

Biology District Benchmark (62 pts total. 45 MC and 17 PE)

Symbiosis

Use the chart below to answer questions 1-2.

Type of Symbiosis	Effect on Organisms 1	Effect on Organism 2
Mutualism	+	A
Commensalism	B	+
Parasitism	+	C

1. Which of the following symbols correctly replaces letter A in the chart above?

A. +
B. -
C. O

2. Which of the following symbols correctly replaces letter B in the chart above?

A. +
B. -
C. O

3. Which of the following types of symbiosis best describes the scenario below?

Army ants travel as a colony on the forest floor. They stir up various flying insect species. As the insects flee from the army ants, the birds following the ants catch the fleeing insects. Army ants are unaffected.

A. Parasitism
B. Commensalism
C. Mutualism
D. Competition
E. Predation

4. Which of the following types of symbiosis best describes the scenario below?

Bumblebees suck the nectar of flowers to meet their nutritional needs. Flowers do not need this nectar. While bees are flying from flower to flower, they also pollinate the flowers. This process allows the plant to reproduce.

A. Parasitism
B. Commensalism
C. Mutualism
D. Competition
E. Predation

5. Which of the following types of symbiosis best describes the scenario below?

Snapdragons (a type of flower) don't always photosynthesize to make their own energy. Instead, they tap into the roots of other plants and steal their glucose.

A. Parasitism
B. Commensalism
C. Mutualism
D. Competition
E. Predation

Photosynthesis & Cellular Respiration

6. In which of the following organelles does cellular respiration take place?
 - A. Cytoplasm
 - B. Chloroplast
 - C. Mitochondria
 - D. Ribosome
 - E. Nucleus

7. Which of the following are the products of photosynthesis?
 - A. glucose & oxygen
 - B. carbon dioxide & water
 - C. oxygen & water
 - D. water & glucose
 - E. oxygen & carbon dioxide

8. Which of the following are the reactants of cellular respiration?
 - A. glucose & oxygen
 - B. carbon dioxide & water
 - C. oxygen & water
 - D. water & glucose
 - E. oxygen & carbon dioxide

9. Which of the following is true about glucose?
 - A. Glucose is a usable form of energy produced through photosynthesis.
 - B. Glucose is an unusable form of energy produced through cellular respiration.
 - C. Glucose is an unusable form of energy produced through photosynthesis.
 - D. Glucose is a usable form of energy produced through cellular respiration.

10. Cellular respiration is most important to organisms because
 - A. carbon dioxide is removed from the atmosphere.
 - B. food energy (glucose) is converted into a usable form.
 - C. oxygen is removed from the atmosphere.
 - D. glucose is produced.

Cell Membrane

11. The term “selectively permeable” refers to
 - A. the cell membranes separating the intracellular and extracellular components.
 - B. the fact that the cell membrane is found in all cells.
 - C. the fact that the cell membrane gives the cell shape.
 - D. the cell membrane’s ability to regulate what enters and exits the cell.

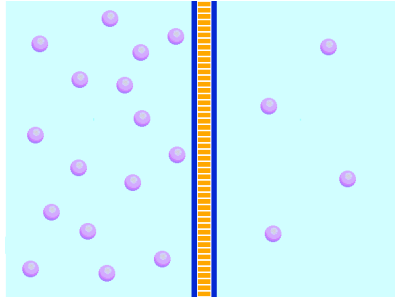
12. The main difference between active & passive transport is that
 - A. active transport requires no energy & passive transport requires energy.
 - B. active transport requires energy & passive transport requires no energy.
 - C. active transport can occur with all types of molecules & passive transport can only occur with certain types of molecules.
 - D. passive transport can occur with all types of molecules & active transport can only occur with certain types of molecules.

13. Which of the following is the process by which water molecules move from high concentration to low concentration?
 - A. Diffusion
 - B. Active Transport
 - C. Osmosis
 - D. Facilitated Diffusion

14. Which of the following is the process by which large molecules and/or ions move from high concentration to low concentration?

- A. Diffusion
- B. Active Transport
- C. Osmosis
- D. Facilitated Diffusion

15. Below is a picture of molecules on both sides of a cell membrane. In which direction will the net flow of molecules be?



- A. to the right
- B. to the left
- C. right & left
- D. up & down

Cell Anatomy

16. The major structural component of the cell membrane is:

- A. pore proteins.
- B. channel proteins.
- C. glycoproteins.
- D. phospholipid molecules.

17. Which cell structure contains the cell's genetic material and controls many of the cell's activities?

- A. Ribosomes
- B. Nucleus
- C. Golgi Bodies
- D. Cytoplasm

18. Cells fall into two broad categories, depending on whether they

- A. have a cell wall.
- B. contain genetic material.
- C. have a nucleus.
- D. contain chloroplasts.

