

## Biology Keystone IN CLASS Review: MODULES A and B

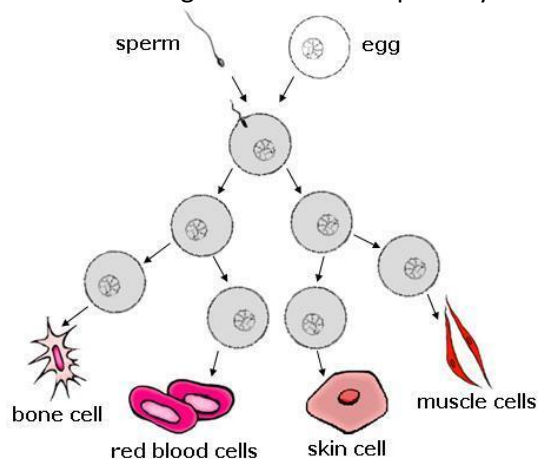
<b>MODULE A – CELLS AND CELL PROCESSES</b>				
Assessment Anchor:	Anchor Descriptor:	Eligible Content:	Question	Notes
BIO.A.1 Basic Biological Principles	BIO.A.1.1 Explain the characteristics common to all organisms.	BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.	1. Which characteristic is shared by all prokaryotes and eukaryotes? <ol style="list-style-type: none"> <li>Ability to store hereditary information</li> <li>Use of organelles to control cell processes</li> <li>Use of cellular respiration for energy release</li> <li>Ability to move in response to environmental stimuli</li> </ol>	
	BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.	BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.	2. Living organisms can be classified as prokaryotes or eukaryotes. Which two structures are common to both prokaryotic and eukaryotic cells? <ol style="list-style-type: none"> <li>Cell wall and nucleus</li> <li>Cell wall and chloroplast</li> <li>Plasma membrane and nucleus</li> <li>Plasma membrane and cytoplasm</li> </ol>	
			3. Which cell part is analogous to the packaging and shipping department of a factory? <ol style="list-style-type: none"> <li>Golgi apparatus</li> <li>Endoplasmic reticulum</li> <li>Ribosomes</li> <li>Nucleolus</li> </ol>	
			4. How does the size of a eukaryotic organism normally compare to the size of a prokaryotic organism? <ol style="list-style-type: none"> <li>Eukaryotes are usually much larger than prokaryotes.</li> <li>Eukaryotes are usually much smaller than prokaryotes.</li> <li>Eukaryotes and prokaryotes are both usually very small organisms.</li> <li>Eukaryotes and prokaryotes are both usually very large organisms.</li> </ol>	

BIO.A.1.2.2  
Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).

5. Alveoli are microscopic air sacs in the lungs of mammals. Which statement best describes how the structure of the alveoli allows the lungs to function properly?

- a. They increase the amount of energy transferred from the lungs to the blood.
- b. They increase the flexibility of the lungs as they expand during inhalation.
- c. They increase the volume of the lungs, allowing more oxygen to be inhaled.
- d. They increase the surface area of the lungs, allowing efficient gas exchange.

6. The diagram shows the processes of fertilization and specialization. Which of the following statements is implied by the diagram?



- a. Specialized cells are produced immediately following fertilization, or the fusion of a sperm cell with an egg cell.
- b. Even though all the cells in an individual organism come from a single cell, they can specialize into different types of cells.
- c. Since all of the cells in an individual organism come from a single cell, they must all be identical.
- d. Specialized cells, such as bone cells, skin cells, red blood cells, and muscle cells, cannot be produced from a single cell.

