Name: _____ **Class:** _____ **Date:** _____ **ID: A**

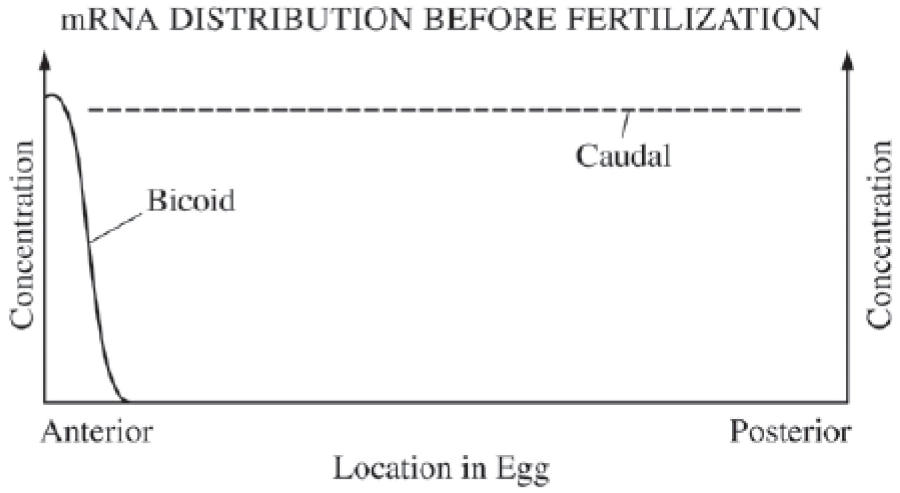
AP Review Guide Practice Exam

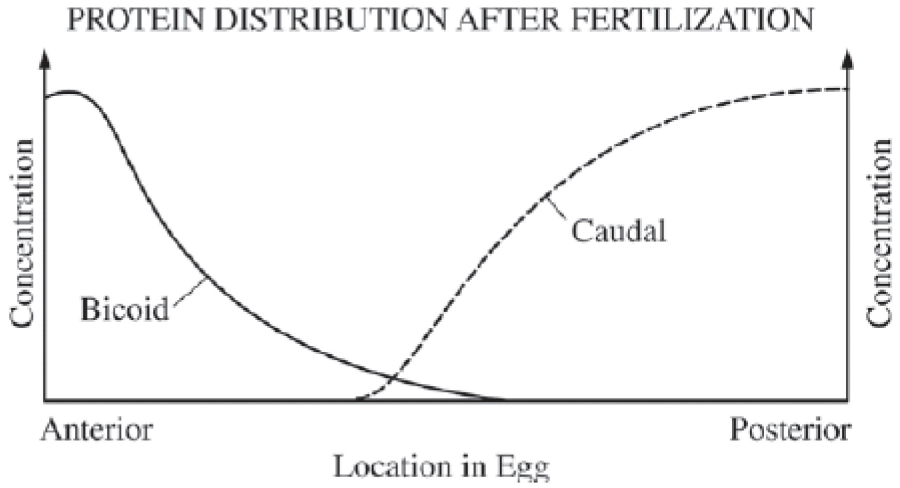
Multiple Choice
Identify the choice that best completes the statement or answers the question.

Note: The following questions are from a variety of non-secure resources. They were in the Review Guide divided by unit, but it was requested to put them together as a practice exam. Due to the initial separation, some prompts might repeat.

Good Luck @apbiopenguins!

1. The first diagram below shows the levels of mRNA from two different genes (bicoid and caudal) at different positions along the anterior-posterior axis of a Drosophila egg immediately before fertilization. The second diagram shows the levels of the two corresponding proteins along the anterior-posterior axis shortly after fertilization.





Which of the following conclusions is best supported by the data?

a. Caudal protein stimulates development of anterior structures.
b. Bicoid protein inhibits translation of caudal mRNA.
c. Translation of bicoid mRNA produces caudal protein.
d. Bicoid protein stabilizes caudal mRNA.

A student placed 20 tobacco seeds of the same species on moist paper towels in each of two petri dishes. Dish A was wrapped completely in an opaque cover to exclude all light. Dish B was not wrapped. The dishes were placed equidistant from a light source set to a cycle of 14 hours of light and 10 hours of dark. All other conditions were the same for both dishes. The dishes were examined after 7 days and the opaque cover was permanently removed from dish A. Both dishes were returned to the light and examined again at 14 days. The following data were obtained.

	Dish A		Dish B	
	Day 7 Covered	Day 14 Uncovered	Day 7 Uncovered	Day 14 Uncovered
Germinated seeds	12	20	20	20
Green-leaved seedlings	0	14	15	15
Yellow-leaved seedlings	12	6	5	5
Mean stem length below first set of leaves	8 mm	9 mm	3 mm	3 mm

2. Additional observations were made on day 21, and no yellow-leaved seedlings were found alive in either dish. This is most likely because
   a. yellow-leaved seedlings were unable to convert light energy to chemical energy
   b. taller green-leaved seedlings blocked the light and prevented photosynthesis
   c. a higher rate of respiration in yellow-leaved seedlings depleted their stored nutrients
   d. yellow-leaved seedlings were unable to absorb water from the paper towels

3. According to the results of this experiment, germination of tobacco seeds during the first week is
   a. prevented by paper towels
   b. accelerated in green-leaved seedlings
   c. unaffected by light intensity
   d. increased by exposure to light

4. The most probable cause for the difference in mean stem length between plants in dish A and plants in dish B is which of the following?
   a. Genetic differences between the seeds
   b. Elongation of seedlings in response to the lack of light
   c. Enhancement of stem elongation by light
   d. Shortening of cells in the stem in response to the lack of light

5. Which of the following best supports the hypothesis that the difference in leaf color is genetically controlled?
   a. The number of germinated seeds in dish A on days 7 and 14
   b. The death of all the yellow-leaved seedlings
   c. The number of yellow-leaved seedlings in dish A on day 7
   d. The existence of yellow-leaved seedlings as well as green-leaved ones on day 14 in dish B

An experiment to measure the rate of respiration in crickets and mice at 10°C and 25°C was performed using a respirometer, an apparatus that measures changes in gas volume. Respiration was measured in mL of O_2 consumed per gram of organism over several five-minute trials and the following data were obtained.

Organism	Temperature (°C)	Average respiration (mL O_2/g/min)
Mouse	10	0.0518
Mouse	25	0.0321
Cricket	10	0.0013
Cricket	25	0.0038

6. According to the data, the mice at 10°C demonstrated greater oxygen consumption per gram of tissue than did the mice at 25°C. This is most likely explained by which of the following statements?
   a. The mice at 10°C had a higher rate of ATP production than the mice at 25°C.
   b. The mice at 25°C were more active than the mice at 10°C.
   c. The mice at 10°C had a lower metabolic rate than the mice at 25°C.
   d. The mice at 25°C weighed less than the mice at 10°C.

7. During aerobic cellular respiration, oxygen gas is consumed at the same rate as carbon dioxide gas is produced. In order to provide accurate volumetric measurements of oxygen gas consumption, the experimental setup should include which of the following?
   a. A plant to produce oxygen
   b. A substance that removes carbon dioxide gas
   c. A valve to release excess water
   d. A glucose reserve

8. According to the data, the crickets at 25°C have greater oxygen consumption per gram of tissue than do the crickets at 10°C. This trend in oxygen consumption is the opposite of that in the mice. The difference in trends in oxygen consumption among crickets and mice is due to their
   a. mode of nutrition
   b. relative size
   c. mode of ATP production
   d. mode of internal temperature regulation

9. Sickle-cell anemia results from a point mutation in the HBB gene. The mutation results in the replacement of an amino acid that has a hydrophilic R-group with an amino acid that has a hydrophobic R-group on the exterior of the hemoglobin protein. Such a mutation would most likely result in altered
   a. DNA structure as a result of abnormal hydrogen bonding between nitrogenous bases
   b. protein secondary structure as a result of abnormal hydrophobic interactions between R-groups in the backbone of the protein
   c. properties of the molecule as a result of abnormal interactions between adjacent hemoglobin molecules
   d. fatty acid structure as a result of changes in ionic interactions between adjacent fatty acid chains

10. A student used a microscope to observe a wet-mount slide of red onion epidermal cells that were suspended in a 1% NaCl solution. The student then added a 15% NaCL solution to the slide and observed the changes that occurred. The student's observations are represented in Figure 1.

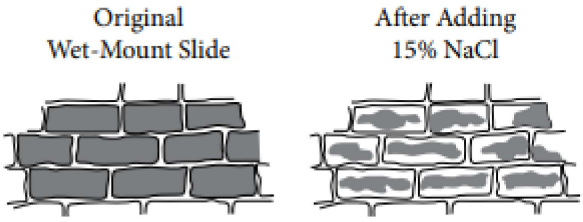


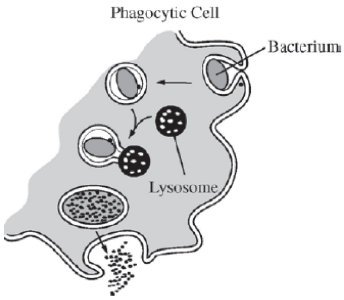
Figure 1. Student's observations of onion cells

Which of the following most directly explains the changes in the cells?

a. The movement of NaCl from the solution into the cytoplasm of the cells
b. The degradation of DNA in the nuclei of the cells
c. The lysis of chloroplasts in the cells
d. The movement of water from the central vacuoles of the cells into the solution

11. A pathogenic bacterium has been engulfed by a phagocytic cell as part of the nonspecific (innate) immune response. Which of the following illustrations best represents the response?

a.



