

Name:
Teacher:

Date:
Class/Period:

- 1) After learning about viruses in Biology class, Sam decides to have his cat vaccinated against feline leukemia virus. According to cell theory, are viruses, such as feline leukemia, considered living things?
- A. Yes, because they can reproduce.
 - B. Yes, because they are composed of cells.
 - C. No, because they cannot adapt to their environment.
 - D. No, because they are not composed of cells.
- 2) Which of the following best describes the level of biological organization that includes assemblages of different groups of species living within a defined area?
- A. Organism
 - B. Population
 - C. Community
 - D. Family
- 3) A scientist studies the effects that barnyard grass, a weed, has on the growth of rice, other weeds, and insects. The barnyard grass and other weeds, rice, and insects make up which level of biological organization?
- A. population
 - B. community
 - C. ecosystem
 - D. biome
- 4) Which is the best example of a population?
- A. All the insects in North America
 - B. All the white-tailed deer on an island
 - C. All the bacteria in a person's digestive tract
 - D. All the single-celled creatures in a sample of pond water

5) What is the correct order of organization of all living things from simplest to most complex?

- A. Atom, cell, organ, organelle, organ system, organism, molecule, tissue
- B. Atom, molecule, organelle, cell, tissue, organ, organ system, organism
- C. Atom, molecule, cell, tissue, organelle, organ, organism, organ system
- D. Organelle, atom, molecule, cell, tissue, organ, organ system, organism

6) Which sequence is in order from the simplest level of organization to the most complex?

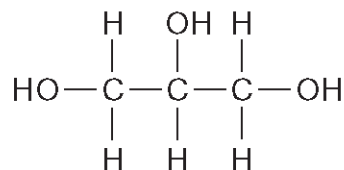
- A. Muscle, erythrocyte, lipid, mitochondrion, carbon
- B. Carbon, lipid, erythrocyte, mitochondrion, muscle
- C. Muscle, mitochondrion, lipid, erythrocyte, carbon
- D. Carbon, lipid, mitochondrion, erythrocyte, muscle

7) Ming volunteers for a study to determine whether a certain medication helps people sleep. Volunteers are assigned to 1 of 2 groups. Volunteers in Group 1 are given the medication, and volunteers in Group 2 are given a placebo. Which of the following steps is necessary to ensure the scientific validity of the results?

- A. Assigning the subjects to each group at random
- B. Assigning all of the subjects with sleeping problems to the placebo group
- C. Telling subjects if they are receiving the medicine or the placebo
- D. Placing 100 volunteers in Group 1 and 10 volunteers in Group 2

- 8) Ethan wants to determine whether temperature affects the rate at which mold grows on bread. He puts one piece of bread inside a petri dish, closes the lid, and places the petri dish in the refrigerator. To determine whether temperature affects the growth of mold, Ethan should place another piece of bread into a petri dish:
- A. leave the dish uncovered, and place the dish in the refrigerator.
 - B. cover the dish, and place the dish in the refrigerator.
 - C. leave the dish uncovered, and place the dish in a dark, room temperature cabinet.
 - D. cover the dish, and place the dish in a dark, room temperature cabinet.
- 9) Carbon-14 is a radioactive isotope used to determine the age of objects composed of organic matter. Carbon-12 and carbon-13 are other isotopes of carbon. The number of what subatomic particle must differ among these 3 carbon isotopes?
- A. Electron
 - B. Neutron
 - C. Photon
 - D. Proton
- 10) Lead (Pb-208) is the heaviest stable isotope known. It has an atomic number of 82. How many neutrons does Pb-208 have?
- A. 82
 - B. 126
 - C. 164
 - D. 208

- 11) In glycerol ($C_3H_8O_3$), there is a hydroxyl group (OH) bound to each of the 3 carbon atoms.

