



BIOLOGY Keystone Review Packet



Name: _____ Date: _____

Module A- Basic Biological Principles

1. Which characteristic is shared by **all** prokaryotes and eukaryotes?
 - A. Ability to store hereditary information
 - B. Use of organelles to control cell processes
 - C. Use of cellular respiration for energy release
 - D. Ability to move in response to environmental stimuli

2. Living organisms can be classified as prokaryotes or eukaryotes. Which two structures are common to both prokaryotic and eukaryotic cells?
 - A. Cell wall and nucleus
 - B. Cell wall and chloroplast
 - C. Plasma membrane and nucleus
 - D. Plasma membrane and cytoplasm

3. Identify a structural difference between prokaryotic cells and eukaryotic cells that is directly related to their difference in size.

4. Based on the structural difference, explain why prokaryotic cells can be much smaller than eukaryotic cells.

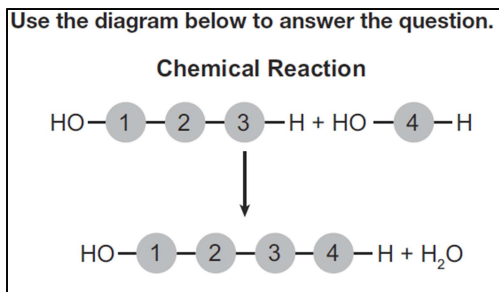
5. Describe one similarity between prokaryotic cells and eukaryotic cells that is independent of size.

6. Alveoli are microscopic air sacs in the lungs of mammals. Which statement **best** describes how the structures of the alveoli allow the lungs to function properly?
- They increase the amount of energy transferred from the lungs to the blood.
 - They increase the flexibility of the lungs as they expand during inhalation.
 - They increase the volume of the lungs, allowing more oxygen to be inhaled.
 - They increase the surface area of the lungs, allowing efficient gas exchange.

Module A- The Chemical Basis for Life

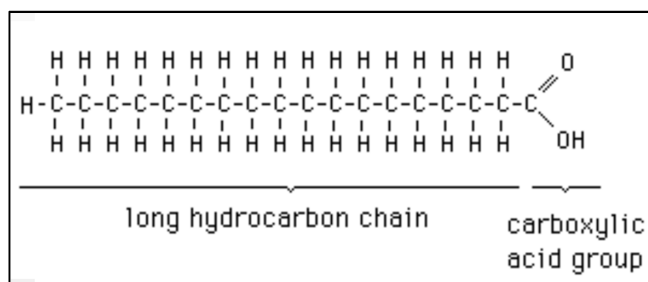
7. Which statement **best** describes an effect of the low density of frozen water in a lake?
- When the water freezes, it contracts, decreasing the water level in the lake.
 - Water in a lake freezes from the bottom up, killing most aquatic organisms.
 - When water in a lake freezes, it floats, providing insulation for organisms below.
 - Water removes thermal energy from the land around a lake, causing the lake to freeze.
8. Which statement correctly describes how carbon's ability to form four bonds makes it uniquely suited to form macromolecules?
- It forms short, simple carbon chains.
 - It forms large, complex, diverse molecules.
 - It forms covalent bonds with other carbon atoms.
 - It forms covalent bonds that can exist in a single plane.

9.



- The diagram shows a reaction that forms a polymer from two monomers. What is this type of reaction called?
- Glycolysis
 - Hydrolysis
 - Photosynthesis
 - Dehydration Synthesis
10. Carbohydrates and proteins are two types of macromolecules. Which functional characteristic of proteins distinguishes them from carbohydrates?
- Large amount of stored information
 - Ability to catalyze biochemical reactions
 - Efficient storage of useable chemical energy
 - Tendency to make a cell membranes hydrophobic

11. A scientist formed Chemical X in a laboratory. The material was then analyzed by other scientists. Analysis showed that the chemical was composed of long chains of repeated CH_2 molecules.



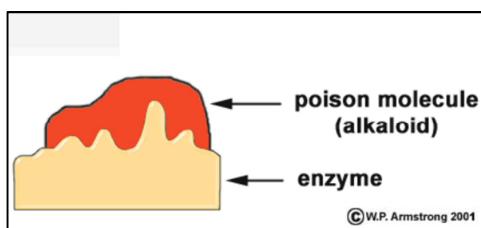
A researcher noticed that a similar CH_2 molecular structure was also located in the plasma membrane of an animal cell. The CH_2 molecular structure contained a negatively charged phosphate groups. Which statement BEST describes the primary function of the CH_2 and phosphate molecular structure located in the plasma membrane?

