



# Exam Preparation for Science and Social Studies Program

## EXPress

June 14 through June 25  
2010

## Assessments

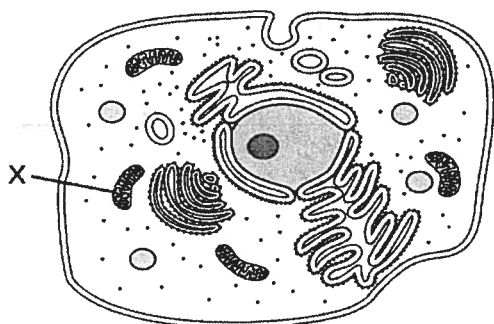
**Review Questions 1**  
**Cell Organelles: Structure and Function**

1. Which cell structure is a passageway for materials, provides protection, and allows cell recognition?

A. cell membrane  
B. Golgi apparatus  
C. mitochondrion  
D. nucleus

2. This diagram represents structures within an animal cell.

**Animal Cell**



Structure X is a mitochondrion. What is the function of structure X?

- A. to make new cells  
B. to make cellular energy  
C. to store information  
D. to control movement
3. Which type of organelle allows glucose to enter cells?
- A. cell membrane  
B. mitochondria  
C. nucleus  
D. ribosomes
4. Which organelle breaks down food into particles the cell can use?
- A. Golgi apparatus  
B. lysosome  
C. endoplasmic reticulum  
D. mitochondrion

5. Which organelle makes proteins using coded instructions that come from the nucleus?

A. Golgi apparatus  
B. mitochondrion  
C. vacuole  
D. ribosome

6. Which organelles help provide cells with energy?

A. mitochondria and chloroplasts  
B. rough endoplasmic reticulum  
C. smooth endoplasmic reticulum  
D. Golgi apparatus and ribosomes

7. Which of the following is a function of the cell membrane?

A. breaks down lipids, carbohydrates, and proteins from foods  
B. stores water, salt, proteins, and carbohydrates  
C. keeps the cell wall in place  
D. regulates which materials enter and leave the cell

8. Which organelle is the principal site of protein synthesis in eukaryotic cells?

A. Nucleus  
B. Ribosomes  
C. Mitochondria  
D. Chloroplasts

9. Which of these is a function of the cell membrane in all cells?

A. Producing cellular nutrients.  
B. Preserving cellular wastes.  
C. Neutralizing chemicals.  
D. Maintaining homeostasis.

10. In which organelle are proteins produced?

- A. nucleus
- B. lysosome
- C. ribosome
- D. mitochondria

11. Which of the following clues would tell you whether a cell is prokaryotic or eukaryotic?

- A. the presence or absence of a rigid cell wall
- B. whether or not the cell is partitioned by internal membranes
- C. the presence or absence of ribosomes
- D. whether or not the cell carries out cellular metabolism

12. You would expect a cell with an extensive Golgi apparatus to

- A. make a lot of ATP
- B. secrete a lot of material
- C. move actively
- D. store large quantities of food

13. Of the following organelles, which group is involved in manufacturing substances needed by the cell?

- A. lysosome, vacuole, ribosome
- B. ribosome, rough ER, smooth ER
- C. vacuole, rough ER, smooth ER
- D. smooth ER, ribosome, vacuole

14. Some unicellular organisms are motile (have the ability to move) and some are nonmotile. Which cellular structures are associated with movement?

- A. Ribosomes
- B. Flagella
- C. Chloroplasts
- D. Vacuoles

15. Which characteristic of prokaryotic organisms makes them different from eukaryotes?

- A. Prokaryotic cells do not have membrane-bound organelles.
- B. Prokaryotes do not have chromosomes.
- C. Prokaryotes are made of cells.
- D. Prokaryotes have DNA.

16. A cell with numerous ribosomes is probably specialized for

- A. enzyme storage
- B. energy production
- C. cell division
- D. protein synthesis

## Review Questions 2

### The Atom and its Structure

- Compared to the charge and mass of a proton, an electron has
  - the same charge and a smaller mass
  - the same charge and the same mass
  - an opposite charge and a smaller mass
  - an opposite charge and the same mass
- Which symbols represent atoms that are isotopes?
  - C-14 and N-14
  - O-16 and O-18
  - I-131 and I-131
  - Rn-222 and Ra-222
- The nucleus of sodium-23 contains:
  - 23 protons and 11 neutrons
  - 23 protons and 11 electrons
  - 11 protons and 12 electrons
  - 11 protons and 12 neutrons
- Which pair of elements is MOST similar?
  - Ca and F
  - Na and Cl
  - Ne and Ar
  - Li and H
- The mass number of an element is 19 and the atomic number is 9. The total number electrons in the atom is:
  - 19
  - 9
  - 29
  - 10
- Which of the following pairs are isotopes of the same element?
  - atom J (27 protons, 32 neutrons) and atom L (27 protons, 33 neutrons)
  - atom Q (56 protons, 81 neutrons) and atom R (57 protons, 81 neutrons)
  - atom V (8 protons, 8 neutrons) and atom W (7 protons, 8 neutrons)
  - atom S (17 protons, 18 neutrons) and atom T (18 protons, 17 neutrons)
- Which of the following are transferred or shared when two atoms react chemically?
  - protons
  - neutrons
  - electrons
  - photons
- The illustration below shows the box from the Periodic Table that represents the element Oxygen (O)

8
O
15.999

Based on the information provided, how many neutrons do most oxygen atoms contain in their nucleus?

  - 4
  - 6
  - 8
  - 15

### Review Questions 3

#### DNA and RNA and Their Role in Heredity

1. Which process reduces the number of chromosomes in a cell?

A. binary fission  
B. crossing over  
C. meiosis  
D. mitosis

2. Which **best** shows the proper code-structure sequence in protein synthesis?

A. DNA, mRNA, mRNA, polypeptide, enzyme  
B. DNA, mRNA, tRNA, polypeptide, enzyme  
C. enzyme, polypeptide, mRNA, mRNA, DNA  
D. mRNA, DNA, mRNA, enzyme, polypeptide

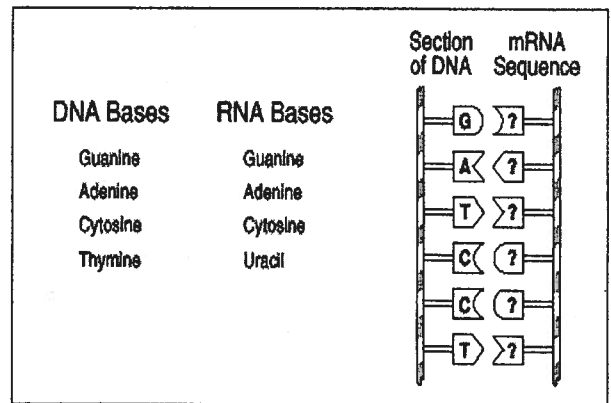
3. As each section of the genetic code on DNA is transcribed to mRNA, the two strands of DNA rejoin. Then the mRNA moves into the cytoplasm through a pore in the nuclear membrane. Ribosomes attach to the mRNA, in the cytoplasm, to carry out the formation of a protein. What is this process called?

A. mutation  
B. synthesis  
C. translation  
D. transference

4. If the sequence of nucleotides were AGC on a strand of DNA, what would be the nucleotide sequence on a strand of mRNA formed during transcription?

A. ACG  
B. UCG  
C. TGC  
D. TCG

5.



Which mRNA sequence complements the above section of DNA?

A. CUAGGA  
B. TCGAAG  
C. CTAGGC  
D. AGCUUC

6. The function of mRNA is to

A. carry genetic information from the nucleus to the site of protein synthesis  
B. begin the "unzipping" of the DNA molecule  
C. maintain homeostasis within the cell during mitosis  
D. direct the movement of centrosomes during meiosis

7. During meiosis how many times is the DNA replicated?

A. zero times  
B. one time  
C. two times  
D. four times

8. Cells secrete proteins, often as enzymes, that have been engineered or directed by the DNA in the nucleus. Which processes are involved in protein synthesis?
- A. transfer to RNA, then to amino acids
  - B. transcription into RNA, then translation into amino acids
  - C. replication of DNA, then transcription into enzymes
  - D. translation into RNA, then replication into DNA
9. What kind of bonds is found between nitrogen bases in a DNA molecule?
- A. Hydrogen
  - B. Nitrogen
  - C. Oxygen
  - D. Phosphate
10. All chromosomes are composed of
- A. DNA and lipids
  - B. DNA and protein
  - C. RNA and lipids
  - D. RNA and protein
11. Which is in the shape of a double helix?
- A. Amino acid
  - B. Deoxyribonucleic acid
  - C. Enzyme
  - D. Protein
12. Messenger RNA carries genetic information in groups of three bases known as
- A. Amino acids
  - B. Codons
  - C. Enzymes
  - D. Helixes
13. Which of the following DNA base pairs are correct?
- A. A - A  
C - C
  - B. A - T  
T - A
  - C. A - T  
G - A
  - D. A - T  
T - G
14. In living things, whether plant or animal, the carrier of hereditary instructions is
- A. DNA
  - B. Genetic vacuole
  - C. Messenger RNA
  - D. Mitochondria in animals, chloroplasts in plants
15. DNA and RNA are similar because they both contain
- A. Deoxyribose
  - B. Nucleotides
  - C. Thymine
  - D. Double helices

## Review Questions 4

### Solutions

1. In the solution we call seawater which of the following is the solvent?

A. Water  
B. oxygen gas  
C. salt  
D. all of these are solvents

2. Air is a solution which includes many substances. See the composition of air chart below.

GAS	% in AIR
Nitrogen	78%
Oxygen	20.95%
Carbon Dioxide	0.03%
Argon	Less than 0.01%

Based on the information in this chart, which statement is FALSE?

A. Nitrogen gas is a solute in air.  
B. Carbon dioxide gas is a solute in air.  
C. Oxygen gas is a solute in air.  
D. Argon is a solute in air.

3. A compound differs from a mixture in that a compound always has a

A. homogeneous composition  
B. maximum of two components  
C. minimum of three components  
D. heterogeneous composition

4. Many laboratory preparations of solutions call for stirring the solvent while adding the solute. Which of the following is always an effect of this procedure?

A. It decreases the reactivity of the solute.  
B. It decreases the solubility of the solute.  
C. It brings the solute and solvent rapidly into contact.  
D. It produces a chemical reaction.

5. A solution in which the crystallizing and dissolving rates of the solute are equal is

A. saturated  
B. unsaturated  
C. concentrated  
D. dilute

6. The \_\_\_\_\_ is the part of the solution that is present in the greater amount.

A. solute  
B. solvent  
C. ion  
D. electrolyte

7. A solution in which more solute can dissolve is

A. Saturated  
B. Unsaturated  
C. Supersaturated  
D. Concentrated

8. If you **decrease** the temperature, what happens to the dissolving rate of NaCl in water?
- A. The dissolving rate increases because more collisions occur between solute and solvent.
  - B. The dissolving rate decreases because fewer collisions occur between solute and solvent.
  - C. The dissolving rate decreases because more collisions occur between solute and solvent.
  - D. No collisions occur between solute and solvent, so the rate goes to zero.
9. Which of the following statements shows the correct relationship between temperature and the solubility of a gas in a liquid?
- A. Dissolved oxygen in a pond decreases when the water temperature increases.
  - B. Dissolved oxygen in a pond decreases when the water temperature decreases.
  - C. More sodium chloride can be dissolved in cold water than in hot water.
  - D. Carbon dioxide escapes from solution when you open a soda can.
10. What does it mean when a mixture is said to have reached saturation at a given temperature and pressure?
- A. A dilute solution has been formed.
  - B. There is more solute than solvent in the mixture.
  - C. As much solute as possible is dissolved in the solvent.
  - D. The solute and solvent have formed a heterogeneous mixture.
11. Vinegar is a liquid solution containing acetic acid and water. It could be accurately classified as which of the following?
- A. A colloid
  - B. A compound
  - C. A homogeneous mixture
  - D. A heterogeneous mixture
12. The salinity, or salt concentration, of tidal rivers flowing into the ocean increases as the you travel down river approaching the mouth of the river. Describe in terms of solute and solvent this increase in salinity
- A. The solvent is increasing greater than the solute
  - B. The solute is increasing greater than the solvent.
  - C. The solute and solvent are increasing in equal amounts.
  - D. The solute and solvent are both decreasing in equal amounts.
13. In all solutions, solutes and solvents
- A. Are always found as liquids
  - B. Are found in the same amounts
  - C. Can be separated by visible means.
  - D. Are found in the same state of matter.