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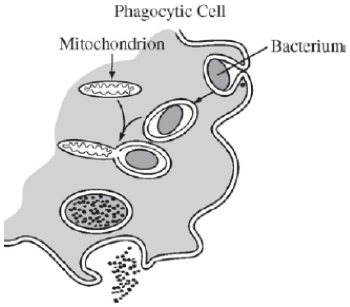

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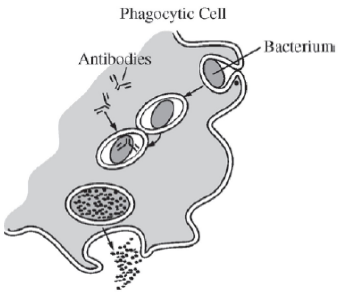

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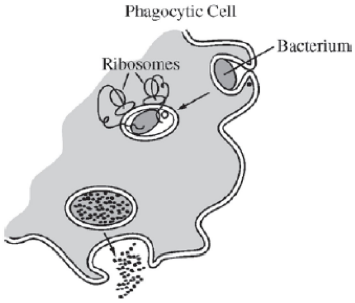
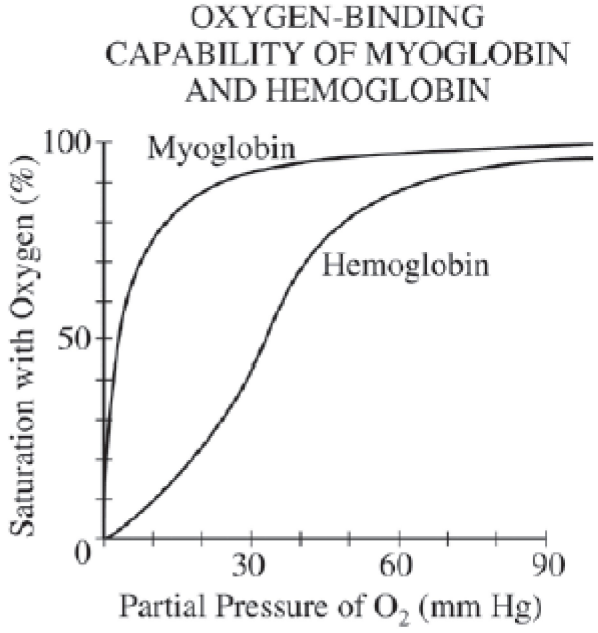


Both myoglobin and hemoglobin are proteins that bind reversibly with molecular oxygen. The graph below shows the oxygen-binding saturation of each protein at different concentrations of oxygen.

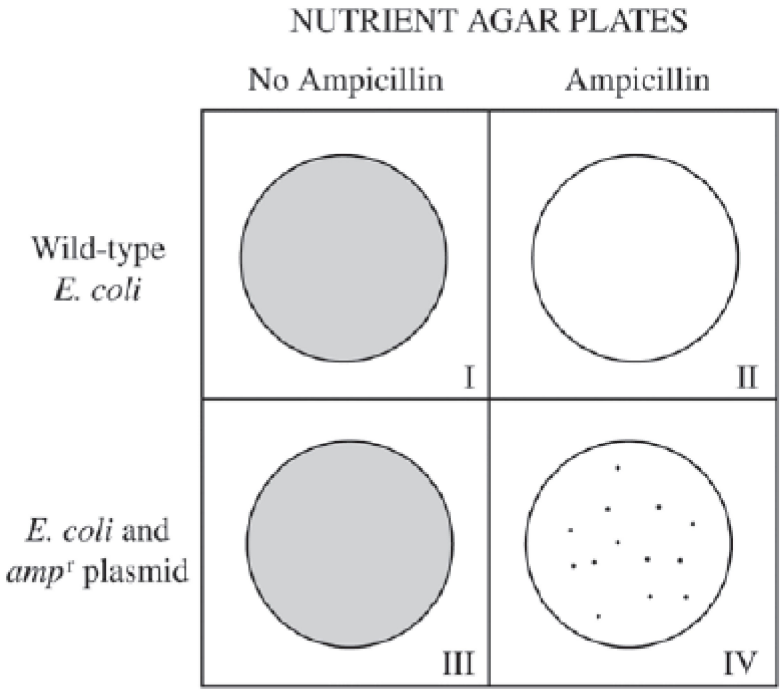


12. Which of the following statements is correct?
    a. At 80 mm Hg partial pressure, myoglobin binds twice as much oxygen as hemoglobin binds.
    b. At 40 mm Hg partial pressure, myoglobin has a greater affinity for oxygen than hemoglobin has.
    c. At 10 mm Hg partial pressure, hemoglobin binds oxygen but myoglobin does not.
    d. At 20 mm Hg partial pressure, myoglobin and hemoglobin bind oxygen in equal amounts.

13. Strenuous exercise lowers the blood pH, causing the curves for both hemoglobin and myoglobin to shift to the right. This shift results in
    a. the capture of more O_2 by hemoglobin
    b. an increase in the number of O_2-binding sites
    c. an unloading of O_2 at higher partial pressures
    d. the capture of more O_2 by myoglobin

14. Which of the following best describes the physiological significance of the different oxygen-binding capabilities of hemoglobin and myoglobin?
    a. They prevent glycogen depletion in muscles.
    b. They prevent muscles from depleting oxygen levels in the blood.
    c. They cause muscles to become anaerobic.
    d. They enhance movement of oxygen from the blood into the muscles.

In a transformation experiment, a sample of E. coli bacteria was mixed with a plasmid containing the gene for resistance to the antibiotic ampicillin (ampr). Plasmid was not added to a second sample. Samples were plated on nutrient agar plates, some of which were supplemented with the antibiotic ampicillin. The results of E. coli growth are summarized below. The shaded area represents extensive growth of bacteria; dots represent individual colonies of bacteria.



15. Which of the following best explains why there is no growth on plate II?
    a. Nutrient agar inhibits E. coli growth.
    b. The bacteria on the plate were transformed.
    c. The transformation procedure killed the bacteria.
    d. The initial E. coli culture was not ampicillin-resistant.

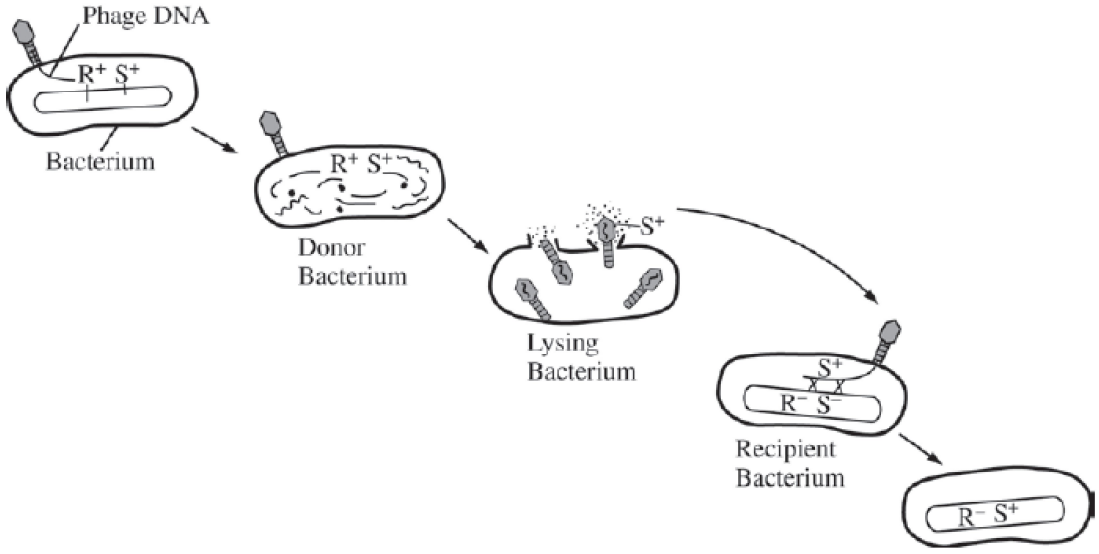
16. In a second experiment, the plasmid contained the gene for human insulin as well as the ampr gene. Which of the following plates would have the highest percentage of bacteria that are expected to produce insulin?
    a. IV only
    b. I only
    c. I and III
    d. III only

17. Plates that have only ampicillin-resistant bacteria growing include which of the following?
    a. III only
    b. IV only
    c. I and II
    d. I only

18. Which of the following statements best explains why there are fewer colonies on plate IV than on plate III?
    a. The bacteria on plate III did not mutate.
    b. Plate IV is the positive control.
    c. The plasmid inhibits E. coli growth.
    d. Not all E. coli cells are successfully transformed.

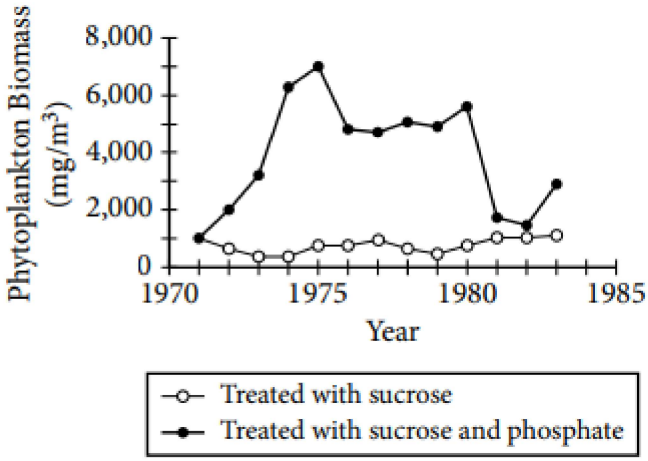
19. Plates I and III were included in the experimental design in order to
    a. demonstrate that the plasmid can lose its ampr gene
    b. demonstrate that the plasmid is needed for E. coli growth
    c. prepare the E. coli for transformation
    d. demonstrate that the E. coli cultures were viable

20. The figure below shows several steps in the process of bacteriophage transduction in bacteria. Which of the following explains how genetic variation in a population of bacteria results from this process?



    a. DNA of the recipient bacterial chromosome undergoes recombination with DNA introduced by the phage from the donor bacterium, leading to a change in the recipient's genotype.
    b. Bacterial proteins transferred from the donor bacterium by the phage to the recipient bacterium recombine with genes on the recipient's chromosome.
    c. The phage infection of the recipient bacterium and the introduction of DNA carried by the phage cause increased random point mutations of the bacterial chromosome.
    d. The recipient bacterium incorporates the transduced genetic material coding for phage proteins into its chromosome and synthesizes the corresponding proteins.

