Use the diagram of the plant cell below to answer the following question.

1. Food, water, and cellular wastes are stored primarily in the
   A. Nucleus
   B. Vacuole
   C. Chloroplasts
   D. Mitochondria

2. A student was looking at different kinds of cells through a microscope. He noticed that plant cells and animal cells have many structures in common, but the cells are also very different. Which of the following statements identifies one of the differences between plant cells and animal cells?
   A. Plant cells have cell walls but animal cells do not.
   B. Plant cells have cell membranes but animal cells do not.
   C. Plant cells have ribosomes but animal cells do not.
   D. Plant cells have vacuoles but animal cells do not.

3. Based on the distribution of these molecules, what would most likely happen after a period of time?
   A. The concentration of O2 will increase inside the cell.
   B. The concentration of CO2 will remain the same inside the cell.
   C. The concentration of O2 will remain the same outside the cell.
   D. The concentration of CO2 will decrease outside the cell.
Use the diagram below to answer the following question.

![Diagram of cell cycles](image)

4. The diagram above represents the phases of mitosis. Which of the following represents the phases of mitosis in their proper sequence?

   A. D, C, A, B
   B. B, A, C, D
   C. D, A, B, C
   D. D, A, C, B

The plant cell below contains two nuclei and is about to complete its division into two separate cells.

![Plant cell diagram](image)

5. Letter A is pointing to a structure in the middle of the parent cell. What is this structure?

   A. A centriole
   B. A cell plate
   C. A chromosome
   D. A cleavage furrow

6. Which of the molecules below is a building block for lipids?

![Molecules](image)

   A. B
   B. C
   C. D

7. A translucent spot (clear spot) on a brown paper bag when a drop of oil is placed on the bag indicates the presence of which organic molecule?

   A. Protein
   B. Carbohydrate
   C. Lipid
   D. Amino acid
8. Sodium ions are "pumped" from a region of lower concentration to a region of higher concentration in the nerve cells of humans. This process is an example of
   A. diffusion
   B. passive transport
   C. osmosis
   D. active transport

9. A certain type of organism can be either black or white. Which of these processes makes it possible for two of these organisms to produce both black offspring and white offspring?
   A. meiosis
   B. mitosis
   C. convergent evolution
   D. complete metamorphosis

10. If an adult female shark has 20 chromosomes in each body cell, how many chromosomes would you predict to be present in each of her unfertilized egg cells?
    A. 5
    B. 10
    C. 15
    D. 20

11. Both a deer and a tree react to changes in their external surroundings, helping them to maintain a constant internal environment. This statement describes
    A. predation
    B. homeostasis
    C. antibiotic resistance
    D. autotrophic nutrition

12. What kinds of molecules carry the instructions for protein synthesis?
    A. DNA and RNA
    B. amino acids
    C. lipids and carbohydrates
    D. enzymes

13. A tick feeds on the blood of a deer and can transmit diseases. Which of these terms describes the relationship between the tick and the deer?
    A. parasitism
    B. mutualism
    C. predation
    D. competition

Use the diagram below to answer the following questions.

14. The primary producer in the ecosystem above is the —
    A. plant
    B. rabbit
    C. hawk
    D. fox
15. A certain plant requires moisture, oxygen, carbon dioxide, light, and minerals in order to survive. This statement shows that a living organism depends on

A. biotic factors
B. abiotic factors
C. symbiotic relationships
D. carnivore-herbivore relationships

16. The island of Guam had no native snake species until the brown tree snake was introduced. What effect did this egg-eating snake have on the native bird populations?

A. Bird populations were not affected by the snake’s introduction.
B. Bird populations increased as the birds preyed on the snakes.
C. Bird populations decreased as the snakes fed on the bird eggs.
D. Bird populations increased as the snakes eliminated predators.

17. The greatest amount of available energy is transferred from level

A. A to level B
B. A to level C
C. B to level A
D. D to level A

18. Which human activity would be more likely to have a negative impact on the environment than the other three?

A. using reforestation and cover cropping to control soil erosion
B. using insecticides to kill insects that compete with humans for food
C. developing research aimed toward the preservation of endangered species
D. investigating the use of biological controls for pests
Use the diagram below to answer the following questions.