- A. It contains the genetic information needed for protein production.
 - B. It allows the energy that a cell needs to perform various life processes.
 - C. It allows a cell to regulate the movement of materials into and out of a cell.
 - D. It catalyzes specific chemical reactions in the cytoplasm of a cell.
12. Referring to the diagram in question #11, which type of organic molecule was MOST LIKELY formed by the scientist in the laboratory?
- A. Lipid
 - B. Protein
 - C. Carbohydrate
 - D. Nucleic Acid
13. Proteins are a major part of every living cell and have many different functions within each cell. Carbohydrates also perform numerous roles in living things.
- Part A:** Describe the general composition of a protein molecule.

Part B: Describe how the structures of proteins differ from the structures of carbohydrates

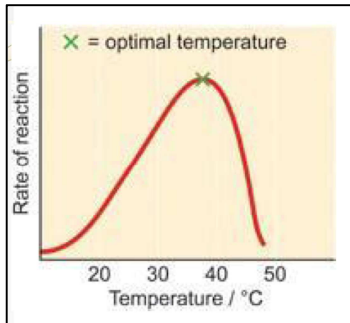
Part C: Describe how the functions of proteins differ from the function of carbohydrates.

14. Substance A is converted to substance B in a metabolic reaction. Which statement **best** describes the role of an enzyme during this reaction?
- A. It adjusts the pH of the reaction medium.
 - B. It provides energy to carry out the reaction.
 - C. It dissolves substance A in the reaction medium.
 - D. It speeds up the reaction without being consumed
15. A scientist observes that, when the pH of the environment surrounding an enzyme is changed, the rate the enzyme catalyzes a reaction greatly decreases. Which statement **best** describes how a change in pH can affect an enzyme to react?
- A. A pH change can cause the enzyme to change its shape.
 - B. A pH change can remove energy necessary to activate an enzyme.
 - C. A pH change can add new molecules to the structure of the enzyme.
 - D. A pH change can cause an enzyme to react with a different substrate.
16. The diagram models how a poison bonds to the active site of an enzyme. Which function is the enzyme **MOST LIKELY** unable to perform because of the attachment of the poison molecule?



- A. The release of stored chemical energy.
- B. The donation of electrons to the substrate.
- C. The supply of activation energy for a reaction.
- D. The catalysis of the reaction with the substrate.

17. The graph shows how the activity of an enzyme changes at different temperature. Which statement BEST describes what happens to the enzyme when the temperature of the reaction increases to 45 degrees?

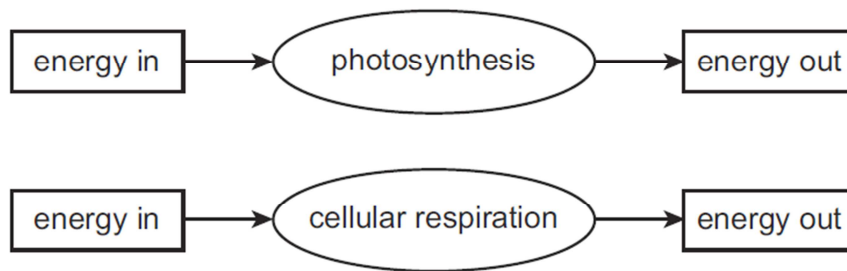


- A. The enzyme is used up the reaction stops.
- B. The enzyme begins to decrease the rate of the reaction.
- C. The enzyme continues to increase the rate of the reaction.
- D. The enzyme changes shape and can no longer speed up the reaction.

Module A- Bioenergetics

18. Using a microscope, a student observes a small, green organelle in a plant cell. Which energy transformation **most likely** occurs first within the observed organelle?
- A. ATP to light
 - B. Light to chemical
 - C. Heat to electrical
 - D. Chemical to chemical
19. Photosynthesis and cellular respiration are two major processes of carbon cycling in living organisms. Which statement correctly describes one similarity between photosynthesis and cellular respiration?
- A. Both occur in animals and plant cells.
 - B. Both include reactions that transform energy.
 - C. Both convert light energy into chemical energy.
 - D. Both synthesize organic molecules as end products.
20. A protein in a cell membrane changed its shape to move sodium and potassium ions in their concentration gradients. Which molecule was **most likely** used by the protein as an energy source?
- A. ATP
 - B. ADP
 - C. Catalase
 - D. Amylase

21. **Part A:** Use the diagram below to answer the question.