Questions 4–7 refer to the following material.



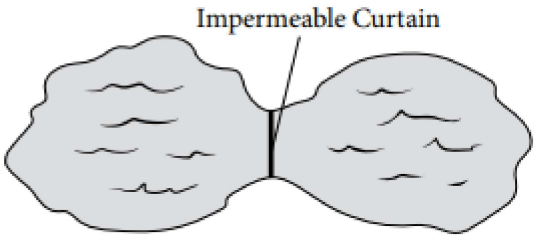


Figure 1. Phytoplankton biomass in two sides of a small lake that is divided by an impermeable curtain

In the early 1970s, researchers hypothesized that carbon was the limiting nutrient in many aquatic ecosystems. To test this hypothesis, the researchers divided a small lake in two roughly equal halves with an impermeable curtain that was fastened and sealed to the bedrock of the lake. Beginning in 1971 the researchers treated one side of the lake with sucrose and the other side with both sucrose and phosphate. From 1971 to 1983 the researchers monitored the phytoplankton biomass in both parts of the lake. The results are shown in Figure 1.

21. Which of the following treatments would have been the best control treatment for the experiment?
    a. A small pool of the lake water maintained in a controlled laboratory environment
    b. A different lake that was treated with sucrose and phosphate
    c. An untreated section of the lake
    d. A section of the lake that was treated with phosphate but not sucrose

22. The average growth rate of the phytoplankton population from 1971 to 1975 in the side of the lake treated with sucrose and phosphate is closest to which of the following?
    a. 6,000 (mg/m^3)/year
    b. 1,000 (mg/m^3)/year
    c. 125 (mg/m^3)/year
    d. 1,500 (mg/m^3)/year

23. Which of the following was most likely a direct consequence of the addition of phosphate to the lake?
    a. The amount of energy available to consumers in the lake increased
    b. The amount of biomass in the first trophic level decreased.
    c. The amount of energy available to producers in the lake increased.
    d. The amount of biomass in the second trophic level decreased.

24. Which of the following claims is best supported by the data?
    a. Carbon was a limiting factor for phytoplankton in the lake.
    b. Neither carbon nor phosphate was a limiting factor for phytoplankton in the lake.
    c. Both carbon and phosphate were limiting factors for phytoplankton in the lake.
    d. Phosphate was a limiting factor for phytoplankton in the lake.

25. Insulin is a protein hormone that is secreted in response to elevated blood glucose levels. When insulin binds to its receptors on liver cells, the activated receptors stimulate phosphorylation cascades that cause the translocation of glucose transporters to the plasma membrane.

    Based on the information provided, which of the following best describes the role of insulin in this liver cell signal transduction pathway?
    a. It acts as a ligand.
    b. It acts as a protein kinase.
    c. It acts as a secondary messenger.
    d. It acts as a receptor.

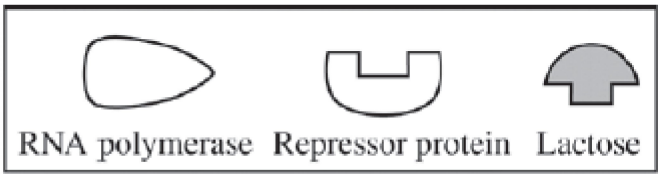
26. The tiny blue-eyed Mary flower is often one of the first flowers seen in the spring in some regions of the United States. The flower is normally blue, but sometimes a white or pink flower variation is found. The following data were obtained after several crosses.

Parents	F_1	F_2
Blue x White	Blue	196 Blue, 63 White
Blue x Pink	Blue	149 Blue, 52 Pink
Pink x White	Blue	226 Blue, 98 White, 77 Pink

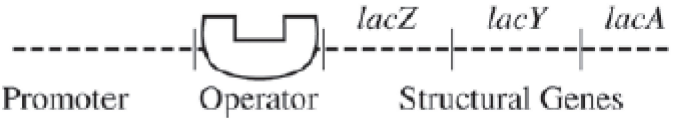
    Which of the following statements best explains the data?
    a. Flower color is an inherited trait, and the F1 and F2 phenotypes of the flowers arising from the pink and white cross can best be explained by another gene product that influences the phenotypic expression.
    b. The appearance of blue in the F1 generation of the pink and white cross demonstrates that flower color is not an inherited trait but is determined by the environment.
    c. Since the F1 and F2 phenotypes of the pink and white cross do not fit the expected genotypic and phenotypic ratios, blue-eyed Mary must reproduce by vegetative propagation.
    d. Flower color depends on stages of flower development, and young flowers are white, advancing to pink and then blue.

27. Lactose digestion in E. coli begins with its hydrolysis by the enzyme b-galactosidase. The gene encoding b-galactosidase, lacZ, is part of a coordinately regulated operon containing other genes required for lactose utilization.

    Which of the following figures correctly depicts the interactions at the lac operon when lactose is NOT being utilized? (The legend below defines the shapes of the molecules illustrated in the options.)



a.



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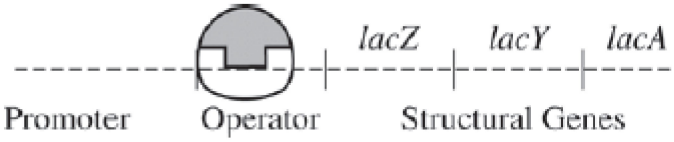

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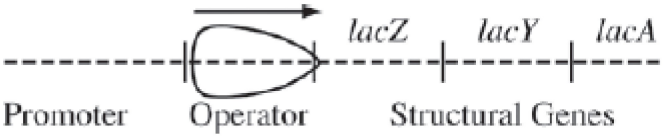

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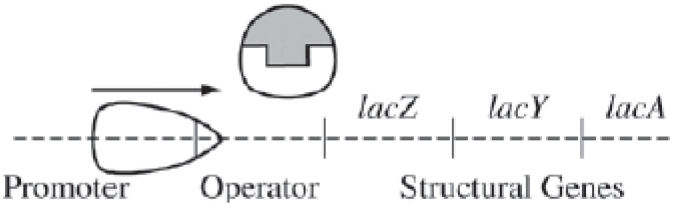
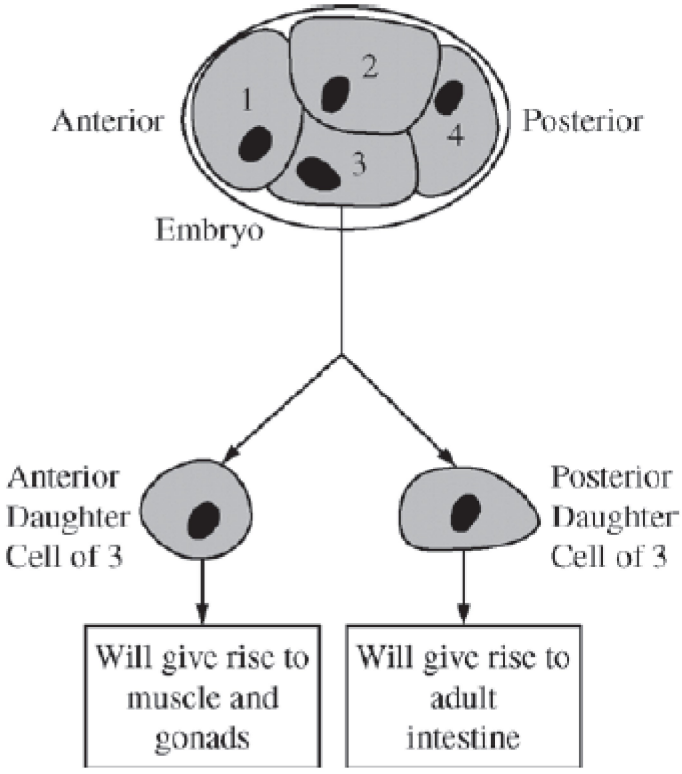


28. The diagram below shows a developing worm embryo at the four-cell stage. Experiments have shown that when cell 3 divides, the anterior daughter cell gives rise to muscle and gonads and the posterior daughter cell gives rise to the intestine. However, if the cells of the embryo are separated from one another early during the four-cell stage, no intestine will form. Other experiments have shown that if cell 3 and cell 4 are recombined after the initial separation, the posterior daughter cell of cell 3 will once again give rise to normal intestine.



Which of the following is the most plausible explanation for these findings?

a. Cell 4 transfers genetic material to cell 3, which directs the development of intestinal cells.
b. Cell 3 passes an electrical signal to cell 4, which induces differentiation in cell 4.
c. A cell surface protein on cell 4 signals cell 3 to induce formation of the worm's intestine.
d. The plasma membrane of cell 4 interacts with the plasma membrane of the posterior portion of cell 3, causing invaginations that become microvilli.

29. Experimental evidence shows that the process of glycolysis is present and virtually identical in organisms from all three domains, Archaea, Bacteria, and Eukarya. Which of the following hypotheses could be best supported by this evidence?
    a. All organisms carry out glycolysis in mitochondria.
    b. Across the three domains, all organisms depend solely on the process of anaerobic respiration for ATP production.
    c. The presence of glycolysis as an energy-releasing process in all organisms suggests that convergent evolution occurred.
    d. Glycolysis is a universal energy-releasing process and therefore suggests a common ancestor for all forms of life.

