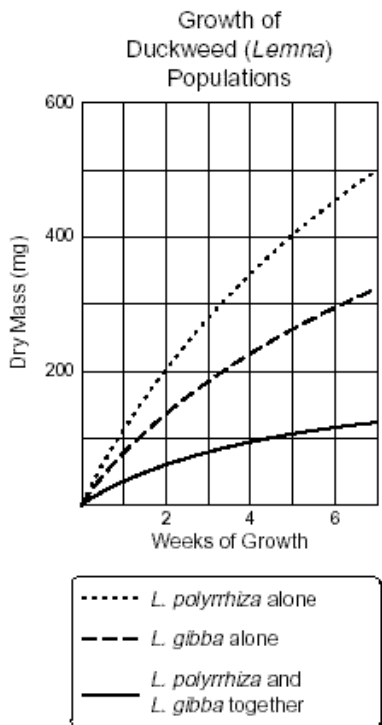
- A. There would be an increase in consumers in the ecosystem.
- B. There would be an increase of photosynthesis in the ecosystem
- C. There would be a decrease in food energy produced by the ecosystem.**
- D. There would be a decrease of carbon dioxide available to the ecosystem..



114.

This graph shows the average number of rabbits and coyotes in an area over time. Which conclusion is best supported by these data?

- A. The rabbit population obtains energy by consuming young plants.
- B. The coyote population is influenced by the available number of rabbits
- C. The number of rabbits will decrease during summer months
- D. The number of coyotes will be greater than the number of rabbits within a ten-year period



115.

The graph shows the results of experiments with two species of duckweed, *L. polyrrhiza* and *L. gibba*. Which of these best explains why growth is LESS when the two species are grown together?

- A. they attract more herbivores
- B. one grows faster than the other
- C. they compete for the same resources
- D. one stimulates the growth of the other

116. In one of the steps of the carbon cycle, a person exhales a molecule of carbon dioxide (CO<sub>2</sub>) into the atmosphere. Which of the following is most likely to happen next to the atom of carbon in this molecule?

- A. It may be used as part of a sugar in a plant.
- B. It may become part of a protein in an animal.
- C. It may be consumed as a fossil fuel is burned.
- D. It may be decomposed into carbon and oxygen by a bacterium.

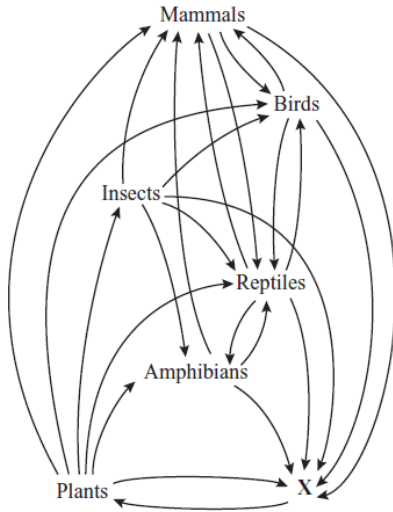
Antarctic Ecosystem
Diatoms photosynthesize
Krill eat diatoms
Squid eat krill
Leopard seals eat emperor penguins
Emperor penguins eat squid
Killer whales eat Weddell seals
Blue whales eat krill
Weddell seals eat squid
Leopard seals eat Weddell seals
Killer whales eat leopard seals

117.

A biology student doing research collects the following information about feeding relationships in an Antarctic ecosystem.

- Use these notes to construct a food web of this ecosystem.
- In your food web, identify one organism at **each** of the following trophic levels: producer, primary consumer, secondary consumer, and higher-order consumer.

118. A food web in a rain forest is shown below



Which of the following most likely occupies the location marked X in this food web?

- decomposers
- primary consumers
- producers
- secondary consumers

119. Legumes, such as clover and alfalfa, have nodules on their roots that contain nitrogen-fixing bacteria. These bacteria convert nitrogen gas from the atmosphere into nitrates. Which of the following best accounts for the presence of nitrogen-fixing bacteria in legume root nodules?

- Nitrates are a food source for earthworms.
- Plants can use nitrates, but not nitrogen gas.
- Nitrates are one of the reactants in photosynthesis.
- Nitrogen gas is toxic to most plants, but nitrates are nontoxic.

120. Many mammals and birds eat crops and seeds that have been sprayed with pesticides that farmers used to control insect damage. If these animals are eaten, then the pesticides are passed on to their predators. In this way, the pesticides

- are effectively removed from the food chain
- increase in concentration while moving up the food chain
- decrease in concentration while moving up the food chain
- remain at the same concentration while moving up the food chain.

121. Deforestation in tropical rain forests has led to soil erosion and loss of nitrogen from the soil. Insects require nitrogen to make their outer shells. What will most likely happen to the insect population if deforestation is reduced by international law?
- A. The insect population will decrease slowly and then increase.
  - B. The insect population will increase slowly and then decrease.
  - C. The insect population will increase slowly and then remain the same.
  - D. The insect population will decrease slowly and then remain the same.