Part A: Complete the chart below by describing energy transformations involved in each process.

Process	Energy Transformations
photosynthesis	
cellular respiration	

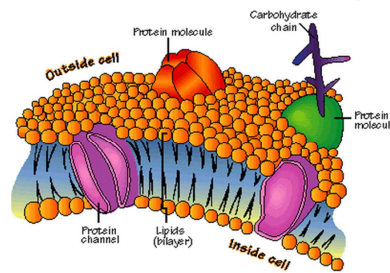
Part B: Describe how energy transformations involved in photosynthesis are related to energy transformations involved in cellular respiration.

Module A- Homeostasis & Transport

22. Carbon dioxide and oxygen are molecules that can move freely across a plasma membrane. What determines the direction that carbon dioxide and oxygen molecules move?
- A. Orientation of cholesterol in the plasma membrane
 - B. Concentration gradient across the plasma membrane
 - C. Configuration of phospholipids in the plasma membrane
 - D. Location of receptors on the surface of the plasma membrane

23. Which component of this membrane contains a hydrophobic region and acts as the primary barrier to the MOST foreign substances?

- A. Protein
- B. Cholesterol
- C. Carbohydrate chain
- D. Phospholipid bilayer



24. A sodium-potassium pump within a cell membrane requires energy to move sodium and potassium ions into or out of the cell. The movement of glucose into or out of a cell does not require energy. Which statement **best** describes the movement of these materials across a cell membrane.

- A. Sodium and potassium ions move by active transport, and glucose moves by osmosis.
- B. Sodium and potassium ions move through active transport, and glucose moves by facilitated diffusion.
- C. Sodium and potassium ions move by facilitated diffusion, and glucose moves by osmosis.
- D. Sodium and potassium ions move by facilitated diffusion, and glucose moves by active transport.

25. Some animals can produce a potassium ion concentration inside their cells that is twenty times greater than that of their environment. This ion concentration gradient is maintained by the plasma membrane.

Part A: Identify the process in the cell membrane that produces this difference in concentration.

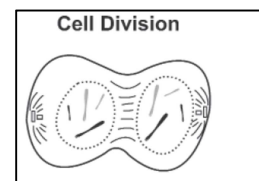
Part B: Explain the process that occurs as the cell produces the ion concentration gradient.

Part C: Compare the process of potassium ion transport to another mechanism that moves material across the plasma membrane.

26. The rough endoplasmic reticulum and the Golgi apparatus work together in eukaryotic cells. What is one way that the rough endoplasmic reticulum assists the Golgi apparatus?
- A. It assembles nucleic acid from monomers.
 - B. It breaks down old, damaged macromolecules.
 - C. It packages new protein molecules into vesicles.
 - D. It determines which protein molecules to synthesize.
27. Which example is an activity that a fish **most likely** uses to maintain homeostasis within its body?
- A. Using camouflage to avoid predators
 - B. Feeding at night to regulate body temperature
 - C. Moving to deeper water to regulate metabolic wastes
 - D. Exchanging gases through its gills to regulate oxygen levels

Module B- Cell Growth & Reproduction

28. Which statement **best** describes the phase of the cell cycle shown?



- A. The cell is in prophase of mitosis because the number of chromosomes has doubled.
- B. The cell is in prophase I of meiosis because the number of chromosomes has doubled.
- C. The cell is in telophase of mitosis because the cell is separating and contains two copies of each chromosome.
- D. The cell is in telophase of meiosis because the cell is separating and contains two copies of each chromosome.

29. Mitosis and Meiosis are processes by which animal and plant divide. Which statement **best** describes a difference between mitosis and meiosis?

- A. Meiosis is a multi-step process.
- B. Mitosis occurs only in eukaryotic cells.
- C. Meiosis is used in the repair of an organism.
- D. Mitosis produces genetically identical daughter cells.