14. Carbon steel, usually simply called steel, is made by melting iron metal and adding a small amount of carbon to the liquid metal. In doing this, the alloy (solution of these metals) becomes much stronger and can be used for everything from automobile parts to I-beams found in skyscrapers. What is the solvent in steel?

- A. Carbon
- B. Carbon steel
- C. Iron
- D. Steel

15. E85 is an alcohol fuel mixture of 85% ethyl alcohol and 15% gasoline by volume. It is becoming more common in the midwestern United States where corn (the source of ethyl alcohol) can be found.

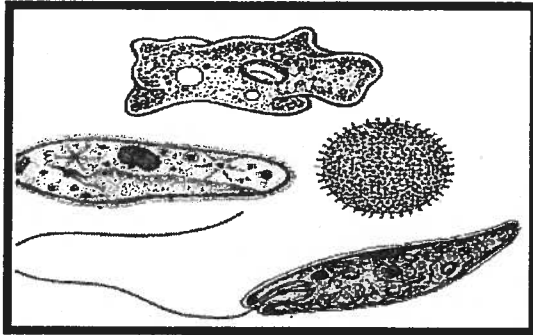
Identify the solvent in this mixture.

- A. Ethyl alcohol
- B. Gasoline
- C. Water
- D. E85

## Review Questions 5

### Similarities and Differences between Organisms of Different Kingdoms

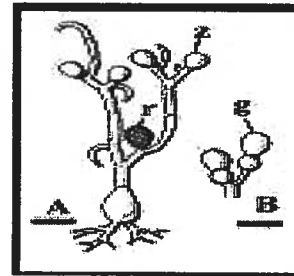
1. The diverse organisms shown in the diagram below belong to the same kingdom.



To which kingdom do these organisms belong?

- A. Animalia
  - B. Fungi
  - C. Plantae
  - D. Protista
2. This kingdom is composed of autotrophs which obtain their energy exclusively from photosynthesis.
- A. Archaeobacteria
  - B. Animals
  - C. Protists
  - D. Plants
3. Members of this kingdom are exclusively anaerobic unicellular prokaryotes including a range of organisms that live in extreme environments.
- A. Archaeobacteria
  - B. Eubacteria
  - C. Protists
  - D. Animals

4. The heterotrophic eukaryotic multi-celled organism shown below absorbs its nutrients from its environment (called a saprophyte) with a network of hyphae shown in A. It reproduces asexually via budding. To which kingdom does it belong?



- A. Archaeobacteria
  - B. Eubacteria
  - C. Protists
  - D. Fungi
5. An outbreak of disease is being researched by the CDC in Atlanta. The organism causing the disease is a heterotroph with cells that do not have walls and enzymes released from organs in its digestive system. To which kingdom does this pathogen belong?
- A. Animal
  - B. Eubacteria
  - C. Protists
  - D. Fungi

6. A fungus has a wall composed of a polysaccharide similar to cellulose, which is also found in the exoskeleton of insects. This material is
- A. chitin
  - B. hemicellulose
  - C. leucine
  - D. protein-lipid layers
7. Which of the following are prokaryotic organisms?
- A. Bacteria
  - B. Oak trees
  - C. Mushrooms
  - D. Brown algae
8. For which group of organisms is binary fission the most common type of asexual reproduction?
- A. Simple plants like mosses and ferns
  - B. Advanced flowering plants
  - C. Invertebrates such as worms
  - D. Unicellular organisms like amoebae
9. Bread molds, a type of fungi, reproduce sexually by conjugation and asexually by
- A. spores
  - B. grafting
  - C. cloning
  - D. meiosis
10. Which of the following distinguishes the organisms in the kingdom Fungi from other eukaryotic organisms?
- A. fungi are unicellular
  - B. fungi reproduce sexually
  - C. fungi obtain nutrients by absorption
  - D. fungi make food through photosynthesis
11. Which of these kingdoms includes prokaryote organisms that were among the first forms of life to evolve?
- A. Fungi
  - B. Algae
  - C. Plantae
  - D. Archaeobacteria
12. A microbiologist notices a strange organism growing on the leftover lasagna that he has left in the lab refrigerator for 2 months. He removes a sample of the organism and places it under an electron microscope. He notes that the organism has no nuclear membrane and no mitochondria in its cells. Though very small in size, a cell wall is present. He notes that the organism seems to be strictly single-celled. Based on the structure of the cells, what type of organism is this likely to be?
- A. A eukaryote in kingdom fungi
  - B. A eukaryote in kingdom protista
  - C. A prokaryote in kingdom plantae
  - D. A prokaryote in kingdom eubacteria
13. A certain kingdom contains heterotrophic, eukaryotic organisms with cell walls. Organisms in this kingdom are usually multi-celled, but a few single-celled exceptions do exist. No organism in this kingdom can photosynthesize or move on its own. What kingdom is this?
- A. Plantae
  - B. Eubacteria
  - C. Fungi
  - D. Animalia

14. A mushroom and a humpback whale are alike because both are

- A. Motile
- B. Heterotrophic
- C. Prokaryotic
- D. Unicellular

15. Four clear glass jars are filled half-way with water and half-way with a mixture of carbon dioxide and oxygen. No food is placed in the jars. Organisms from four different kingdoms are placed separately into the four jars. The jars are sealed and placed in direct sunlight for six months. After this period the jars are checked to see if there are living inhabitants. Which classification of organisms lacks the characteristics necessary to survive the conditions in the jar for six months?

- A. Fungi
- B. Plantae
- C. Photosynthetic eubacteria
- D. Algae

16. Which example lacks the basic structures of a living organism and cannot metabolize or maintain homeostasis?

- A. A strep throat bacteria
- B. A cold virus
- C. A green algae
- D. A yeast

17. A certain kingdom's members are always multi-celled autotrophs, and thus, have chloroplasts for sugar production. Cell walls, composed of cellulose, surround the cells of these organisms. Identify this kingdom.

- A. Algae
- B. Fungi
- C. Plantae
- D. Protista

18. Which of these criteria are used to classify organisms into the modern classification system?

- A. Diet
- B. Life span
- C. Similarities to fossils
- D. The habitat in which they live

19. An important difference between viruses and living cells is that viruses

- A. Cannot reproduce outside of cells
- B. Contain more nuclei than cells
- C. Cannot mutate but cells can
- D. Need an energy source but cells do not

20. Experimental Observation

- 1. Nucleus is present
- 2. Cell wall is present
- 3. Chloroplasts and mitochondria are both present

The eukaryotic organism described above should be classified as

- A. An animal
- B. A bacterium
- C. A fungus
- D. A plant

21. Unlike plants, fungi cannot make their own food because they do not have

- A. Roots
- B. Hyphae
- C. Spores
- D. Chlorophyll

22. Which pair of structures *best* shows that plant cells have functions different from animal cells?

- A. Cytoplasm and mitochondria
- B. Chloroplasts and cell walls
- C. Nuclei and centrioles
- D. Ribosomes and cell membranes

23. When an animal eats, food stays in the stomach for a period of time. When a unicellular organism, such as *Paramecium*, takes in food, the food is contained in which organelle?

- A. Chloroplast
- B. Mitochondrion
- C. Nucleus
- D. Vacuole

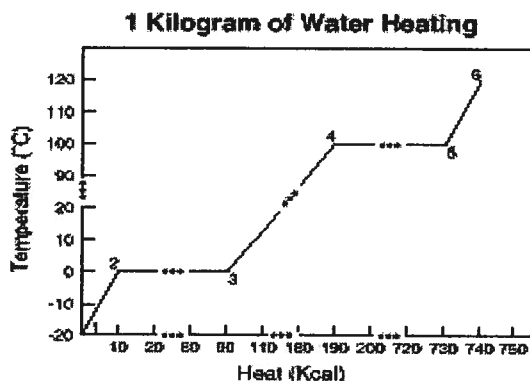
## Review Questions 6

### Half Life and Phases of Matter

1. What fraction of carbon-14 will remain after it has decayed for 3 half-lives?

A.  $\frac{1}{16}$   
 B.  $\frac{1}{2}$   
 C.  $\frac{1}{4}$   
 D.  $\frac{1}{8}$

Use the diagram below to answer questions 2-4.



2. Between points 4 and 5, energy is being used to change water from a

A. solid to a liquid  
 B. solid to a gas  
 C. liquid to a gas  
 D. liquid to a solid

3. Between points 3 and 4 the water is in which of the following states?

A. solid  
 B. liquid  
 C. gas  
 D. liquid and gas

4. Between which points would you expect to receive the worst burns?

A. 3 and 4  
 B. 4 and 5  
 C. 5 and 6  
 D. 4 through 6

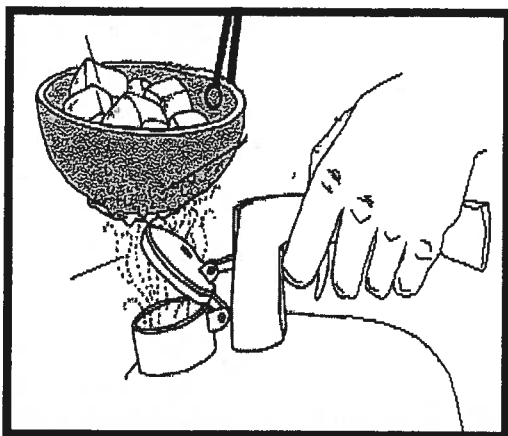
5. Which of the following changes occurs as a solid is heated?

A. The kinetic energy of the solid decreases.  
 B. The average density of the solid increases.  
 C. The specific heat capacity of the solid decreases.  
 D. The average molecular speed in the solid increases.

6. Carbon-14 has a half-life of approximately 5,700 years. Analysis of the carbon in a piece of charred wood found in an excavation revealed that the carbon has 25 percent of the amount of carbon-14 that is found in the carbon of living trees. Which of the following is most nearly the age of the excavated wood?

A. 160 years  
 B. 5,700 years  
 C. 11,400 years  
 D. 23,000 years

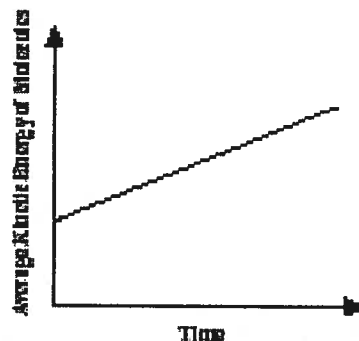
7. See the figure below



The particles are moving most quickly in the:

- A. Ice in the bowl
  - B. Drops of water on the bowl
  - C. Steam under the bowl
  - D. Water inside the teapot
8. Which of the following correctly describes molecules of two different gases if they are at the same temperature and pressure?
- A. They must have the same mass.
  - B. They must have the same velocity.
  - C. They must have the same average kinetic energy.
  - D. They must have the same average potential energy.
9. A sample of Francium-212 will decay to one-sixteenth its original amount after 80 minutes. What is the half-life of francium-212?
- A. 10 min.
  - B. 20 min.
  - C. 30 min.
  - D. 80 min.