<p>BIO.A.2 The Chemical Basis for Life</p>	<p>BIO.A.2.1 Describe how the unique properties of water support life on Earth.</p>	<p>BIO.A.2.1.1 Describe the unique properties of water and how these properties support life on Earth (e.g. freezing point, high specific heat, cohesion).</p>	<p>7. Which statement best describes an effect of the low density of frozen water in a lake?</p> <ol style="list-style-type: none"> <li>a. When water freezes, it contracts, decreasing the water level in a lake.</li> <li>b. Water in a lake freezes from the bottom up, killing most aquatic organisms.</li> <li>c. When water in a lake freezes, it floats, providing insulation for organisms below.</li> <li>d. Water removes thermal energy from the land around a lake, causing the lake to freeze.</li> </ol>	
		<p>BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules.</p>	<p>8. Water is the most abundant molecule found in living organisms. Most mammals, in fact, are approximately 70% water by weight. About two-thirds of this water is present inside cells. The other one-third is present outside cells (e.g. in blood plasma or other body fluids). Why is water so important to cells?</p> <ol style="list-style-type: none"> <li>a. Almost all the chemical reactions in life processes occur in solutions with water.</li> <li>b. Water determines which proteins are translated from the cellular DNA.</li> <li>c. Water is stored in the cells to be used when the organism gets thirsty.</li> <li>d. The main structural component found in plasma membranes and cell walls is water.</li> </ol>	
	<p>relationship between structure and function at various levels of biochemical organization (i.e.,</p>	<p>9. Which statement correctly describes how carbon's ability to form four bonds makes it uniquely suited to form macromolecules?</p> <ol style="list-style-type: none"> <li>a. It forms short, simple carbon chains.</li> <li>b. It forms large, complex, diverse molecules.</li> <li>c. It forms covalent bonds with other carbon atoms.</li> <li>d. It forms covalent bonds that can exist in a single plane.</li> </ol>		

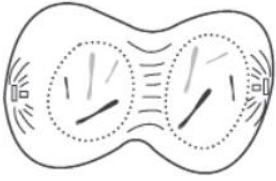
		<p>BIO.A.2.2.2 Describe how biological macromolecules form from monomers.</p>	<p>10. Use the diagram below to answer the question:</p> <p style="text-align: center;"><b>Chemical Reaction</b></p> $\text{HO}-\textcircled{1}-\textcircled{2}-\textcircled{3}-\text{H} + \text{HO}-\textcircled{4}-\text{H}$ <p style="text-align: center;">↓</p> $\text{HO}-\textcircled{1}-\textcircled{2}-\textcircled{3}-\textcircled{4}-\text{H} + \text{H}_2\text{O}$ <p>The diagram shows a reaction that forms a polymer from two monomers. What is the type of reaction called?</p> <ol style="list-style-type: none"> <li>Glycolysis</li> <li>Hydrolysis</li> <li>Photosynthesis</li> <li>Dehydration synthesis</li> </ol>	
		<p>BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.</p>	<p>11. Carbohydrates and proteins are two types of macromolecules. Which functional characteristic of proteins distinguishes them from carbohydrates?</p> <ol style="list-style-type: none"> <li>Large amount of stored information</li> <li>Ability to catalyze biochemical reactions</li> <li>Efficient storage of usable chemical energy</li> <li>Tendency to make cell membranes hydrophobic</li> </ol>	
			<p>12. What do lipids provide organisms?</p> <ol style="list-style-type: none"> <li>Connection between bones</li> <li>Genetic codes</li> <li>Long-term energy storage</li> <li>Regulation of cell temperature</li> </ol>	
<p>BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.</p>	<p>BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.</p>		<p>13. Substance A is converted to substance B in a metabolic reaction. Which statement best describes the role of an enzyme during this reaction?</p> <ol style="list-style-type: none"> <li>It adjusts to pH of the reaction medium.</li> <li>It provides energy to carry out the reaction.</li> <li>It dissolved substance A in the reaction medium.</li> <li>It speeds up the reaction without being consumed.</li> </ol>	

		<p>BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.</p>	<p>14. 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?</p> <ol style="list-style-type: none"> <li>A pH change can cause the enzyme to change its shape.</li> <li>A pH change can remove energy necessary to activate an enzyme.</li> <li>A pH change can add new molecules to the structure of the enzyme.</li> <li>A pH change can cause an enzyme to react with a different substrate.</li> </ol>	
BIO.A.3 Bioenergetics	BIO.A.3.1 Identify and describe the cell structures involved in processing energy.	<p>BIO.A.3.1.1 Describe the fundamental roles of plastids (e.g. chloroplasts) and mitochondria in energy transformations.</p>	<p>15. 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?</p> <ol style="list-style-type: none"> <li>ATP to light</li> <li>Light to chemical</li> <li>Heat to electrical</li> <li>Chemical to chemical</li> </ol>	
			<p>16. Which molecules are the reactants for cell respiration?</p> <ol style="list-style-type: none"> <li>Glucose and oxygen</li> <li>Glucose, oxygen, and ATP</li> <li>Carbon dioxide and water</li> <li>Carbon dioxide, water, and ATP</li> </ol>	
	BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.	<p>BIO.A.3.2.1 Compare the basic transformation of energy during photosynthesis and cellular respiration.</p>	<p>17. 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?</p> <ol style="list-style-type: none"> <li>Both occur in animal and plant cells.</li> <li>Both include reactions that transform energy.</li> <li>Both convert light energy into chemical energy.</li> <li>Both synthesize molecules as end products.</li> </ol>	
		<p>BIO.A.3.2.2 Describe the role of ATP in biochemical reactions.</p>	<p>18. A protein in a cell membrane changed its shape to move sodium and potassium ions against their concentration gradients. Which molecule was most likely used by the protein as an energy source?</p> <ol style="list-style-type: none"> <li>ATP</li> <li>ADP</li> <li>Catalase</li> <li>Amylase</li> </ol>	

