

CRT Science Review #4

Life Science: Heredity



Standard: Heredity is the genetic passing of a set of instructions from generation to generation. These instructions are encoded as DNA and may manifest themselves as characteristics. Some characteristics are inherited, and some result from interactions with the environment.

Indicators & Item Specifications:

L.8.A.1 Students know heredity is the passage of genetic instructions from one generation to the next generation. E/S

- Know reproduction of organisms includes cell division, transfer of genetic information, and the probability of certain characteristics passed from one generation to the next.
- Differentiate between asexual and sexual reproduction at the cellular level.

L.8.A.2 Students know changes in genes of eggs and sperm can cause changes in inherited characteristics. E/S

- Know about inheritance, nature of mutations (beneficial and/or harmful), and genetic variation.
- Recognize that in sexual reproduction, mutations only get passed to the next generation when they occur in sex cells.

L.8.A.3 Students know organisms can be bred for specific characteristics. I/L

L.8.A.4 Students know some characteristics of an organism are the result of a combination of interaction with the environment and genetic information. E/S

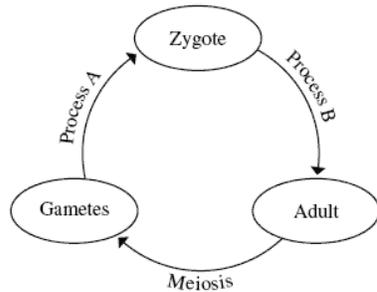
- Distinguish between innate and learned behaviors.
- Describe physical traits that are inherited and influenced by the environment.

Sample Multiple Choice CRT-Style Questions Related to Heredity

1. What molecule allows hereditary information to be passed from generation to generation?
A. DNA
B. ATP
C. Lipids
D. Proteins
2. In order for a mutation to be passed from one generation to the next, the mutation must be present in which of these cells?
A. Skin cell
B. Blood cell
C. Heart cell
D. Sperm cell
3. A change in genetic material that produces variation within a species is a
A. mutation.
B. translation.
C. transcription.
D. replication.
4. The process of choosing parent organisms for desired characteristics is called
A. natural selection.
B. artificial selection.
C. genetic manipulation.
D. random chance.
5. If a human egg cell with 24 chromosomes is fertilized by a sperm cell containing 23 chromosomes, what will be the result? The offspring will
A. resemble the mother more than the father.
B. resemble the father more than the mother.
C. inherit a disorder due to the extra chromosome.
D. inherit a disorder due to a missing chromosome.
6. According to the theory of evolution, variations within a species are most likely the result of which of the following?
A. Sexual reproduction and cell division
B. Sexual reproduction and mutations
C. Asexual reproduction and acquired traits
D. Asexual reproduction and overpopulation
7. A difference between sexual and asexual reproduction is that the offspring of
A. asexual reproduction have fewer chromosomes than their parents, while offspring of sexual reproduction have the same number of chromosomes.
B. sexual reproduction have fewer chromosomes than their parents, while offspring of asexual reproduction have the same number of chromosomes.
C. asexual reproductions are clones of their parents, while offspring of sexual reproduction are genetically different from their parents.
D. sexual reproduction are clones of their parents, while offspring of asexual reproduction are genetically different from their parents.

8. A spider can weave a perfect web the very first time it tries, because it is born with this ability. This behavior is an example of a(n)
- learned behavior.
 - environmental influence.
 - innate behavior.
 - codominant trait.

9. The diagram below shows a generalized cycle in sexually reproducing animals.



What is Process B in this diagram?

- Fertilization of gametes
 - Cell division by mitosis
 - Osmosis through the cell membrane
 - Replication of the cell structures
10. White is a helpful adaptation for animals living near the North Pole because it
- absorbs more heat from the sun.
 - provides camouflage for the environment.
 - helps the animals run faster.
 - makes the animals feel more comfortable.

11. In rabbits, brown (B) fur is dominant to white (b) fur. If a rabbit with the genotype Bb is crossed with a rabbit with a genotype bb. What percentage of the offspring are expected to have brown fur?
- 0%
 - 25%
 - 50%
 - 100%

12. Use the table below showing characteristics of plant varieties to answer the question that follows.

Plant Variety	More Fruit/Plant	Drought Resistant	Faster Growing	Disease Resistant
1	X		X	
2		X		X
3	X	X		
4		X	X	

A farmer wants to grow a crop that is resistant to disease while producing more fruit per plant. Which plants should the farmer select to cross to get the desired combination of traits?