10. The graph below represents changes in molecular motion in a solid plastic cylinder over time.



These changes in the molecules of the plastic cylinder must be accompanied by which of the following?

- A. an increase in mass
  - B. a decrease in volume
  - C. an increase in temperature
  - D. a decrease in heat capacity
11. Which arrangement correctly shows the molecular movement for the phases of water, going from the slowest to fastest (least amount of kinetic energy to the greatest amount of kinetic energy)
- A. Gas-Liquid-Solid
  - B. Liquid-Gas-Solid
  - C. Solid-Liquid-Gas
  - D. Solid-Gas-Liquid
12. In which of the following situations would water molecules have the least energy?
- A. when water is frozen as ice
  - B. in a mixture of ice & water
  - C. when water is boiling
  - D. when water is superheated steam

13. Which ONE of the following is a TRUE statement?

- A. In the gas state, molecules move around freely.
- B. Liquids do not change shape easily.
- C. Gas molecules move more slowly as they are heated.
- D. Plasma is the most common state of matter found on Earth.

14. How long does it take a 180g sample of Au-198 to decay to  $\frac{1}{8}$  its original mass?

- A. 1 half-life
- B. 2 half-lives
- C. 3 half-lives
- D. 4 half-lives

15. Health officials are concerned about radon levels in homes. The half-life of radon-222 is 3.82 days. If a sample of gas contains 4.38 micrograms of radon-222, how much will remain in the sample after 15.2 days?

- A. 27 mg
- B. .54 mg
- C. 2.19 mg
- D. .27 mg



**Review Questions 7**  
**Mendel's Laws and Biotechnology**

1. Which explains how the advantage of genetic variation through sexual reproduction occurs?
  - A. One of each pair of chromosomes comes from each parent.
  - B. The union of sperm and egg occurs during meiosis.
  - C. Meiosis occurs in all body cells also.
  - D. Division of body cells results in a greater variety of traits.
2. Why is meiosis important?
  - A. The process allows an organism to reproduce asexually.
  - B. The process produces two cells identical to the parent cell.
  - C. The process produces cells with half the normal number of chromosomes.
  - D. The process causes a fertilized egg to multiply and develop into an embryo.
3. Which of the following would be an important advantage of sexual reproduction over asexual reproduction?
  - A. more variation among offspring
  - B. the production of more offspring
  - C. the quicker development of offspring
  - D. the protection of the offspring by the parent
4. The process of asexual reproduction forms offspring from
  - A. a single organism
  - B. the process of mating
  - C. male and female parents
  - D. the joining of two sets of chromosomes
5. Which is an example of cloning?
  - A. taking leaf cuttings from a houseplant and growing new plants from them
  - B. transferring pollen from one flower to another
  - C. conjugation of two paramecia
  - D. none of these
6. A normal cell formed by fertilization, containing two copies of each chromosome, one from the mother and one from the father, is
  - A. diploid
  - B. haploid
  - C. a gamete
  - D. an allele
7. Scientists use artificial pollination to develop new kinds of flowers, fruits, and vegetables. This type of selective breeding produces new varieties called
  - A. dicots
  - B. hybrids
  - C. predators
  - D. monocots
8. The curled ears of the American Curl cat are caused by an autosomal dominant allele. What are the chances of a heterozygous female and a homozygous recessive male producing offspring with curled ears?
  - A. 1 in 4
  - B. 2 in 4
  - C. 3 in 4
  - D. 4 in 4

9. An animal combines DNA from two parent organisms through sexual reproduction. Organisms that do NOT exchange genetic material must rely on what for new traits?
- A. Meiosis
  - B. Mutation
  - C. Hemolysis
  - D. Cross breeding
10. Artificial selection is human intervention allowing only the **best** organisms to produce offspring. How is this process **most** useful to humanity?
- A. It allows the development of new species not dependent on the environment
  - B. It allows geneticists to emphasize desirable traits in food, plants, and animals.
  - C. It prevents the development of new species.
  - D. It gives the existing species a better chance to reproduce in greater numbers.
11. Read the passage and answer the question.  
The French biologist Cuenot crossed wild, gray-colored mice with white (albino) mice. In the first generation, all were gray. From the many litters of the second generation, 223 were gray and 72 were white. What principle of genetics is demonstrated by the data?
- A. Codominance
  - B. Crossing over
  - C. Dominance
  - D. Epistasis
12. During sexual reproduction, traits pass from parents to offspring. The meiosis phase allows chromosomes to
- A. Remain constant in number after fertilization
  - B. Fluctuate in number with environmental changes
  - C. Increase in number from the previous generation
  - D. Remain constant in number from parent to offspring
13. The process of meiosis, which is a special kind of cell division, forms gametes for
- A. Growth
  - B. Repair
  - C. Replacement
  - D. Reproduction
14. What happens during meiosis?
- A. The number of chromosomes increases from haploid to diploid
  - B. The number of chromosomes decreases from diploid to haploid
  - C. There is a segregation of dominant and recessive genes
  - D. There is an integration of dominant and recessive genes
15. Few of Wendy's chromosomes are identical to those of either parent because most of the genes on them have been exchanged with genes on other chromosomes. What process accounts for this?
- A. Independent assortment
  - B. Crossing over
  - C. Nondisjunction
  - D. Segregation

16. Which describes a current use of genetic engineering?
- A. Identifying hereditary diseases
  - B. Vaccinating a child for measles
  - C. Making human insulin using bacteria
  - D. Treating cancer with radiation therapy

17. An organism that is capable of passing on a trait for a specific disease to its offspring, but which does NOT express the disease itself, is described as which of the following?

- A. A carrier
- B. A homozygote
- C. A mutant
- D. A purebred

18. A normal cell formed by fertilization, containing two copies of each chromosome, one from the mother and one from the father, is

- A. Diploid
- B. Haploid
- C. A gamete
- D. An allele

19. The observed trait that appears in an organism as a result of its genetic makeup is called the organism's

- A. Allele
- B. Genotype
- C. Phenotype
- D. Karyotype

20. Genetic information for a breed of chicken is shown below.

Frizzle Fowl



Types of Chickens with Different Feathers	
Genotype	Phenotype
FF	Normal (Normal feathers)
Ff	Frizzle fowl (Curly feathers)
ff	Feather shedder (Loses feathers easily)

Which of the following crosses of chickens will produce **only** Frizzle fowl offspring?

- A. Normal X Frizzle fowl
- B. Frizzle fowl X Frizzle fowl
- C. Normal X Feather shedder
- D. Feather shedder X Feather shedder

**Review Questions 8**  
**Energy Transformation and Heat Transfer**

1. Which of the following changes occurs as a solid is heated?
- A. The kinetic energy of the solid decreases.
  - B. The average density of the solid increases.
  - C. The specific heat capacity of the solid decreases.
  - D. The average molecular speed in the solid increases.

2. Which system shows a transformation from chemical to electrical and light energy?
- A. A car battery causes the headlights to shine.
  - B. A candle burns and lights up the room.
  - C. A display of fireworks in the night sky.
  - D. An avalanche rolls down a steep

3. Which of the following most correctly explains the flow of thermal energy in the picture below?



- A. gas to a liquid
- B. a liquid to a solid
- C. a warmer region to a cooler region
- D. a freezing material to a boiling material

4. A hang glider is able to sail through the air on warm winds which are heated by Earth's surface. This **best** illustrates one use of which principle of heat transfer?

- A. conduction
- B. convection
- C. radiation
- D. solar transfer

5. The sun's heat reaches Earth by what means?

- A. convection
- B. conduction
- C. collision
- D. radiation

6. The transfer of heat energy by heat traveling through a metal is known as

- A. Conduction
- B. Convection
- C. Radiation
- D. Reflection

7. When you put ice in a drink to cool it off

- A. coldness is transferred from the ice to the warmer drink
- B. heat is transferred from the warmer drink to the cooler ice
- C. heat from the ice is lost to the warmer liquid around it
- D. the ice cracks and releases cold air molecules which cool off the drink

8. The gasoline used in a car and the hamburger you ate for lunch, have which of the following similarities?
- I. Both materials contain potential energy stored in their chemical bonds.
  - II. Both materials have complex compounds containing carbon.
  - III. The combination of either material with oxygen requires a net consumption of energy.
- A. I only
  - B. III only
  - C. I and II only
  - D. I, II, and III
9. Although we rarely notice or think about it, we observe and use some of the basic principles of chemistry every day. The following questions ask you to consider some basic chemistry in the context of a camping trip. Before the camp fire is completely burned out, you ask your friend to get some more firewood. Jokingly, your friend asks why you cannot burn the ashes. Which of the following best explains why you cannot burn the ashes?
- A. The stored chemical energy of the firewood has already been released
  - B. The kinetic energy of the wood has already been changed to chemical energy
  - C. The volume of the ashes is less than the volume of the wood burned
  - D. The temperature of the ashes in the fire is too high
10. Which energy transformation takes place when a match is struck against the side of a matchbox and bursts into flames?
- A. electrical energy to light energy
  - B. Heat energy to kinetic energy
  - C. chemical energy to heat energy
  - D. Potential energy to electrical energy
11. While sitting next to a campfire, Susan noticed several different forms of energy being transformed from the potential chemical energy of the wood. She correctly named all of the following forms of energy except
- A. Heat
  - B. Nuclear
  - C. Light
  - D. Sound
12. As a car is slowed, most of its kinetic energy is converted by the brakes to
- A. potential energy
  - B. electrical energy
  - C. thermal energy
  - D. chemical energy
13. The best example of an object that possesses potential energy is
- A. a rock sitting on the cliff
  - B. a falling rock
  - C. a rolling ball
  - D. a burning log

14. The potential energy of an object decreases as its \_\_\_\_\_ increases

- A. Velocity
- B. kinetic energy
- C. volume
- D. mechanical

15. While listening to your CD player, there are several different forms of energy being transformed from the chemical energy of the battery. Which of the following types of energy is the chemical energy that is not being transformed to another type?

- A. Heat
- B. Sound
- C. Nuclear
- D. Kinetic

16. As a basket ball is thrown up in the air, the kinetic energy \_\_\_\_\_ while the potential energy \_\_\_\_\_

- A. increases, increases
- B. decreases, decreases
- C. decreases, increases
- D. increases, decreases

17. The amount of thermal energy stored in an object depends on

- A. the mass of the object
- B. the temperature of the object
- C. the amount of energy that the particular material stores per degree of temperature
- D. the amount of thermal energy depends on all of the above

## Practice Test

1. Which occurrence is a major source of the gases that can produce acid rain?

- A. a hole in the ozone layer
- B. burning of fossil fuels
- C. cloud-seeding by airplanes
- D. emissions by nuclear reactors

2. Cells use passive and active transport to move materials across cell membranes in order to maintain a constant internal environment. What is the process of maintaining a constant internal environment called?

- A. diffusion
- B. evolution
- C. homeostasis
- D. respiration

3. Which of the following examples illustrates osmosis?

- A. Water leaves the tubules of the kidney in response to the hypertonic fluid surrounding the tubules.
- B. Digestive enzymes are excreted into the small intestine.
- C. White blood cells consume pathogens and cell debris at the site of an infection.
- D. Calcium is pumped inside a muscle cell after the muscle completes its contraction.