<p>BIO.A.4 Homeostasis and Transport</p>	<p>BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into and out of, and throughout a cell.</p>	<p>BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p>	<p>19. 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?</p> <ol style="list-style-type: none"> <li>a. Orientation of cholesterol in the plasma membrane.</li> <li>b. Concentration gradient across the plasma membrane</li> <li>c. Configuration of phospholipids in the plasma membrane</li> <li>d. Location of receptors on the surface of the plasma membrane</li> </ol>	
		<p>BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport – diffusion, osmosis, facilitated diffusion; and active transport – pumps, endocytosis, exocytosis).</p>	<p>20. Which process does an organism use to move large molecules out of a cell?</p> <ol style="list-style-type: none"> <li>a. Diffusion</li> <li>b. Osmosis</li> <li>c. Endocytosis</li> <li>d. Exocytosis</li> </ol>	
		<p>BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p>	<p>21. The rough endoplasmic reticulum and Golgi apparatus work together in eukaryotic cells. What is the one way that the rough endoplasmic reticulum assists the Golgi apparatus?</p> <ol style="list-style-type: none"> <li>a. It assembles nucleic acids from monomers.</li> <li>b. It breaks down old, damaged macromolecules.</li> <li>c. It packages new protein molecules into vesicles.</li> <li>d. It determines which protein molecules to synthesize.</li> </ol>	
	<p>BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external</p>	<p>BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulations, oxygen regulation).</p>	<p>22. Which example is an activity that a fish most likely uses to maintain homeostasis within its body?</p> <ol style="list-style-type: none"> <li>a. Using camouflage to avoid predators</li> <li>b. Feeding at night to regulate body temperature</li> <li>c. Moving to deeper water to regulate metabolic wastes</li> <li>d. Exchanging gases through its gills to regulate oxygen levels</li> </ol>	

			<p>23. When dry environmental conditions exist, guard cells close the openings in leaves to reduce the loss of water from the plant. This process is an example of a feedback mechanism that plants use in order to</p> <ol style="list-style-type: none"> <li>Maintain homeostasis</li> <li>Produce more chlorophyll</li> <li>Absorb more solar energy</li> <li>Expend their resources</li> </ol>	
--	--	--	--	--

**MODULE B – CONTINUITY AND UNITY OF LIFE**

Assessment Anchor	Anchor Descriptor	Eligible Content	Questions	Notes
BIO.B.1 Cell Growth and Reproduction	BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.	BIO.B.1.1.1 Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.	<p>24. Use the illustration below to answer the question.</p> <p>Which statement best describes the phase of the cell cycle shown?</p>  <p style="text-align: center;"><b>Cell Division</b></p> <ol style="list-style-type: none"> <li>The cell is in prophase of mitosis because the number of chromosomes has doubled.</li> <li>The cell is in prophase I of meiosis because the number of chromosomes has doubled.</li> <li>The cell is in telophase of mitosis because the cell is separating and contains two copies of each chromosome.</li> <li>The cell is in telophase of meiosis because the cell is separating and contains two copies of each chromosome.</li> </ol>	
			<p>25. What is the longest phase of the cell cycle?</p> <ol style="list-style-type: none"> <li>Meiosis</li> <li>Telophase</li> <li>Anaphase</li> <li>Interphase</li> </ol>	
			<p>26. Cytokinesis follows which developmental stage?</p> <ol style="list-style-type: none"> <li>Telophase</li> <li>Anaphase</li> <li>Metaphase</li> <li>Interphase</li> </ol>	