19. The following cell structures are located within cells that make proteins: nucleus, ribosomes, endoplasmic reticulum.

Which description best explains the relationship among these cell structures in making a protein?

- A. nucleus makes protein; protein winds through the ER; protein folds into its active shape
- B. nucleus directs ER to assemble protein; ribosomes surround protein; protein folds into its active shape
- C. ER creates protein; DNA in the nucleus codes for ribosomes to surround protein; protein folds into its active shape
- D. DNA in nucleus codes for protein; protein is assembled in ribosomes; protein moves through the ER and fold into its active shape

20. Which of the following is a function of the nuclear envelope: [1point; III.1.C.b]

- A. To facilitate communication between the nucleus and the rest of the cell
- B. To not allow anything to exit the nucleus
- C. To not allow anything to enter the nucleus
- D. Both b and c are correct

Food Chains & Food Webs

Diagram 1

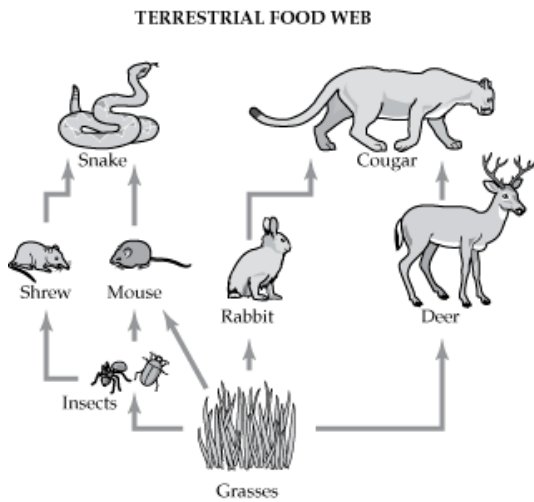
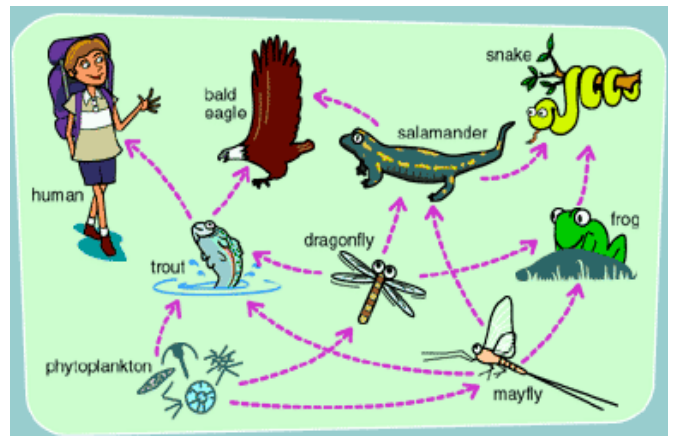


Diagram 2



21. How many producers are in the food web shown in **diagram 1**?
 - A. 0
 - B. 1**
 - C. 2
 - D. 3

22. Which of the following organism has the least energy in the food web in **diagram 1**?
 - A. Cougar
 - B. Grasses
 - C. Mouse
 - D. Snake**

23. What would eventually happen to the snake population if an insecticide was sprayed in this ecosystem?
 - A. It would increase
 - B. It would decrease**
 - C. It would stay the same
 - D. it is impossible to predict what would happen to the snake population

24. Which of the following organisms in this food web **in diagram 2** is a primary consumer?
 - A. Phytoplankton
 - B. Snake
 - C. Human
 - D. Mayfly**

25. What is the ultimate source of all energy in this ecosystem shown in **diagram 2**?
 - A. Phytoplankton
 - B. Mayfly
 - C. Trout
 - D. The sun**

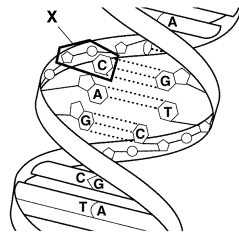
Cell Division

26. During normal mitotic (mitosis) cell division, a parent cell having 36 chromosomes will produce two daughter cells, each containing
- A. 18 chromosomes.
 - B. 36 chromosomes.
 - C. 9 chromosomes.
 - D. 72 chromosomes
27. How do daughter cells in mitosis compare to each other and to the original cell?
- A. The daughter cells are identical to each other and to the original cell
 - B. The daughter cells are identical to each other but not the original cell
 - C. The daughter cells contain half the amount of chromosomes as the original cell
 - D. The daughter cells contain double the amount of chromosomes as the original cell
28. If there are 28 chromosomes in an organism's liver cells, how many chromosomes are in the organism's sperm cells?
- A. 112 chromosomes
 - B. 56 chromosomes
 - C. 28 chromosomes
 - D. 14 chromosomes
 - E. 7 chromosomes
29. Unlike mitosis, meiosis results in the formation of
- A. two genetically identical diploid cells.
 - B. four genetically identical haploid cells.
 - C. four genetically un-identical haploid cells.
 - D. two genetically un-identical diploid cells.
30. Why do organisms undergo meiosis?
- A. To produce gametes for sexual reproduction
 - B. To repair damaged tissue
 - C. To grow
 - D. Both A and C are correct
 - E. Both b and c are correct