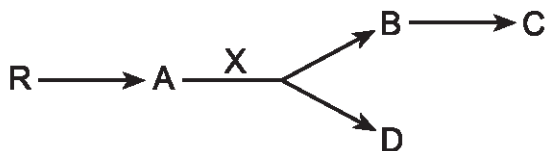


The bond between the oxygen atom of a hydroxyl group and a carbon atom in glycerol is best classified as what type of bond?

- A. Covalent
B. Hydrogen
C. Intermolecular
D. Ionic
- 12) In aerobic respiration, glucose ($C_6H_{12}O_6$) combines with oxygen (O_2) to yield carbon dioxide (CO_2) and water (H_2O). What is the balanced chemical equation for this reaction?
- A. $C_6H_{12}O_6 \rightarrow CO_2 + H_2O$
B. $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 H_2O$
C. $C_6H_{12}O_6 + O_2 \rightarrow 6 CO_2 + 6 H_2O$
D. $C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O$
- 13) Which of the following solutions has the greatest concentration of hydroxide ions (OH^-) ?
- A. Urine (pH 6.0)
B. Rainwater (pH 5.5)
C. Tomato juice (pH 4.0)
D. Gastric juice (pH 2.0)
- 14) When the pH in a stomach increases from 2 to 4, how does the hydrogen ion concentration change?
- A. It increases by a factor of 2.
B. It increases by a factor of 100.
C. It decreases by a factor of 2.
D. It decreases by a factor of 100.

- 15) Which statement most accurately describes the induced fit model of enzyme function?
- A. Substrate binding is not dependent upon the shape of the active site.
 - B. Competitive inhibitors block the substrate from the active site.
 - C. Substrate binding slightly changes the shape of the enzyme.
 - D. An enzyme creates a permanent bond with the substrate.

- 16) In this series of metabolic reactions, Compound R is converted into Compound A, and Enzyme X then catalyzes the conversion of Compound A into Compounds B and D. Compound B is converted to Compound C.



Assume that Compound C inhibits Enzyme X and that Compound C is not consumed in a subsequent reaction. As the concentration of Compound C increases, the rate of production of which compound is LEAST likely to decrease?

- A. A
 - B. B
 - C. C
 - D. D
- 17) How do enzymes speed up chemical reactions?
- A. By reducing activation energy
 - B. By reducing energy produced by the reaction
 - C. By increasing activation energy
 - D. By increasing energy produced by the reaction

- 18)** Two students conduct an experiment in which they measure the concentration of an enzyme in a test tube at 1 minute intervals over the course of a chemical reaction. Before beginning the experiment, each of the students makes a prediction about what will happen to the enzyme concentration as the reaction progresses.

Student 1 predicts that the concentration of the enzyme in the test tube will significantly decrease as the reaction progresses.

Student 2 predicts that the concentration of the enzyme in the test tube will not significantly decrease as the reaction progresses.

The results of the experiment will most likely support the prediction of which student?

- A.** Student 1; enzymes are consumed during a chemical reaction.
 - B.** Student 1; enzymes are not consumed during a chemical reaction.
 - C.** Student 2; enzymes are consumed during a chemical reaction.
 - D.** Student 2; enzymes are not consumed during a chemical reaction.
- 19)** The hydrolysis of which of the following molecules provides energy for muscle contraction?
- A.** ATP
 - B.** DNA
 - C.** Lactic acid
 - D.** Oxygen
- 20)** Naomi adds cycloheximide to cells grown in a test tube. Within minutes, she identifies short incomplete segments of proteins in the cells. On which organelle does cycloheximide act?
- A.** Endoplasmic reticulum
 - B.** Golgi apparatus
 - C.** Nucleus
 - D.** Ribosome

21) After Tyler adds a chemical to normally functioning cells, proteins begin to accumulate in the cells' endoplasmic reticula. This chemical most likely prevents movement of proteins from the endoplasmic reticulum to which organelle?

- A.** Golgi apparatus
- B.** Lysosome
- C.** Mitochondrion
- D.** Ribosome

22) A scientist adds an antibody specific to the actin protein to a prepared culture of macrophages. The macrophages exhibit active movement before, but not after, treatment. What is the most accurate conclusion about the function of actin?

