**Biology Keystone Review Session: MODULES A and B   
Thursday, Jan. 7, 2016: 2:45 PM – 4:15 PM**

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| **MODULE A – CELLS AND CELL PROCESSES** | | | | | |
| **Assess-ment 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. https://app148.studyisland.com/pics/143923bacteriophage.pngThe diagram below shows a T4 bacteriophage. This virus consists of a single strand of DNA enclosed in a protein capsule. Is this virus considered a living organism?    1. No; living organisms must have two characteristics of life, and the T4 bacteriophage only has one.    2. Yes; since the virus contains protein, it is a living organism.    3. Yes; since the virus contains DNA, it is a living organism.    4. No; viruses are not considered to be living organisms. |  |
|  | 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. | 1. The capsule around the cell wall of a prokaryote helps it to    1. Move through water or soil    2. Reproduce under harsh conditions    3. Protects the cell from being engulfed    4. Convert sunlight into energy |  |
|  | 1. Which statement best describes the function of the cell wall?    1. Supports the plasma membrane,    2. Helps the cell attach to surfaces.    3. Manufactures proteins and lipids.    4. Stores water and food. |  |
|  | 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). | 1. At which level of biological organization does life emerge?    1. Organism    2. Molecules    3. Cells    4. Organelles |  |
| BIO.A.2 The Chemical Basis for Life | BIO.A.2.1 Describe how the unique properties of water support life on Earth. | | 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). | 1. Which of the following is responsible for many of water’s unique qualities?    1. Surface tension    2. Hydrogen bonding    3. Its low molecular mass    4. Adhesion |  |
|  | BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules). | | BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules. | 1. Carbon atoms have four electrons in their outer shell. This means that a single carbon atom can form up to \_\_\_ bonds with other atoms.    1. Eight    2. Four    3. Six    4. Two |  |
|  | BIO.A.2.2.2 Describe how biological macromolecules form from monomers. | 1. Which is not a macromolecule?    1. Protein    2. Nucleotide    3. Carbohydrate    4. Lipid |  |
|  | BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms. | 1. Carbohydrates and proteins are two types of macromolecules. Which functional characteristic of proteins distinguishes them from carbohydrates?    1. Large amount of stored information    2. Ability to catalyze biochemical reactions    3. Efficient storage of usable chemical energy    4. Tendency to make cell membranes hydrophobic |  |
|  | BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell. | | BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction. | 1. Which of the following is an enzyme?    1. Lactose    2. Adenosine    3. Protease    4. Phosphate |  |
|  | BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function. | 1. 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?    1. A pH change can cause the enzyme to change its shape.    2. A pH change can remove energy necessary to activate an enzyme.    3. A pH change can add new molecules to the structure of the enzyme.    4. A pH change can cause an enzyme to react with a different substrate. |  |
| BIO.A.3 Bioenergetics | BIO.A.3.1 Identify and describe the cell structures involved in processing energy. | | BIO.A.3.1.1 Describe the fundamental roles of plastids (e.g. chloroplasts) and mitochondria in energy transformations. | 1. Which process do most cells use to release chemical energy from glucose and other food molecules?    1. Active transport    2. Cell respiration    3. Passive transport    4. Photosynthesis |  |
|  | BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes. | | BIO.A.3.2.1 Compare the basic transformation of energy during photosynthesis and cellular respiration. | 1. During photosynthesis, plant cells take in water (H2O) and carbon dioxide (CO2) and release oxygen (O2). How is this different from what takes place during aerobic respiration?    1. During aerobic respiration, O2 is inhaled and CO2 and H2O are exhaled.    2. During aerobic respiration, the mitochondria form CO2 during the process of fermentation.    3. During aerobic respiration, cells take in O2 and release CO2, H2O, and ATP.    4. During aerobic respiration, cells use ATP to convert insulin into glucose and CO2. |  |
|  | BIO.A.3.2.2 Describe the role of ATP in biochemical reactions. | 1. Through the process of hydrolysis, cells remove phosphate groups from molecules of ATP to form molecules of ADP. This hydrolytic reaction results in    1. the breaking of low-energy bonds to produce free energy.    2. the formation of high-energy bonds to store free energy.    3. the formation of low-energy bonds to store free energy.    4. the breaking of high-energy bonds to produce free energy. |  |
| BIO.A.4 Homeostasis and Transport | BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into and out of, and throughout a cell. | | 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. | 1. Which function is carried out by the plasma membrane?    1. Synthesize the production of proteins.    2. Modify and transport proteins in the cell.    3. Regulate which materials enter and leave the cell.    4. Carry out reactions that create energy for the cell. |  |
|  | 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). | 1. A sodium-potassium pump within a cell membrane requires energy to move sodium and potassium ions into and out of a 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?    1. Sodium and potassium ions move by active transport, and glucose moves by osmosis.    2. Sodium and potassium ions move by active transport, and glucose moves by facilitated diffusion.    3. Sodium and potassium ions move by facilitated diffusion, and glucose moves by osmosis.    4. Sodium and potassium ions move by facilitated diffusion, and glucose moves by active transport. |  |