- 1 and 2
- 2 and 4
- 1 and 3
- 3 and 4

Sample Constructed Response Questions Related to Heredity

- Mr. and Mrs. Smith recently had a baby. The nurses at the hospital accidentally mixed up the name tags of 3 babies (**A, B, and C**), one of which belongs to the Smiths. Baby **A** has type O blood and freckles. Baby **B** has type A blood, and no freckles. Baby **C** has type B blood, and freckles. Use this and the following information to determine which baby belongs to the Smiths. Be sure to justify your answer with both an explanation and by drawing the Punnett squares for each trait.
 - Freckles (F) are dominant over no freckles (f). Mr. Smith is homozygous dominant for freckles, while Mrs. Smith has no freckles.
 - Type A and B blood are codominant to type O blood. Mr. Smith is heterozygous type A blood, while Mrs. Smith has type AB blood.
- Genetically identical twins named Jane and Sue were born in China. They were given up for adoption by their mother. Jane was adopted by a family in America and had all of the proper food and nutrients as she grew. Sue was never adopted and lived in a Chinese orphanage throughout her childhood. Sue did not receive the proper food and nutrition that she needed, because the orphanage had very little money.
 - Identify two physical characteristics that would be the same between Jane and Sue. Explain why these traits would be the same.
 - Identify two physical characteristics that would be different between Jane and Sue. Justify your answer why the traits would be different.

CRT Science Review #4 Key Life Science: Heredity



Standard: Heredity is the genetic passing of a set of instructions from generation to generation. These instructions are encoded as DNA and may manifest themselves as characteristics. Some characteristics are inherited, and some result from interactions with the environment.

Answer Key

- | | |
|-------------------|--------------------|
| 1. A, DOK Level 1 | 7. C, DOK Level 2 |
| 2. D, DOK Level 1 | 8. C, DOK Level 1 |
| 3. A, DOK Level 1 | 9. B, DOK Level 2 |
| 4. B, DOK Level 1 | 10. B, DOK Level 1 |
| 5. C, DOK Level 2 | 11. C, DOK Level 2 |
| 6. B, DOK Level 1 | 12. A, DOK Level 2 |

Constructed Response Answers

13. DOK Level 3

3 points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>Both Punnett Squares are drawn and completed correctly. Note that the letters may be different for freckles as long as the capitalization is the same. For blood type, the letters must be the same. The Punnett squares show that Mr. and Mrs. Smith can only have children with freckles, so baby B cannot be theirs because it does not have freckles. The Punnett squares also show that Mr. and Mrs. Smith can only have babies with the blood types A, B, or AB. Baby A has type O blood and cannot be theirs. Therefore, by the process of elimination, Baby C is their baby.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Freckles</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="background-color: black; width: 20px; height: 20px;"></td><td style="padding: 5px;">F</td><td style="padding: 5px;">F</td></tr> <tr><td style="padding: 5px;">f</td><td style="padding: 5px;">Ff</td><td style="padding: 5px;">Ff</td></tr> <tr><td style="padding: 5px;">f</td><td style="padding: 5px;">Ff</td><td style="padding: 5px;">Ff</td></tr> </table> </div> <div style="text-align: center;"> <p>Blood type</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td style="background-color: black; width: 20px; height: 20px;"></td><td style="padding: 5px;">A</td><td style="padding: 5px;">O</td></tr> <tr><td style="padding: 5px;">A</td><td style="padding: 5px;">AA</td><td style="padding: 5px;">AO</td></tr> <tr><td style="padding: 5px;">B</td><td style="padding: 5px;">AB</td><td style="padding: 5px;">BO</td></tr> </table> </div> </div>		F	F	f	Ff	Ff	f	Ff	Ff		A	O	A	AA	AO	B	AB	BO
	F	F																	
f	Ff	Ff																	
f	Ff	Ff																	
	A	O																	
A	AA	AO																	
B	AB	BO																	
2 points	<i>Response addresses all parts of the question and includes only minor errors.</i>																		
1 point	<i>Response does not address all parts of the question.</i>																		
0 points	<i>Response is totally incorrect or no response provided.</i>																		

14. DOK Level 3

3 points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>Jane and Sue have the same DNA, so physical characteristics that are determined only by genes would be the same between them. Examples may include eye or hair color, and nose or eye shape would be the same between Jane and Sue because those characteristics are determined by genes. Physical characteristics that are influenced by the environment will not be the same between Jane and Sue. For example, height and weight are not only determined by genes, but also depends on nutrition. Since Sue did not receive the proper nutrition as a child, she will most likely be shorter and thinner than Jane. Skin color is another characteristic affected not only by genes, but by the amount of sunlight a person's skin is exposed to. Most likely, Jane and Sue will not have the same shade of skin, because they will not have been exposed to the same amount of sunlight.</p>
2 points	Response addresses all parts of the question and includes only minor errors.
1 point	Response does not address all parts of the question.
0 points	Response is totally incorrect or no response provided.