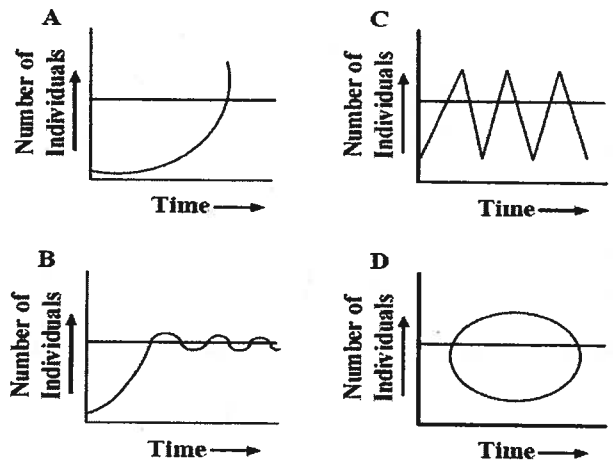
4. The observed trait that appears in an organism as a result of its genetic makeup is called the organism's

- A. allele
- B. genotype
- C. phenotype
- D. Karyotype

5. Unlike prokaryotic cells, eukaryotic cells have the capacity to

- A. assemble into multicellular organisms
- B. establish symbiotic relationships with other organisms
- C. obtain energy from the Sun
- D. store genetic information in the form of DNA

6. An undisturbed deer population grows until its carrying capacity is reached. Which of the graphs below BEST resembles this deer population?



7. Which of the following practices is MOST likely to slow the buildup of  $\text{CO}_2$  in the atmosphere?

- A. increased use of tropical rain forest areas for agriculture
- B. increased use of genetically engineered plants
- C. decreased pesticide use in favor of biological controls
- D. decreased use of fossil fuels

8. Humans have had a tremendous impact on the environment. What has caused an increase in the amount of acid rain?

- A. use of chlorofluorocarbons
- B. use of pesticides
- C. coal burning power plants
- D. nuclear power plants

9. Which of the following is a primary function of carbohydrates?

- A. storage of energy
- B. transmission of genetic material
- C. acceleration of chemical reactions
- D. transport of molecules across membranes

10. Genetic information usually flows in one specific direction. Which of the following best represents this flow?

- A. DNA → Protein → RNA
- B. Protein → RNA → DNA
- C. RNA → Protein → DNA
- D. DNA → RNA → Protein

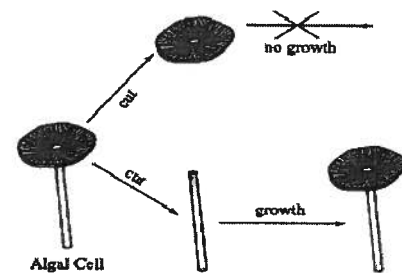
11. Which of the following is an example of codominance in genetic traits?

- A. A tall pea plant and a short pea plant produce tall pea plants.
- B. An orange cat and a black cat produce an orange-and-black kitten.
- C. A blue-eyed man and a brown-eyed woman produce a blue-eyed child.
- D. A color-blind woman and a man with normal vision produce a color-blind son.

12. A cell has a defect that results in the loss of its ability to regulate the passage of water, food, and wastes into and out of the cell. In which of the following cell structures is this defect most likely to be located?

- A. ribosomes
- B. chloroplasts
- C. cell membrane
- D. endoplasmic reticulum

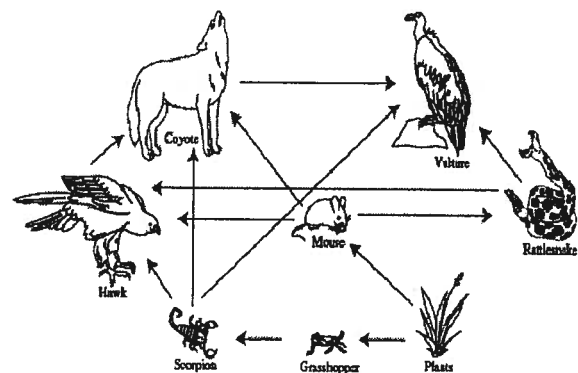
13. The algal cell picture below is a single-celled organism.



When the algal cell is cut in two as shown, the bottom part can grow into a complete cell, but the top part cannot. What conclusion does this support?

- A. The ribosomes are found in the top of the cell.
- B. The nucleus is found in the bottom of the cell.
- C. The top of the cell contains most of its chromosomes.
- D. The bottom of the cell contains most of its cytoplasm.

14. The diagram below shows some of the feeding relationships in a desert food web.



Which of the following trophic levels is not shown in this diagram?

- A. producers
- B. decomposers
- C. primary consumers
- D. secondary consumers



15. A mutation that prevents a maple tree from efficiently taking gases from the air would most directly affect which of the following processes
- A. reproduction
  - B. photosynthesis
  - C. water uptake
  - D. DNA replication
16. As you move from left to right across a row of elements in the periodic table, what happens to the number of neutrons in a typical atom?
- A. It stays the same.
  - B. It increases.
  - C. It decreases.
  - D. It decreases until you reach the middle and then it increases.
17. Which of the following could be used to convert light energy to electrical energy?
- A. a windmill
  - B. a chemical storage battery
  - C. a solar cell
  - D. rotating coils in a magnetic field
18. In a restaurant kitchen, lamps are used to keep food warm. Which type of electromagnetic radiation do the lamps emit that is primarily responsible for keeping the food warm?
- A. gamma
  - B. infrared
  - C. ultraviolet
  - D. visible
19. Carbon atoms can link themselves together into long chains and rings to form a vast number of highly complicated molecules. Which of the following statements BEST explains why carbon atoms behave this way?
- A. They easily form ionic bonds with each other.
  - B. They easily form covalent bonds with each other.
  - C. They easily combine with atoms of oxygen.
  - D. They easily become highly charged ions.
20. Which of the following situations violates the law of conservation of energy?
- A. A ball, dropped from the top of a building, increases in speed until it hits the ground.
  - B. A block sliding freely on level ice increases in speed until it hits a wall.
  - C. A child playing on a swing moves fastest at the bottom of the swing's path.
  - D. The height a ball bounces decreases with each bounce.
21. Aluminum oxide,  $\text{Al}_2\text{O}_3$ , is produced by combining  $\text{Al}^{3+}$  and  $\text{O}^{2-}$  particles. What type of compound has been formed?
- A. covalent
  - B. ionic
  - C. metallic
  - D. molecular
22. Which of the following pairs are isotopes of the same element?
- E. atom J (27 protons, 32 neutrons) and atom L (27 protons, 33 neutrons)
  - F. atom Q (56 protons, 81 neutrons) and atom R (57 protons, 81 neutrons)
  - G. atom V (8 protons, 8 neutrons) and atom W (7 protons, 8 neutrons)
  - H. atom S (17 protons, 18 neutrons) and atom T (18 protons, 17 neutrons)

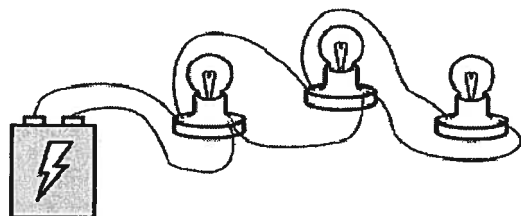
23. An ionic bond typically forms between certain types of elements. Which pair of elements will form an ionic compound?

A. Na and Cu  
B. K and Cl  
C. Ne and O  
D. Li and Mg

24. Albert stirs a mug of hot chocolate with a metal spoon. What type of heat transfer is responsible for the spoon getting hot?

A. conduction  
B. convection  
C. thermoelectric  
D. radiation

25. A student connects three identical light bulbs in a parallel to a dry cell as shown below. What happens when the student removes one of the light bulbs from its socket?



- A. All the light bulbs go out.  
B. The other light bulbs remain on and will be equally bright.  
C. The other light bulbs remain on, one less bright and the other the same brightness as before.  
D. The other light bulbs remain on, one brighter and the other less bright than before.

26. Which of the following are transferred or shared when two atoms react chemically?

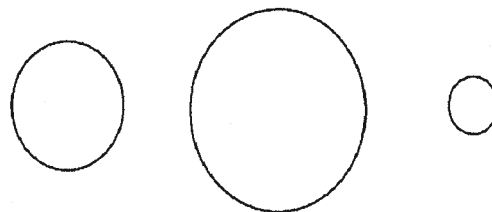
E. protons  
F. neutrons  
G. electrons  
H. photons

27. In the absence of air resistance, which of these objects will fall at the fastest rate when dropped?

mass = 25 kg

mass = 10 kg

mass = 75 kg

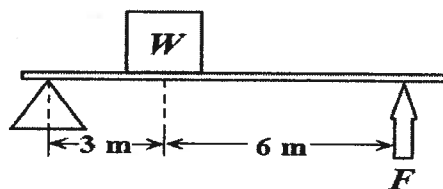


- A. the ball with a mass of 75 kg  
B. the ball with a mass of 25 kg  
C. the ball with a mass of 10 kg  
D. They all fall at the same rate.

28. Which pair of elements is MOST similar?

E. Ca and F  
F. Na and Cl  
G. Ne and Ar  
H. Li and H

29. A box of weight  $W$  is lifted by a force  $F$  using a lever as shown below.



What is the mechanical advantage of the lever?

- A.  $\frac{1}{2}$   
B. 2  
C. 3  
D. 6

30. An airplane in level flight is acted on by four basic forces. Drag is air resistance, lift is the upward force provided by the wings, thrust is the force provided by the airplane's engines, and weight is the downward force of gravity acting on the airplane.



In level flight at constant speed, which pair of forces must be equal

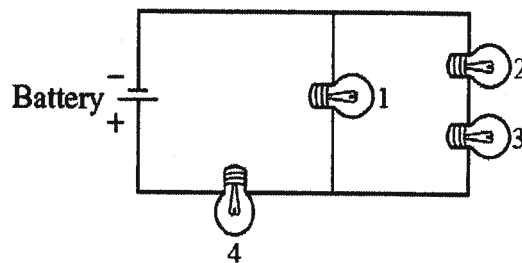
- A. lift and drag  
B. drag and weight  
C. lift and weight  
D. thrust and lift
31. Pat measures a small rubber ball and then makes three other balls of the same diameter from lead, foam, and wood. Which ball has the greatest inertia?
- A. the rubber ball  
B. the lead ball  
C. the foam ball  
D. the wood ball

32. A sound wave is produced and begins to travel from left to right through four different media. The speed of the wave varies as it travels. The media are solid, liquid, gas, and vacuum, but not necessarily in that order.

1	2	3	4
344 m/sec	5000 m/sec	1450 m/sec	No transmission

Which speed MOST likely represents a gas?

- A. 1  
B. 2  
C. 3  
D. 4
33. A car was sitting in sunlight all day long. The heat that is now contained in the car was transferred to the car primarily by which of the following processes?
- A. convection  
B. conduction  
C. radiation  
D. electrical energy transfer
34. Four identical light bulbs are connected in a circuit as shown below.



The current is greatest through which of the light bulbs?

- A. 1  
B. 2  
C. 3  
D. 4

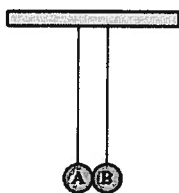
35. What property of electromagnetic waves makes it possible to use these waves to transmit information between a space shuttle and NASA mission control centers on the ground?

- A. Electromagnetic waves are transverse waves.
- B. Electromagnetic waves have very low velocity.
- C. Electromagnetic waves are all visible to human eyes.
- D. Electromagnetic waves can travel through a vacuum.

36. Which of the following is certain to change as a ball accelerates?

- A. mass of the ball
- B. inertia of the ball
- C. velocity of the ball
- D. force acting on the ball

37. The diagram below shows two aluminum spheres



Aluminum sphere A contains a small negative charge and is touched by aluminum sphere B, which has a larger negative charge. Which of the following occurs next?

- A. Protons flow from sphere B to sphere A.
- B. Protons flow from sphere A to sphere B.
- C. Electrons flow from sphere B to sphere A.
- D. Electrons flow from sphere A to sphere B.

