



High School Science Proficiency Review #4

Life Science: Heredity

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Life Science Heredity

L.12.A.1 Students know genetic information passed from parents to offspring is coded in the DNA molecule. E/S

- ♦ Identify the location of the DNA molecule and the shape of its double helix structure.
- ♦ Explain that DNA copies itself.
- ♦ Explain that DNA contains hereditary information.
- ♦ Describe the process of DNA replication in the formation of sex cells.

L.12.A.2 Students know DNA molecules provide instructions for assembling protein molecules. E/S

- ♦ Recognize that the DNA code carries instructions for making protein molecules.

L.12.A.3 Students know all body cells in an organism develop from a single cell and contain essentially identical genetic instructions. E/S

- ♦ Explain how organisms grow through the processes of cellular division and differentiation.
- ♦ Recognize that all body cells in an organism have fundamentally the same DNA.

L.12.A.4 Students know several causes and effects of somatic versus sex cell mutations. E/S

- ♦ Describe the difference between sex cells and somatic cells in an organism.
- ♦ Recognize that DNA in sperm cells is different from DNA in egg cells.
- ♦ Explain that mutations in sex cells may be passed on to offspring.
- ♦ Explain that mutations in somatic cells are not passed on to offspring.
- ♦ Explain that environmental factors may cause mutations in DNA in both somatic cells and sex cells.
- ♦ Recognize that mutations result from changes in DNA.

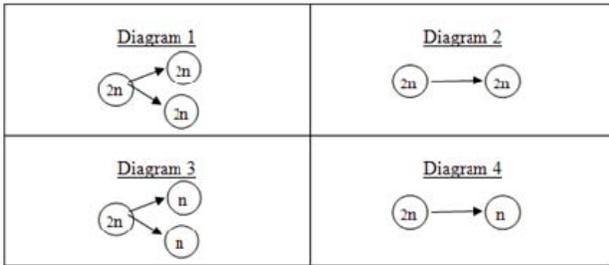
L.12.A.5 Students know how to predict patterns of inheritance. E/S

- ♦ Explain how reproduction is responsible for genetic variation.
- ♦ Use a Punnett Square to predict the proportion of specific genetic traits in offspring.

Sample Proficiency-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 human blood types, type A and type B are codominant over the allele for type O blood. If a female with type O blood and a male with type AB blood have children, which of the following statements is TRUE?
 - A. 50% of their offspring will have type O blood.
 - B. 50% of their offspring will have AB blood.
 - C. 50% of their offspring will have type A blood and 50% will have type B blood.
 - D. 50% of their offspring will have type A blood and 50% will have type AB blood.
3. A change in genetic material that produces variation within a species is a
 - A. mutation.
 - B. translation.
 - C. transcription.
 - D. replication.
4. 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.
5. If the base sequence in DNA is ATCG, the mRNA sequence is
 - A. AUUCG
 - B. ATCG
 - C. TAGC
 - D. UAGC

6. Use the following diagram to answer the next question.



Which diagram correctly represents mitosis?

- Diagram 1
 - Diagram 2
 - Diagram 3
 - Diagram 4
7. An organism is described as $2n = 30$. How many chromosomes do all somatic cells of this organism contain?
- 15
 - 20
 - 25
 - 30
8. Nondisjunction of sex chromosomes in a human female during meiosis may result in her son inheriting the disorder represented by
- XXY
 - XYY
 - XXX
 - YYY
9. Environmental factors like ultraviolet light, asbestos fibers, and cigarette smoke are
- harmless and do not cause lasting cellular damage.
 - only temporarily damaging to cellular DNA.
 - carcinogenic resulting in permanent DNA changes.
 - damaging to only somatic cells and not gametes.

10. Which of the following genotypes has the potential for the greatest genetic variation in the offspring?

- Homozygous dominant crossed with homozygous recessive.
- Heterozygous crossed with homozygous recessive.
- Homozygous dominant crossed with homozygous dominant.
- Heterozygous crossed with another heterozygous individual.

11. Use the Punnett Square below to answer the following question.

Parent Genotype $Ff \times ff$

	F	f
f	1	2
f	3	4

In humans, having freckles is dominant to no freckles. Which of the following statements **BEST** describes the child represented in box 1 in the above Punnett Square?