CRT Science Review #5

Life Science: Structure of Life



Standard: Structure of Life – All living things are composed of cells. Cells can range from very simple to very complex and have structures which perform functions for the organism. Cells and cell structures can be damaged or fail because of intrinsic failures or disease.

Indicators & Item Specifications:

L.8.B.1 Students know all organisms are composed of cells, which are the fundamental units of life. E/S

- Know organisms are unicellular or multicellular.
- Recognize that cells are made of many specialized parts (i.e., nucleus, cell membrane, cell wall, chromosomes, chloroplast, vacuole, mitochondria)

L.8.B.2 Students know cells grow, divide, and take in nutrients which they use to provide energy for cell functions. E/S

- Understand the general process of cell division.
- Identify that the specialized parts of cells perform specific functions.
- Know the function of semi-permeable membranes.
- Understand the general processes of cellular respiration and photosynthesis.

L.8.B.3 Students know some organisms are made of just one cell and that multicellular organisms can consist of thousands to millions of cells working together. E/S

- Describe the specialization of cells in multicellular organisms (e.g., skeletal muscle, nerve cells, epidermal cells, cardiac muscle).

L.8.B.4 Students know cells combine to form tissues that combine to form organs and organ systems that are specialized to perform life functions. E/S

- Know cells work together to form tissues, organs, and organ systems.
- Know the functions of organs and organ systems. (i.e., skeletal, muscular, digestive, circulatory, respiratory, nervous)
- Know there are different types of cells within tissues, organs, and organ systems in the same organism designed to take on specialized tasks.

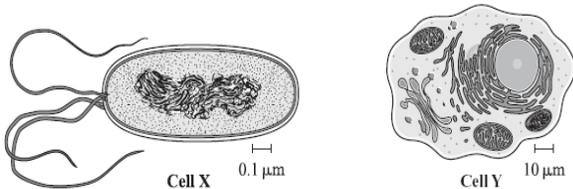
L.8.B.5 Students know disease can result from defects in body systems or from damage caused by infection. E/S

- Understand the general ways that diseases are spread among organisms.
- Understand the general ways that disease affects individual organisms.
- Recognize that some diseases are caused by many different types of infections (e.g., virus – influenza, AIDS; bacteria – pneumonia, strep throat; protista – malaria; fungus – athlete's foot)
- Identify that some diseases are infectious, others are inherited, and some result from a breakdown of body systems.
- Know defects in body systems can be related to congenital, autoimmune, or environmental conditions.

Sample Multiple Choice CRT-Style Questions Related to Structure of Life

1. Which cellular organelle contains DNA and controls the function of the cell?
 - A. Ribosome
 - B. Endoplasmic Reticulum
 - C. Golgi Body
 - D. Nucleus
2. The process of photosynthesis occurs in the
 - A. ribosomes.
 - B. mitochondria.
 - C. chloroplast.
 - D. nucleus.
3. What theory provides the explanation that diseases are caused by microorganisms?
 - A. Cell Theory
 - B. Immune Theory
 - C. Germ Theory
 - D. Infection Theory
4. Which cell type would **most likely** have the most mitochondria?
 - A. A muscle cell in the leg muscle of a runner.
 - B. A cell of the stomach lining that manufactures digestive enzymes.
 - C. A red blood cell that transports oxygen.
 - D. A nerve cell that transmit signals to the brain stem.
5. Many animals have an internal or external skeleton that provides support and structure. What cell structure found in plants plays a similar role?
 - A. Cytoplasm
 - B. Cell wall
 - C. Chloroplast
 - D. Cell membrane

6. The process that moves water across a semipermeable membrane from high to low concentrations is called
 - A. osmosis.
 - B. active transport.
 - C. diffusion.
 - D. facilitated diffusion.
7. Which of the following is the correct ranking of organizational hierarchy of organisms from simplest to most complex?
 - A. cells, organs, tissues, organ systems, organisms
 - B. cells, tissues, organs, organ systems, organisms
 - C. tissues, cells, organs, organ systems, organisms
 - D. tissues, organs, cells, organ systems, organisms
8. What two body systems work together to produce movement?
 - A. Circulatory and skeletal
 - B. Muscular and digestive
 - C. Respiration and nervous
 - D. Skeletal and muscular
9. The illustrations below represent two different cells.



(Diagram from <http://www.doe.mass.edu/mcas/>)

Which of the following statements **best** identifies Cell X and Cell Y?