38. The chart below shows a portion of the electromagnetic spectrum.

Gamma	X-rays	Ultraviolet	Visible	Infrared	Microwave	Radio
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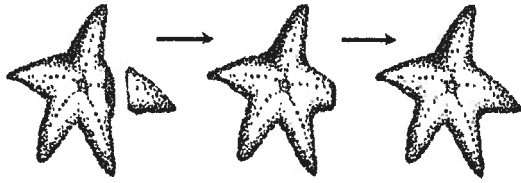
A plastic filter is fitted over a light. The light emits white light, but the filter only lets the longest wavelengths of visible light pass through. Which color would a person looking at the filtered light see?

- A. green
- B. red
- C. violet
- D. yellow

39. A party shop delivers helium-filled balloons to homes and businesses. The owners realize from experience that on hot summer days they should inflate the balloons only three-quarters full. On cold winter days they can fully inflate the balloons. Which of the following is the **best** hypothesis to explain this observation?

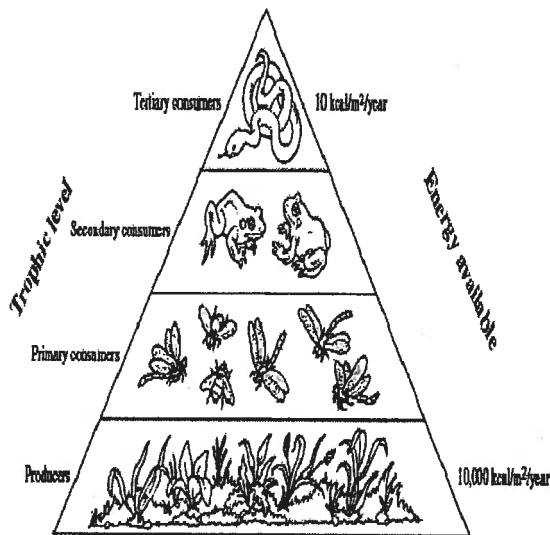
- A. The helium gas is more active in the winter season.
- B. Air outside the balloons leaks into the balloons.
- C. As the temperature increases, the helium in the balloons expands.
- D. Outdoor air pressure in the summer is less than indoor air pressure.

40. The diagram below shows a sea star in various stages of regeneration.



What cellular process is directly responsible for this regeneration?

- A. meiosis
  - B. mitosis
  - C. transpiration
  - D. respiration
41. The diagram below shows an energy pyramid.



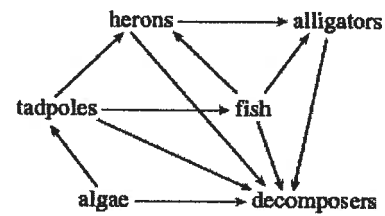
Approximately how much energy is available to the secondary consumers in this energy pyramid?

- A. 10 kcal/m<sup>2</sup>/year
- B. 100 kcal/m<sup>2</sup>/year
- C. 1,000 kcal/m<sup>2</sup>/year
- D. 5,000 kcal/m<sup>2</sup>/year

42. DNA and RNA are similar because the both contain

- A. deoxyribose
- B. nucleotides
- C. thymine
- D. double helices

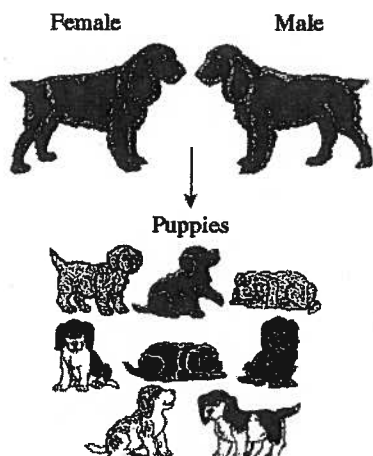
43. The diagram below shows a food web.



Which population would probably increase if the tadpole population decreased?

- A. herons
  - B. alligators
  - C. fish
  - D. algae
44. Many animals have internal or external skeletons that provide support and structure. Which of the following parts of plant cells play a similar role?
- A. cell membranes
  - B. cell walls
  - C. chloroplasts
  - D. cytoplasm

45. The picture below shows two dogs and their puppies.



The parent dogs are each heterozygous for two traits: fur color and white spotting. Both parent dogs are solid black. Their puppies, however, have four different phenotypes as listed below.

- solid black
- black with white spots
- solid red
- red with white spots

Which of the following explains how these parent dogs can produce puppies with these four phenotypes?

- A. The genes for these traits are sex-linked.
- B. The genes for these traits mutate frequently.
- C. The genes for these traits assort independently.
- D. The genes for these traits are on the same chromosome.

46. A student heated a 10 g sample of a compound in an open container. A chemical reaction occurred. The mass of the sample was measured again and found to be less than before. Which of the following explains the change in mass of the sample?

- A. The heat caused the compound to become less dense.
- B. The reaction gave off more heat than was added.
- C. Some of the lighter atoms were converted to energy.
- D. One of the reaction products was a gas.

47. Which of the following represents a pair of isotopes?

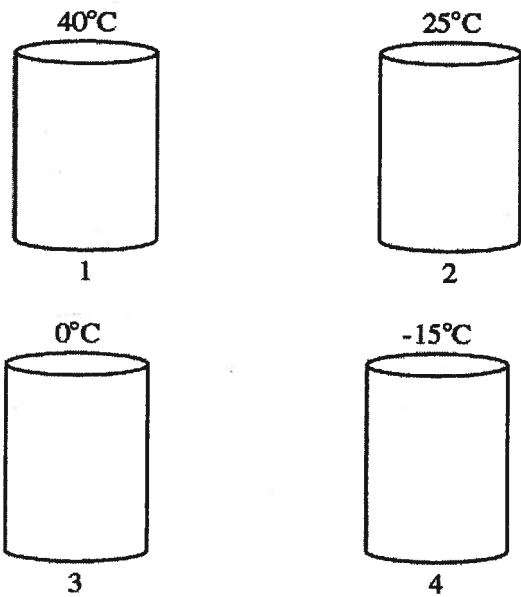
- A.  $^1\text{H}$  and  $^3\text{H}$
- B.  $^{16}\text{O}^{2-}$  and  $^{19}\text{F}^{1-}$
- C.  $^{40}\text{K}$  and  $^{40}\text{Ca}$
- D.  $^{16}\text{O}^{2-}$  and  $^{32}\text{S}^{2-}$

48. The water from hot springs near the Ebeko volcano in the Pacific Ocean has a very low pH.

A low pH indicates which of the following about the water?

- A. It has no detectable  $\text{H}^+$  or  $\text{OH}^-$  ions.
- B. It has equal concentrations of  $\text{H}^+$  and  $\text{OH}^-$  ions.
- C. It has high concentrations of  $\text{H}^+$  ions.
- D. It has equal numbers of positive and negative ions.

49. The illustration below shows four containers. Each container is full of helium gas at a different temperature.



If all of the containers are closed and have a pressure of 1 atm, which container has helium particles with the **greatest** average kinetic energy?

- A. 1
- B. 2
- C. 3
- D. 4

50. While hiking through Granville State Forest, a student finds an unusual plant-like organism that appears to lack chlorophyll. When the student examines a sample using a microscope, he sees many cells with cell walls and no chloroplasts. This organism is **most likely** a member of what Kingdom?

- a. Animalia
- b. Eubacteria
- c. Fungi
- d. Protista

**Practice Test  
Answer Sheet**

Name: \_\_\_\_\_

Question

1.    ☐ A   ☐ B   ☐ C   ☐ D
2.    ☐ A   ☐ B   ☐ C   ☐ D
3.    ☐ A   ☐ B   ☐ C   ☐ D
4.    ☐ A   ☐ B   ☐ C   ☐ D
5.    ☐ A   ☐ B   ☐ C   ☐ D
6.    ☐ A   ☐ B   ☐ C   ☐ D
7.    ☐ A   ☐ B   ☐ C   ☐ D
8.    ☐ A   ☐ B   ☐ C   ☐ D
9.    ☐ A   ☐ B   ☐ C   ☐ D
10.   ☐ A   ☐ B   ☐ C   ☐ D
11.   ☐ A   ☐ B   ☐ C   ☐ D
12.   ☐ A   ☐ B   ☐ C   ☐ D
13.   ☐ A   ☐ B   ☐ C   ☐ D
14.   ☐ A   ☐ B   ☐ C   ☐ D
15.   ☐ A   ☐ B   ☐ C   ☐ D
16.   ☐ A   ☐ B   ☐ C   ☐ D
17.   ☐ A   ☐ B   ☐ C   ☐ D
18.   ☐ A   ☐ B   ☐ C   ☐ D
19.   ☐ A   ☐ B   ☐ C   ☐ D
20.   ☐ A   ☐ B   ☐ C   ☐ D

Question

21.   ☐ A   ☐ B   ☐ C   ☐ D
22.   ☐ A   ☐ B   ☐ C   ☐ D
23.   ☐ A   ☐ B   ☐ C   ☐ D
24.   ☐ A   ☐ B   ☐ C   ☐ D
25.   ☐ A   ☐ B   ☐ C   ☐ D
26.   ☐ A   ☐ B   ☐ C   ☐ D
27.   ☐ A   ☐ B   ☐ C   ☐ D
28.   ☐ A   ☐ B   ☐ C   ☐ D
29.   ☐ A   ☐ B   ☐ C   ☐ D
30.   ☐ A   ☐ B   ☐ C   ☐ D
31.   ☐ A   ☐ B   ☐ C   ☐ D
32.   ☐ A   ☐ B   ☐ C   ☐ D
33.   ☐ A   ☐ B   ☐ C   ☐ D
34.   ☐ A   ☐ B   ☐ C   ☐ D
35.   ☐ A   ☐ B   ☐ C   ☐ D
36.   ☐ A   ☐ B   ☐ C   ☐ D
37.   ☐ A   ☐ B   ☐ C   ☐ D
38.   ☐ A   ☐ B   ☐ C   ☐ D
39.   ☐ A   ☐ B   ☐ C   ☐ D
40.   ☐ A   ☐ B   ☐ C   ☐ D

Question

41.   ☐ A   ☐ B   ☐ C   ☐ D
42.   ☐ A   ☐ B   ☐ C   ☐ D
43.   ☐ A   ☐ B   ☐ C   ☐ D
44.   ☐ A   ☐ B   ☐ C   ☐ D
45.   ☐ A   ☐ B   ☐ C   ☐ D
46.   ☐ A   ☐ B   ☐ C   ☐ D
47.   ☐ A   ☐ B   ☐ C   ☐ D
48.   ☐ A   ☐ B   ☐ C   ☐ D
49.   ☐ A   ☐ B   ☐ C   ☐ D
50.   ☐ A   ☐ B   ☐ C   ☐ D
51.   ☐ A   ☐ B   ☐ C   ☐ D
52.   ☐ A   ☐ B   ☐ C   ☐ D
53.   ☐ A   ☐ B   ☐ C   ☐ D
54.   ☐ A   ☐ B   ☐ C   ☐ D
55.   ☐ A   ☐ B   ☐ C   ☐ D
56.   ☐ A   ☐ B   ☐ C   ☐ D
57.   ☐ A   ☐ B   ☐ C   ☐ D
58.   ☐ A   ☐ B   ☐ C   ☐ D
59.   ☐ A   ☐ B   ☐ C   ☐ D
60.   ☐ A   ☐ B   ☐ C   ☐ D



