

ROUND 9

TOSS-UP

1) GENERAL SCIENCE *Multiple Choice* Which of the following terms characterizes DNA replication?

- W) Conservative
- X) Parallel
- Y) Dispersive
- Z) Semiconservative

ANSWER: Z) SEMICONSERVATIVE

BONUS

1) GENERAL SCIENCE *Short Answer* What is the maximum number of hydrogen bonds that a molecule of water can form with neighboring water molecules?

ANSWER: 4

TOSS-UP

2) MATH *Short Answer* How many x-intercepts are there in the parabola with the equation:
 $y = 7x^2 + 4x + 12$?

ANSWER: 0

BONUS

2) MATH *Short Answer* What is the greatest integer less than or equal to $\log_3(200)$?

ANSWER: 4

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following BEST describes electrostatic induction?

- W) It is caused by the influence of nearby charged objects
- X) It occurs between two charged objects
- Y) It transfers electrons from a charged object to a neutral object
- Z) It produces voltage across a conductor by means of a magnetic field

ANSWER: W) IT IS CAUSED BY THE INFLUENCE OF NEARBY CHARGED OBJECTS

BONUS

3) PHYSICAL SCIENCE *Short Answer* What two natural amino acids contain sulfur?

ANSWER: CYSTEINE AND METHIONINE

TOSS-UP

4) LIFE SCIENCE *Multiple Choice* Which of the following elements is responsible for stimulating muscle contractions?

- W) Iron
- X) Potassium
- Y) Calcium
- Z) Phosphorus

ANSWER: Y) CALCIUM

BONUS

4) LIFE SCIENCE *Multiple Choice* What makes the phosphorus cycle unique from the nitrogen, carbon, or oxygen cycles?

- W) It does not involve animals
- X) It is very short
- Y) It only occurs in rocks or soils
- Z) It does not significantly involve the atmosphere

ANSWER: Z) IT DOES NOT SIGNIFICANTLY INVOLVE THE ATMOSPHERE

TOSS-UP

5) GENERAL SCIENCE *Multiple Choice* Which of the following characterizes a muscle fiber?

- W) A multinucleate cell
- X) A single nucleus cell
- Y) A bundle of single nucleus cells
- Z) Non-cellular tissue

ANSWER: W) A MULTINUCLEATE CELL

BONUS

5) GENERAL SCIENCE *Short Answer* In a tidal river, during which phase or phases of the Moon will the salt water travel the furthest up river?

ANSWER: NEW MOON AND FULL MOON

TOSS-UP

6) PHYSICAL SCIENCE *Short Answer* In chemistry, what is the term for the settling of particles or sediment from a solution, suspension, or mixture onto a pre-existing surface?

ANSWER: DEPOSITION

BONUS

6) PHYSICAL SCIENCE *Short Answer* Name the four elements found in all amino acids.

ANSWER: CARBON, HYDROGEN, OXYGEN, AND NITROGEN

TOSS-UP

7) LIFE SCIENCE *Multiple Choice* Which of the following is the site where small and large subunits of ribosomes (read as: RY-boh-sōems) are assembled?

- W) Nucleolus (read as: n(y)uh-KLEE-oh-lus)
- X) Nucleoplasm
- Y) Golgi (read as: GOHL-jee) body
- Z) Nucleus

ANSWER: W) NUCLEOLUS

BONUS

7) LIFE SCIENCE *Multiple Choice* Which of the following is the role of DNA ligase in DNA replication?

- W) Joining the 3 prime end of the DNA that replaces the primer to the rest of the sequence
- X) Unwinding the parental DNA strand
- Y) Relieving strain caused by over-winding the DNA strand
- Z) Synthesis of an RNA primer

ANSWER: W) JOINING THE 3 PRIME END OF THE DNA THAT REPLACES THE PRIMER TO THE REST OF THE SEQUENCE

TOSS-UP

8) PHYSICAL SCIENCE *Multiple Choice* Which of the following is the lowest atomic number above which all elements are synthetic?