			<p>27. What happens during cytokinesis in plant cells?</p> <ol style="list-style-type: none"> <li>A new cell wall develops between the daughter cells.</li> <li>The cell elongates and pulls the sister chromosomes apart.</li> <li>Replication of chromosomes forms sister chromatids.</li> <li>Pairs of chromosomes condense and attach to spindle fibers.</li> </ol>	
		<p>BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions.</p>	<p>28. Mitosis and meiosis are processes by which animal and plant cells divide. Which statement best describes a difference between mitosis and meiosis?</p> <ol style="list-style-type: none"> <li>Meiosis is a multi-step process.</li> <li>Mitosis occurs only in eukaryotic cells.</li> <li>Meiosis is used in the repair of an organism.</li> <li>Mitosis produces genetically identical daughter cells.</li> </ol>	
<p>BIO.B.1.1.2 Explain how genetic information is inherited.</p>		<p>BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic material.</p>	<p>29. Which process helps to preserve the genetic information stored in DNA during DNA replication?</p> <ol style="list-style-type: none"> <li>The replacement of nitrogen base thymine with uracil</li> <li>Enzymes quickly linking nitrogen bases with hydrogen bonds</li> <li>The synthesis of unique sugar and phosphate molecules for each nucleotide</li> <li>Nucleotides lining up along the template strand according to base pairing rules</li> </ol>	
			<p>30. Which cell process occurs before cell division?</p> <ol style="list-style-type: none"> <li>DNA leaves the nucleus</li> <li>DNA splits into two halves</li> <li>DNA replicates itself</li> <li>DNA sequence unwinds</li> </ol>	
		<p>BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p>	<p>31. 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?</p> <ol style="list-style-type: none"> <li>Red and white alleles present on one chromosome</li> <li>Red and white alleles present on two chromosomes</li> <li>A red allele present on both homologous chromosomes</li> <li>A red allele present on at least one of two homologous chromosomes</li> </ol>	



BIO.B.2 Genetics

BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.

BIO.B.2.1.1 Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).

32. Use the table below to answer the question.

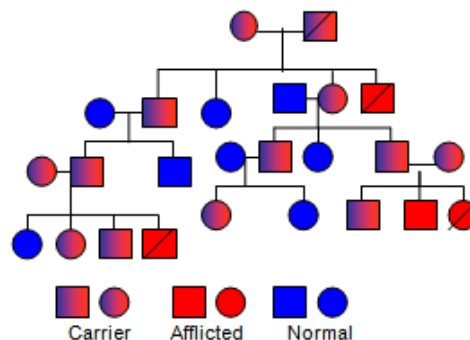
Blood type is inherited through multiple alleles, including  $I^A$ ,  $I^B$ , and  $i$ . A child has type A blood. If the father has type AB blood, what are all the possible phenotypes of the mother?

Blood Types

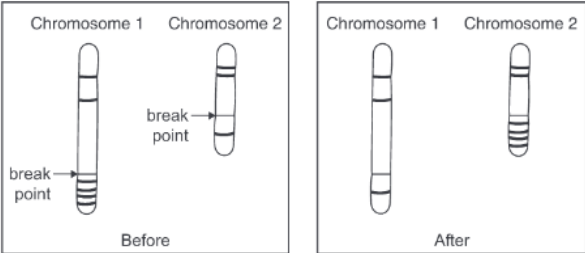
Genotype(s)	Phenotype
$ii$	O
$I^A I^A, I^A i$	A
$I^B I^B, I^B i$	B
$I^A I^B$	AB

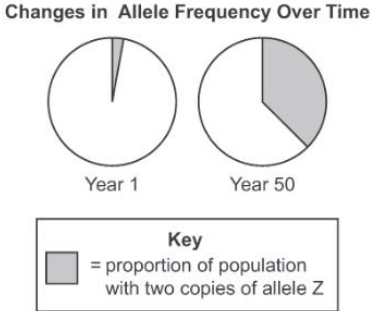
- Phenotypes O or A
- Phenotypes A or AB
- Phenotypes A, B, AB
- Phenotypes O, A, B, AB

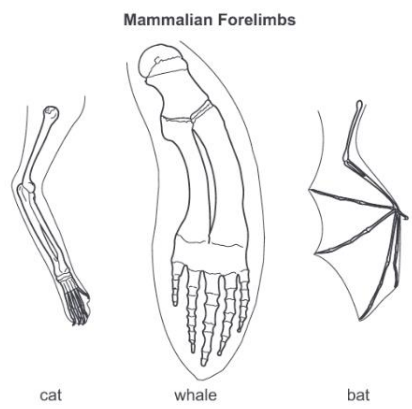
33. A family is afflicted with Tay-Sachs disease. According to the family's pedigree chart below, which of the following correctly describes Tay-Sachs disease?