## Review Questions 9

### Relationships

1. A group of similar ecosystems that share the same climax community is called a
  - A. Population
  - B. Community
  - C. Trophic level
  - D. Biome
2. The role an organism plays in an ecosystem is called it's
  - A. Habitat
  - B. Niche
  - C. Trophic level
  - D. Biome
3. The abiotic factor in this list is
  - A. Bacteria
  - B. Fungi
  - C. Water
  - D. Human
4. The biome that is the most biologically diverse is
  - A. tropical rain forest
  - B. Temperate forest
  - C. Desert
  - D. Grassland
5. The biome that is dominated by cone bearing trees, and is populated by moose, showshoe hare, and lynx, and has long winters is
  - A. Tundra
  - B. Taiga
  - C. temperate forest
  - D. Chaparral
6. An intense forest fire burns an entire forest to the ground. Soon wild flowers, grasses, and weeds begin to repopulate the area. This is
  - A. primary succession
  - B. secondary succession
  - C. tertiary succession
  - D. climax succession
7. An example of a population would be
  - A. neighborhood cats and dogs
  - B. all the rocks in your yard
  - C. all the largemouth bass in a fish pond
  - D. all the species of trees in the school nature area
8. Major ecosystems that occur over wide areas of land are called
  - A. Communities
  - B. Habitats
  - C. Biomes
  - D. food chains
9. A relationship between a producer and consumer is best illustrated by
  - A. a snake eating a bird
  - B. a fox eating a mouse
  - C. a lion eating a zebra
  - D. a zebra eating grass
10. A tick feeding on a human is an example of
  - A. Parasitism
  - B. Mutualism
  - C. Competition

D. Predation

11. An organism's niche includes

- A. what it eats
- B. where it eats
- C. when it eats
- D. all of the above

12. An ecologist who studies how several species in an area interact among each other and with the abiotic parts of the environment is interested in the biological organization level called

- A. Organism
- B. Population
- C. Community
- D. Ecosystem

13. The relationship between plants and the bees that pollinate them is an example of

- A. Commensalisms
- B. Competition
- C. Mutualism
- D. Parasitism

14. Symbiosis involving a fungi and algae is seen in which of the following?

- A. Moss
- B. lichen
- C. mildew
- D. bread mold

15. In the study of ecology, what is a population?

- A. all plants and animals in a given place
- B. all the living and nonliving things in an environment
- C. all the organisms of one particular species in a given place
- D. different plants interacting with each other in a given place

16. Which of the following is an abiotic factor in an ocean ecosystem?

- A. Coral
- B. Whale
- C. water
- D. shrimp

15. Which of the following best describes a biome?

- A. areas of like climate and ecology
- B. primary productivity per square kilometer
- C. all of the living organisms in an ecosystem
- D. areas that include the entire range of an organism

**Review Questions 10**  
**Force, Mass, Velocity and Acceleration**

1. How much force is needed to accelerate a 500.0-kg car at a rate of 4.000 m/s/s?

A. 125.0 N  
B. 2,000. N  
C. 250.0 N  
D. 4,000. N

2. Two equal forces act at the same time on the same stationary object but in opposite directions. Which statement describes the object's motion?

A. It remains stationary.  
B. It accelerates.  
C. It moves at a constant speed.  
D. It decelerates.

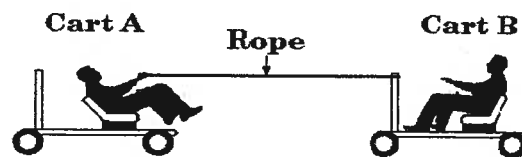
3. A 100-N force causes an object to accelerate at 2 m/s/s. What is the mass of the object?

A. 0.02 kg  
B. 102 kg  
C. 50 kg  
D. 200 kg

4. A chair exerts a force of 20 N on a floor. What is the force that the floor exerts on the chair?

A. 10 N  
B. 21 N  
C. 20 N  
D. 40 N

5. Carts A and B have the same mass. Both students have a mass of 80 kg.



If the student in cart A pulls the rope, what will result?

- A. Cart A will move toward a stationary Cart B.  
B. Cart B will move toward a stationary Cart A.  
C. Both carts will move toward each other.  
D. Cart B will move faster than Cart A.
6. A student in a boat decided to go for a swim. He dove off the back of the boat, as shown in the diagram. The boat moved in the direction shown by the arrow.



Which statement **best** explains why the boat moved in the direction shown?

- A. A body in motion tends to remain in motion.  
B. The acceleration of a body is directly proportional to the force applied.  
C. For every action there is an equal and opposite reaction.  
D. Friction on the bottom of the boat was reduced because of the lake water.

7. A car's velocity changes from 0 m/s to 40 m/s in 5 seconds. What is the average acceleration of the car?

A. 5 m/s/s  
B. 35 m/s/s  
C. 8 m/s/s  
D. 200 m/s/s

8. A rocket sled accelerates from 10 m/sec to 60 m/sec in 2 seconds. What is the acceleration of the sled?

A. 10 m/sec<sup>2</sup>  
B. 25 m/sec<sup>2</sup>  
C. 40 m/sec<sup>2</sup>  
D. 20 m/sec<sup>2</sup>

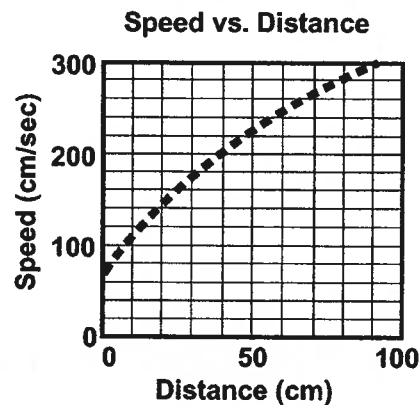
9. John Force, a drag racer, starts from a stopped position he reaches a speed of 140 m/sec in 7 seconds. What is his acceleration?

A. 147 m/sec<sup>2</sup>  
B. 200 m/sec<sup>2</sup>  
C. 0.5 m/sec<sup>2</sup>  
D. 20 m/sec<sup>2</sup>

10. A rocket can fly into space because

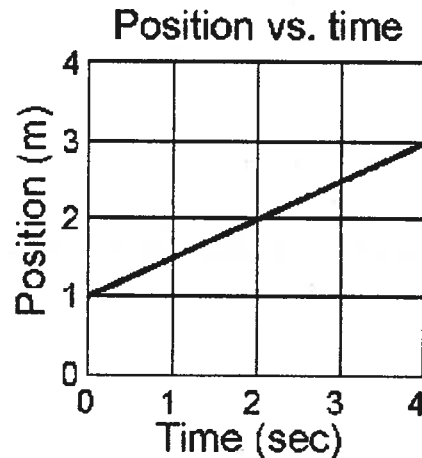
A. when it is launched, the hot exhaust gases hit the ground and push the rocket forward.  
B. the rocket pushes the exhaust gases backward, and there is an equal and opposite reaction pushing the rocket forward.  
C. when the gases are burning up, the mass of the rocket decreases, changing the amount of gravity on the rocket.  
D. the launch pad pushes the rocket forward like a slingshot.

11. Use the graph to predict the speed of the car when the car is at 60 cm.



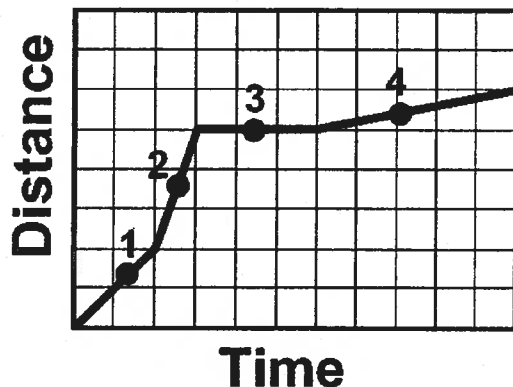
A. 220 cm/sec  
B. 230 cm/sec  
C. 240 cm/sec  
D. 250 cm/sec

12. Calculate the speed of the object from the position vs. time graph shown below.



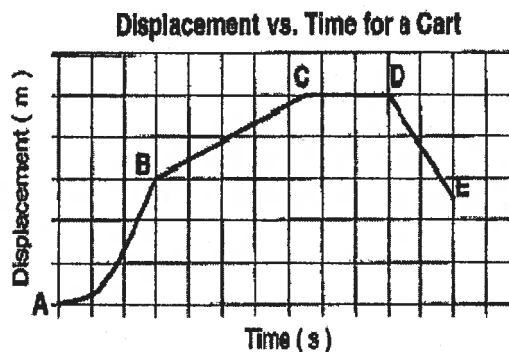
A. 0.5 m/sec  
B. 0.75 m/sec  
C. 2 m/sec  
D. 3 m/sec

13. At which of the following points on the graph is the speed the greatest?



- A. Point 1  
 B. Point 2  
 C. Point 3  
 D. Point 4
14. Compared to your weight and mass on Earth, if you were on the moon
- A. your weight and mass would be less  
 B. your weight would be less but your mass would remain the same  
 C. your weight would remain the same, but your mass would be less  
 D. your weight would increase, but your mass would remain the same
15. A car passed a truck on the road. The car accelerates from 20 meters/second to 24 meters/second in 2 seconds. What was the car's acceleration?
- A. 2 meters/second/second  
 B. 4 meters/second/second  
 C. 12 meters/second/second  
 D. 22 meters/second/second

16. The displacement-time graph below represents the motion of a cart along a straight line. During which interval is the cart NOT moving at constant speed?

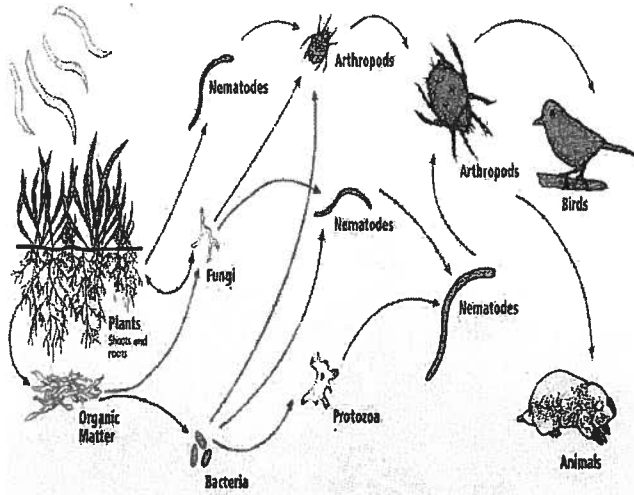


- A. AB  
 B. BC  
 C. CD  
 D. DE
17. A vehicle travels a distance of 160 km in 5 hours. The average speed is
- A. 32 km/hr  
 B. 40 km/hr  
 C. 80 km/hr  
 D. 165 km/hr

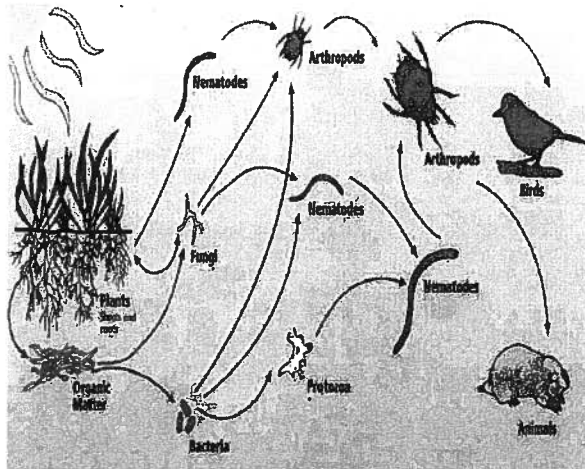
**Review Questions 11**  
**Flow of Energy and Matter**

1. A relationship between a producer and consumer is best illustrated by
  - A. a snake eating a bird
  - B. a fox eating a mouse
  - C. a lion eating a zebra
  - D. a zebra eating grass
2. As energy passes through an ecosystem from sunlight to grass to cow
  - A. the energy is destroyed
  - B. the energy stops at the cow
  - C. the amount of energy always increases
  - D. the energy is converted into different forms
3. Animals that feed on plants are in the
  - A. first trophic level
  - B. second trophic level
  - C. third trophic level
  - D. fourth trophic level
4. A tick feeding on a human is an example of
  - A. Parasitism
  - B. Mutualism
  - C. Competition
  - D. Predation
5. When an organism dies, the nitrogen in its body
  - A. can never be reused by other living things
  - B. is immediately released into the atmosphere
  - C. is released by the action of decomposers
  - D. none of the above
6. The relationship between plants and the bees that pollinate them is an example of
  - A. Commensalisms
  - B. Competition
  - C. Mutualism
  - D. Parasitism
7. Matter moves through ecosystems in cycles such as the carbon, nitrogen, and water cycles. The total amount of matter
  - A. remains constant
  - B. increases
  - C. decreases
  - D. cannot be measured
8. Nitrogen-fixing bacteria help cycle nitrogen through ecosystems. How do they do this?
  - A. They change nitrogen into forms usable by plants.
  - B. They convert water and carbon dioxide into sugar.
  - C. They release the chemical energy in nitrogen for respiration.
  - D. They convert sunlight into chemical energy stored in nitrogen.
9. Replacing inorganic nutrients in soil is accomplished primarily by the
  - A. second-order consumers
  - B. first-order consumers
  - C. decomposers
  - D. herbivores

10. In the soil food chain shown, arthropods would be considered \_\_\_\_\_ with respect to nematodes.



- A. primary producers  
B. secondary producers  
C. primary consumers  
D. secondary consumers
11. Which of the organisms in the food chain shown above would have the LEAST amount of overall biomass?