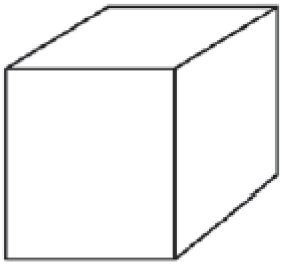
30. The human *TPM1* gene encodes members of the tropomyosin family of cytoskeletal proteins. Which of the following best explains how different proteins can be made in different cell types from the one TPM1 gene?
    a. Different portions of the primary transcript remain bound to the template DNA.
    b. The GTP cap is selectively added to and activates different exons.
    c. Different introns are selectively converted to exons.
    d. Different exons are retained or spliced out of the primary transcript.

31. The apple maggot fly, *Rhagoletis pomonella*, is native to North America and originally fed on fruit of the wild hawthorn. Since the mid-1800s, a population of flies has emerged that instead feed on domesticated apples. Apple maggot flies typically mate on or near the fruit of their host plants. Many varieties of apples ripen three to four weeks before the hawthorn fruits do.

    The different fruit preferences of the two fly populations will most likely have which of the following effects?
    a. The single fly species will evolve into two distinct species because of the lack of gene flow between the two populations.
    b. The ability to survive on a diet of two different fruits will help the flies learn to eat many more types of fruit.
    c. The flies that eat hawthorn fruit will lay some of their eggs on the earlierripening apples to minimize competition among the larvae.
    d. The flies that eat hawthorn fruit will increase in number, while the flies that eat apples will decrease in number because of the use of insecticides on apple trees.

32. Simple cuboidal epithelial cells line the ducts of certain human exocrine glands. Various materials are transported into or out of the cells by diffusion. (The formula for the surface area of a cube is 6 x S^2, and the formula for the volume of a cube is S^3, where S = the length of a side of the cube.) Which of the following cube-shaped cells would be most efficient in removing waste by diffusion?

a.



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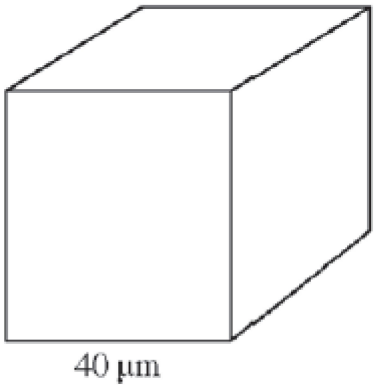

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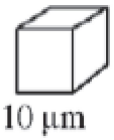

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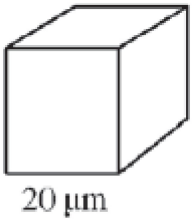
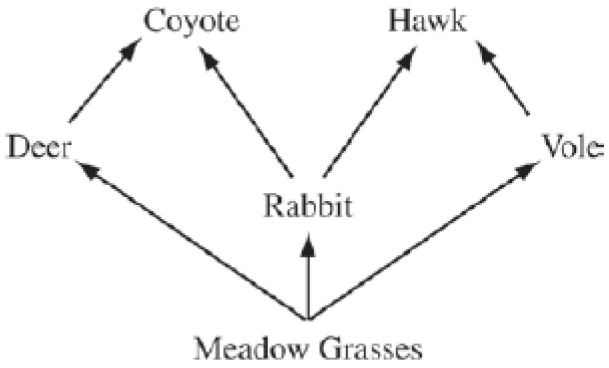


33. The following is a food web for a meadow habitat that occupies 25.6 km2. The primary producers' biomass is uniformly distributed throughout the habitat and totals 1,500 kg/km2.

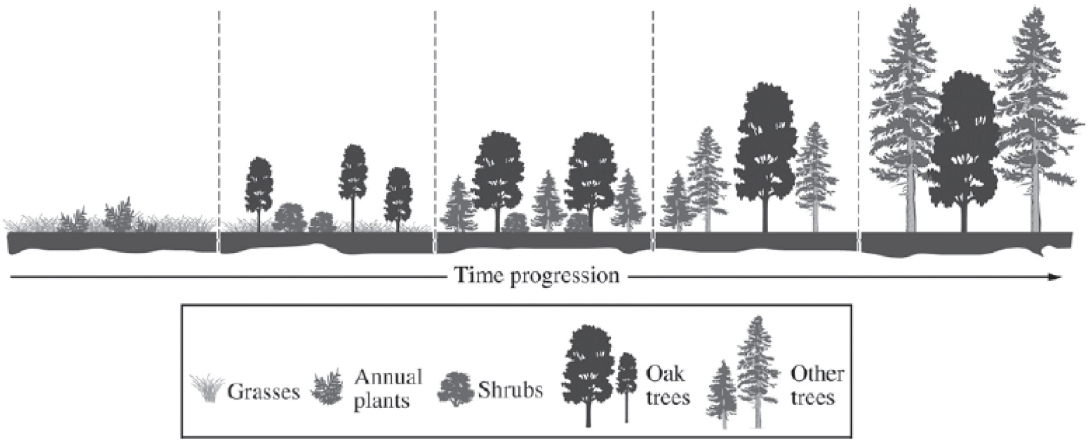


Developers have approved a project that will permanently reduce the primary producers' biomass by 50 percent and remove all rabbits and deer.

Which of the following is the most likely result at the completion of the project?

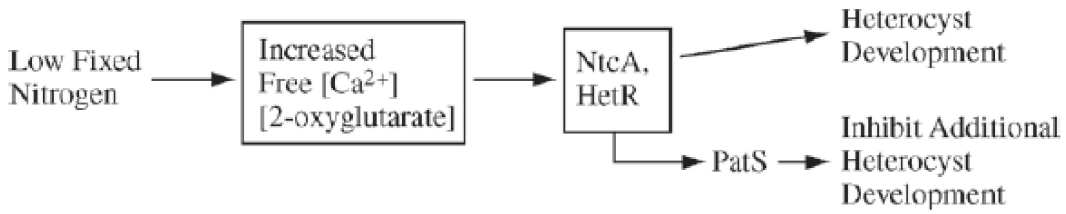
a. There will be 50 percent fewer voles and 90 percent fewer hawks.
b. The biomass of coyotes will be dramatically reduced.
c. The biomass of coyotes will be 6 kg, and the biomass of hawks will be 0.5 kg.
d. The coyotes will switch prey preferences and outcompete the hawks.

34. The diagram below shows the progression of ecological events after a fire in a particular ecosystem. Based on the diagram, which of the following best explains why the oak trees are later replaced by other trees?



a. Eventually the other trees grow taller than the oak trees and form a dense canopy that shades the understory.
b. Roots of shrubs proliferate in the soil of the forest and prevent the oak trees from obtaining water.
c. Oak trees alter the pH of the soil, making the forest better suited for shrubs and other trees.
d. Oak trees succumb to environmental pollutants more readily than do either the shrubs or the other trees.

35. Anabaena is a simple multicellular photosynthetic cyanobacterium. In the absence of fixed nitrogen, certain newly developing cells along a filament express genes that code for nitrogen-fixing enzymes and become non-photosynthetic heterocysts. The specialization is advantageous because some nitrogen-fixing enzymes function best in the absence of oxygen. Heterocysts do not carry out photosynthesis but instead provide adjacent cells with fixed nitrogen, in exchange receiving fixed carbon and reduced energy carriers.

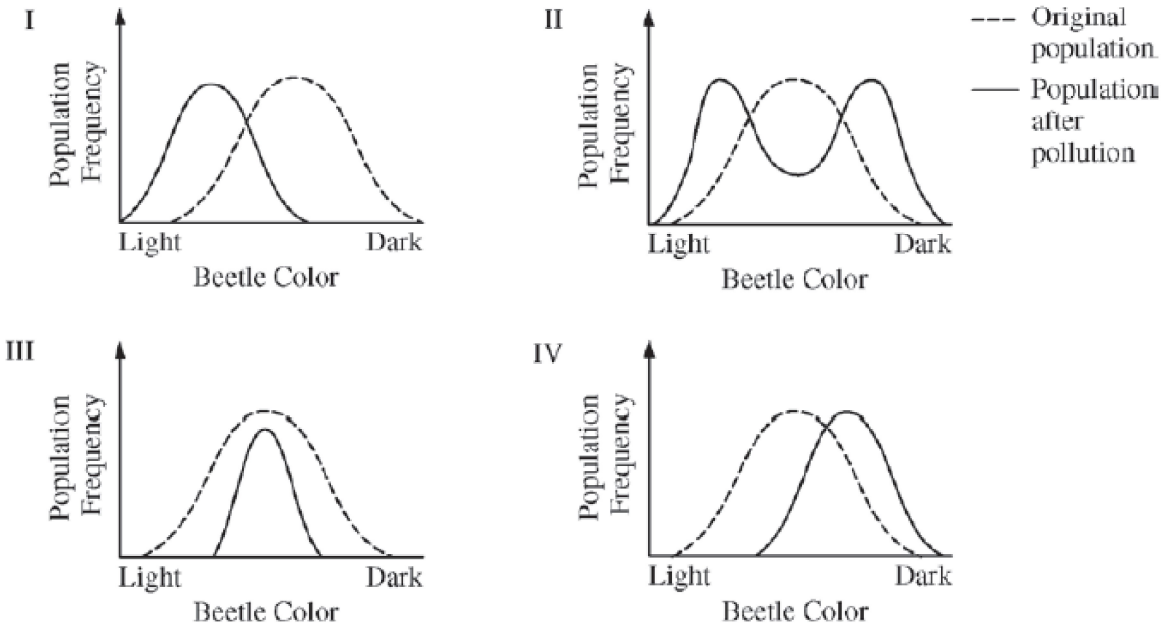


As shown in the diagram above, when there is low fixed nitrogen in the environment, an increase in the concentration of free calcium ions and 2-oxyglutarate stimulates the expression of genes that produce two transcription factors (NtcA and HetR) that promote the expression of genes responsible for heterocyst development. HetR also causes production of a signal, PatS, that prevents adjacent cells from developing as heterocysts.

