Student Assessment Questions – Control of Gene Expression in Prokaryotes

Questions

1. Allolactose induces the synthesis of the enzyme lactase. An *E. coli* cell is presented for the first time with the sugar lactose (containing its isomer, allolactose) as a potential food source. Which of the following occurs when the lactose enters the cell?

   a. The repressor protein and allolactose binds to the RNA polymerase.

   b. Allolactose binds to the repressor protein.

   c. The repressor protein attaches to the regulatory gene.

   d. Allolactose binds to the regulatory gene.

2. What is the function of the operator portion of an operon?

   a. Producing repressor molecules.

   b. Producing mRNA.

   c. Binding the RNA polymerase.

   d. Binding the repressor protein.

3. Describe the cellular environment that must be present for a repressible operon to be turned "on."

Student Assessment Questions – Cell Cycle Regulation

Questions

1. Which of the following molecules is necessary for progression through the G_2 cell cycle checkpoint?

   a. Cdk (cyclin dependent kinase).

   b. Cyclin.

   c. Both.

   d. Neither.

2. Which cell cycle checkpoint would a cell fail if there were a large number of errors in the replicated DNA?

   a. G_1

   b. G_2

   c. M

   d. None of the above.

3. Describe how the concentrations of cyclin, Cdk, and MPF change throughout the cell cycle, and the role these molecules play in regulating the cell cycle.

Student Assessment Questions – Statistics of Inheritance

Questions

1. Phenylketonuria (PKU) is an inherited human disease caused by a recessive allele. Individuals that are homozygous for the gene cannot metabolize the amino acid phenylalanine. This can lead to seizures, mental retardation, and other medical conditions. If both parents of an infant are heterozygous for the gene, what is the probability of one of their offspring having the disease?

   a. 100% *b.* 50% *c.* 25% *d.* 0%

2. A certain species of fish have individuals with both brown and green eyes. Explain how a study of the eye color of 50 offspring from a brown eyed homozygous fish and a green-eyed homozygous fish would help determine which color allele is dominant in that species.

3. A flowering plant can produce red flowers if it is homozygous or heterozygous in the dominant allele R. The plant produces white flowers if it is homozygous in the recessive allele r. Without drawing a Punnett square, calculate the probability that an offspring from a heterozygous red-flowering plant and a homozygous white-flowering plant would produce a seed that will grow into red-flowering plant.

Student Assessment Questions – Chi-Square

Questions

1. A chi-square result of P = 0.80 indicates

   a. 80% of the observed data is valid.

   b. there is an 80% chance that the observed data is accurate.

   c. there is an 80% chance that the observed data is not different from the expected values.

   d. there is an 80% chance that the observed data is different from the expected values.

2. The distribution of eye color within your class is 7 people have blue eyes, 8 people have brown eyes, and 3 people have green eyes. The expected distribution would be 6 people with blue eyes, 7 people with brown eyes, and 5 people with green eyes. Calculate the value for χ^2.

3. For the calculation you performed above, answer the following:

   a. What are the degrees of freedom?

   b. What is the P value?

   c. Are the differences observed statistically significant?

   d. Do the eye colors in your class statistically match the expected eye colors in the population?

Student Assessment Questions – Selection and Speciation

Questions

1. Which type of selection has probably occurred in a population of turtles with large jaws and small jaws, but no medium-sized jaws?

   a. Directional selection.

   b. Disruptive selection.

   c. Evolutionary selection.

   d. Stabilizing selection.

2. What type of selection has occurred in the poultry industry where birds with extremely large breasts are preferred? Explain your reasoning.

3. Researchers find very similar bird species on islands off the coast of Australia. The birds have similar morphology and serve similar roles in their respective niches. What questions might the researchers need to ask in order to determine if the two populations represent the same species?

Student Assessment Questions – Phylogenetic Trees

Questions

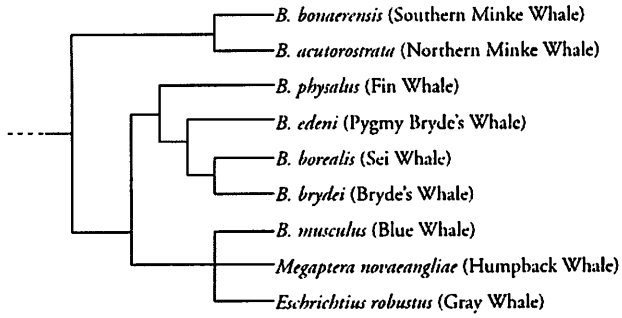
1. Use the diagram to determine which of the following pairs are most closely related.

   a. Gray Whale & Sei Whale

   b. Sei Whale & Bryde's Whale

   c. Bryde's Whale & Pygmy Bryde's Whale

   d. Blue Whale & Bryde's Whale



2. The section of a gene from several species is analyzed. The DNA sequence from organism X is ATTCGCTATCGTAT. Which organism below is most closely related to organism X?

   a. Organism A—ATTCGCTATCGTAT

   b. Organism B—TAACCGATAGCATT

   c. Organism C—TAACGGATAGCATT

   d. Organism D—TAAGCGTTTCCATT

3. Compare the accuracy of determining relatedness through morphology and behaviors versus looking at neutral mutations in DNA sequences.