- A. Animals  
B. Arthropods  
C. Bacteria  
D. Grass

12. A Columbian tropical rainforest food chain includes the following set of feeding relationships:

**Fig leaves -> Leaf cutter ants -> Anteater -> Jaguar.**

Approximately how many pounds of ants would be needed to support one 300-pound adult jaguar?

- A. 300,000  
B. 30,000  
C. 3,000  
D. 300
13. Which of these organisms contributes the MOST biomass and MOST energy to a food chain?
- A. pine trees  
B. humans  
C. coral reef animals  
D. bacteria
14. Arrange the members of a Southwest Georgia food chain in the proper order, from primary producer to secondary consumer.

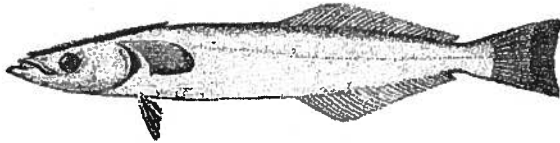
- i. Black buzzard
- ii. Coyote
- iii. Field mouse
- iv. Garter snake
- v. Grass seeds

- A. Grass seeds → garter snake → field mouse → coyote  
B. Grass seeds → garter snake → field mouse → coyote  
C. Grass seeds → field mouse → coyote → garter snake  
D. Grass seeds → field mouse → coyote → black buzzard

15. In regard to mutualism versus parasitism, what is the relationship between the two involved organisms?

- A. Both organisms benefit in mutualism; both organisms are harmed in parasitism.
- B. One organism receives a benefit in mutualism; both organisms are harmed in parasitism.
- C. Both organisms receive a benefit in mutualism; one organism is harmed and the other helped in parasitism
- D. One organism receives a benefit in mutualism; one organism is hurt and the other is harmed in parasitism.

16.



The picture above shows a remora, a species of fish that attaches itself harmlessly to sharks and other large fish with a sucker-like organ on its head.

The remora receives the benefit of a free ride and scraps of food from any meals the large fish eats. While the remora does not hurt the large fish, no one has ever proven that they help the fish either.

This type of relationship is known as

- A. mutualism
- B. symbiosis
- C. co-evolution
- D. commensalism



**Review Questions 12**  
**Newton's Three Laws of Motion**

1. Which **best** describes the function of a lever?

- A. Using a small force at a great distance to move a large object a short distance
- B. Using a small force over a short distance to move a large object over a short distance
- C. Using a large force over a great distance to move a small object over a short distance
- D. Using a large force over a short distance to move a small object over a great distance

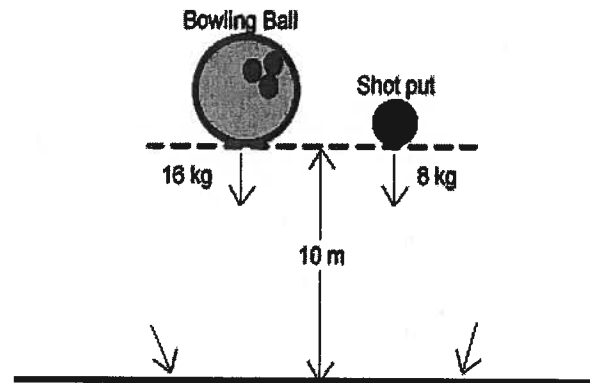
2. Many public buildings now have entrance ramps in addition to entrance stairs. Which principle explains the idea behind entrance ramps?

- A. By increasing the distance, the required force decreases
- B. By increasing the distance, the required force increases
- C. By increasing the force, the required distance decreases
- D. By increasing the force, the required distance increases

3. Which of the following **BEST** describes why someone may **NOT** be able to lift a full wheelbarrow by its handles?

- A. The effort force is not great enough to raise the fulcrum
- B. The resistance force is not great enough to raise the fulcrum
- C. The resistance force is not great enough to overcome the effort force
- D. The effort force is not great enough to overcome the resistance force.

4. A 16 kg bowling ball and a 8 kg shot put are held 10 meters above the ground outside an office window. Which of these statements is true?

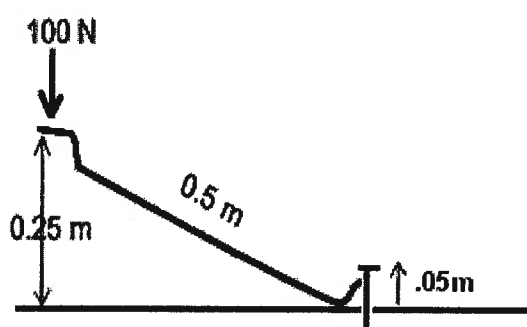


- A. The bowling ball will hit the ground first
- B. The bowling ball will experience twice the velocity
- C. The bowling ball experiences twice as much gravitational force
- D. The bowling ball will accelerate twice as fast

5. Which of these is an example of Newton's First Law, inertia?

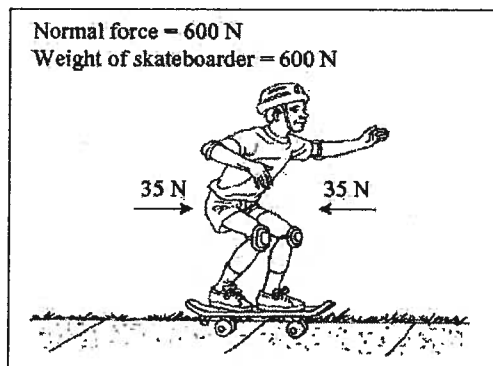
- A. Pushing against a brick wall, and the brick wall does not move
- B. Pushing a stationary wheelbarrow, and the wheelbarrow accelerates forward
- C. Pushing a wheelbarrow full of bricks, and the bricks slide back towards the handles
- D. Pushing a wagon to the top of a hill, and the wagon accelerates down the hill without assistance

6. A prybar is a simple machine that acts as a lever, similar to a crowbar. It can do the job of quickly and easily removing nails, boards or other attached items. In the image, a force of 100 N pushes downward over 0.25 m. The imbedded nail is moved vertically upward a distance of 5 cm. The length of the prybar is 0.5 m. Determine the mechanical advantage of the simple machine (prybar) in this example.



- A. 0.5  
B. 2  
C. 5  
D. 400
7. What would be the **most** realistic body shape for a science fiction character from a massive planet with strong gravitational attraction?
- A. Squat and sturdy  
B. Mushroom-shaped  
C. Tall and thin-boned  
D. Birdlike with strong flight muscles
8. Which of the following situations **best** illustrates the principle of inertia?
- A. Steve throws a ball straight up and notices it slowing down  
B. Emily asks for a push to get started on a swing  
C. Paula decides to sit in an outside seta of a merry-go-round so that she will have a wilder ride.  
D. When Dave drops a bowling ball, it does not bounce as high as a basketball dropped from the same height.
9. Anne-Marie is using a fixed pulley to raise a weight. How does using the pulley change her effort?
- A. It reduces the effort needed to raise the weight  
B. It changes the direction of the effort but doesn't reduce it  
C. It increases the effort needed to raise the weight  
D. It both reduces and changes the direction of the effort
10. Slamming on the brakes in a moving car makes a passenger move forward against his or her seat belt because
- A. The passenger has the inertia to keep moving forward  
B. The passenger is being pushed by the seats of the car  
C. The passenger is better able to stop themselves in this manner  
D. The passenger has an equal and opposite force supporting their weight

11. The forces acting on a skateboarder moving at a constant velocity along a sidewalk are shown in the figure below.



Which of the following is the net force on the skateboarder?

- A. 0 N  
B. 70 N  
C. 670 N  
D. 1270 N
12. Which of these is an example of Newton's Second Law,  $F=ma$ ?
- A. A tug of war where both sides pull equally, and the rope does not move  
B. A wide receiver using his hands to stop and catch a football thrown by the quarterback at 20 m/s  
C. A car traveling on a straight part of the highway with a cruise control set and a constant velocity of 55 miles/hour  
D. A book pushing down on the desk where it is resting.
13. You pull a wagon with your younger sister in it. Which of these would accelerate the rate at which you can pull the wagon?
- A. Pull the wagon with less force  
B. Pull the wagon with more force  
C. Have your sister push down on the wagon  
D. Put another of your siblings in the wagon
14. Which of these is true regarding weight but NOT mass?
- A. Weight is based on density, mass is not  
B. Weight is proportional to volume, mass is not  
C. Weight changes based on inertia, mass does not  
D. Weight changes depending on distance from the earth, mass does not
15. A rotating water sprinkler has many arms which rapidly shoot water backward out of the ends, in response, the arms of the sprinkler
- A. Fall with the water  
B. Are lifted as the water falls due to gravity  
C. Move forward and, hence, rotate  
D. Remain motionless due to inertia
16. Which of these experiences the greatest gravitational force if dropped from an airplane?
- A. A 2 pound metal wrench  
B. A 15 pound box of food and supplies  
C. A 150 pound paratrooper with her parachute still closed  
D. A 1500 pound jeep with an open parachute

17. When a Civil War era canon is fired, the force of the gas produced by exploding powder propels the cannonball forward at a high speed. According to Newton's Third Law,

- A. The cannon itself moves backward
- B. The cannon itself does not move due to inertia
- C. The cannon itself moves forward as well with the momentum
- D. The cannon itself moves forward with the inertia of the cannonball

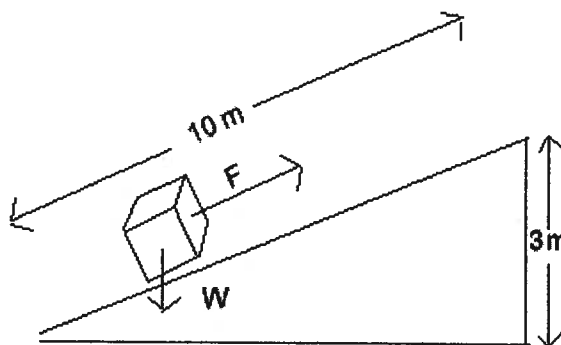
18. You accidentally drop a drinking glass. After the glass left your hand,

- A. The inertia of the earth pulled the glass down
- B. Gravity caused the glass to fall at a constant rate
- C. Gravity caused the glass to fall faster and faster
- D. The equal and opposite forces of gravity and air resistance acted upon it.