Based on your understanding of the ways in which signal transmission mediates cell function, which of the following predictions is most consistent with the information given above?

a. In an environment with abundant fixed nitrogen, free calcium levels should be high in all cells so that no heterocysts develop.
b. A strain that overexpresses the patS gene should develop many more heterocysts in a low fixed nitrogen environment.
c. In an environment with low fixed nitrogen, treating the Anabaena cells with a calcium-binding compound should prevent heterocyst differentiation.
d. In environments with abundant fixed nitrogen, loss of the hetR gene should induce heterocyst development.

36. In a hypothetical population of beetles, there is a wide variety of color, matching the range of coloration of the tree trunks on which the beetles hide from predators. The graphs below illustrate four possible changes to the beetle population as a result of a change in the environment due to pollution that darkened the tree trunks.



Which of the following includes the most likely change in the coloration of the beetle population after pollution and a correct rationale for the change?

a. The coloration in the population split into two extremes, as in diagram II. Both the lighter-colored and the darker-colored beetles were able to hide on the darker tree trunks.
b. The coloration in the population shifted toward more darker-colored beetles, as in diagram IV. The lighter- colored beetles were found more easily by the predators than were the darker-colored beetles.
c. The coloration range shifted toward more light-colored beetles, as in diagram I. The pollution helped the predators find the darkened tree trunks.
d. The coloration range became narrower, as in diagram III. The predators selected beetles at the color extremes.

37. By discharging electric sparks into a laboratory chamber atmosphere that consisted of water vapor, hydrogen gas, methane, and ammonia, Stanley Miller obtained data that showed that a number of organic molecules, including many amino acids, could be synthesized. Miller was attempting to model early Earth conditions as understood in the 1950s. The results of Miller's experiments best support which of the following hypotheses?
    a. The molecules essential to life today were initially self-replicating proteins that were synthesized approximately four billion years ago.
    b. The molecules essential to life today did not exist at the time Earth was first formed.
    c. The molecules essential to life today could have formed under early Earth conditions.
    d. The molecules essential to life today could not have been carried to the primordial Earth by a comet or meteorite.

38. Humans have a diploid number ("2n") of 46. Which of the following statements best predicts the consequence if meiosis did not occur during gametogenesis?
    a. The chromosome number would triple with each generation.
    b. The gametes would get larger from one generation to the next.
    c. The chromosome number would be halved with each generation.
    d. The chromosome number would double with each generation.

39. It is estimated that oxygen production first evolved in photosynthetic prokaryotes approximately 2.7 billion years ago. The first photosynthetic prokaryotes are presumed to be similar to today's cyanobacteria.

    Which of the following best supports the claim that photosynthetic prokaryotes were responsible for the oxygen in Earth's atmosphere?
    a. The Calvin cycle splits water into hydrogen ions and oxygen.
    b. The light reactions of photosynthesis split carbon dioxide into carbon and oxygen.
    c. The Calvin cycle splits glucose into carbon, hydrogen, and oxygen.
    d. The light reactions of photosynthesis split water into hydrogen ions and oxygen.

40. Mutations in the *MYO6* and *POU4F3* genes have been associated with a form of hereditary hearing loss in humans. Researchers studying the genes have proposed that *POU4F3* encodes a transcription factor that influences the regulation of *MYO6*.

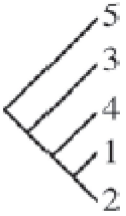
    Which of the following questions will best help guide the researchers toward a direct test of their proposal?
    a. In what types of cells are the mutant forms of the *POU4F3* gene expressed?
    b. Have mutations in other genes also been associated with hearing loss?
    c. Do mutations in the *POU4F3* gene affect *MYO6* mRNA levels in cells?
    d. Are mutations in the *MYO6* and *POU4F3* genes also found in mice?

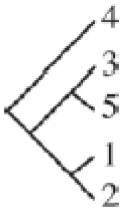
41. Five new species of bacteria were discovered in Antarctic ice core samples. The nucleotide (base) sequences of rRNA subunits were determined for the new species. The table below shows the number of nucleotide differences between the species.

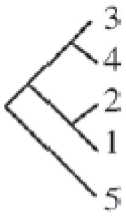
NUCLEOTIDE DIFFERENCES

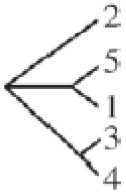
Species	1	2	3	4	5
1	–	3	19	18	27
2		–	19	18	26
3			–	1	27
4				–	27
5					–

Which of the following phylogenetic trees is most consistent with the data?

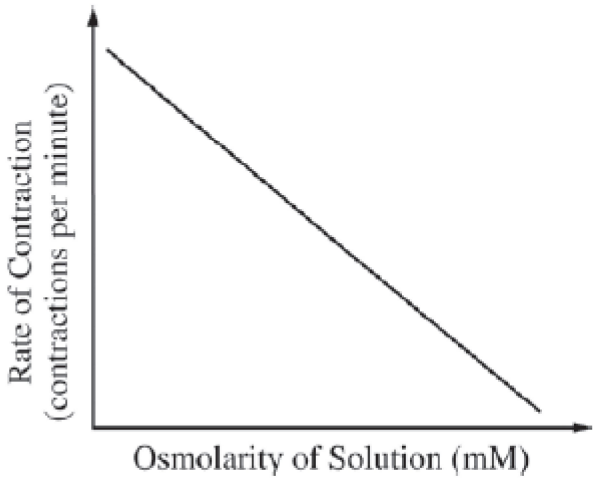
a. 

c. 

b. 

d. 

42. Paramecia are unicellular protists that have contractile vacuoles to remove excess intracellular water. In an experimental investigation, paramecia were placed in salt solutions of increasing osmolarity. The rate at which the contractile vacuole contracted to pump out excess water was determined and plotted against osmolarity of the solutions, as shown in the graph. Which of the following is the correct explanation for the data?



a. The contractile vacuole is less efficient in solutions of high osmolarity because of the reduced amount of ATP produced from cellular respiration.
b. In an isosmotic salt solution, there is no diffusion of water into or out of the paramecia, so the contraction rate is zero.
c. At higher osmolarity, lower rates of contraction are required because more salt diffuses into the paramecia.
d. The contraction rate increases as the osmolarity decreases because the amount of water entering the paramecia by osmosis increases.

43. Scientists examined the folded structure of a purified protein resuspended in water and found that amino acids with nonpolar R groups were primarily buried in the middle of the protein, whereas amino acids with polar R groups were primarily on the surface of the protein. Which of the following best explains the location of the amino acids in the folded protein?
a. Polar R groups are too bulky to fit in the middle of the protein and are pushed toward the protein's surface.
b. Nonpolar R groups that cannot form hydrogen bonds with water are pushed into the middle of the protein.
c. Polar R groups on the surface of the protein can form ionic bonds with the charged ends of the water molecules.
d. Nonpolar R groups from different parts of the protein form covalent bonds with each other to maintain the protein's structure.

Platelets are fragments of larger cells and normally circulate in the blood without adhering to blood vessel walls. When the wall of a blood vessel is damaged, collagen fibers in the wall are exposed to the interior of the blood vessel. The exposed fibers and chemicals released from the endothelial cells that line the blood vessel attract platelets, which start to form a plug and release other chemicals (Figure 1).

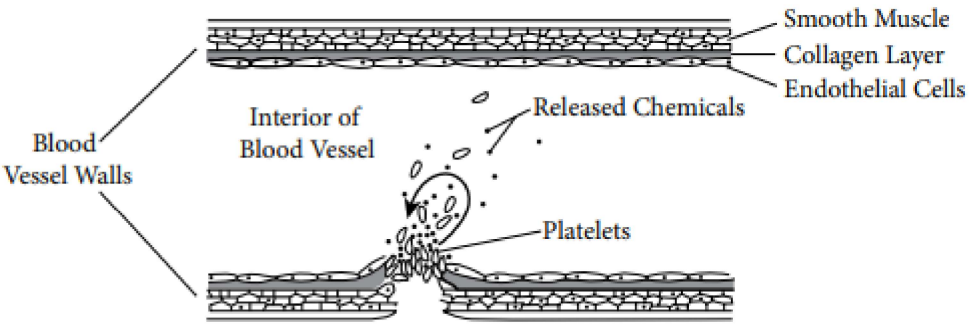
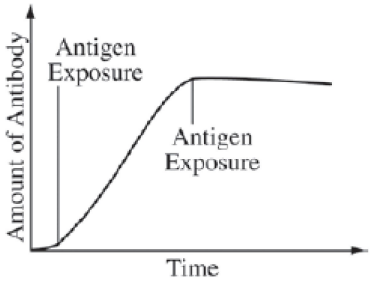


Figure 1. Formation of a platelet plug in a damaged blood vessel wall

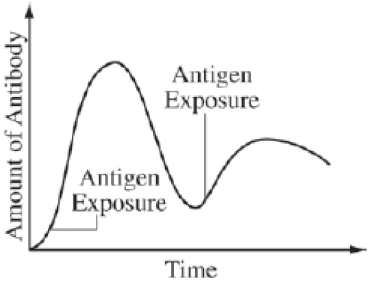
44. Which of the following best explains the feedback mechanism illustrated in Figure 1?
    a. This is an example of negative feedback, because a large clump of platelets can block the blood vessel and prevent blood flow through it.
    b. This is an example of positive feedback, because the few platelets that initially bind attract more platelets to the damaged area.
    c. This is an example of positive feedback, because it results from the interactions among collagen, endothelial cells, and platelets.
    d. This is an example of negative feedback, because the accumulation of platelets returns the open blood vessel wall to a closed state.