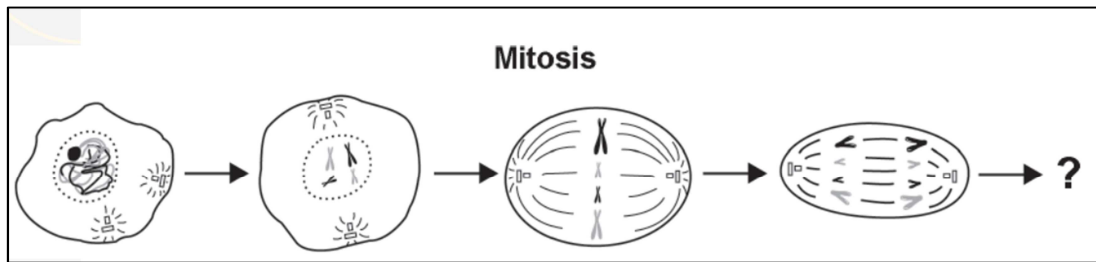
30. Patau syndrome can be a lethal genetic disorder in mammals, resulting from chromosomes failing to separate during meiosis.

Part A: Identify the step during the process of meiosis when chromosomes would **most likely** fail to separate.

Part B: Describe how chromosome separation in meiosis is different from chromosome separation in mitosis.

Part C: Compare the effects of a disorder caused by chromosomes failing to separate during meiosis, such as Patau syndrome, to the effects of chromosomes failing to separate during mitosis.

31. Which event **most likely** occurs next in mitosis?



- A. The chromatin condenses.
 - B. The nuclear envelope dissolves.
 - C. The chromosomes double in number.
 - D. The cell membrane pinches inward to divide the cytoplasm.
32. Which process helps to preserve the genetic information stored in DNA during DNA replication?
- A. The replacement of nitrogen bases thymine with uracil
 - B. Enzymes quickly linking nitrogen bases with hydrogen bonds
 - C. The synthesis of unique sugar and phosphate molecules for each nucleotide.
 - D. Nucleotides lining up along the template strand according to base pairing rules
33. In a flowering plant species, red flower color is dominant over white flower color. What is the genotype of any red-flowering plant resulting from this species?
- A. Red and white alleles present on one chromosome
 - B. Red and white alleles present on two chromosomes
 - C. A red allele present on both homologous chromosomes
 - D. A red allele present on at least one of the two homologous chromosomes

Module B- Genetics

34. Blood type is inherited through multiple alleles, including I^A , I^B , and i . A child has type A blood. If the father has type AB blood, what are all the possible phenotypes of the mother?

- A. Phenotypes O or A
- B. Phenotypes A or AB
- C. Phenotypes A, B, AB
- D. Phenotypes O, A, B, AB

<u>GENOTYPES</u>	<u>PHENOTYPES</u>
$I^A i, I^A I^A$	A
$I^B i, I^B I^B$	B
$I^A I^B$	AB
ii	O

35. A cattle farmer genetically crosses a cow (female) with a white coat with a bull (male) with a red coat. The resulting calf (offspring) is roan, which means there are red and white hairs intermixed in the coat of the calf. The genes are co-dominant.

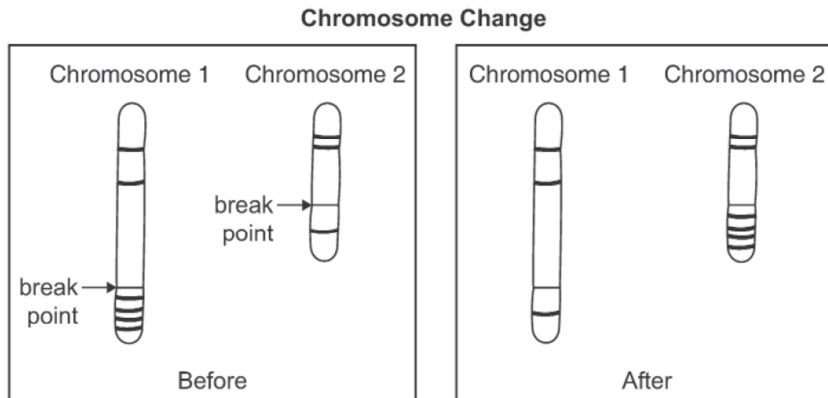
Part A: Although the farm has cattle in all three colors, the farmer prefers roan cattle over red or white cattle. Use the Punnett Square to show a cross that would produce only roan offspring.

Part B: Explain how the roan calf results from one white- and one red-coated parent. In your explanation, use letters to represent genes. Be sure to indicate what colors the letters represent.

Part C: Predict the possible genotypes of the offspring produced from two roan cattle.

36.

Use the diagram below to answer the question.