- A. Cell X is a prokaryotic and Cell Y is a eukaryotic.
- B. Cell X is a nerve cell and Cell Y is nerve tissue.
- C. Cell X is a red blood cell and Cell Y is a muscle cell.
- D. Cell X is a plant cell and Cell Y is an animal cell.

10. Use the diagram of the human body below to answer the following question.



(Diagram from <http://www.doe.mass.edu/mcas/>)

Which of the following **best** describes the function of this system?

- A. Supports the skeletal system
 - B. Absorbs nutrients from food
 - C. Responds to stimuli in the environment
 - D. Exchanges gases with the environment
11. Which type of infection of the human body can **most** likely be treated with an antibiotic?
 - A. Viral
 - B. Fungal
 - C. Bacterial
 - D. Protist
 12. Malaria is a disease that is caused by a protist known as *Plasmodium*. When a mosquito bites a person infected with malaria, then bites a healthy person, the malaria-causing pathogens can infect the healthy person. What is the vector in this case?
 - A. Human
 - B. Plasmodium
 - C. Mosquito
 - D. Blood

Sample Constructed Response Questions Related to Heredity

1. Cells have a variety of organelles, each with a specific function. The organelles must work together in order for the cell to survive.
 - A. Describe the function of a chloroplast and mitochondria. Include a basic description of the chemical reaction that takes place in each organelle.
 - B. Describe how the chloroplast and mitochondria work together to help a plant cell survive.
 - C. Predict what would happen if a plant cell lacked mitochondria. Justify your answer.
2. A group of students took potato salad made with mayonnaise to a picnic on a very hot day.
 - A. Explain how eating the potato salad could cause food poisoning.
 - B. Describe something that could be done to the potato salad to prevent the people who eat it from getting food poisoning, and why this would work.

CRT Science Review #5 Key Life Science: Structure of Life



Standard: Structure of Life – All living things are composed of cells. Cells can range from very simple to very complex and have structures which perform functions for the organism. Cells and cell structures can be damaged or fail because of intrinsic failures or disease.

Answer Key

1. D, DOK Level 1
2. C, DOK Level 1
3. C, DOK Level 1
4. A, DOK Level 2
5. B, DOK Level 2
6. A, DOK Level 1
7. B, DOK Level 1
8. D, DOK Level 1
9. A, DOK Level 2
10. D, DOK Level 1
11. C, DOK Level 1
12. C, DOK Level 2

Constructed Response Answers

13. DOK Level 3

3 points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>A. The chloroplast is the site of photosynthesis where sunlight energy, carbon dioxide and water are converted to simple sugars (food). The mitochondria are the site of cellular respiration where glucose is broken down into usable cellular energy.</p> <p>B. A plant cell contains both chloroplasts and mitochondria. Food (simple sugars) is made in the chloroplast. The sugars are stored until the cell needs energy. The sugars are then transferred to the mitochondria to be broken down into usable energy (ATP?) to carry out cellular activities.</p> <p>C. A plant cell that lacked mitochondria would be able to make food but would be unable to convert the food into cellular energy. The cell would die.</p>
2 points	<i>The response addresses all parts of the question and includes only minor errors.</i>
1 point	<i>Response does not address all parts of the question.</i>
0 points	<i>Response is totally incorrect or no response provided.</i>

14. DOK Level 3

3 Points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>The potato salad may cause food poisoning if it is not refrigerated. As the temperature of the potato salad increase, the rate that the microbes reproduce in the salad also increases. Over time, the bacteria in the potato salad will increase and if the students eat the potato salad then they may get sick because the bacteria produce toxins that harm people. If the potato salad was refrigerated, then the bacteria would not reproduce as quickly, and the students would not get food poisoning.</p>
2 Points	<i>Response addresses all parts of the question and includes only minor errors.</i>
1 Point	<i>Response does not address all parts of the question.</i>
0 Points	<i>Response is totally incorrect or no response provided.</i>

CRT Science Review #6

Life Science: Organisms and Their Environment



Standard: Organisms and Their Environment – A variety of ecosystems and communities exist on Earth. Ecosystems are dynamic interactions of organisms and their environment. Ecosystems have distinct characteristics and components that allow certain organisms to thrive. Change in one of more components can affect the entire ecosystem.

Indicators & Item Specifications:

L.8.C.1 Students know how matter and energy are transferred through food webs in an ecosystem. E/S

- Diagram and label a food web.
- Given a scenario, identify the pathways of energy flow in the system.
- Know the Sun is the primary source of energy for most living organisms on Earth.
- Explain that matter and energy are transferred, transformed, and conserved within an ecosystem.
- Know that in a food web, the amount of energy available decreases from producer to primary consumer to secondary consumer due to energy used for cellular/life functions that is lost as heat.