45. An individual's humoral response to a particular antigen differs depending on whether or not the individual has been previously exposed to that antigen. Which of the following graphs properly represents the humoral immune response when an individual is exposed to the same antigen more than once?

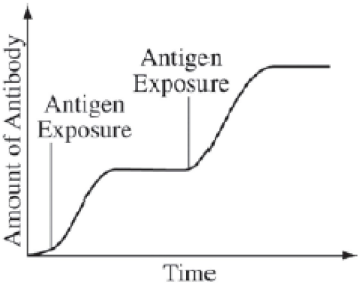
a.



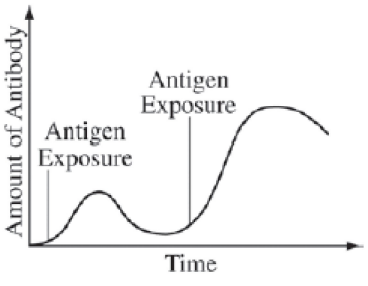
b.



c.

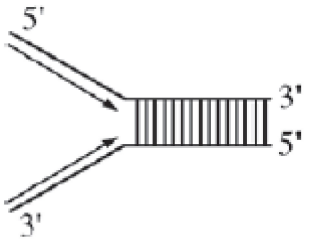


d.

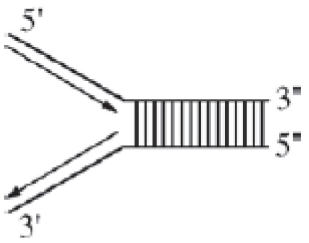


46. When DNA replicates, each strand of the original DNA molecule is used as a template for the synthesis of a second, complementary strand. Which of the following figures most accurately illustrates enzyme-mediated synthesis of new DNA at a replication fork?

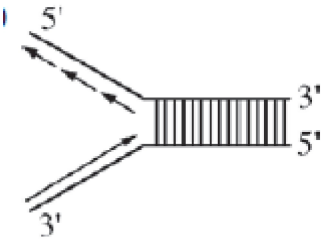
a.



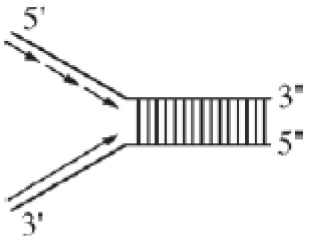
b.



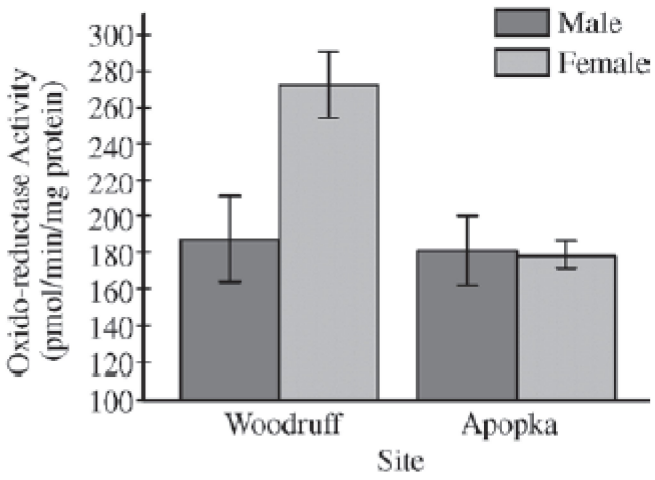
c.



d.



47. Testosterone oxido-reductase is a liver enzyme that regulates testosterone levels in alligators. One study compared testosterone oxido-reductase activity between male and female alligators from Lake Woodruff, a relatively pristine environment, and from Lake Apopka, an area that has suffered severe contamination. The graph above depicts the findings of that study.



The data in the graph best support which of the following claims?

a. Environmental contamination elevates total testosterone oxido-reductase activity in females.
b. Environmental contamination elevates total testosterone oxido-reductase activity in males.
c. Environmental contamination reduces total testosterone oxido-reductase activity in females.
d. Environmental contamination reduces total testosterone oxido-reductase activity in males.

48. Figure I shows the growth of an algal species in a flask of sterilized pond water. If phosphate is added as indicated, the growth curve changes as shown in Figure II.

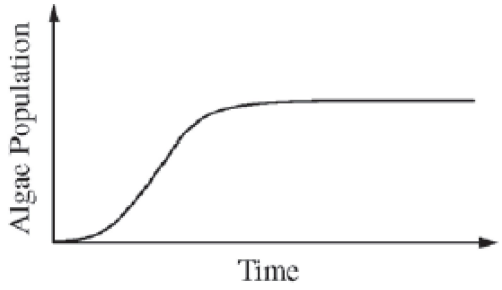


Figure I

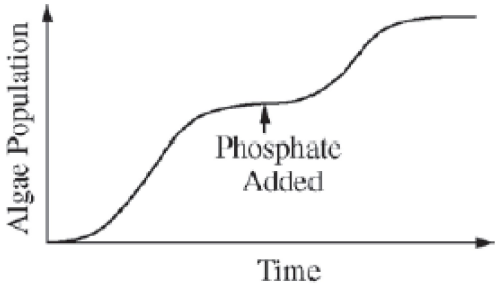
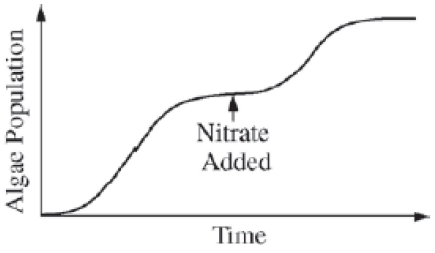


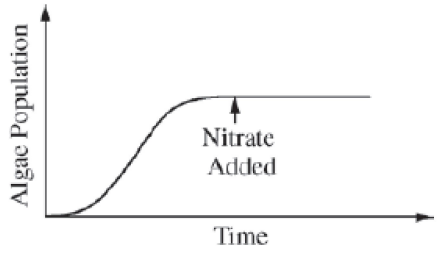
Figure II

Which of the following is the best prediction of the algal growth if nitrate is added instead of phosphate?

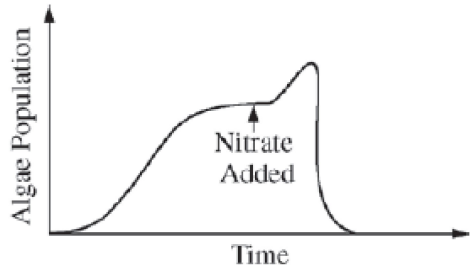
a.



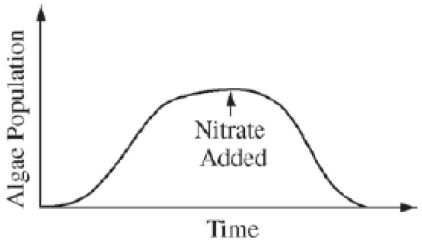
b.



c.



d.



49. The endocrine system incorporates feedback mechanisms that maintain homeostasis. Which of the following demonstrates negative feedback by the endocrine system?
    a. After a meal, blood glucose levels become elevated, stimulating beta cells of the pancreas to release insulin into the blood. Excess glucose is then converted to glycogen in the liver, reducing blood glucose levels.
    b. During labor, the fetus exerts pressure on the uterine wall, inducing the production of oxytocin, which stimulates uterine wall contraction. The contractions cause the fetus to further push on the wall, increasing the production of oxytocin.
    c. At high elevation, atmospheric oxygen is more scarce. In response to signals that oxygen is low, the brain decreases an individual's rate of respiration to compensate for the difference.
    d. A transcription factor binds to the regulatory region of a gene, blocking the binding of another transcription factor required for expression.

Different photosynthetic organisms have different types of chlorophyll molecules. The distribution of chlorophylls in several different groups of organisms is shown in Table 1. A plus sign (+) in the table indicates the presence of a chlorophyll, while a minus sign (-) indicates its absence.

Table 1. The distribution of chlorophylls in several groups of organisms

	Chlorophyll *a*	Chlorophyll *b*	Chlorophyll *c*	Chlorophyll *d*
Flowering plants	+	+	–	–
Green algae	+	+	–	–
Brown algae	+	–	+	–
Red algae	+	–	–	+
Cyanobacteria	+	–	–	–

50. Based on the data, which of the following most likely describes the evolutionary relationship among the organisms?
    a. Because green algae and flowering plants contain chloroplasts, they evolved more recently than brown algae, red algae, and cyanobacteria did.
    b. Because all of the organisms contain chlorophyll a, the organisms share a common ancestor.
    c. Because brown algae, red algae, and cyanobacteria lack chlorophyll b, they evolved before green algae and flowering plants did.
    d. Because increasingly complex forms of chlorophyll are found in red algae, brown algae, green algae, and flowering plants, respectively, this reflects the order of their appearance.

51. Which of the following statements most directly supports the claim that different species of organisms use different metabolic strategies to meet their energy requirements for growth, reproduction, and homeostasis?
    a. During cold periods pond-dwelling animals can increase the number of unsaturated fatty acids in their cell membranes while some plants make antifreeze proteins to prevent ice crystal formation in tissues.
    b. Plants generally use starch molecules for storage while animals use glycogen and fats for storage.
    c. Carnivores have more teeth that are specialized for ripping food while herbivores have more teeth that are specialized for grinding food.
    d. Bacteria lack introns while many eukaryotic genes contain many of these intervening sequences.