|  | 1. What statement best describes the reaction to a cell when it is placed in a hypertonic solution?    1. It shrinks and shrivels.    2. It swells and bursts.    3. It cannot survive.    4. It stops making proteins. |  |
|  | 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. | 1. Which organelle does the cell send proteins to for modification after they leave the endoplasmic reticulum?    1. Nucleus    2. Vacuole    3. Mitochondrion    4. Golgi apparatus |  |
|  | BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments. | | BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulations, oxygen regulation). | 1. The components of the human body, from organ systems to cell organelles, interact to maintain a balanced internal environment (homeostasis). To successfully accomplish this, organisms possess many different control mechanisms that detect deviations and make corrective actions. For example, when there is an increase in muscle cell activity, the body responds by    * 1. Increasing the heart rate      2. Increasing the respiratory rate      3. Producing more red blood cells      4. Producing more hemoglobin 2. I, II, and III only 3. III and IV only 4. I, II, III, and IV 5. I and II only |  |
| **MODULE B – CONTINUITY AND UNITY OF LIFE** | | | | | |
| **Assess-ment 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. | | 1. Which female structure becomes a zygote when it is fertilized?    1. Polar body    2. Chromatid    3. Egg    4. Sperm |  |
|  | 1. Which eukaryotic cell structure is membrane-bound?    1. Chromosomes    2. Organelles    3. Nuclei    4. Spindles |  |
|  | BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions. | | 1. Cellular division involves the redistribution of the nuclear material, or DNA, as well as the cytoplasm and organelles. During which of the following processes is the cytoplasm and organelles divided?    * 1. Cytokinesis      2. Meiosis      3. Mitosis    1. III only    2. I only    3. I, II, and III    4. II only |  |
|  | BIO.B.1.2 Explain how genetic information is inherited. | BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic material. | | 1. When the DNA segment shown below replicates, what will be the sequence of bases in the nucleotide chain that is synthesized? T-G-C-C-T-A-G    1. T-G-C-C-T-A-G    2. A-C-C-G-T-T-G    3. A-C-G-C-A-A-C    4. A-C-G-G-A-T-C |  |
|  | BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. | | 1. One of Mendel’s pea plant experiments crossed a homozygous tall plant with a homozygous short plant. The offspring were all tall. What is the best explanation for these results?    1. There is only one gene that controls height.    2. There are two different genes that control height.    3. The allele for tallness is dominant over the allele for shortness.    4. The allele for tallness is recessive to the allele for shortness. |  |
| 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). | | 1. Which trait can disappear for one or more generations before reappearing?    1. Heterozygous    2. Homozygous    3. Recessive    4. Dominant |  |
|  | 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). | | 1. During normal meiosis, homologous chromosomes pair up and separate so that each gamete receives a copy of every chromosome. Sometimes an error is made during this separation and homologous chromosomes fail to separate. This results in one gamete that has two copies of the chromosome, and another gamete that does not have the chromosome at all. This type of error is known as \_\_\_\_\_\_\_ and usually results in zygotes that either do not develop to term or have severe abnormalities.    1. Chromosome translocation    2. Chromosome nondisjunction    3. Chromosome inversion    4. Chromosome insertion |  |
|  | BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification). | BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. | | 1. During translation, the anticodon on the tRNA makes a temporary bond with the codons on the mRNA. How many nucleotides make a codon?    1. One    2. Two    3. Three    4. Four |  |
|  | 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. | | 1. 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?    1. It stores all proteins for later use.    2. It provides an attachment site for larger organelles.    3. It aids in the production of membrane and secretory proteins.    4. It stores amino acids required for the production of all proteins. |  |
|  | BIO.B.2.3 Explain how genetic information is expressed. | 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). | | 1. Which type of mutation has no effect on an individual human?    1. Silent mutation    2. Nonsense mutation    3. Missense mutation    4. Frame-shift mutation |  |
|  | BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics. | 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). | | 1. Today, genetically-engineered crops are becoming more common. Which of the following is a likely possible negative impact of the use of genetically-engineered crops?    1. Crops that have been genetically engineered to resist disease would increase the use of pesticides.    2. Animals that consume genetically-engineered crops will no longer be able to reproduce.    3. Human DNA might experience recombinant mutations with the plant DNA.    4. Genetically-engineered genes can be transferred to wild plants in the area. |  |
| BIO.B.3 Theory of Evolution | BIO.B.3.1 Explain the mechanisms of evolution. | BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population. | | 1. Which of the following best explains how variations among individuals of a species are related to natural selection?    1. Variations are always a result of genetic mutations.    2. Small populations have more variations than large populations.    3. Organisms with useful variations are most likely to survive and reproduce.    4. Variations cause increased competition for limited resources. |  |