L.8.C.2 Students know how to characterize organisms in any ecosystem by their functions. E/S

- Identify producers, consumers, decomposers and their functions in an ecosystem.
- Understand how different populations interact within an ecosystem.
- Understand different types of relationships (e.g., symbiotic, mutual, and parasitic/host) in an ecosystem.
- Understand the process of succession (e.g., producers enter ecosystem first, followed by consumers).

L.8.C.3 Students will evaluate how changes in environments can be beneficial or harmful. E/S

- Predict the beneficial and harmful results of a large change in an ecosystem.
- Understand that ecosystems include both living (biotic) and non-living (abiotic) elements.
- Given an example predict the relationships between living and non-living factors and the types of organisms that can live there.
- Understand that changes in an ecosystem can be the result of human impact or natural causes/processes and can be beneficial and/or harmful.

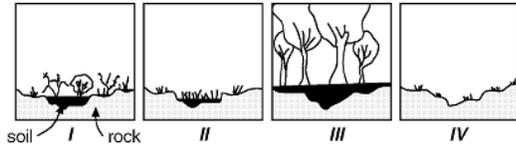
L.8.C.4 Students know inter-related factors affect the number and type of organisms an ecosystem can support. E/S

- Understand that inter-related factors include both living (biotic) and non-living (abiotic) elements.
- Predict and recognize the effect of a change in the inter-related factors in an ecosystem.
- Understand that populations of organisms have specific adaptations that help them survive in an ecosystem and explain why an organism could/could not survive in a particular environment (e.g., due to specific adaptations, carrying capacity, and available biotic and abiotic resources).
- Know living organisms compete for resources in an ecosystem and the amount of available resources limits the carrying capacity of an ecosystem.

Sample Multiple Choice CRT-Style Questions Related to Organisms and Their Environment

1. What abiotic factor is the initial energy source in most food webs?
 - A. Producers
 - B. Sun
 - C. Bacteria
 - D. Rain
2. Most of the minerals within an ecosystem are recycled and returned to the environment by the direct activities of organisms known as
 - A. producers.
 - B. consumers.
 - C. scavengers.
 - D. decomposers.
3. The symbiotic relationship between a flower and the insect that feeds on its nectar is an example of
 - A. mutualism because the flower provides the insect with food and the insect pollinates the flower.
 - B. commensalism because the insect lives off the nectar but the flower does not benefit.
 - C. parasitism because the insect harms the flower by removing the nectar.
 - D. predation because the insect feeds on the flower and the flower dies.
4. Plants transform energy from the sun into
 - A. nuclear energy.
 - B. solar energy.
 - C. chemical energy.
 - D. mechanical energy.

5. Use the diagram below representing different stages in succession to answer the following question.

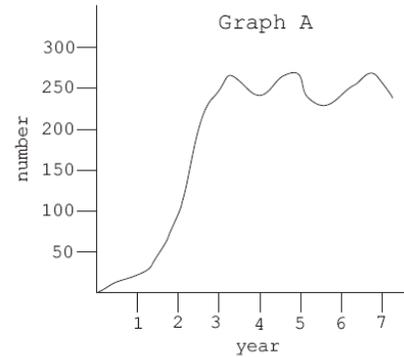


(Figure from Examgen test generating program)

Select the order that represents how succession progresses in an ecosystem.

- A. I, II, III, IV
 B. II, IV, I, III
 C. IV, II, I, III
 D. III, IV, II, I
6. Which of the following human activities reduces biodiversity?
- A. Prohibiting hunting in wildlife preserves
 B. Collecting tissue samples from endangered species in the area
 C. Planting native grass species to prevent erosion
 D. Planting one type of tree to replace native forests cut for lumber
7. What paired factors below are the most important in determining the type of vegetation that is present in a natural ecosystem?
- A. Soil and water
 B. Landforms and soil
 C. Water and temperature
 D. Temperature and soil
8. Which of the following adaptations would **least** likely help a plant survive in a hot, dry environment?
- A. Open their stomata at night
 B. Grow long shallow roots
 C. Have needles instead of leaves
 D. Have thin large leaves on branches
9. There is a limit to how large any given population can grow. Which of the following statements best explains why a population must eventually stop growing?
- A. A low female-to-male ratio develops as the population grows.
 B. Older individuals outnumber the younger members of the population.
 C. Natural selection causes the gene pool to shift as the population increases.
 D. The available resources necessary for life are used up by the population as it grows.