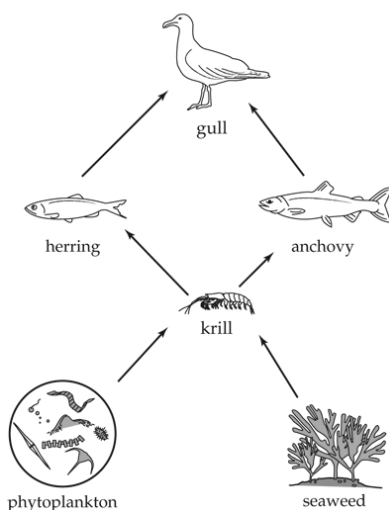
122. The water quality of the Barnegat Bay is measured by the Barnegat Bay Water Quality Monitoring Program. Scientists measure the salinity, temperature, pH, and oxygen levels to help determine the health of the Bay. Healthy water also contains appropriate amounts of nutrients. Monitoring water quality helps communities make decisions about the Bay.

Measuring oxygen levels of the Bay provides scientists with information about which process?

- A. mitosis
  - B. meiosis
  - C. chemosynthesis
  - D. photosynthesis
123. Which of these would likely be the most immediate result if oxygen levels in the Bay decreased by 90%?
- A. decrease in fish populations
  - B. decrease in salinity levels
  - C. increase in producer populations
  - D. increase in water temperature

124.

COASTAL FOOD WEB



Global warming causes an increase in coastal water temperatures. Increased coastal water temperature causes a decrease in reproduction of krill. Which of these would most likely experience an increase in population?

- A. gull
- B. herring
- C. anchovy
- D. phytoplankton

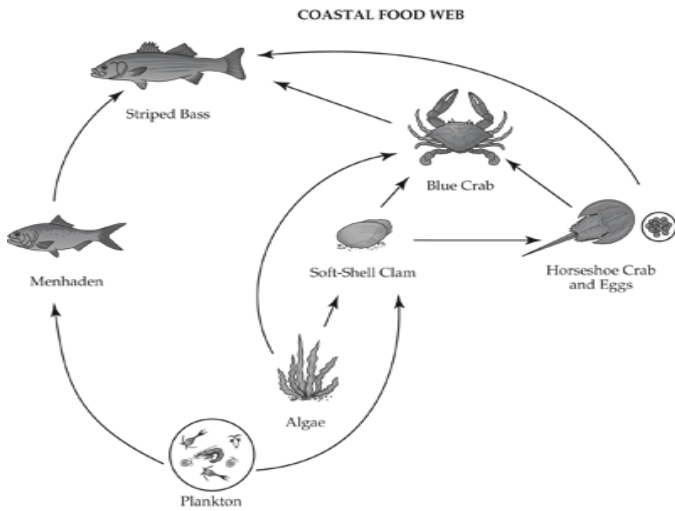
125. Which of these is an abiotic factor in both North American and tropical forest ecosystems?

- A. age of trees
- B. intensity of light
- C. number of consumers
- D. number of producer

126. Many bird species in the forests of eastern North America have very large geographic ranges. Bird species in tropical forests have very small geographic ranges. Many forest areas within the ranges of these birds are being destroyed. Scientists believe that the destruction of forests affects birds with small ranges more than birds with large ranges. As a result of the destruction of forests, birds with a small geographic range are most likely to
- A. lose their specific niche
  - B. adapt to a new environment
  - C. lose their ability to navigate
  - D. become less susceptible to disease
127. A new species is introduced into an area. This can have harmful effects on species already inhabiting the area. The harmful effects are most likely a result of
- A. succession
  - B. mutualism
  - C. competition
  - D. commensalism
128. All living things need nitrogen. The nitrogen gas in Earth's atmosphere must be changed into ammonia before most living things can use it. Which of these organisms can change nitrogen gas into ammonia?
- A. bacteria
  - B. mold
  - C. moss
  - D. yeast
129. The use of certain chemicals by humans has caused holes to form in the Earth's ozone layer. This allows more ultraviolet (UV) light to reach the oceans. Scientists are concerned that an increase in UV light will start killing microscopic marine algae. Which of these statements describes how the ocean food web would be affected by a large decrease in microscopic marine algae?
- A. There will be fewer marine animals because there will be fewer producers.
  - B. There will be no change because the algae are very small.
  - C. There will be more consumers because the UV light kills producers.
  - D. There will be fewer consumers because the UV light kills decomposers.
130. Which of the following practices is **MOST** likely to slow the buildup of CO<sub>2</sub> in the atmosphere?
- A. increased use of tropical rain forest areas for agriculture
  - B. increased use of genetically engineered plants
  - C. decreased pesticide use in favor of biological controls
  - D. decreased use of fossil fuel

131. Shallow coastal waters provide an essential habitat to a variety of plants and animals. A small part of a coastal food web is shown below.

**A**



Students want to compare fish diversity in two different areas of the coast. Which of these sets of items would be most useful for the students to gather for this study?

A.

boat  
life jacket  
net  
fish identification book  
field book for recording data

B.

microscope  
petri dish  
dissection equipment  
test tube rack  
field book for recording data

C.

boat  
eye goggles  
net  
petri dish  
video camera

D.

boat  
life jacket  
petri dish  
dissection equipment  
microscope