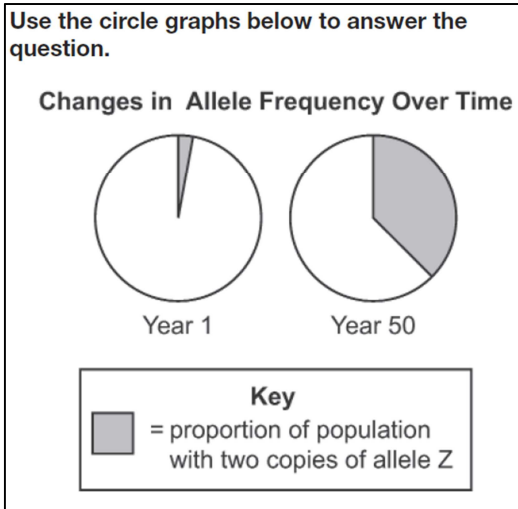
Which type of change in chromosome composition is illustrated in the diagram?

- A. Deletion
 - B. Insertion
 - C. Inversion
 - D. Translocation
37. A scientist observes that a certain trait is determined by a single allele. An organism inherited one version of the trait from one parent and another version from the other parent. Both versions of the trait are expressed in the phenotype of the offspring. Which pattern of inheritance **best** classifies the observed trait?
- A. Dominance
 - B. Sex-linkage
 - C. Co-dominance
 - D. Incomplete dominance
38. Which statement describes a cell process that is common to both eukaryotic and prokaryotic cells?
- A. Both cells carry out transcription in the nucleus.
 - B. Both cell types use ribosomes to carry out translation.
 - C. Both cell types assemble amino acids to carry out transcription.
 - D. Both cell types carry out translation in the endoplasmic reticulum.
39. The endoplasmic reticulum is a network of membranes within the cell, and it is often classified as rough or smooth, depending on whether there are ribosomes on its surface. Which statement **best** describes the role of rough endoplasmic reticulum in the cell?
- A. It stores all proteins for later use.
 - B. It provides an attachment site for larger organelles.
 - C. It aids in the production of membrane and secretory proteins.
 - D. It stores amino acids required for the production of all proteins.

40. The bacterium *Acetobacter aceti* is found in acidic environments and has an acidic cytoplasm. For this reason, most of its proteins are able to function in acidic conditions. This property distinguishes *Acetobacter aceti* proteins from those of most other organisms. Which characteristic does *Acetobacter aceti* **most likely** share with other organisms?
- A. The method that the organism uses to reproduce itself.
 - B. The physical and chemical responses to environmental changes.
 - C. The type of organelle used to produce energy for cellular functions.
 - D. The process used to form proteins by transcription and translation.
41. A genetic mutation resulted in a change in the sequence of amino acids of a protein, but the function of the protein was not changed. Which statement **best** describes the genetic mutation?
- A. It was a silent mutation that caused a change in the DNA of the organism.
 - B. It was a silent mutation that caused a change in the phenotype of the organism.
 - C. It was a nonsense mutation that caused a change in the DNA of the organism.
 - D. It was a nonsense mutation that caused a change in the phenotype of the organism.
42. A mutation occurs at the midpoint of a gene, altering all amino acids encoded after the point of mutation. Which mutation could have produced this change?
- A. Deletion of two nucleotides
 - B. Deletion of three nucleotides
 - C. Insertion of six nucleotides
 - D. Insertion of twelve nucleotides
43. Genetic engineering has led to genetically modified plants that resist insect pests and bacterial and fungal infection. Which outcome would **most likely** be a reason why some scientists recommend caution in planting genetically modified plants?
- A. Unplanned ecosystem interactions
 - B. Reduced pesticide and herbicide use
 - C. Improved agricultural yield and profit
 - D. Increased genetic variation and diversity