10. Use the graph below showing the number of organisms in an area over time to answer the following question.

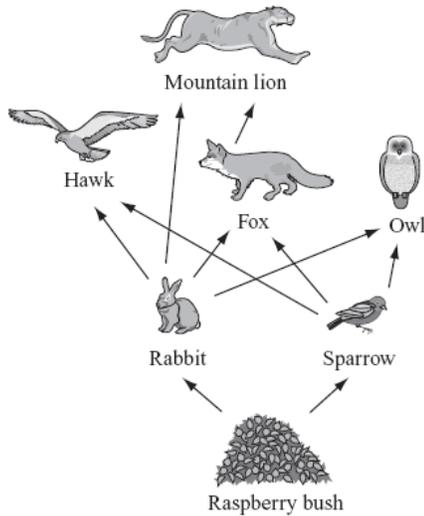


(From <http://www.gov.mb.ca/conservation/sustain/carcap.pdf>)

During which year did the population reach its carrying capacity?

- A. Year 2
 B. Year 3
 C. Year 6
 D. Year 7
11. Carefully examine the food web in the figure below.
-
- (From ExamView test Generator for Modern Biology, Holt, Rinehart, and Winston, 2006.)
- A drought has caused the producer populations to significantly decrease. Which of the following statements describes an immediate effect caused by the decrease of producers?
- A. The grouse population would increase.
 B. The grasshopper population would decrease.
 C. The seed populations would increase.
 D. The grizzly bear populations would decrease.
12. What process below releases primarily oxygen into the atmosphere?
- A. Respiration
 B. Combustion
 C. Osmosis
 D. Photosynthesis

Use the food web to answer questions 13 and 14.



(Diagram from <http://www.doe.mass.edu/mcas/>)

13. In the food web above which organism would have the largest population?
- A. Fox
 - B. Sparrow
 - C. Raspberry bush
 - D. Mountain lion

Sample Constructed Response Question Related to Organisms and Their Environment

15. Use the passage below to help answer the three questions which follow.

In a grassland habitat, the rabbits, herbivorous insects and field mice eat the grasses. The herbivorous insects are eaten by predaceous insects. The mice eat both types of insects. Both the rabbits and field mice are eaten by snakes in this habitat. Hawks flying in the area eat the rabbits, field mice and the snakes.

- A. Draw a food web showing all of the organisms in this grassland habitat.
- B. Which organism is the primary producer? How does it obtain its energy?
- C. Select one organism to remove from this web and explain in detail the impact that it would have on the rest of the food web.

14. If the owl is removed from the food web, what will **most likely** be the result and why?
- A. The hawk population will increase because there will be less competition for their niche within this environment.
 - B. The sparrow and rabbit populations will increase sharply because they will have no predators in this environment.
 - C. The raspberry bush population will increase because there will be fewer rabbits due to the increased predation by the fox and the hawk.
 - D. The mountain lions will leave the area because there will be less prey available in the ecosystem.

CRT Science Review #6 Key

Life Science: Organisms and Their Environment



Standard: Organisms and Their Environment – A variety of ecosystems and communities exist on Earth. Ecosystems are dynamic interactions of organisms and their environment. Ecosystems have distinct characteristics and components that allow certain organisms to thrive. Change in one of more components can affect the entire ecosystem.

Answer Key

- | | |
|-------------------|--------------------|
| 1. B, DOK Level 1 | 8. D, DOK Level 1 |
| 2. D, DOK Level 1 | 9. D, DOK Level 2 |
| 3. A, DOK Level 2 | 10. B, DOK Level 1 |
| 4. C, DOK Level 1 | 11. B, DOK Level 2 |
| 5. C, DOK Level 2 | 12. D, DOK Level 1 |
| 6. D, DOK Level 1 | 13. C, DOK Level 2 |
| 7. C, DOK Level 1 | 14. A, DOK Level 2 |

Constructed Response Answer

15. DOK Level 3

3 points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>The student can draw a food web (see sample below) using all organisms and include at least 8 arrows correctly showing the direction of the energy flow. The grasses are identified as the primary producer which obtain energy from the sun and make food by photosynthesis. The hawks are the least common. Being at the top of the food chain, less energy is available as energy is lost from one trophic level to the next on the food web. Energy is lost as waste or used for respiration and maintenance.</p> <div style="text-align: center;"> <pre> graph BT Grasses --> Rabbits Grasses --> FieldMice[Field Mice] Grasses --> HerbivorousInsects[Herbivorous Insects] Rabbits --> Snakes FieldMice --> Snakes FieldMice --> Predaceous HerbivorousInsects --> Predaceous Snakes --> Hawks Predaceous --> Hawks </pre> </div>
2 points	<i>Response addresses all parts of the question and includes only minor errors.</i>
1 points	<i>Response does not address all parts of the question.</i>
0 points	<i>Response is totally incorrect or no response provided.</i>

CRT Science Review #7 Life Science: Diversity of Life



Standard: Diversity of Life – Evidence suggests that living things change over periods of time. These changes can be attributed to genetic and/or environmental influences. This process of change over time is called biological evolution. The diversity of life on Earth is classified using objective characteristics. Scientific classification uses a hierarchy of groups and subgroups based on similarities that reflect evolutionary relationships.