Two cellular processes are shown below.

C₆H₁₂O₆ + 6O₂ → 6CO₂ + 6H₂O + Energy

6CO₂ + 6H₂O + Energy → C₆H₁₂O₆ + 6O₂

21. One of the equations represents respiration. During respiration the reactants are converted into

A. Energy and O₂
B. C₆H₁₂O₆ and O₂
C. C₆H₁₂O₂ and H₂O
D. H₂O, CO₂, and Energy

22. Which word equation best represents the process of photosynthesis

A. glucose --> alcohol + carbon dioxide
B. carbon dioxide + water --> glucose + oxygen + water
C. maltose + water --> glucose + glucose
D. glucose + oxygen --> carbon dioxide + water of water plus six molecules of oxygen

Use the diagram of the plant cell below to answer the question.

23. Which organelle makes food?

A. the chloroplast
B. the ribosome
C. the vacuole
D. the nucleus
The diagram below shows the flow of oxygen and carbon dioxide in an ecosystem.

24. Carbon dioxide is used by
   A. Animals during respiration
   B. Animals, plants, and fungi during respiration
   C. Plants during photosynthesis
   D. Plants and fungi during photosynthesis

25. When the body needs to exercise for long periods of time, it generates ATP by carrying out
   A. lactic acid fermentation.
   B. alcoholic fermentation.
   C. cellular respiration.
   D. glycolysis.

26. In the material cycle shown below, which processes are represented by letters A and B?

   \[
   \begin{align*}
   \text{H}_2\text{O} + \text{CO}_2 + \text{C}_6\text{H}_{12}\text{O}_6 & \rightarrow \text{CO}_2 + \text{H}_2\text{O} \\
   \text{A} & \text{A} \\
   \text{B} & \text{B}
   \end{align*}
   \]

   A. A–excretion, B–respiration
   B. A–transpiration, B–excretion
   C. A–photosynthesis, B–transpiration
   D. A–respiration, B–photosynthesis

Cells that line the human stomach contain hydrogen ion pumps in their cell membranes. These pumps allow the cells to move hydrogen from areas of low concentration inside the cells to areas of higher concentration outside the cells.

27. Which equation best represents the reaction that makes the movement of hydrogen ions possible?
   A. \( \text{ATP} \rightarrow \text{ADP} + \text{P} + \text{energy} \)
   B. \( \text{ATP} + \text{P} + \text{energy} \rightarrow \text{ADP} \)
   C. \( \text{O}_2 + \text{H}_2\text{O} + \text{energy} \rightarrow \text{ATP} + \text{CO}_2 \)
   D. \( \text{ATP} + \text{CO}_2 \rightarrow \text{O}_2 + \text{H}_2\text{O} + \text{energy} \)

28. Which phrases best identify characteristics of asexual reproduction?
   A. one parent, union of gametes, offspring similar to but not genetically identical to the parent
   B. one parent, no union of gametes, offspring genetically identical to parents
   C. two parents, union of gametes, offspring similar to but not genetically identical to parents
   D. two parents, no union of gametes, offspring genetically identical to parents

29. In cows, long hair is dominant to short hair. In a cow that is heterozygous for long hair, what percentage of the cells produced by meiosis will carry the dominant allele?
   A. 25%
   B. 50%
   C. 75%
   D. 100%
Punnett Square for Corn Height

Square 4 of this Punnett square represents the genotype of the offspring if

A. ovule T is fertilized by pollen grain T
B. ovule t is fertilized by pollen grain T
C. ovule T is fertilized by pollen grain t
D. ovule t is fertilized by pollen grain t

Use the diagram below to answer the following question.

31. What general type of mutation results from processes A, B, C, and D in the figure above?
   A. Chromosomal Mutation
   B. Point Mutation
   C. Inversion
   D. Translocation

32. Which DNA strand below represents the complementary base sequence to the portion of a DNA strand represented in the diagram below?

   Use the diagram below to answer the following question.