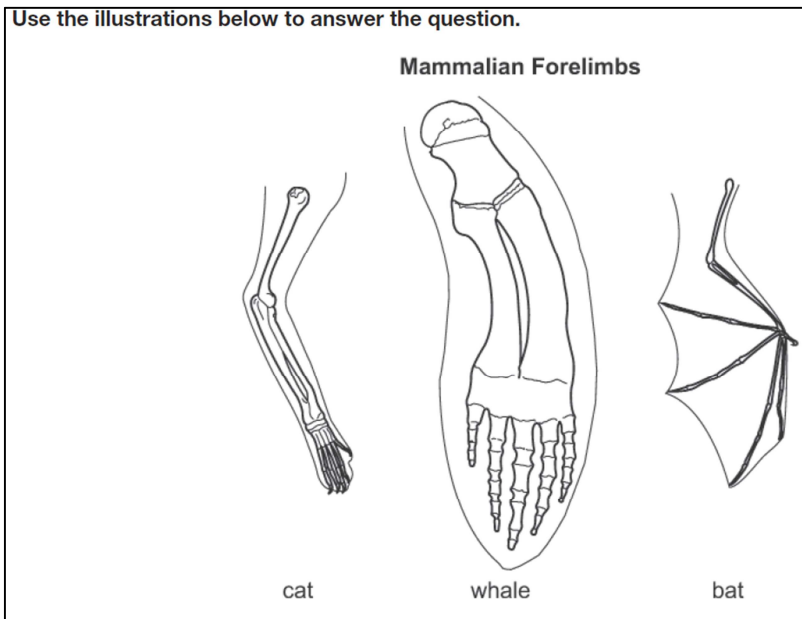
Module B- Theory of Evolution

44.



- The graph illustrates change in a lizard population over time. Which process **most likely** led to the change in the lizard population?
- A. Natural selection acting on a harmful trait
 - B. Natural selection acting on a beneficial trait
 - C. Natural selection acting on a dominant trait
 - D. Natural selection acting on a recessive trait
45. In North America, the eastern spotted skunk mates in late winter, and the western spotted skunk mates in late summer. Even though their geographic ranges overlap, the species do not mate with each other. What **most likely** prevents these two species from interbreeding?
- A. Habitat isolation
 - B. Gametic isolation
 - C. Geographic isolation
 - D. Reproductive isolation
46. A mutation occurs in the genes that code for coat color in deer. Which change will **most likely** result from this mutation?
- A. A change in the selection pressures acting on coat color
 - B. A change in the coat-color genes of deer predator species
 - C. An increase in coat-color diversity in the population
 - D. An increase in the number of genes for coat color in population

47.



The skeletons of mammalian forelimbs represent variations of a structure that was present in their common ancestor. What has **most likely** caused the variation in forelimbs?

- A. Changes in muscle structure
- B. Changes in the genetic codes.
- C. Trait formation due to behaviors
- D. Development of vestigial structures

48. The gene *COII* is in the genome of many organisms. A comparison of the number of base differences between the *COII* gene in a rat and that of two other animals is shown.

Animal	Number of base differences from rat
Mouse	101
Cow	136

Part A: Based on the data, describe a possible evolutionary relationship between rats, mice, and cows.

Part B: Describe how different organisms have a common gene such as COII supports the theory of evolution.

Part C: The COII gene of a monkey has 203 base differences from the same gene in a rat and 210 base differences from the same gene in a mouse. Compare the evolutionary relationships between the monkey, the rat, and the mouse.

49. The frequency of an allele in a fly population changes from 89% to 20% after three generations. Which other events **most likely** occurred during the same period?
- A. An environmental change and a fly population increase
 - B. An environmental change and a fly population decrease
 - C. Interbreeding of flies with an invasive species and fly population speciation
 - D. Interbreeding of flies with an established local species and fly population speciation

50.

Quantitative	Qualitative
37 fish & 3 frogs	Leaves lie on the bottom of the pond
2 types of aquatic grass	Water insects move along the water's surface
12 small rocks and 1 medium rock	All 3 frogs are sitting on a pond bank

A group of students measured a ten-square-meter section of a pond ecosystem and recorded observations. Which statement is a testable hypothesis?

- A. The frogs living in a pond represent a population.
- B. Water is an abiotic component in the pond ecosystem.
- C. If the fish are given more food, then they will be happier. ☺
- D. If the frogs are startled, then they will jump into the water.

Module B- Ecology

51.

Observations

- two grey wolves
- five moose
- several species of conifer trees
- large granite rock
- shallow pond

A student wrote several observations in a field notebook. Which term **best** classifies all of the student's observations?

- A. Population
- B. Food chain
- C. Ecosystem
- D. Community

52. A researcher observing an ecosystem describes the amount of sunlight, precipitation, and type of soil present. Which factor is the researcher **most likely** describing?

- A. Biotic factors in a forest
- B. Biotic factors in a tundra
- C. Abiotic factors in a prairie
- D. Abiotic factors in an ocean

53.

Use the diagram below to answer the question.