DNA

31. DNA replication results in two DNA molecules,
- A. each with two new strands.
 - B. one with two new strands and the other with two original strands.
 - C. each with one new strand and one original strand.
 - D. each with two original strands.
32. Unlike DNA, mRNA contains
- A. adenine.
 - B. uracil.
 - C. phosphate groups.
 - D. thymine.
33. Which of the following is produced during transcription?
- A. mRNA molecules
 - B. complementary DNA molecules
 - C. "proofreading" enzymes
 - D. a string of amino acids

34. Which of the following happens during the process of translation?
 A. mRNA is made from DNA.
 B. The cell uses information from mRNA to produce proteins.
 C. DNA “unzips.”
 D. Copies of DNA are made.
35. The portion of the molecule below (marked “X”) represents



- A. a DNA molecule
 B. a protein
 C. a nucleotide
 D. an amino acid

Genetics

36. In humans, red-green colorblindness is a recessive, sex-linked trait. If a woman who is a carrier for the trait marries a man with normal color vision, what is the probability that their children will inherit the colorblindness trait?
 A. 0%
 B. 25%
 C. 50%
 D. 75%
 E. 100%
37. What is the phenotype of the mother in Question 36?
 A. Red-green colorblind
 B. normal color vision
 C. a carrier for the trait
 D. red colorblind, but not green
38. Two plants with the genotypes TT and Tt
 A. would have the same phenotype.
 B. would have different phenotypes.
 C. have all dominant alleles.
 D. have all recessive alleles.
39. The common grackle is a species of robin-sized blackbirds. Suppose that long tails (L) were dominant to short tails in these birds. A female short-tailed grackle mates with a male who is heterozygous for tail length. What is the male’s genotype?
 A. LL
 B. Ll
 C. ll
 D. LL or Ll
40. Determine the phenotypic ratio of the offspring in #38.
 A. 2Ll:2ll
 B. ALL long-tailed
 C. 1LL:2Ll:1ll
 D. 2 long-tailed:2 short

Natural Selection & Evolution

41. Darwin called the ability of an organism to survive and reproduce in its environment
- diversity.
 - fitness.
 - adaptation.
 - evolution.
42. The two main sources of genetic variation are
- genotypes & phenotypes
 - gene shuffling & mutations
 - single-gene traits & polygenic traits
 - directional selection & disruptive selection
43. According to Darwin's theory of natural selection, the individuals that tend to survive are those that tend to have
- characteristics that their parents acquired by use & disuse.
 - characteristics that plant & animal breeders value.
 - the greatest number of offspring.
 - variations best suited to the environment.
44. When lions prey on a herd of antelope, some antelope are killed and some escape. Which part of Darwin's concept of natural selection might be used to describe this situation?
- acquired characteristics
 - reproductive isolation
 - survival of the fittest
 - descent with modification
45. Examine the following two diagrams of the regal horned lizard. This type of lizard can frequently be found warming in the sun. It warms as it absorbs the sunlight. The ability to change skin color is an adaptation. Which of the following best explain how this adaptation may help these lizards to survive?



- Changing colors probably has little to do with the survival of these lizards.
- The darker color helps the lizard hide from its predators
- Lizards that can change their color can regulate body temperature. They will be able to survive in a wider variety of conditions.
- The lighter color helps lizards sneak up on their prey.

**Biology District Benchmark
Performance Event (17 pts)**

Name _____ Date _____ Hour _____

Experimental Design: The temperature of water can effect population growth of aquatic animals. Scientists looked at the number of bass fish and bullfrog tadpoles in Lake Carlyle, Illinois at different temperatures. The experiment was done in a controlled environment in a lab, using water from Carlyle Lake, air temperature was 24°C and pH was 7.2.

46. Name the independent variable in this experiment. (1 pt) water temperature
47. Name the dependent variable in this experiment. (1 pt) population growth of aquatic animals
48. What was the research question scientists wanted to know the answer of? (1 pt) What is the effect of water temperature on population growth of aquatic animals?
49. Write an effective hypothesis for this experiment. (3 pts.) If the water temperature increases, then the population of aquatic animals (increases/decreases)

At 10° C, the scientists found that the 10 bass fish eggs developed and 6 bullfrog tadpoles developed. At 15° C, the scientists found that the 15 bass fish eggs developed and 7 bullfrog tadpoles developed. At 20° C, the scientists found that the 18 bass fish eggs developed and 10 bullfrog tadpoles developed. At 25° C, the scientists found that the 20 bass fish eggs developed and 11 bullfrog tadpoles developed. At 30° C, the scientists found that the 22 bass fish eggs developed and 15 bullfrog tadpoles developed. At 40° C, the scientists found that the 22 bass fish eggs developed and 18 bullfrog tadpoles developed. At 50° C, the scientists found that the 21 bass fish eggs developed and 20 bullfrog tadpoles developed.