   The pedigree chart represents the inheritance of color blindness through three generations.

33. Barbara is expecting another child. What is the probability that the new baby will be colorblind?
   A. 0%
   B. 25%
   C. 50%
   D. 100%
34. Colorblindness is a sex-linked recessive trait. If a normal sighted, non-carrier woman married a colorblind man, what is the probability of the sons in this marriage being colorblind?
   A. 0%
   B. 25%
   C. 50%
   D. 75%

A scientist is studying the following sequence in a section of DNA.

TACGGCCATGAA

35. If the DNA sequence undergoes a deletion mutation, which of these sequences will most likely result?
   A. TAGGCCATGAA
   B. ATGCGGCTACTT
   C. TACGGGCATGAA
   D. TACCGGCCATGAA

DNA from four organisms was examined using gel electrophoresis. The results are shown in the diagram below.

36. According to the data, which of these pairs of organisms are most closely related?
   A. 1 and 2
   B. 2 and 3
   C. 2 and 4
   D. 3 and 4

37. The DNA fingerprints were made from blood samples taken from a puppy and four possible sires of this puppy in an effort to determine the puppy’s pedigree. According to this information, which sire was probably the father of this puppy?

38. A recently married couple wants to have their first child. One of the parents has cystic fibrosis, a disease caused by recessive alleles. The other does not have the recessive allele. What is the probability that the couple will have a child with cystic fibrosis?
   A. 0%
   B. 50%
   C. 75%
   D. 100%
39. During transcription, an RNA molecule is formed
   A. that is complementary to both strands of DNA.
   B. that is identical to part of a single strand of DNA.
   C. that is double-stranded.
   D. inside the nucleus.

Use the Punnett Square below to answer the following questions.

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40. In rabbits, short fur (F) is dominant to long fur (f). According to the Punnett square, what is the chance of two heterozygous short-haired rabbits having offspring with short fur?
   A. One in four
   B. Two in four
   C. Three in four
   D. Four in four

41. Which animal would be found in the biome that has cold to moderate winters, warm summers, fertile soils, and is home to a variety of vegetation, such as coniferous trees, broadleaf deciduous trees, flowering shrubs, and ferns?
   A. white-tailed deer
   B. polar bear
   C. iguana
   D. moose

42. According to this diagram, which statement is not true about the fossils in the rock layers?
   A. Fossil 1 is the youngest fossil.
   B. Fossil 5 is the oldest fossil.
   C. Fossil 3 is older than fossil 1.
   D. Fossil 4 is older than fossil 2.
Use the picture below to answer the following questions.

43. Which of these activities could most likely lead to the extinction of this species of duck?

A. Planting long-stemmed grasses along banks of rivers  
B. Building dams across low areas to catch rainwater  
C. Removing trees from shallow lake areas  
D. Draining ponds to develop land for other uses

44. Finches found on the isolated Galapagos Islands are different species with different beak sizes and shapes, but are otherwise similar to a finch species found on the South American mainland. What might be the cause of the differences in the development of the beaks of these Galapagos finches?

A. The different types of food available on the islands  
B. The original source of the finches  
C. The differences in the types of nests the birds built  
D. The type of predators found on the islands

45. As evidence of evolution, the flipper of a whale and the wing of a bat are considered

A. analogous structures.  
B. homologous structures.  
C. examples of industrial melanism.  
D. evidence of fossil divergence.

46. The diversity within the wild bird species in the diagram below can best be explained by which process?

A. natural selection  
B. ecological succession  
C. asexual reproduction  
D. mitotic cell division
The pictures below show the embryo and adult stages of a fish and a bird. According to scientists, these organizations evolved from a common ancestor.

47. Which of the statements explains why the adult stages of fish and birds are different from each other?

A. The DNA sequences in adult fish and adult birds are completely different.
B. The DNA sequences in fish and birds were similar at first but changed as they became adults.
C. Fish and birds developed the same adaptations in order to survive in their different environments.
D. Fish developed fins and birds developed wings that helped them survive in their different environments.