52. The chemical reaction for photosynthesis is

$6\ CO_2 + 12\ H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6\ O_2 + 6\ H_2O$

If the input water is labeled with a radioactive isotope of oxygen, 18O, then the oxygen gas released as the reaction proceeds is also labeled with ^{18}O. Which of the following is the most likely explanation?

a. During the light reactions of photosynthesis, water is split, the hydrogen atoms combine with the CO_2, and oxygen gas is released.
b. During the Calvin cycle, water is split, regenerating NADPH from $NADP^+$, and oxygen gas is released.
c. During the Calvin cycle, water is split, the hydrogen atoms are added to intermediates of sugar synthesis, and oxygen gas is released.
d. During the light reactions of photosynthesis, water is split, removing electrons and protons, and oxygen gas is released.

53. A human kidney filters about 200 liters of blood each day. Approximately two liters of liquid and nutrient waste are excreted as urine. The remaining fluid and dissolved substances are reabsorbed and continue to circulate throughout the body. Antidiuretic hormone (ADH) is secreted in response to reduced plasma volume. ADH targets the collecting ducts in the kidney, stimulating the insertion of aquaporins into their plasma membranes and an increased reabsorption of water.

If ADH secretion is inhibited, which of the following would initially result?

a. The number of aquaporins would increase in response to the inhibition of ADH.
b. The person would decrease oral water intake to compensate for the inhibition of ADH.
c. The person would produce greater amounts of dilute urine.
d. Blood filtration would increase to compensate for the lack of aquaporins.

54. The enzyme trypsin aids in protein digestion in the small intestine. The relative activity of trypsin at different pH values is shown in Figure 1.

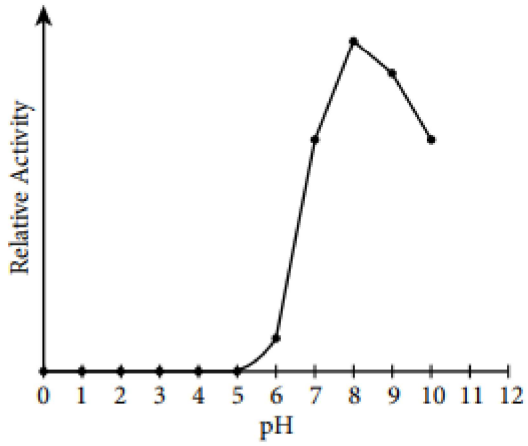


Figure 1. Effect of pH on the activity of trypsin

Which of the following statements best explains the activity levels of trypsin shown in Figure 1?

a. As pH values increase, the substrate concentration decreases, leading to an eventual decline in the rate of the trypsin-catalyzed reaction.
b. At extremely low pH values, trypsin is denatured and cannot function efficiently
c. The small intestine releases inhibitor molecules that block the activity of trypsin unless it is at its optimum pH.
d. The number of effective collisions between trypsin and its substrate increase at higher pH values.

55. A group of students summarized information on five great extinction events.

Mass Extinction	Time of Extinction	Organisms Greatly Reduced or Made Extinct
End of the Ordovician period	443 million years ago	Trilobites, brachiopods, echinoderms, and corals
End of the Devonian period	354 million years ago	Marine familes on tropical reefs, corals, brachiopods, and bivalves
End of the Permian period	248 million years ago	Trilobites, mollusks, brachiopods, and many vertebrates
End of the Triassic period	206 million years ago	Mollusks, sponges, marine vertebrates, and large amphibans
End of the Cretaceous period	65 million years ago	Ammonites, dinosaurs, brachiopods, bivalves, and echinoderms

The students are sampling a site in search of fossils from the Devonian period. Based on the chart, which of the following would be the most reasonable plan for the students to follow?

a. Looking in sedimentary layers next to bodies of water in order to find marine fossils of bivalves and trilobites
b. Using relative dating techniques to determine the geological ages of the fossils found so they can calculate the rate of speciation of early organisms
c. Searching horizontal rock layers in any class of rock and try to find those that contain the greatest number of fossils
d. Collecting fossils from rock layers deposited prior to the Permian period that contain some early vertebrate bones

AP Review Guide Practice Exam
Answer Section

MULTIPLE CHOICE

1. ANS: B PTS: 1 REF: Practice Exam 2012 #34
   OBJ: L.O. 2.32: The student is able to use a graph or diagram to analyze situations or solve problems (quantitatively or qualitatively) that involve timing and coordination of events necessary for normal development in an organism.
   NAT: E.K. 2.E.1: Timing and coordination of specific events are necessary for the normal development of an organism, and these events are regulated by a variety of mechanisms.
   STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.
2. ANS: A PTS: 1 REF: Practice Exam 2012 #29
   OBJ: L.O. 2.23: The student is able to design a plan for collecting data to show that all biological systems (cells, organisms, populations, communities, and ecosystems) are affected by complex biotic and abiotic interactions.
   NAT: E.K. 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.
   STA: S.P. 7.2: The student can connect concepts in and across domain(s) to generalize or extrapolate in and/or across enduring understandings and/or big ideas.
3. ANS: D PTS: 1 REF: Practice Exam 2012 #26
   OBJ: L.O. 2.24: The student is able to analyze data to identify possible patterns and relationships between a biotic or abiotic factor and a biological system (cells, organisms, populations, communities, or ecosystems).
   NAT: E.K. 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy
   STA: S.P. 5.1: The student can analyze data to identify patterns or relationships
4. ANS: B PTS: 1 REF: Practice Exam 2012 #27
   OBJ: L.O. 2.24: The student is able to analyze data to identify possible patterns and relationships between a biotic or abiotic factor and a biological system (cells, organisms, populations, communities, or ecosystems).
   NAT: E.K. 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.
   STA: S.P. 5.1: The student can analyze data to identify patterns or relationships.
5. ANS: D PTS: 1 REF: Practice Exam 2012 #28
   OBJ: L.O. 3.26: The student is able to explain the connection between genetic variations in organisms and phenotypic variations in populations.
   NAT: E.K. 3.C.1: Changes in genotype can result in changes in phenotype.
   STA: S.P. 7.2: The student can connect concepts in and across domain(s) to generalize or extrapolate in and/or across enduring understandings and/or big ideas.
6. ANS: A PTS: 1 REF: Practice Test 2012 #18
   OBJ: L.O. 2.5: The student is able to construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store, or use free energy.
   NAT: E.K. 2.A.2: Organisms capture and store free energy for use in biological processes.
   STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.

7. ANS: B PTS: 1 REF: Practice Exam 2012 #17
OBJ: L.O. 2.5: The student is able to construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store, or use free energy.
NAT: E.K.2.A.2: Organisms capture and store free energy for use in biological processes. E.K. 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
8. ANS: D PTS: 1 REF: Practice Exam 2012 #19
OBJ: L.O. | 2.1: The student is able to explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow, and to reproduce.
NAT: E.K. 2.A.1: All living systems require constant input of free energy. E.K. 2.A.2: Organisms capture and store free energy for use in biological processes.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
9. ANS: C PTS: 1 REF: Practice Exam 2012 #36
OBJ: L.O. 4.1: The student is able to explain the connection between the sequence and subcomponents of a biological polymer and its properties.
NAT: E.K. 4.A.1: The subcomponents of biological molecules and their sequence determine the properties of that molecule.
STA: S.P. 7.1: The student can connect phenomena and models across spatial and temporal scales.
10. ANS: D PTS: 1 OBJ: ENE-2.H NAT: 2.B.b
TOP: 2
11. ANS: A PTS: 1 REF: Practice Exam 2012 #14
OBJ: L.O. 2.29: The student can create representations and models to describe immune responses.
NAT: E.K. 2.D.4: Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.
STA: S.P. 1.2: The student can describe representations and models of natural or man-made phenomena and systems in the domain.
12. ANS: B PTS: 1 REF: Practice Exam 2012 #51
OBJ: L.O. 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function. NAT: E.K. 4.B.1: Interactions between molecules affect their structure and function.
STA: S.P. 5.1: The student can analyze data to identify patterns or relationships.
13. ANS: C PTS: 1 REF: Practice Exam 2012 #52
OBJ: L.O. 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function. NAT: E.K. 4.B.1: Interactions between molecules affect their structure and function.
STA: S.P. 5.1: The student can analyze data to identify patterns or relationships.
14. ANS: D PTS: 1 REF: Practice Exam 2012 #53
OBJ: L.O. 4.17: The student is able to analyze data to identify how molecular interactions affect structure and function. NAT: E.K. 4.B.1: Interactions between molecules affect their structure and function.
STA: S.P. 5.1: The student can analyze data to identify patterns or relationships.
15. ANS: D PTS: 1 REF: Practice Exam 2012 #41
OBJ: L.O. 3.28: The student is able to construct an explanation of the multiple processes that increase variation within a population.
NAT: E.K. 3.C.2: Biological systems have multiple processes that increase genetic variation.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.