- Homozygous for freckles.
 - Homozygous for extra freckles.
 - Heterozygous for freckles.
 - Heterozygous for no freckles.
12. In human polydactyly, having more than five fingers on one hand, is a dominant trait. A man who has five fingers on each hand marries a woman who is polydactyl. The couple has 8 children, only 3 of the children are polydactyl. What is the genotype of mother?
- Homozygous dominant
 - Heterozygous
 - Homozygous recessive
 - Hemizygous



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



High School Science Proficiency Review #5

Life Science: Structure of Life

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Life Science Structure of Life

L.12.B.1 Students know cell structures and their functions. E/S

- ♦ Identify major cell structures and their functions.
- ♦ Identify the differences between plant and animal cells based on their structures and functions.

L.12.B.2 Students know the human body has a specialized anatomy and physiology composed of a hierarchical arrangement of differentiated cells. E/S

- ♦ Identify human body systems and describe their general functions.
- ♦ Identify relationships among cells, tissues, organs, organ systems and organisms and know their hierarchical order.

L.12.B.3 Students know disease disrupts the equilibrium that exists in a healthy organism. E/S

- ♦ Evaluate how a disease disrupts the homeostasis of an organism.
- ♦ Describe ways that an imbalance in one organ system affects the entire organism.

Sample Proficiency-Style Questions Related to Structure of Life

- Which organelle is the site of cellular respiration in both animal **AND** plant cells?
 - Nucleus
 - Chloroplasts
 - Mitochondria
 - Vacuole
- Which of the following is present in a typical plant cell but **NOT** in an animal cell?
 - Mitochondria
 - Cell Wall
 - Ribosome
 - Golgi Apparatus
- If a parasite invades and irritates the small intestine of an animal, what effect will it most likely have on the body?
 - Increases water retention.
 - Disrupts balance and causes blindness.
 - Decreases white blood cell count.
 - Interferes with nutrient absorption.
- Which of the following lists the structural units of the body from smallest to largest?
 - Cell, Tissue, Organ, Organ System, Organism
 - Organism, Organ System, Organ, Tissue, Cell
 - Tissue, Cell, Organ, Organ System, Organism
 - Cell, Organ, Tissue, Organism, Organ System
- An individual is born with a hole in the septum of their heart between the two atria. Which of the following explain why this condition may be harmful?
 - The person will have high blood pressure.
 - The person will have low blood pressure.
 - The cells of the body may not get enough oxygen.
 - The blood will not flow to the lungs for gas exchange.
- Use the graph below to answer the following question. The graph shows the number of antibodies in the blood over a period of time.

Point 1: person bitten by mosquito carrying bacterium

Point 2: same person bitten by mosquito carrying same bacterium

Response I

Response II

Amount of antibody in blood

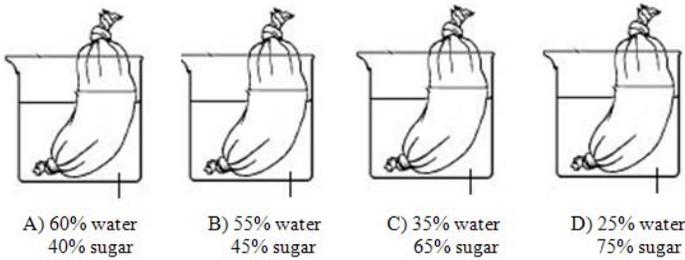
Time (days)

What is the best reason why Response II is greater than Response I?

- More bacteria entered at point 2 than at point 1.
- Memory cells were produced during Response I.
- Antibodies from Response I still remained in the blood.
- Macrophages increased their production of antibodies.

7. Which cell structures are most directly involved in the production and transport of proteins out of the cell?
- Mitochondria and rough endoplasmic reticulum
 - Ribosomes and the rough endoplasmic reticulum
 - Nucleus and cytoplasm
 - Vacuole and mitochondria

8. Use the illustrations below the answer the next question.



A student places a bag that each contains equal solutions of 55% water and 45% sugar into 4 beakers. Each beaker contains different concentrations of a sugar solution as shown in the illustrations above. The bags are not permeable to sugar, but water will pass through.

Which statement below best describes what will happen?

- The sugar concentration in Beaker A will decrease.
 - The sugar concentration in Beaker B will increase.
 - The water level in Beaker C will decrease.
 - The water level in Beaker D will increase.
9. Trees require several substances for photosynthesis and growth. The substance that provides the most mass for a tree is
- soil.
 - water.
 - carbon dioxide.
 - oxygen.