50. Create a data table (with all necessary parts) below for the experimental data provided. No average is needed. (3 pts.)

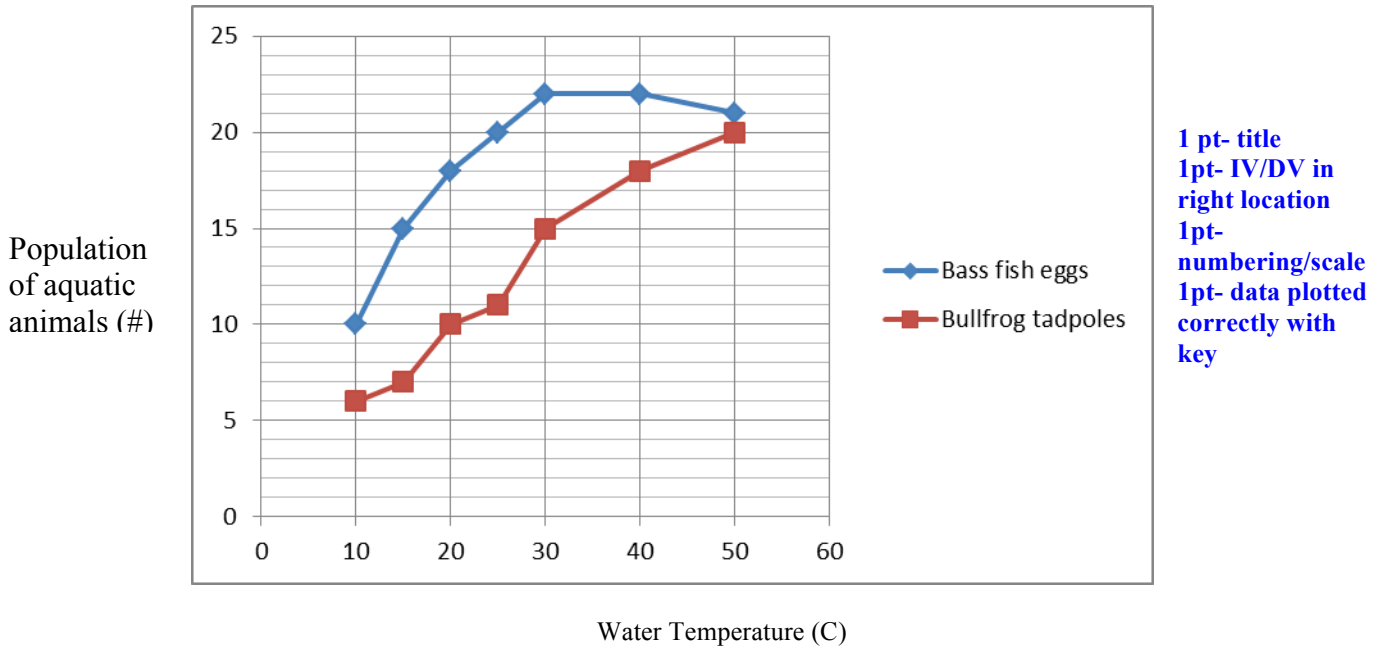
1 pt- title
1pt- IV/DV in right location
1pt- numbers in correct places

The effect of water temperature on the population growth of aquatic animals

Water Temperature (°C)	Population growth of aquatic animals (#)	
	Bass fish eggs	Bullfrog tadpoles
10	10	6
15	15	7
20	18	10
25	20	11
30	22	15
40	22	18
50	21	20

51. Create a double line graph to represent your data. Make sure to include all necessary parts of the graph. (4 pts.)

The effect of water temperature on population of aquatic animals



1 pt- title
 1pt- IV/DV in right location
 1pt- numbering/scale
 1pt- data plotted correctly with key

52. What should scientists conclude, according to this data? (2 pts.) _____ **USE YOUR BEST JUDGMENT. 1 POINT** for commenting on trend/ relate IV to DV and **1 POINT** for giving data example _____

53. Name one thing in the experiment that may have been a source of error in the data collected. (1pt) **use best judgment**

54. Name one thing in the experiment that had to remain constant. (1 pt) **use best judgment. Water pH, type of aquatic animals, type of water, amount of water, type of tank, etc** _____