16. ANS: A PTS: 1 REF: Practice Exam 2012 #44
OBJ: L.O. 3.28: The student is able to construct an explanation of the multiple processes that increase variation within a population.
NAT: E.K. 3.C.2: Biological systems have multiple processes that increase genetic variation.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
17. ANS: B PTS: 1 REF: Practice Exam 2012 #40
OBJ: L.O. 3.28: The student is able to construct an explanation of the multiple processes that increase variation within a population.
NAT: E.K. 3.C.2: Biological systems have multiple processes that increase genetic variation.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
18. ANS: D PTS: 1 REF: Practice Exam 2012 #43
OBJ: L.O. 3.28: The student is able to construct an explanation of the multiple processes that increase variation within a population.
NAT: E.K. 3.C.2: Biological systems have multiple processes that increase genetic variation.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
19. ANS: D PTS: 1 REF: Practice Exam 2012 #42
OBJ: L.O. 3.28: The student is able to construct an explanation of the multiple processes that increase variation within a population.
NAT: E.K. 3.C.2: Biological systems have multiple processes that increase genetic variation.
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
20. ANS: A PTS: 1 REF: Practice Exam 2012 #60
OBJ: L.O. 3.30: The student is able to use representations and appropriate models to describe how viral replication introduces genetic variation in the viral population.
NAT: E.K. 3.C.3: Viral replication results in genetic variation, and viral infection can introduce genetic variation into the hosts.
STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.
21. ANS: C PTS: 1 OBJ: SYI-1.G NAT: 3.C.b
TOP: 8
22. ANS: D PTS: 1 OBJ: SYI-1.G NAT: 5.A.c
TOP: 8
23. ANS: A PTS: 1 OBJ: ENE-1.N NAT: 6.E.a
TOP: 8
24. ANS: D PTS: 1 OBJ: SYI-1.G NAT: 4.B.c
TOP: 8
25. ANS: A PTS: 1 OBJ: IST-3.B NAT: 1.A
TOP: 4

26. ANS: A PTS: 1 REF: Practice Exam 2012 #50
OBJ: L.O. 3.11: The student is able to evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization.
NAT: E.K. 3.A.2: In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle, mitosis, or meiosis plus fertilization.
STA: S.P. 5.3: The student can evaluate the evidence provided by data sets in relation to a particular scientific question.
27. ANS: A PTS: 1 REF: Practice Exam 2012 #16
OBJ: L.O. 3.21: The student can use representations to describe how gene regulation influences cell products and function.
NAT: E.K. 3.B.1: Gene regulation results in differential gene expression, leading to cell specialization.
STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.
28. ANS: C PTS: 1 REF: Practice Exam 2012 #49
OBJ: L.O. 2.32: The student is able to use a graph or diagram to analyze situations or solve problems (quantitatively or qualitatively) that involve timing and coordination of events necessary for normal development in an organism.
NAT: E.K. 2.E.1: Timing and coordination of specific events are necessary for the normal development of an organism, and these events are regulated by a variety of mechanisms
STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.
29. ANS: D PTS: 1 REF: Practice Exam 2012 #45
OBJ: L.O. 1.15: The student is able to describe specific examples of conserved core biological processes and features shared by all domains or within one domain of life, and how these shared, conserved core processes and features support the concept of common ancestry for all organisms.
NAT: E.K. 1.B.1: Organisms share many conserved core processes and features that evolved and are widely distributed among organisms today.
STA: S.P. 7.2: The student can connect concepts in and across domain(s) to generalize or extrapolate in and/or across enduring understandings and/or big ideas.
30. ANS: D PTS: 1 OBJ: IST-1.N NAT: 1.C
TOP: 6
31. ANS: A PTS: 1 OBJ: EVO-3.F NAT: 1.C
TOP: 7
32. ANS: C PTS: 1 REF: Practice Exam 2012 #3
OBJ: L.O. | 2.6: The student is able to use calculated surface area-to- volume ratios to predict which cell(s) might eliminate wastes or procure nutrients faster by diffusion.
NAT: E.K. | 2.A.3: Organisms must exchange matter with the environment to grow, reproduce, and maintain organization.
STA: S.P. | 2.2: The student can apply mathematical routines to quantities that describe natural phenomena.
33. ANS: B PTS: 1 REF: Practice Exam 2012 #12
OBJ: L.O. 4.15: The student is able to use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy.
NAT: E.K. 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy.
STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.

34. ANS: A PTS: 1 REF: Practice Exam 2012 #15
OBJ: L.O. 4.27: The student is able to make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability.
NAT: E.K. 4.C.4: Diversity of species within an ecosystem may influence the stability of the ecosystem.
STA: S.P. 6.4: The student can make claims and predictions about natural phenomena based on scientific theories and models.

35. ANS: C PTS: 1 REF: Practice Exam 2012 #59
OBJ: L.O. 4.7: The student is able to refine representations to illustrate how interactions between external stimuli and gene expression result in specialization of cells, tissues, and organs. (
NAT: E.K. 4.A.3: Interactions between external stimuli and regulated gene expression result in specialization of cells, tissues, and organs.
STA: S.P. 1.3: The student can refine representations and models of natural or man-made phenomena and systems in the domain

36. ANS: B PTS: 1 REF: Released Exam 2012 #37
OBJ: L.O. 1.13: The student is able to construct and/or justify mathematical models, diagrams, or simulations that represent processes of biological evolution.
NAT: E.K. 1.A.4: Biological evolution is supported by scientific evidence from many disciplines, including mathematics.
STA: S.P. 1.1: The student can create representations and models of natural or man-made phenomena and systems in the domain.

37. ANS: C PTS: 1 REF: Practice Exam 2012 #2
OBJ: L.O. 1.28: The student is able to evaluate scientific questions based on hypotheses about the origin of life on Earth.
NAT: E.K. 1.D.1: There are several hypotheses about the natural origin of life on Earth, each with supporting scientific evidence. STA: S.P. 3.3: The student can evaluate scientific questions.

38. ANS: D PTS: 1 OBJ: IST-1.F NAT: 6.E.a
TOP: 5.1

39. ANS: D PTS: 1 OBJ: ENE-1.I NAT: 6.B
TOP: 3

40. ANS: C PTS: 1 OBJ: IST-2.C NAT: 3.A
TOP: 6

41. ANS: B PTS: 1 REF: Practice Exam 2012 #32
OBJ: L.O. 1.19: The student is able create a phylogenetic tree or simple cladogram that correctly represents evolutionary history and speciation from a provided data set.
NAT: E.K. 1.B.2: Phylogenetic trees and cladograms are graphical representations (models) of evolutionary history that can be tested.
STA: S.P. 1.1: The student can create representations and models of natural or man-made phenomena and systems in the domain.

42. ANS: D PTS: 1 REF: Practice Exam 2012 #25
OBJ: L.O. 2.12: The student is able to use representations and models to analyze situations or solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across membranes.
NAT: E.K. 2.B.2: Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.
STA: S.P. 1.4: The student can use representations and models to analyze situations or solve problems qualitatively and quantitatively.

43. ANS: B PTS: 1 OBJ: SYI-1.B NAT: 1.B
TOP: 1

44. ANS: B PTS: 1 OBJ: ENE-3.C NAT: 2.C
TOP: 4
45. ANS: D PTS: 1 REF: Practice Exam 2012 #39
OBJ: L.O. 2.29: The student can create representations and models to describe immune responses.
NAT: E.K. 2.D.4: Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.
STA: S.P. 1.2: The student can describe representations and models of natural or man-made phenomena and systems in the domain.
46. ANS: C PTS: 1 REF: Practice Exams 2012 #6
OBJ: L.O. | 3.3: The student is able to describe representations and models that illustrate how genetic information is copied for transmission between generations.
NAT: E.K. | 3.A.1: DNA, and in some cases RNA, is the primary source of heritable information.
STA: S.P. | 1.2: The student can describe representations and models of natural or man-made phenomena and systems in the domain.
47. ANS: C PTS: 1 REF: Practice Exam 2012 #38
OBJ: L.O. 4.23: The student is able to construct explanations of the influence of environmental factors on the phenotype of an organism.
NAT: E.K. 4.C.2: Environmental factors influence the expression of the genotype in an organism
STA: S.P. 6.2: The student can construct explanations of phenomena based on evidence produced through scientific practices.
48. ANS: B PTS: 1 REF: Practice Exam 2012 #61
OBJ: L.O. 2.22: The student is able to refine scientific models and questions about the effect of complex biotic and abiotic interactions on all biological systems from cells and organisms to populations, communities, and ecosystems.
NAT: E.K. 2.D.1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.
STA: S.P. 3.2: The student can refine scientific questions.
49. ANS: A PTS: 1 REF: Practice Exam 2012 #31
OBJ: L.O. 2.16: The student is able to connect how organisms use negative feedback to maintain their internal environments.
NAT: E.K. 2.C.1: Organisms use negative feedback mechanisms to maintain their internal environments and respond to external environmental changes.
STA: S.P. 7.2: The student can connect concepts in and across domain(s) to generalize or extrapolate in and/or across enduring understandings and/or big ideas.
50. ANS: B PTS: 1 OBJ: EVO-2.B NAT: 4.B.b
TOP: 7
51. ANS: B PTS: 1 REF: Practice Exam 2012 #24
OBJ: L.O. 2.2: The student is able to justify a scientific claim that free energy is required for living systems to maintain organization, to grow, or to reproduce, but that multiple strategies exist in different living systems.
NAT: E.K. 2.A.1: All living systems require constant input of free energy.
STA: S.P. 6.1: The student can justify claims with evidence.
52. ANS: D PTS: 1 REF: Practice Exam 2012 #55
OBJ: L.O. 2.8: The student is able to justify the selection of data regarding the types of molecules that an animal, plant, or bacterium will take up as necessary building blocks and excrete as waste products.
NAT: E.K. 2.A.3: Organisms must exchange matter with the environment to grow, reproduce, and maintain organization.
STA: S.P. 4.1: The student can justify the selection of the kind of data needed to answer a particular scientific question.

53. ANS: C PTS: 1 REF: Practice Exam 2012 #48
OBJ: L.O 3.36: The student is able to describe a model that expresses the key elements of signal transduction pathways by which a signal is converted to a cellular response.
NAT: E.K. 3.D.3: Signal transduction pathways link signal reception with cellular response.
STA: S.P. 1.5: The student can re-express key elements of natural phenomena across multiple representations in the domain.
54. ANS: B PTS: 1 OBJ: ENE-1.F NAT: 2.B.b
TOP: 3
55. ANS: D PTS: 1 REF: Practice Exam 2012 #58
OBJ: L.O. 1.21: The student is able to design a plan for collecting data to investigate the scientific claim that speciation and extinction have occurred throughout Earth,s history.
NAT: E.K. 1.C.1: Speciation and extinction have occurred throughout the Earth,s history.
STA: S.P. 4.2: The student can design a plan for collecting data to answer a particular scientific question.