Indicators & Item Specifications:

L.8.D.1 Students know species can be identified and classified based upon their characteristics. E/S

- Understand how to classify species based on certain characteristics (e.g., DNA, skeletal structure, body covering, petal arrangement, and deciduous/coniferous) and behaviors.
- Given a group of organisms and a key, classify organisms based on observable characteristics.

L.8.D.2 Students know fossils provide evidence of how life and environmental conditions have changed throughout geologic time. E/S

- Know fossils provide evidence of how environments and organisms have changed over time.
- Given examples, predict the relative age of rock layers based on the types of fossils that they contain.
- Know the conditions necessary for fossil formation.

L.8.D.3 Students know an organism's behavior is based on both experience and on the species' evolutionary history. E/S

- Know some mechanisms of biological evolution (e.g., natural selection, competition and survival, variation and adaptation, and genetic mutation).
- Know that differences among individuals within a species can yield advantages and/or disadvantages in survival and/or reproduction.

Sample Multiple Choice CRT-Style Questions Related to Diversity of Life

1. When there are no more living members of a species, that species is said to be
 - A. endangered.
 - B. extinct.
 - C. evolved.
 - D. unchanged.
2. More than 1.5 million species of animals have been described, yet all of them have DNA that is made of the same building blocks. This is evidence that all animals have
 - A. similar appearances.
 - B. the same DNA sequence.
 - C. common fossil records.
 - D. a common ancestor.
3. A tool used by scientists to identify unknown organisms based on observable characteristics is called a
 - A. dichotomous key.
 - B. scientific name.
 - C. taxonomic Tree.
 - D. homologous structure.
4. Fossils are most commonly preserved in
 - A. igneous rock.
 - B. metamorphic rock.
 - C. sedimentary rock.
 - D. transitional rock.
5. The fossil record supports Darwin's theory of evolution by demonstrating that plants and animals
 - A. have changed over time.
 - B. existed for only a few thousands of years.
 - C. are the same in various environments.
 - D. remain unchanged until extinction.
6. Scientists have discovered fossils of whale ancestors that have well developed hip and thigh bones, which are typically used for walking by mammals. Modern whales most likely evolved from ancestors who
 - A. lived in the sea, and then became better adapted for land.
 - B. lived on land, and then became better adapted for the sea.
 - C. evolved in the sea and remained in the sea.
 - D. evolved on land and remained on land.
7. Fossils of shellfish and snails are commonly found in the Las Vegas Valley. What can be inferred about the environmental conditions in the Las Vegas Valley millions of years ago?
 - A. It was always a desert.
 - B. It was once a forest.
 - C. It once contained a glacier.
 - D. It once contained a shallow sea.

8. Which term refers to the process by which organisms that are better adapted to their environment are more likely to survive and reproduce?
- Variation
 - Competition
 - Overproduction
 - Natural selection

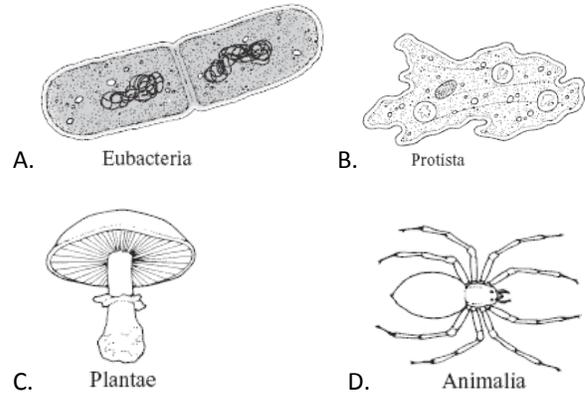
9. Which of the following provides the **best** evidence that organisms of two different species share a common ancestor?
- They live in similar environments.
 - They have the same anatomy.
 - They reproduce at the same time.
 - They have similar DNA sequences.

10. European rabbits were introduced to Australia in 1859. The rabbits reproduced rapidly in their new environment, displaced other animals and overgrazed vegetation. In an attempt to reduce the rabbit population, a virus deadly to European rabbits was introduced in 1951.

When the virus was first introduced, the rabbits died in large numbers, but over time the death rate decreased. What statement **best** explains the decrease in the rabbit death rate?