10. The explanation that diseases are caused by microorganism is known as the
- cell theory.
 - immune theory.
 - germ theory.
 - infection theory.
11. Organisms that cause disease are
- pathogens.
 - toxins.
 - genetics.
 - symptoms.
12. The table below describes the patient and the symptoms they are experiencing. Use the table to answer the question below.

Patient	Description of Symptoms
1	A student recently ate food from a damaged food container and is now experiencing difficulty seeing, swallowing and breathing.
2	A food handler in a rural area does not have access to proper toilet facilities. He now has a high fever, chills, cramps, and blood in stool.
3	A 6 year-old child had cold-like symptoms for several days, then developed a red rash all over her body and became dehydrated.
4	A traveler went to a country with poor water treatment and no proper toilet facilities. She exhibits vomiting, muscle cramps, and dehydration.

Cholera is a highly infectious disease common in areas where sanitation is poor. Symptoms include severe diarrhea, vomiting, extreme dehydration, and muscle cramps. What patient is most likely experiencing cholera?

- Patient 1
- Patient 2
- Patient 3
- Patient 4



High School Science Proficiency Review #5

Life Science: Structure of Life

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- ♦ Evaluate how a disease disrupts the homeostasis of an organism.
- ♦ Describe ways that an imbalance in one organ system affects the entire organism.

Sample Proficiency-Style Questions Related to Structure of Life

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



High School Science Proficiency Review #6

Life Science: Organisms and Their Environment

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Life Science Organisms and Their Environment

L.12.C.1 Students know relationships of organisms and their physical environment. E/S

- ♦ Identify the energy relationships in an ecosystem.
- ♦ Classify an organism by the manner in which it obtains energy.
- ♦ Describe how an organism's needs are met by aspects of its physical environment.

L.12.C.2 Students know how changes in an ecosystem can affect biodiversity and biodiversity's contribution to an ecosystem's stability. E/S

- ♦ Predict how changes in an ecosystem's stability impact biodiversity.
- ♦ Recognize that ecosystems change over time.
- ♦ Predict consequences of an environmental change.

L.12.C.3 Students know the amount of living matter an environment can support is limited by the availability of matter, energy, and the ability of the ecosystem to recycle materials. E/S

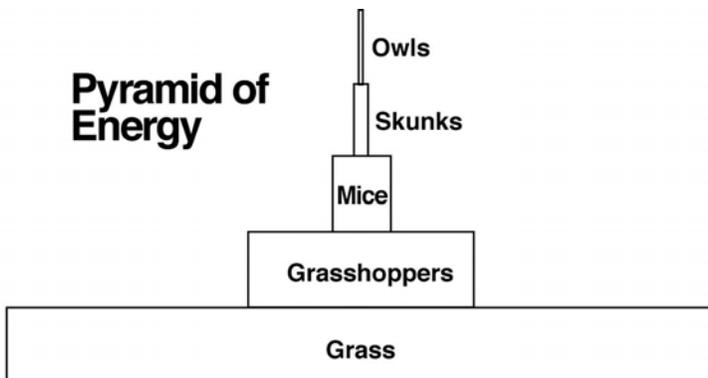
- ♦ Explain that different environments have different carrying capacities.
- ♦ Identify the factors that affect carrying capacity.
- ♦ Predict the result of changing a factor on the carrying capacity of an ecosystem.

L.12.C.4 Students know the unique geologic, hydrologic, climatic, and biological characteristics of Nevada's bioregions. E/S

- ♦ Recognize the distinguishing characteristics of the Mojave Desert, alpine forest, and basin and range bioregions.

Sample Proficiency-Style Questions Related to Organisms and Their Environment

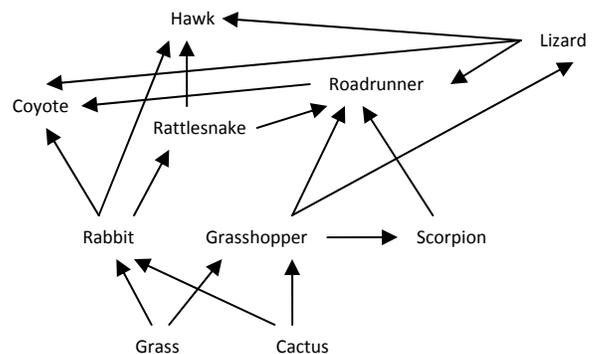
1. An energy pyramid is represented below.



Which number sequence represents the flow of available energy from the base of the pyramid to the top of the pyramid in the ecosystem represented above?