- A.** Actin depolymerizes microtubular arrays.
- B.** Actin plays a role in the function of pseudopodia.
- C.** Actin disrupts cellular activities in the cytoskeleton.
- D.** Actin guides the movement of chromosomes in macrophages.

23) A paramecium lives in a relatively hypotonic environment. Which of these structures does the paramecium use to maintain homeostasis under these conditions, and how does it do so?

- A.** Contractile vacuole; by expelling water from the intracellular space into the extracellular space
- B.** Contractile vacuole; by absorbing water from the extracellular space into the intracellular space
- C.** Lysosome; by expelling water from the intracellular space into the extracellular space
- D.** Lysosome; by absorbing water from the extracellular space into the intracellular space

24) The cytoplasm of red blood cells has a higher concentration of Na^+ than does pure water. Suppose a biologist places a red blood cell in pure water. Is there a net flow of water molecules into or out of the red blood cell, and by which process does this net flow of water occur?

- A.** Out of the cell; osmosis
- B.** Into the cell; osmosis
- C.** Out of the cell; active transport
- D.** Into the cell; active transport

25) During aerobic cellular respiration, in which of the following locations do ATP molecules form?

- A.** Cytosol only
- B.** Mitochondrial matrix only
- C.** Mitochondrial matrix and outer mitochondrial membrane only
- D.** Cytosol, mitochondrial matrix, and outer mitochondrial membrane only

26) The process that is most directly responsible for the majority of the ATP produced during aerobic respiration is which of the following?

- A.** Fermentation
- B.** Glycolysis
- C.** Krebs cycle
- D.** Electron transport

27) In biology class, Keesha places a suspension of the green algae *Chlorella* in a growth chamber. She turns the light on in the growth chamber, then measures the change in the amount of CO₂ in the growth chamber over the next 15 minutes. She then repeats the experiment, using a growth chamber that is devoid of light. She finds that the amount of CO₂ in the lighted growth chamber decreases over time, while the amount of CO₂ in the dark growth chamber increases over time. The most likely explanation for her results is that, in the absence of light, CO₂:

- A. consumption by photosynthesis is greater than CO₂ production by cellular respiration.
- B. consumption by cellular respiration is greater than CO₂ production by photosynthesis.
- C. production by photosynthesis is greater than CO₂ consumption by cellular respiration.
- D. production by cellular respiration is greater than CO₂ consumption by photosynthesis.

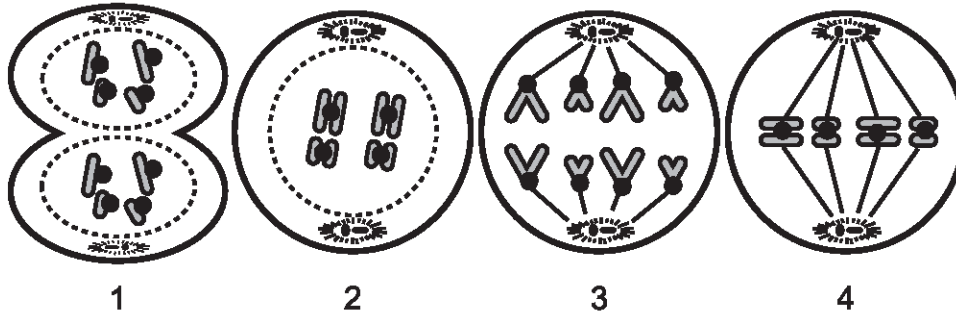
28) A single mitotic division of a human skin cell generally produces:

- A. 2 cells, each with 1 complete diploid set of chromosomes.
- B. 2 cells, each with 1 complete haploid set of chromosomes.
- C. 4 cells, each with 1 complete diploid set of chromosomes.
- D. 4 cells, each with 1 complete haploid set of chromosomes.