- Young rabbits learned to avoid being infected by the virus.
- The virus had a short life span and died out with the rabbits.
- Natural selection favored rabbits that were resistant to the virus.
- The rabbits died of natural causes and the introduced virus did not work.

11. What organism is **not** correctly labeled with its kingdom?



12. The table below shows the taxons of four different animal species.

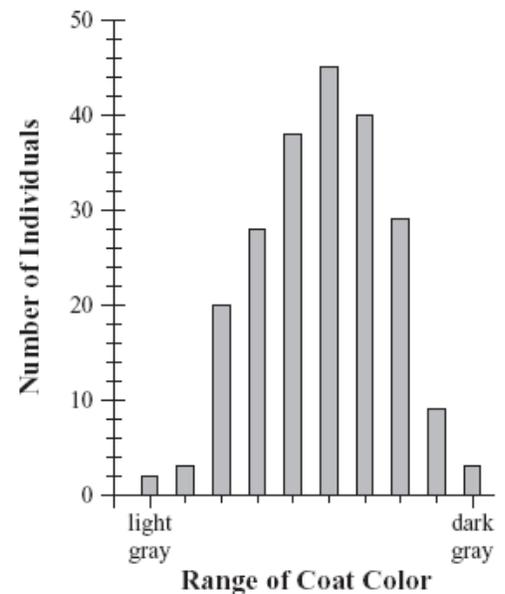
	Species 1	Species 2	Species 3	Species 4
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Order	Carnivora	Carnivora	Artiodactyla	Carnivora
Family	Felidae	Otariidae	Ceridae	Felidae
Genus	<i>Felis</i>	<i>Zalophus</i>	<i>Odocoileus</i>	<i>Panthera</i>
Species	<i>catus</i>	<i>californianus</i>	<i>virginianus</i>	<i>pardus</i>

Based upon the information in the table, which two species are most closely related?

- Species 1 and 2
- Species 1 and 4
- Species 2 and 3
- Species 2 and 4

Sample Constructed Response Question Related to Diversity of Life

13. The graph shows the number of gray squirrels in a small population and their coat colors. This squirrel population has been separated from other squirrel populations by a new highway and several construction sites. The main predators of these squirrels are cats and hawks.
- Assume that dark gray squirrels are very visible in this new environment. What is likely to happen to the distribution of coat color in this squirrel population over several generations?
 - Using graph paper, sketch a graph to show the predicted distribution, and explain your answer.
 - Assume that dark gray squirrels are very visible on the ground, and light gray squirrels are very visible in the trees. Explain what is likely to happen to the distribution of coat color in the squirrel population over several generations.



CRT Science Review #7 Key Life Science: Diversity of Life



Standard: Diversity of Life – Evidence suggests that living things change over periods of time. These changes can be attributed to genetic and/or environmental influences. This process of change over time is called biological evolution. The Diversity of life on Earth is classified using objective characteristics. Scientific classification uses a hierarchy of groups and subgroups based on similarities that reflect evolutionary relationships.

Answer Key

1. B, DOK Level 1
2. D, DOK Level 1
3. A, DOK Level 1
4. C, DOK Level 1
5. A, DOK Level 1
6. B, DOK Level 2
7. D, DOK Level 2
8. D, DOK Level 1
9. D, DOK Level 1
10. C, DOK Level 2
11. C, DOK Level 2
12. B, DOK Level 2

Constructed Response Answers

13. DOK Level 3

3 points	<p><i>Response addresses all parts of the question clearly and correctly.</i></p> <p>A. If gray squirrels are more visible in the new environment, then the gray squirrel population will decrease over generations due to predation by the cats and hawks.</p> <p>B. Student draws a correctly labeled bar graph showing a directional shift of the squirrel population from the dark gray to a medium/light gray color. If the dark gray squirrels are not as camouflaged in their new environment, then they will be less likely to reproduce and there will be less dark gray squirrels in the population over time.</p> <p>C. If the squirrels are more fit in different environments, then they will most likely inhabit areas where they are more camouflaged. The dark squirrels will not live on the ground and light gray squirrels will spend less time in the trees. Due to their behaviors, it is possible that a disruptive selection pattern will result where the light gray and dark gray squirrel populations increase, but the intermediate color decreases. This type of natural selection may lead to the formation of two different squirrel populations over time.</p>
2 points	<i>Response addresses all parts of the question and includes only minor errors.</i>
1 points	<i>Response does not address all parts of the question.</i>
0 points	<i>Response is totally incorrect or no response provided.</i>

Visit RPDP's Middle School TIPS website for additional sample CRT questions: http://rpd.net/sciencetips_v3/