19. As the space shuttle lifts off from Cape Canaveral and ascends into the atmosphere, its \_\_\_\_\_ becomes less.

- A. density
- B. inertia
- C. mass
- D. weight

20. In order to raise a box 3 meters (m) to the awaiting bed of a tractor-trailer, you push it up a 10 m ramp. The box is filled with books and weighs 200 Newtons (N). You use a force of 75 N applied parallel to the ramp.



Determine the mechanical advantage of the ramp.

- A. 0.3
- B. 0.375
- C. 2.67
- D. 3.33

### Review Questions 13

#### Mechanical and Electromagnetic Waves

1. Which property of waves is illustrated in the example below?  
A black car hood in the July sun becomes very hot.

A. Refraction  
B. Diffraction  
C. Absorption  
D. Reflection

2. Which is NOT true of a light wave?

A. it is a disturbance  
B. it transfers energy  
C. it needs a medium in which to travel  
D. it is an electromagnetic wave

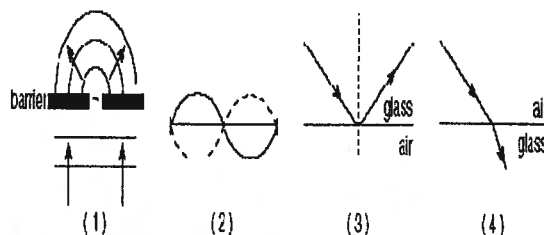
3. A scientist is delivering a lecture about sound. Which statement about sound would NOT be correct?

A. The speed of sound in a steel rail on a railroad is slower than the speed of sound in the air above it.  
B. sound needs a medium in which to travel  
C. sound travels faster in the hot air of a desert than in the colder air of Antarctica  
D. sound is a mechanical wave

4. Which property of waves is illustrated in the example below?  
Two ocean waves meet and combine to make a bigger wave.

A. Diffraction  
B. Absorption  
C. Reflection  
D. Interference

5. Which diagram below best represents refraction?



A. 1  
B. 2  
C. 3  
D. 4

6. For a wave traveling at constant speed, frequency increases as

A. amplitude decreases  
B. amplitude increases  
C. wavelength decreases  
D. wavelength increases

7. The electromagnetic spectrum is arranged according to

A. wave speed  
B. wave amplitude  
C. wave medium  
D. wavelength

8. When two sound waves interfere constructively,

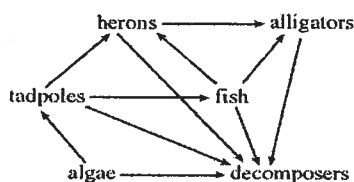
A. the resulting sound is louder than either sound  
B. the resulting sound is softer than either sound  
C. neither sound wave is changed  
D. there is no resulting sound

9. A wave that carries a large amount of energy will always have a
- A. large amplitude
  - B. small amplitude
  - C. high frequency
  - D. short wavelength
10. The color in the electromagnetic spectrum with the most energy would be
- A. red
  - B. orange
  - C. violet
  - D. yellow
11. Electromagnetic waves are different from other types of waves in that they do not
- A. have amplitude
  - B. have frequency
  - C. transfer energy
  - D. need a medium
12. Which of the following waves carries the most energy?
- A. Infrared
  - B. Ultraviolet
  - C. gamma rays
  - D. X – rays
13. Wave A carries more energy than wave B. Wave B has a smaller \_\_\_\_\_ than wave A.
- A. Frequency
  - B. Wavelength
  - C. Amplitude
  - D. Speed
14. The speed of a sound depends on
- A. its source
  - B. the force of its compressions
  - C. the number of waves per second
  - D. the medium through which it travels
15. Because of their high energy, \_\_\_\_\_ can be used by radiologists to treat some forms of cancer.
- A. X-rays
  - B. gamma rays
  - C. microwaves
  - D. ultraviolet radiation
16. The energy of light is proportional to
- A. its amplitude
  - B. its wavelength
  - C. its frequency
  - D. the speed of light itself
17. Refraction occurs when a wave enters a new medium at an angle because
- A. the frequency changes
  - B. the amplitude changes
  - C. the wave speed changes
  - D. none of the above
18. For a given wave, if the frequency doubles, the wavelength \_\_\_\_\_.
- A. Doubles
  - B. stays the same
  - C. is halved
  - D. quadruples

## Review Questions 14

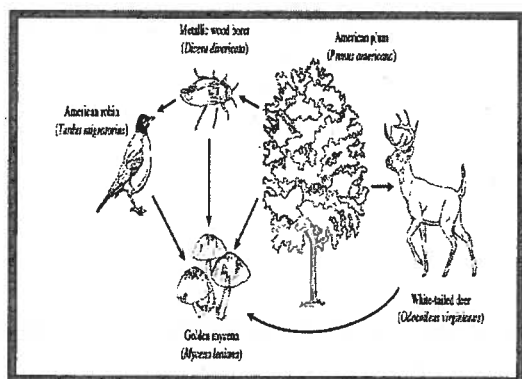
### Organisms' Interactions within Food Chains and Webs

1. The diagram below shows a food web.



Which population would **probably** increase if the tadpole population decreased?

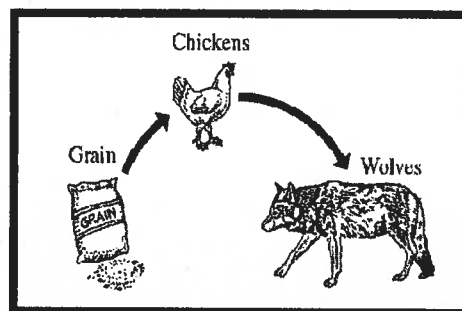
- A. herons
  - B. alligators
  - C. fish
  - D. algae
2. A food web is shown below.



Which organism in this food web is a decomposer?

- A. American plum
- B. Golden mycena
- C. Metallic wood borer
- D. White-tailed deer

3. The figure below represents the flow of food energy through a system.



In an experiment, chickens were fed grain that contained a chemical marker in its protein. The presence of the marker can be detected in organisms.

Which of the following is the **MOST** reasonable prediction from this experiment?

- A. The marker will only be found in the grain.
  - B. Both chickens and wolves will have the marker.
  - C. Wolves will have the marker, but chickens will not.
  - D. The marker will only be found in the animal's wastes.
4. Plants → Aphids → Spiders → Sparrows
- In this food chain, the spiders are
- A. Hawks
  - B. Weasels
  - C. Raccoons
  - D. Mice

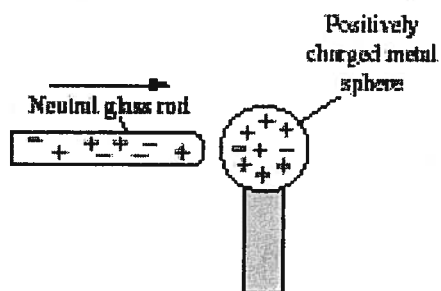
5. Many species of beetles, fungi and bacteria feed exclusively on dead plants and animals in the tropical rainforest biome so that the nutrients are very rapidly recycled in the biome. These organisms would be considered:
- A. Producers
  - B. Carnivores
  - C. Herbivores
  - D. Decomposers
6. Major ecosystems that occur over wide areas of land are called
- A. Communities
  - B. Habitats
  - C. Biomes
  - D. food chains
7. A relationship between a producer and consumer is best illustrated by
- A. a snake eating a bird
  - B. a fox eating a mouse
  - C. a lion eating a zebra
  - D. a zebra eating grass
8. The physical location of an ecosystem in which a given species lives is called a
- A. habitat
  - B. tropical level
  - C. community
  - D. food zone
9. Animals that feed on plants are at least in the
- A. first trophic level
  - B. second trophic level
  - C. third trophic level
  - D. fourth trophic level
10. An organism's niche includes
- A. what it eats
  - B. where it eats
  - C. when it eats
  - D. all of the above
11. An ecosystem consists of
- A. a community of organisms
  - B. energy
  - C. the soil, water, and weather
  - D. all of the above
12. In the study of ecology, what is a population?
- A. all plants and animals in a given place
  - B. all the living and nonliving things in an environment
  - C. all the organisms of one particular species in a given place
  - D. different plants interacting with each other in a given place
13. Physical and chemical factors may affect an organism's survival. These abiotic factors may include
- A. infectious parasites
  - B. autotrophs and chemoautotrophs
  - C. pathogens such as fungi and bacteria
  - D. available gases such as O<sub>2</sub>, CO<sub>2</sub> and N<sub>2</sub>
14. Replacing inorganic nutrients in soil is accomplished primarily by the
- A. second-order consumers
  - B. first-order consumers
  - C. decomposers
  - D. herbivores



**Review Questions 15**  
**Electricity and Magnetism**

1. If a circuit has a current equal to 10 amps and a resistance equal to 2 ohms, what is the voltage in the circuit?
  - A. 5 volts
  - B. 20 volts
  - C. 0.2 volts
  - D. cannot be determined
2. Which of the following statements about circuits is true?
  - A. As you add light bulbs to a parallel circuit, the light bulbs will become less bright as less current flows through each.
  - B. If you stop the flow of current in one branch of a parallel circuit, the entire circuit MUST stop carrying electric current.
  - C. If you stop the flow of current in one part of a series circuit, no current will flow in any part of the circuit.
  - D. All of these statements are true.
3. Electric charges are usually transferred by
  - A. electrons
  - B. the nucleus
  - C. protons
  - D. neutrons
4. Appliances connected so that they form a single pathway for electricity to flow are connected in a(n)
  - A. a series circuit
  - B. a parallel circuit
  - C. an open circuit
  - D. not enough information
5. If a circuit has a voltage of 60 volts and a resistance of 5 ohms, what is the current flowing through the circuit?
  - A. 300 amps
  - B. 1/12 amp
  - C. 12 amps
  - D. 55 amps
6. A dry-cell battery produces
  - A. direct current
  - B. alternating current
  - C. both direct and alternating current
  - D. neither a direct current or alternating current
7. If you want holiday lights to operate so that when one bulb burns out and the rest stay lit, you will want to get lights that
  - A. are connected in series
  - B. are only white
  - C. are connected in parallel
  - D. have many colors
8. A negatively charged rubber rod was brought near some small pieces of paper. The rod's charges repelled the negative charges in the pieces. Which of the following caused the repulsion of the negative charges?
  - A. conduction
  - B. gravitation
  - C. induction
  - D. insulation

9. The figure below shows a neutral glass rod and a positively charged metal sphere.



Which of the following **best** describes the movement of charges as this glass rod touches the sphere?

- A. Negative charges move from the sphere to the glass rod.
  - B. Negative charges move from the glass rod to the sphere.
  - C. Positive charges move from the sphere to the glass rod.
  - D. Positive charges move from the glass rod to the sphere.
10. Which of the following is common to all electric motors?
- A. battery power
  - B. magnetic forces
  - C. hydroelectric power
  - D. internal combustion engines
11. In which way do permanent magnets and electromagnets differ?
- A. Electromagnets have fixed magnetic strength
  - B. Permanent magnets can only be used in fixed positions
  - C. Electromagnets can attract other substances besides metals
  - D. The largest permanent magnets are weaker than the largest electromagnets

12. An electric generator converts

- A. solar energy to electric energy
- B. thermal energy to electric energy
- C. chemical energy to electric energy
- D. mechanical energy to electric energy

13. A student's hair stands out when the Van de Graff generator charges them. The reason for this is

- A. hair strands are at a high voltage
- B. hair is a good conductor
- C. the student is in a strong electric field
- D. like charges repel

14. Reginald has set up an electromagnet, but it is weak and won't even attract paperclips. How might Reginald make the electromagnet stronger?

- A. Increase the current
- B. Increase the number of turns
- C. Use a soft iron core instead of a nail
- D. Decrease the amount of wire used

15. In which way do permanent magnets and electromagnets differ?

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