- 100-100-100-100
- 100-75-50-25
- 100-50-25-0
- 100-20-5-1

2. Use the desert food web below to answer the following question.



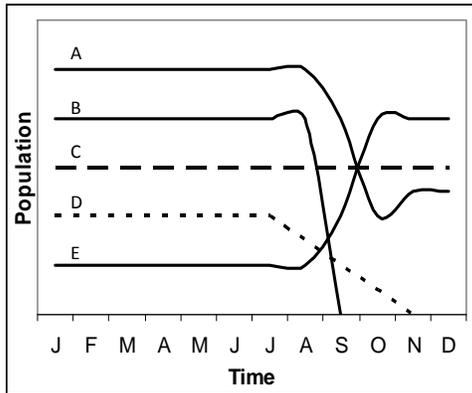
Two of the primary consumers in the food web are the

- coyote, rattlesnake, and hawk.
- grass and cactus.
- rabbit and grasshopper.
- rabbit, grasshopper, and scorpion.



Life Science Review Organisms and Their Environment

3. A lava field is bare for several years when lichens begin to grow on the rocks. These are gradually replaced with grasses, shrubs, and finally trees. This process is called
- primary homeostasis.
 - secondary homeostasis.
 - primary succession.
 - secondary succession.
4. This graph shows the population trends of five populations over time.



- Which of the following statements is the **MOST** plausible explanation for the changes in population E?
- Species E started eating species A because the increase in E occurs concurrently with the decrease in A.
 - Individuals of species E immigrated into this habitat from the surrounding areas.
 - The decline in B and D reduced the competition for resources resulting in an increase in species E.
 - Species E moved into the niche previously occupied by species B resulting in an increase in species E.
5. When Rapa Nui (Easter Island) was colonized by a small number of humans it was covered with trees and abundant food types. Within a thousand years the Rapa Nui population disappeared and the island was grassy. Which of the following is the **MOST** plausible cause of the population crash? As the population increased,
- the different groups warred with each other reducing the overall population.
 - the people cut down the trees for shelter and overused the food available faster than the resources were replenished.
 - the people used the island as a resting place before moving onto other islands.
 - new immigrants brought a disease with them that caused a fatal epidemic.
6. You would know that you are located in the Mojave Desert if you were surrounded by
- Joshua trees.
 - Sagebrush.
 - Creosote bush.
 - Pinyon Pine trees.
7. Which reason **BEST** explains why temperatures in Nevada are warmer than areas at the same latitude on the Pacific coast of California.
- As air masses from the west descend into Nevada they begin to lose heat.
 - As air masses from the west descend into Nevada they begin to gain heat.
 - The Rocky Mountains block cool air from moving into Nevada.
 - Warm air masses from the Rocky Mountains enter Nevada.
8. Nevada has a very high biodiversity compared to other states. Which reason below best explains why this is the case.
- It is a large state in terms of area.
 - It is surrounded by many mountains.
 - It has numerous ecological ecosystems.
 - It has few people to disturb plant and animal habitats.
9. Which sequence of terms below best illustrates how energy flows from the sun to an animal cell where it is used for cellular work?
- Sun → Plants → Sugars → Animal cell → ATP
 - Sun → Plants → Food → Animal cell → Sugar
 - Sun → ATP → Plants → Animal cell → Sugar
 - Sun → Sugars → Plants → Animal cell → ATP
10. Plants transform energy from the sun into
- nuclear energy.
 - solar energy.
 - chemical energy.
 - mechanical energy.
11. If the decomposers were removed from an ecosystem, what would most likely occur?
- Energy from the sun would not be absorbed by plants.
 - Carnivores would have no source of energy.
 - Essential elements would not be available to plants.
 - Herbivores would lose their source of energy and nutrients.



High School Science Proficiency Review #6

Life Science: Organisms and Their Environment

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Sample Proficiency-Style Questions Related to Organisms and Their Environment

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



High School Science Proficiency Review #7

Life Science: Diversity of Life

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Critical Information to focus on while reviewing Life Science Diversity of Life

L.12.D.1 Students know organisms can be classified based on evolutionary relationships. E/S

- ♦ Use evolutionary relationships to classify organisms.

L.12.D.2 Students know similarity of DNA sequences gives evidence of relationships between organisms. E/S

- ♦ Describe DNA as biochemical evidence for evolution.
- ♦ Identify relationships between organisms based on similarities in DNA sequences.

L.12.D.3 Students know the fossil record gives evidence for natural selection and its evolutionary consequences. E/S

- ♦ Recognize patterns of diversity observed throughout geologic history.
- ♦ Identify evidence for biological evolution gathered by scientists and others from the fields of biology (including biochemistry and molecular genetics) and geology.