The mouth of an earthworm’s digestive system is used for ingestion, the intestine for digestion, and the anus for egestion. Worms perform extracellular digestion because the food is digested outside of individual cells; food is digested within a tube. Enzymes are necessary for all chemical digestion.

48. Which statement correctly describes one characteristic of the tubelike digestive system of an earthworm?

A. Various parts of the system perform different digestive functions.
B. The shape of the system allows food to be processed by intracellular digestion.
C. The shape of the system eliminates the need for egestion.
D. Digestive enzymes are not used in the system.

Use the diagram below to answer the following questions.

49. The life cycle of the butterfly is an example of

A. asexual reproduction
B. convergent evolution
C. complete metamorphosis
D. incomplete metamorphosis
50. The body symmetry of the crayfish shown below can best be determined by

A. Dividing it into four equal parts
B. Dividing it into two equal halves
C. Dividing it into six parts around a central axis
D. Dividing it into an odd number of parts around a central axis.

The human body contains a muscular, bag-like structure that is open on both ends. This organ is lined with mucous and filled with enzymes. It is highly acidic with a pH between 1.5 and 2.5.

51. What is the function of this organ?

A. Digesting food
B. Excreting waste
C. Fighting foreign bodies
D. Producing red blood cells

Use the diagram below to answer the following questions.

Classification Key

1a wings covered by an exoskeleton ……go to step 2
1b wings not covered by an exoskeleton …go to step 3
2a body has a round shape ……………Paramysia oblonguttata
2b body has an elongated shape ……….. Romalea microptera
3a wings point out from the side of the body ……… Crocothemis servila
3b wings point to the posterior of the body ……… Musca Musca

52. According to the classification key, to which genus and species does this insect belong?

A. Paramysia oblonguttata
B. Romalea microptera
C. Crocothemis servila
D. Musca Musca
53. Which biome is most suitable for raising crops, such as corn, wheat, and oats?

A. Desert  
B. Grassland  
C. Rainforest  
D. Taiga

Use the table below to answer the following question

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<th>Classification of Four Organisms</th>
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54. Which two organisms listed in Figure 18-4 are most closely related to each other?

A. Humpback whale and the Spider monkey
B. Whale Shark and Spider Monkey
C. Whale Shark and Humpback Whale
D. Corn and Spider Monkey
55. Which of these occurs during the life cycle of a lady bug but not a butterfly?

A. mitosis
B. pollination
C. alternation of generations
D. incomplete metamorphosis
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Performance Indicator and Answer Key

Standard Number: 1.0 Cells

identify major cell organelles, given a diagram. (Item 1B)
distinguish between plant and animal cells given diagrams or scenarios. (Item 2A)
predict the movement of water molecules across the cell membrane, given solutions of different concentrations. (Item 3A)
sequence a series of diagrams depicting the movement of chromosomes during mitosis. (Item 4D)
compare and contrast the cell cycle in plant and animal cells, given a diagram or description. (Item 5B)
distinguish proteins, carbohydrates, lipids, and nucleic acids, given structural diagrams. (Item 6B)
identify a positive test for carbohydrates and lipids when given an experimental procedure, data, and results. (Item 7C)
distinguish between active and passive transport, given examples of different molecules. (Item 8D)
evaluate the role of meiosis in maintaining genetic variability and continuity, given a scenario. (Item 9A)
determine the number of chromosomes following mitosis or meiosis, given the number of chromosomes in the original cell. (Item 10B)
recognize the significance of homeostasis to the viability of humans and other organisms, given the definition of homeostasis. (Item 11B)
identify the biomolecules responsible for communicating, responding, regulating, or reproducing in the cell. (Item 12A)

Standard Number: 2.0 Interactions

identify commensalism, parasitism, and mutualism, given a scenario with examples. (Item 13A)
classify organisms as producers, consumers, or decomposers, given their behaviors and environment. (Item 14A)
identify abiotic and biotic factors, given a description or an illustration of an ecosystem. (Item 15B)
make inferences about how environmental factors would affect population growth, given a scenario. (Item 16C)
examine the energy flow and loss through the trophic levels of an ecosystem, given an illustration of an energy pyramid. (Item 17A)
determine the effects of human activities on ecosystems, given a scenario. (Item 18B)
analyze and interpret population growth curves, given graphs. (Item 19D)
distinguish between a learned or an innate behavior, given a description of that behavior in a scenario. (Item 20C)