Student Assessment Questions – Hardy-Weinberg Equilibrium

Questions

1. In the Hardy-Weinberg equations p and q refer to the
   a. Frequencies of phenotypes in a population.
   b. Frequencies of genotypes in a population.
   c. Frequencies of alleles in a population.
   d. None of the above.
2. If a population is in Hardy-Weinberg equilibrium, which of the following is NOT true?
   a. The population is not evolving.
   b. The allele frequencies remain constant from one generation to the next.
   c. The number of individuals each generation is the same.
   d. The genotype frequencies remain constant from one generation to the next.
3. What are the five conditions that must be met in order for a population to be considered in Hardy-Weinberg equilibrium?

Student Assessment Questions – Mass Extinctions

Questions

1. How many mass extinctions are recorded in the geologic history of the Earth?

   a. Two.
   c. Five.
   b. Four.
   d. Seven.

2. Compare and contrast the immediate effect of a mass extinction event with the long-term effect on biodiversity.

3. Explain how the long-term effects of a mass extinction can lead to adaptive radiation opportunities for the survivors.

Student Assessment Questions – Global Climate Change

Questions

1. Which of the following is a direct effect of decreased polar ice cap albedo?
   a. Decreased melting rates.
   b. Decreased reflectivity of the Sun's heat.
   c. Increased melting rates.
   d. Increased ocean pH levels.
2. Proxy data would include all of the following examples except
   a. Current ocean surface temperature.
   b. Tree ring data for past growing conditions and temperatures.
   c. Ice core data to analyze temperature.
   d. Historical records like a ship's log.
3. The past 1,000 years have shown great increases and decreases in the Earth's average temperature. Some say that the current trend in rising temperatures is just one more fluctuation in the Earth's history. How would you refute that claim using data from this activity?

Student Assessment Questions – Eutrophication

Questions

1. Eutrophic lakes are characterized by:

   a. Poor light penetration.

   b. High biochemical oxygen demand (BOD).

   c. Low diversity of plants and animals.

   d. High nutrient levels.

   e. All of the above.

2. What is the connection between eutrophication of a lake ecosystem and secondary succession in a terrestrial system?

3. In class you overhear your friend say, "The biological oxygen demand is the oxygen that is used by the fish in the water." What could you say to your friend to help them correct this misconception?

Student Assessment Questions – Feedback Mechanisms

Questions

1. Which of the following correctly describes a positive feedback mechanism?

   a. The stimulus decreases the response.

   b. The response decreases the stimulus.

   c. The response increases the stimulus.

   d. The response increases spontaneously.

2. Describe the feedback mechanism that is employed by the body when the internal temperature gets too high.

3. Dopamine is a neurotransmitter that is released in the brain when you learn. It rewards you with a feeling of happiness and euphoria. Is this a positive or negative feedback mechanism? Justify your reasoning.

Student Assessment Questions – Control of Blood Sugar Levels

Questions

1. As blood glucose levels rise, the pancreas releases which hormone?

   a. Estrogen.

   b. Glucagon.

   c. Glycogen.

   d. Insulin.

2. Which hormone helps glucose get converted into glycogen in the liver and muscle cells?

   a. Estrogen.

   b. Glucagon.

   c. Glycogen.

   d. Insulin.

3. Is the regulation of blood sugar concentration achieved by positive or negative feedback loops? Justify your answer.

Student Assessment Questions – Neuron Structure

Questions

1. Which part of the neuron receives a signal from other neurons or sensory cells?

   a. Dendrite.
   c. Axon.
   b. Soma.
   d. Synapse.

2. What is the resting potential for a neuron membrane?

   a. –80 mV
   c. –55 mV
   b. –70 mV
   d. –70 V

3. When sodium ions move into a cell through embedded proteins what happens to the membrane potential?

Student Assessment Questions – Neuron Function

Questions

1. What is the threshold potential for the propagation of an action potential along the axon of a neuron?

   a. –70 mV
   b. –55 mV
   c. –35 mV
   d. –80 mV

2. Describe the phases of a neuron action potential that are considered polarization, depolarization, and hyperpolarization.

3. Draw a graph to illustrate the membrane potential changes as an action potential moves down the axon of a neuron.

Student Assessment Questions – Plant Hormones

Questions

1. Which of the following plant hormones is responsible for the elongation of certain cells during phototropic responses?

   a. Auxins.
   b. ABA.
   c. Ethylene.
   d. All of the above.

2. Which of the following plant hormones work antagonistically in controlling the germination of seeds?

   a. Auxins and brassinosteroids.
   b. Gibberellins and abscisic acid.
   c. Auxins and ethylene.
   d. Ethylene and abscisic acid.

3. Design an experiment that would test the ripening effects of ethylene from a ripe banana.

Student Assessment Questions – Immunity

Questions

1. Which type of cell releases antibodies?

   a. Antigen-presenting cell.

   b. B-cell.

   c. T-cell.

   d. All of these.

2. What is one key to the immune system's ability to respond quickly to a second infection by a particular pathogen?

   a. Having many particles of that pathogen in the body.

   b. Receiving a signal from a T-cell.

   c. Making memory B-cells after the first exposure to the pathogen.

   d. Having encounters with many different kinds of pathogens.

3. How do vaccines help prevent disease?