L.12.D.4 Students know the extinction of species can be a natural process. E/S

- ♦ Recognize that most species that have lived on Earth are now extinct.
- ♦ Explain that extinction can be slow or rapid.

L.12.D.5 Students know biological evolution explains diversity of life. E/S

- ♦ Explain that organisms change over time as a result of biological evolution.
- ♦ Recognize that all populations have some genetic variations.

L.12.D.6 Students know the concepts of natural and artificial selection. E/S

- ♦ Explain how naturally occurring genetic variation may result in reproductive advantages.
- ♦ Describe how humans use artificial selection to produce desired traits in other organisms.

Sample Proficiency-Style Questions Related to Diversity of Life

1. Which of the following will most likely provide the best data for determining the phylogeny of three very closely related species?

- Comparing their anatomical structures
- Investigating their scientific names
- Examining their fossil record
- Analyzing their DNA

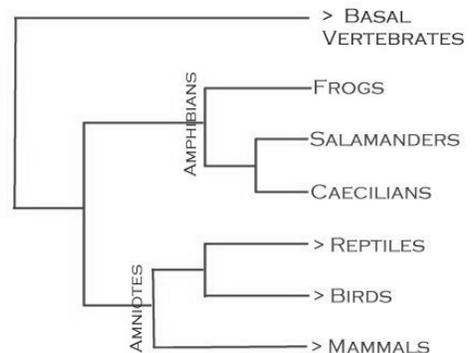
2. The table below shows the taxons of four different animal species.

	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

3. Use the diagram below to answer the question that follows.



According to the diagram, which two groups of organisms are most closely related?

- Frogs and Salamanders
- Reptiles and Birds
- Birds and Mammals
- Mammals and Reptiles



Life Science Review

Diversity of Life

4. The DNA sequence from an endangered pupfish was compared to the DNA samples collected from closely related fish species. The table below shows a portion of the DNA sequences from each of the fish species.

Pupfish DNA Sequence: ATT AAG CCG ATA	
Fish 1	ATT GAA CCG ATA
Fish 2	ATT AAG CGG ATA
Fish 3	TTT GAA CGG AAA
Fish 4	ATT GAA CGA ATA

List the fish from the least to most closely related to the pupfish.

- A. Fish 1, Fish 2, Fish 3, Fish 4
 - B. Fish 3, Fish 2, Fish 4, Fish 1
 - C. Fish 3, Fish 4, Fish 1, Fish 2
 - D. Fish 2, Fish 3, Fish 4, Fish 1
5. Species with features between hypothesized ancestors and descendant species are known as
- A. transitional species.
 - B. relative species.
 - C. homologous species.
 - D. middle species.
6. George Cuvier reconstructed fossils that showed organisms in the past differed greatly from organisms in the present. His discovery helped support the theory of
- A. catastrophism.
 - B. uniformitarianism.
 - C. heredity.
 - D. evolution.
7. When there are no more living members of a species, that species is said to be
- A. endangered.
 - B. extinct.
 - C. evolved.
 - D. unchanged.
8. The major unifying concept in biology that provides an explanation for the vast diversity of life on our planet is the
- A. theory of evolution.
 - B. cell theory.
 - C. classification theorem.
 - D. gene-chromosome theorem.
9. Natural selection can best be defined as the
- A. survival of the biggest and strongest organisms in a population.
 - B. survival of the smallest organisms by eliminating bigger organisms.
 - C. survival and reproduction of the organisms that occupy the largest area.
 - D. survival and reproduction of the organisms that are genetically best adapted.
10. What term describes the ability of an organism to survive and reproduce in its environment?
- A. Evolution
 - B. Fitness
 - C. Artificial selection
 - D. Natural selection
11. An individual in a population that is considered the most fit would
- A. live the longest.
 - B. consume the most food.
 - C. produce the most fertile offspring.
 - D. be the strongest and the fastest.
12. Fossils of shellfish and snails are commonly found in the Las Vegas valley. What can you infer about the environmental conditions in the Las Vegas valley millions of years ago? The Las Vegas valley
- A. was always a desert.
 - B. was once a forest.
 - C. once contained a glacier.
 - D. once contained a shallow sea.
13. Scientists infer that related species inherited many of the same genes from
- A. relative dating.
 - B. a common ancestor.
 - C. sedimentary rock.
 - D. different ancestors.



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