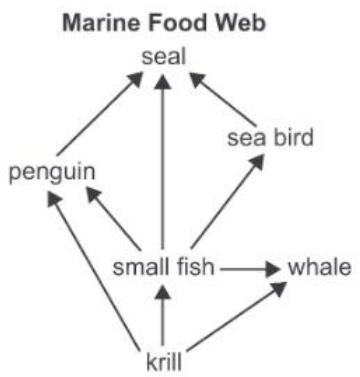
- Autosomal dominant
- Autosomal recessive
- Codominant
- Sex-linked

		<p>BIO.B.2.1.2 Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).</p>	<p>34. Use the diagram below to answer the question.</p> <p style="text-align: center;">Chromosome Change</p>  <p>Which type of change in chromosome composition is illustrated in the diagram?</p> <ol style="list-style-type: none"> <li>Deletion</li> <li>Insertion</li> <li>Inversion</li> <li>Translocation</li> </ol>	
<p>BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).</p>		<p>BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms.</p>	<p>35. Which statement describes a cell process that is common to both eukaryotic and prokaryotic cells?</p> <ol style="list-style-type: none"> <li>Both cell types carry out transcription in the nucleus.</li> <li>Both cell types use ribosomes to carry out translation.</li> <li>Both cell types assemble amino acids to carry out transcription.</li> <li>Both cell types carry out translation in the endoplasmic reticulum.</li> </ol>	
		<p>BIO.B.2.2.2 Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.</p>	<p>36. Where does transcription take place?</p> <ol style="list-style-type: none"> <li>Nucleus</li> <li>Cytoplasm</li> <li>Rough ER</li> <li>Golgi apparatus</li> </ol>	
			<p>37. 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?</p> <ol style="list-style-type: none"> <li>It stores all proteins for later use.</li> <li>It provides an attachment site for larger organelles.</li> <li>It aids in the production of membrane and secretory proteins.</li> <li>It stores amino acids required for the production of all proteins.</li> </ol>	

	<p>BIO.B.2.3 Explain how genetic information is expressed.</p>	<p>BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g. silent, nonsense, frameshift).</p>	<p>38. 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?</p> <ol style="list-style-type: none"> <li>It was a silent mutation that caused a change in the DNA of the organism.</li> <li>It was a silent mutation that caused a change in the phenotype of the organism.</li> <li>It was a nonsense mutation that caused a change in the phenotype of the organism.</li> <li>It was a nonsense mutation that caused a change in the phenotype of the organism.</li> </ol>	
	<p>BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.</p>	<p>BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g. selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).</p>	<p>39. Genetic engineering has led to genetically modified plants that resist insect pests and bacterial and fungal infections. Which outcome would most likely be a reason why some scientists recommend caution in planting genetically modified plants?</p> <ol style="list-style-type: none"> <li>Unplanned ecosystem interactions</li> <li>Reduced pesticide and herbicide use</li> <li>Improved agricultural yield and profit</li> <li>Increased genetic variation and diversity</li> </ol>	
<p>BIO.B.3 Theory of Evolution</p>	<p>BIO.B.3.1 Explain the mechanisms of evolution.</p>	<p>BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population.</p>	<p>40. Use the circle graphs below to answer the question.</p> <p>The graphs illustrate change in a lizard population over time. Which process most likely led to the change in the lizard population?</p> <ol style="list-style-type: none"> <li>Natural selection acting on a harmful trait</li> <li>Natural selection acting on a beneficial trait</li> <li>Natural selection acting on a dominant trait</li> <li>Natural selection acting on a recessive trait</li> </ol>	<p><b>Changes in Allele Frequency Over Time</b></p>  <p>Year 1      Year 50</p> <p><b>Key</b>  <span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> = proportion of population with two copies of allele Z</p>