29) During what phase of mitosis do sister chromatids attached at the centromere first separate from one another as they begin to move toward the cell poles?

- A. Anaphase
- B. Metaphase
- C. Prophase
- D. Telophase

30) These diagrams represent different stages of animal cell division.



From start to finish, what is the correct order of the stages?

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

31) During metaphase I of meiosis, which of the following occurs?

- A. Centrioles of replicated chromosomes line up along the cell's equator.
- B. Sister chromatids separate and move toward opposite poles of the cell.
- C. Paired homologous chromosomes line up along the cell's equator.
- D. Homologous chromosomes separate and move toward opposite poles of the cell.

32) Nondisjunction can occur during which of the following phases?

- A. Metaphase I only
- B. Anaphase I only
- C. Metaphase I and II only
- D. Anaphase I and II only

- 33) In humans, pigmented skin is dominant to non-pigmented skin (albinism). What is the genotype of an individual with albinism?
- A. Carrier
 - B. Heterozygous
 - C. Homozygous dominant
 - D. Homozygous recessive
- 34) Suppose that a *Brassica rapa* plant has 2 alleles for dark green leaf color and has dark green leaves. A second *B. rapa* plant has 1 allele for dark green leaf color and 1 allele for yellow-green leaf color and has dark green leaves. Based on this information, which term best describes the relationship between these 2 alleles, in terms of the resulting phenotype, assuming that the leaf color character is controlled by a single gene?
- A. The alleles for the gene coding for leaf color are sex-linked.
 - B. The alleles for the gene coding for leaf color are codominant.
 - C. The allele for dark green leaf color is dominant to the allele for yellow-green leaf color.
 - D. The allele for yellow-green leaf color is dominant to the allele for dark green leaf color.
- 35) Horses born to 2 palomino (golden-coated) horses have a 25% chance of having a white coat, a 25% chance of having a chestnut (brown) coat, and a 50% chance of having a palomino coat. Which description of inheritance best explains the coat-color trait in these horses?
- A. Palomino coat color is a recessive trait.
 - B. Palomino coat color is a dominant trait.
 - C. Coat color is an incompletely dominant trait.
 - D. Coat color is a sex-linked trait.

- 36) Suppose that in humans, a certain type of color blindness is a recessive, X-linked trait. The chromosomes and alleles associated with this type of color blindness are represented in this chart.

<p>X = X chromosome Y = Y chromosome B = allele for normal color vision b = allele for color blindness</p>
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Which of these could NOT be a biological child of parents having the genotypes $X^B X^b$ and $X^B Y$?

- A. Color-blind son
 - B. Color-blind daughter
 - C. Daughter with normal color vision
 - D. Son with normal color vision
- 37) An individual with the genotype AaBb is crossed with an individual with the genotype AaBb. Assuming that these 2 genes are unlinked, what is the percent chance that their offspring will have the genotype AaBb?
- A. 50%
 - B. 25%
 - C. 12.5%
 - D. 6.25%
- 38) Suppose Condition A is an autosomal recessive trait that affects the nervous system. In one family, the father, mother, daughter, and elder son do not have Condition A, but the younger son has Condition A. Both of the individuals in which of the following pairs MUST be carriers of the Condition A allele?
- A. Father and elder son
 - B. Mother and daughter
 - C. Daughter and elder son
 - D. Mother and father

Answer Key

- 1) D
- 2) C
- 3) B
- 4) B
- 5) B
- 6) D
- 7) A
- 8) D
- 9) B
- 10) B
- 11) A
- 12) D
- 13) A
- 14) D
- 15) C
- 16) A
- 17) A
- 18) D
- 19) A
- 20) D
- 21) A
- 22) B
- 23) A
- 24) B
- 25) B
- 26) D
- 27) D
- 28) A
- 29) A
- 30) A
- 31) C
- 32) D
- 33) D
- 34) C
- 35) C
- 36) B
- 37) B

38) D