Standard Number: 3.0 Photosynthesis and Respiration

identify the reactants and products of photosynthesis and respiration, given the equations. (Item 21D, 22B)
identify the cell organelle in which photosynthesis occurs, given a diagram of a plant. (Item 23A)
interpret a diagram of the oxygen-carbon dioxide cycle, given a diagram. (Item 24C)
distinguish between aerobic and anaerobic respiration in terms of the presence or absence of oxygen and ATP produced. (Item 25C)
relate the interdependence of the processes of photosynthesis and respiration to living organisms, given a diagram or a description. (Item 26D)
recognize the transfer of energy from respiration to cellular work, given an equation or diagram of the ATP cycle. (Item 27A)
**Standard Number: 4.0 Genetics and Biotechnology**

distinguish between asexual and sexual methods of reproduction, using a scenario. (Item 28B )
distinguish between asexual and sexual methods of reproduction, using a scenario. (Item 28B )
determine the dominant trait, given the results of a monohybrid cross in a scenario. (Item 29B )
determine the genotype and phenotype of a monohybrid cross, given a Punnet square. (Item 30D )
relate changes in the DNA instructions to cause mutations, given diagrams. (Item 31A )
recognize the two major functions of DNA as replication and protein synthesis, given diagrams showing a strand of bases with a complimentary strand. (Item 32C )
identify the sex chromosomes in humans and recognize inheritance patterns that are sex-linked, using a pedigree. (Item 33A )
analyze modes of inheritance including co-dominance, incomplete dominance, polygenic, and multiple alleles using genetic problems or Punnet Squares. (Item 34A )
analyze a series of DNA bases to determine the sequence which demonstrates a mutation. (Item 35A )
describe and analyze DNA fingerprinting using an illustration of DNA bands. (Item 36C )
determine the probability of having a child with cystic fibrosis, sickle cell anemia, or Tay-Sachs if both parents are carriers, given a scenario or genetic problem. (Item 38A )
differentiate the processes of transcription and translation, given diagrams. (Item 39B )
analyze a hybrid cross given a completed Punnett square to determine the probability of a particular trait. (Item 40C )

**Standard Number: 5.0 Diversity**

infer animals or plants indigenous to an environment, given pictures or diagrams of the organisms and a description of the environment. (Item 41A )
infer the biome in which an animal or plant lives, given a description of the organism and pictures of various biomes. (Item 53B )
infer the relatedness of different organisms using the Linnean system of classification, given pictures of a variety of different plants or animals and a key to classification of organisms. (Item 54B )
determine the genus and species of an organism, given a dichotomous key containing descriptions of the characteristic of each classification level. (Item 52C )
determine whether an insect undergoes complete or incomplete metamorphosis, given pictures or diagrams of the insect in its stages of development. (Item 49C )
infer the body symmetry of an organism, given a diagram or picture of the organism. (Item 50B )
predict the function of a system or organ, given structural descriptions, whether in the earthworm, crayfish, frog, or human. (Item 48A )
predict the function of an organ, given a description of its component tissues. (Item 51A )
compare and contrast life cycles of various organisms to include alternation of generations, given pictorial representations. (Item 55C )

**Standard Number: 6.0 Biological Evolution**

differentiate between the relative age of various fossils in sedimentary rock, given a diagram of rock strata. (Item 42A )
predict how environmental changes will encourage or discourage the formation of a new species or extinction of an existing species, given a written scenario. (Item 43D )
transfer knowledge of divergent evolution, as in Darwin’s finches, to determine why species with a common ancestor have adapted differently, given a diagram of the various species. (Item 44A )
compare homologous structures in species to determine the relatedness of certain species, given diagrams or pictures of each. (Item 45B )
differentiate between natural selection and selective breeding, given a scenario. (Item 46A )
recognize the relatedness of species using DNA strands. (Item 47D )