			<p>41. Both Lamarck and Darwin studied how organisms change over time. Which of the following ideas proposed by Lamarck was later proved to be incorrect?</p> <ol style="list-style-type: none"> <li>Each species has evolved over time.</li> <li>Acquired characteristics can be inherited.</li> <li>Organisms are adapted to their environments.</li> <li>All species were descended from other species.</li> </ol>	
		<p>BIO.B.3.1.2 Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).</p>	<p>42. 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?</p> <ol style="list-style-type: none"> <li>Habitat isolation</li> <li>Gametic isolation</li> <li>Geographic isolation</li> <li>Reproductive isolation</li> </ol>	
		<p>BIO.B.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population.</p>	<p>43. A mutation occurs in the genes that code for coat color in deer. Which change will most likely result from this mutation?</p> <ol style="list-style-type: none"> <li>A change in the selection pressures acting on coat color</li> <li>A change in the coat-color genes of deer predator species</li> <li>An increase in coat-color diversity in the population</li> <li>An increase in the number of genes for coat color in the population</li> </ol>	
<p>BIO.B.3.2 Analyze the sources of evidence for biological evolution.</p>		<p>BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).</p>	<p>44. Use the illustrations below to answer the question.</p> <p>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?</p> <ol style="list-style-type: none"> <li>Changes in muscle structure</li> <li>Changes in the genetic codes</li> <li>Trait formation due to behaviors</li> <li>Development of vestigial structures</li> </ol>	

	<p>BIO.B.3.3 Apply scientific thinking, processes, and technologies in the study of the theory of evolution.</p>	<p>BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.</p>	<p>45. Use the table below to answer the question.</p> <p style="text-align: center;"><b>Student's Observations of a Pond Ecosystem</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Quantitative</th> <th style="text-align: center;">Qualitative</th> </tr> </thead> <tbody> <tr> <td>37 fish and 3 frogs</td> <td>Leaves lie on the bottom of the pond.</td> </tr> <tr> <td>2 types of aquatic grass</td> <td>Water insects move along the water's surface.</td> </tr> <tr> <td>12 small rocks and 1 medium rock</td> <td>All 3 frogs are sitting on a pond bank.</td> </tr> <tr> <td>sand</td> <td></td> </tr> </tbody> </table> <p>A group of students measured a ten-square-meter section of pond ecosystem and recorded observations. Which statement is a testable hypothesis?</p> <ol style="list-style-type: none"> <li>a. The frogs living in the pond represent a population.</li> <li>b. Water is an abiotic component in the pond ecosystem.</li> <li>c. If the fish are given more food, then they will be happier.</li> <li>d. If the frogs are startled, they will jump into the water.</li> </ol>	Quantitative	Qualitative	37 fish and 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.	sand		
Quantitative	Qualitative													
37 fish and 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.													
sand														
<p>BIO.B.4 Ecology</p>	<p>BIO.B.4.1 Describe ecological levels of organization in the biosphere.</p>	<p>BIO.B.4.1.1 Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).</p>	<p>46. Use the list below to answer the question.</p> <p style="text-align: center;"><b>Observations</b></p> <ul style="list-style-type: none"> <li>• Two grey wolves</li> <li>• Five moose</li> <li>• Several species of conifer trees</li> <li>• Large granite rock</li> <li>• Shallow pond</li> </ul> <p>A student wrote several observations in a field notebook. Which term best classifies all of the students' observations.</p> <ol style="list-style-type: none"> <li>a. Population</li> <li>b. Food chain</li> <li>c. Ecosystem</li> <li>d. community</li> </ol>											
			<p>47. The biome concept illustrates</p> <ol style="list-style-type: none"> <li>a. Dominant plant communities</li> <li>b. Insect populations</li> <li>c. Old field succession</li> <li>d. Temperature and precipitation similarities in an area</li> </ol>											