Marine Food Web

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graph BT; krill --> penguin; krill --> small_fish; krill --> whale; small_fish --> seal; small_fish --> sea_bird; penguin --> seal; sea_bird --> seal;
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Which sequence correctly describes the flow of energy between organisms in the marine food web?

- A. from seals to penguins to krill
- B. from whales to krill to small fish
- C. from sea birds to seals to penguins
- D. from small fish to penguins to seals

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54. A species of snapping turtle has a tongue that resembles a worm. The tongue is used to attract small fish. Which **best** describes the interaction between the fish and the snapping turtle?

- A. Predation
- B. Symbiosis
- C. Parasitism
- D. Competition

55. Which statement correctly describes how nitrogen in the soil returns to the atmosphere?

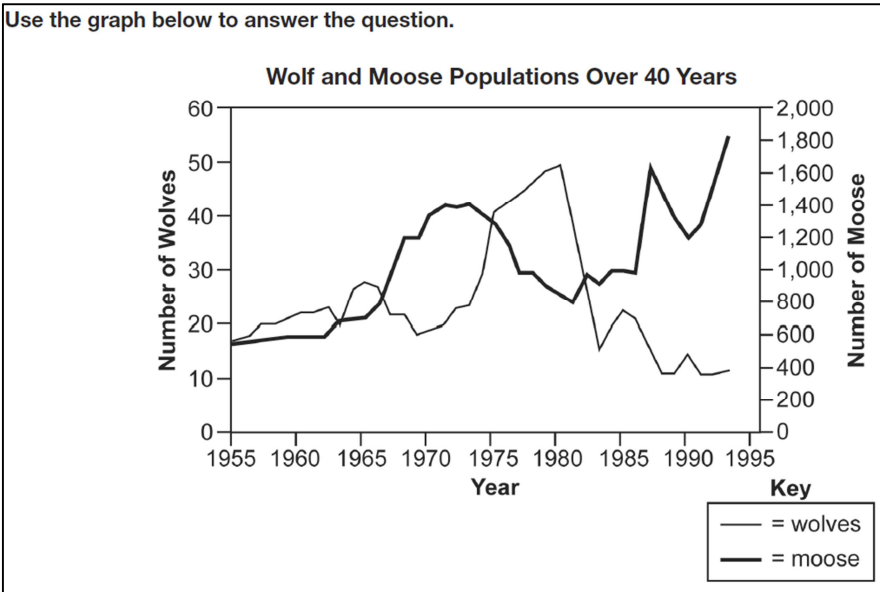
- A. Soil bacteria convert nitrates into nitrogen gas
- B. Decomposers directly convert ammonium into nitrogen gas
- C. Plants assimilate nitrites and convert them into nitrogen gas
- D. Nitrogen-fixing bacteria in plant roots convert nitrates into nitrogen gas

56. Agricultural runoff can carry fertilizer into lakes and streams. This runoff can cause algae population to greatly increase. Which effect does this change in the algae population size **most likely** have on the affected lakes and streams?

- A. An increase in water level
- B. An increase in water clarity
- C. A reduction in dissolved oxygen needed by fish and shellfish
- D. A reduction in temperature variations near the water's surface

57. A farmer observed that an increase in a field's soil nitrogen content was followed by an increase in producer productivity. What does this observation **most likely** indicate about the relationship between nitrogen and the producers in the field?
- A. Nitrogen was a biotic factor
 - B. Nitrogen was a limiting factor
 - C. Nitrogen became a surplus resource
 - D. Nitrogen became a selection pressure

58.



Isle Royale is located in Lake Superior. Isle Royale is home to populations of wolves and moose. The interaction between the wolves and moose, as well the individual population sizes, have been studied since 1958. The graph shows the population size over time for both wolves and moose.

Part A: Describe one limiting factor for the moose population.

Part B: Explain one likely reason why the wolf population rapidly increases between 1975 and 1980.

Part C: Predict what will happen to the moose population's size after 1994 by describing the shape of the curve. In your answer, be sure to explain the reasoning behind your prediction.

59. Scientists observed that the populations of top-level consumers in a particular ecosystem were rapidly decreasing. Further studies revealed that there was also a decline in producer productivity. Which other changes did the scientists **most likely** observe in the ecosystem?
- A. Increase in producer diversity
 - B. Decrease population size at all levels
 - C. Decreased primary consumer populations only
 - D. Increased primary and secondary consumer diversity