|  | 1. Which of the following statements concerning inherited traits and acquired traits is true?    1. Individuals can pass both acquired and inherited traits to the next generation.    2. Individuals can pass acquired traits, but not inherited traits, to the next generation.    3. Individuals can pass inherited traits, but not acquired traits, to the next generation.    4. Individuals can pass neither inherited nor acquired traits to the next generation. |  |
|  |  | 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). | | 1. The diagram shows a population of beetles that is separated by a rising river. After time passes, the river subsides, and the two populations are no longer separated. However, the two populations are unable to successfully reproduce with each other any longer. What has happened?   06.jpg   * 1. A single population has been split into two populations that will eventually become a single population again.   2. A single species has adapted to several conditions, increasing genetic variability.   3. Two populations of a single species have adapted to different conditions and have become different species.   4. Two different species have adapted to the same conditions and have become the same species. |  |
|  |  | BIO.B.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population. | | 1. A mutation occurs in the genes that code for coat color in deer. Which change will most likely result from this mutation?    1. A change in the selection pressures acting on coat color    2. A change in the coat-color genes of deer predator species    3. An increase in coat-color diversity in the population    4. An increase in the number of genes for coat color in the population |  |
|  | BIO.B.3.2 Analyze the sources of evidence for biological evolution. | BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code). | | 1. Use the illustrations below to answer the question.   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?   1. Changes in muscle structure 2. Changes in the genetic codes 3. Trait formation due to behaviors 4. Development of vestigial structures |  |
|  | BIO.B.3.3 Apply scientific thinking, processes, and technologies in the study of the theory of evolution. | BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation. | | 1. Use the table below to answer the question.     A group of students measured a ten-square-meter section of pond ecosystem and recorded observations. Which statement is a testable hypothesis?   1. The frogs living in the pond represent a population. 2. Water is an abiotic component in the pond ecosystem. 3. If the fish are given more food, then they will be happier. 4. If the frogs are startled, they will jump into the water. |  |
| BIO.B.4 Ecology | BIO.B.4.1 Describe ecological levels of organization in the biosphere. | BIO.B.4.1.1 Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere). | | 1. Which of the following would represent an ecosystem?    1. Lake    2. Fish tank    3. Prairie    4. All of these |  |
|  | 1. Which of the following represents the most complex level?    1. Community    2. Species    3. Ecosystem    4. Population |  |
|  | BIO.B.4.1.2 Describe characteristics biotic and abiotic components of aquatic and terrestrial ecosystems. | | 1. Which biome is characterized by a layer of permafrost?    1. Taiga    2. Savanna    3. Chaparral    4. Tundra |  |
|  | 1. All the nonliving parts of an ecosystem are referred to as:    1. The community    2. Biotic factors    3. Abiotic factors    4. Biomes |  |
|  | BIO.B.4.2 Describe interactions and relationships in an ecosystem. | BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids). | | 1. Which of the following is a primary consumer?    1. Cow    2. Dog    3. Hawk    4. Bear |  |
|  | 1. An organism’s trophic level refers to    1. The rate at which it uses energy    2. Where it lives    3. What it eats    4. Whether it is early or late in ecological succession |  |
|  | 1. Which best describes the transfer of energy in a food web?    1. The producers and consumers transfer energy among each other so that there is no energy loss within the food web.    2. The transfer of energy results in an increase in overall energy due to the accumulation of energy in each consumer.    3. Some of the energy is list to the environment as heat, and there is an overall decrease in energy when it is transferred.    4. The consumers transfer energy stored in their bodies to the producers, which use the energy for life processes. |  |
|  | BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis). | | 1. A symbiotic relationship in which both species benefit is best described as    1. Commensalism    2. Competitive exclusion    3. Mutualism    4. Parasitism |  |
|  | BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e. water cycle, carbon cycle, oxygen cycle, and nitrogen cycle). | | 1. The water cycle shows the continuous movement of Earth's water.   https://app148.studyisland.com/pics/79341WaterCycle3.jpg  During which of the following water cycle processes does water move from living, organic matter to abiotic resources?   * + 1. Transpiration     2. Vapor transport     3. Precipitation     4. Condensation |  |
|  | 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). | | 1. Which of the following has had the greatest effect on ozone depletion?    1. Chlorofluorocarbons (CFCs)    2. Carbon monoxide (CO)    3. Carbon dioxide (CO2)    4. Water vapor (H2O) |  |
|  | BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction. | | 1. A population that is growing exponentially in the absence of limiting factors can be illustrated by a(n)    1. S-shaped curve    2. J-shaped curve    3. Curve that terminates in a plateau phase    4. Tolerance curve |  |
| 1. **Open Response Question**   Use the diagrams below to answer the question:    **Part A:** Complete the chart below by describing energy transformations involved in each process.    **Part B:** Describe how energy transformations involved in photosynthesis are related to energy transformations involved in cellular respiration. | | | | | |