		<p>BIO.B.4.1.2 Describe characteristics biotic and abiotic components of aquatic and terrestrial ecosystems.</p>	<p>48. The eastern portion of the United States is dominated by which biome?</p> <ol style="list-style-type: none"> <li>Temperate forest</li> <li>Desert</li> <li>Taiga</li> <li>prairie</li> </ol>	
			<p>49. The types and numbers of species in a given area are most greatly determined by the areas:</p> <ol style="list-style-type: none"> <li>Biotic factors</li> <li>Precipitation</li> <li>Climate</li> <li>Biodiversity</li> </ol>	
<p>BIO.B.4.2 Describe interactions and relationships in an ecosystem.</p>		<p>BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).</p>	<p>50. Use the diagram below to answer the question.</p> <p>Which sequence correctly describes the flow of energy between organisms in the marine food web?</p> <ol style="list-style-type: none"> <li>From seals to penguins to krill</li> <li>From whales to krill to small fish</li> <li>From sea birds to seals to penguins</li> <li>From small fish to penguins to seals</li> </ol>	 <p>The diagram is a marine food web with the following energy flow paths indicated by arrows:</p> <ul style="list-style-type: none"> <li>krill → penguin</li> <li>krill → small fish</li> <li>krill → whale</li> <li>small fish → seal</li> <li>small fish → sea bird</li> <li>seal → sea bird</li> </ul>
			<p>51. Bacteria and fungi act as ___ within an ecosystem.</p> <ol style="list-style-type: none"> <li>Primary producers</li> <li>Primary consumers</li> <li>Secondary consumers</li> <li>Decomposers</li> </ol>	
			<p>52. Which of these describes the flow of energy through the food chain below?</p> <p>Sun &gt; clover &gt; field mice &gt; garter snakes</p> <ol style="list-style-type: none"> <li>Directly from clover to garter snakes</li> <li>Directly from garter snakes to clover</li> <li>From clover to field mice to garter snakes</li> <li>From garter snakes to field mice to clover</li> </ol>	

			<p>53. A chicken eats grain and then a person eats the chicken. What happens to the energy that the chicken obtains from the grain?</p> <ol style="list-style-type: none"> <li>Almost all of the energy is passed on to the person.</li> <li>The chicken uses the energy to produce more energy.</li> <li>The chicken uses all of the energy to carry out life processes.</li> <li>Most of it is used for life processes and given off as heat energy.</li> </ol>	
		<p>BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).</p>	<p>54. A species of snapping turtles has a tongue that resembles a worm. The tongue is used to attract small fish. Which best describe the interaction between the fish and the snapping turtle?</p> <ol style="list-style-type: none"> <li>Predation</li> <li>Symbiosis</li> <li>Parasitism</li> <li>Competition</li> </ol>	
			<p>55. Frogs are predators of flies. What will most likely happen to the frog population if the fly population increases?</p> <ol style="list-style-type: none"> <li>The frog population will increase.</li> <li>The frog population will decrease.</li> <li>The size of the frog population does not depend on the fly population.</li> <li>The frog population will increase for a while and then decrease.</li> </ol>	
		<p>BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e. water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).</p>	<p>56. Which statement correctly describes how nitrogen in the soil returns to the atmosphere?</p> <ol style="list-style-type: none"> <li>Soil bacteria convert bacteria into nitrogen gas.</li> <li>Decomposers directly convert ammonium into nitrogen gas.</li> <li>Plants assimilate nitrites and convert them into nitrogen gas.</li> <li>Nitrogen-fixing bacteria in plant roots convert nitrates into nitrogen gas.</li> </ol>	
		<p>BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).</p>	<p>57. Agricultural runoff can carry fertilizers into lakes and streams. This runoff can cause algae populations to greatly increase. Which effect does this change in the algae population sizes most likely have on affected lakes and streams?</p> <ol style="list-style-type: none"> <li>An increase in water level</li> <li>An increase in water clarity</li> <li>A reduction in dissolved oxygen needed by fish and shellfish</li> <li>A reduction in temperature variations near the water's surface</li> </ol>	

		<p>BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction.</p>	<p>58. 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?</p> <ol style="list-style-type: none"> <li>Nitrogen was a biotic factor.</li> <li>Nitrogen was a limiting factor.</li> <li>Nitrogen became a surplus resource.</li> <li>Nitrogen became a selection pressure.</li> </ol>	
--	--	--	---	--

**59. Open Response Question**

**Part A:** Identify a structural difference between prokaryotic cells and eukaryotic cells that is directly related to their difference in size.

**Part B:** Based on the structural difference, explain why prokaryotic cells can be much smaller than eukaryotic cells.

**Part C:** Describe one similarity between prokaryotic cells and eukaryotic cells that is independent of size.

**60. Open Response Question**

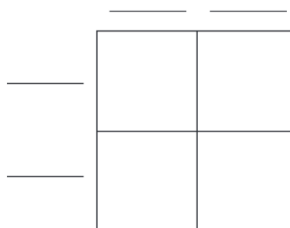
Draw and label a diagram that illustrates enzyme action before, during, and after a dehydration synthesis reaction.



**61. Open Response Question**

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

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



**Part B:** Explain how a 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 and phenotypes of the offspring produced from two roan cattle.

**62. Open Response Question**

Why is a food web a more accurate description of the energy flow in an ecosystem than a food chain?