- W) 90
- X) 92
- Y) 95
- Z) 100

ANSWER: X) 92

BONUS

8) PHYSICAL SCIENCE *Short Answer* Assuming that g is 10 meters per second squared and providing your answer as a decimal to the nearest tenth, calculate the coefficient of friction for a 50 kilogram box, which experiences a force of 200 newtons of friction. being pulled at a constant velocity across a level surface.

ANSWER: 0.4

TOSS-UP

9) ENERGY *Multiple Choice* Assuming the potential difference remains constant, if the resistance of a circuit is doubled, which of the following will happen to the power dissipation?

- W) It will increase
- X) It will be zero
- Y) It will decrease by a fourth
- Z) It will be halved

ANSWER: Z) IT WILL BE HALVED

BONUS

9) ENERGY *Short Answer* By name or number, rank the following four kinds of coal in increasing order of alteration: 1) lignite, 2) bituminous (read as: by-TYUH-mi-nuhs), 3) anthracite (read as: AN-thrah-syt), 4) sub-bituminous (read as: sub-by-TYUH-mi-nuhs).

ANSWER: LIGNITE, SUB-BITUMINOUS, BITUMINOUS, ANTHRACITE (ACCEPT: 1, 4, 2, 3)

TOSS-UP

10) MATH *Short Answer* What is the smallest angle of rotational symmetry possible in an equilateral triangle?

ANSWER: 120

BONUS

10) MATH *Short Answer* The graph of the equation $y = 3x^2 - 2x + 4$ is translated 3 units to the left and 4 units up. What is the equation of the new graph in standard polynomial form?

ANSWER: $y = 3x^2 + 16x + 29$

TOSS-UP

11) EARTH AND SPACE SCIENCE *Short Answer* What is the prevailing wind direction between 9 and 25 degrees north in the trade wind belt of the Pacific Ocean?

ANSWER: EAST NORTHEAST (ACCEPT: NORTHEASTERLY)

BONUS

11) EARTH AND SPACE SCIENCE *Short Answer* A rock contains a radioactive substance with a half life of 15,000 years. After 87.5% has decayed, how many years have passed?

ANSWER: 45,000

TOSS-UP

12) PHYSICAL SCIENCE *Multiple Choice* Which of the following demonstrates Bernoulli's principle?

- W) Slower-moving fluid causing lower pressure
- X) Still fluid causing lower pressure
- Y) Faster-moving fluid causing higher pressure
- Z) Faster-moving fluid causing lower pressure

ANSWER: Z) FASTER-MOVING FLUID CAUSING LOWER PRESSURE

BONUS

12) PHYSICAL SCIENCE *Short Answer* By name or number, identify all of the following three longitudinal wave forms that correspond to transverse wave crests and troughs: 1) relaxations, 2) compressions, 3) rarefactions.

ANSWER: COMPRESSIONS AND RAREFACTIONS (ACCEPT: 2 AND 3)

TOSS-UP

13) EARTH AND SPACE SCIENCE *Multiple Choice* Water ice is NOT thought to be present on which of the following celestial bodies?

- W) Mars
- X) Venus
- Y) Earth's moon
- Z) Europa

ANSWER: X) VENUS

BONUS

13) EARTH AND SPACE SCIENCE *Short Answer* In what geologic eras, respectively, were the following three geologic periods: 1) Siderian, 2) Jurassic, 3) Paleogene?

ANSWER: PALOPROTEROZOIC, MESOZOIC, CENOZOIC

TOSS-UP

14) ENERGY *Multiple Choice* Transformers are based on the principle of electromagnetic induction, stated by which of the following laws?

- W) Faraday's
- X) Ampere's
- Y) Biot-Savart's
- Z) Lenz's

ANSWER: W) FARADAY'S

BONUS

14) ENERGY *Short Answer* If you have a mass of 200 kilograms traveling at a velocity of 3 meters per second, what is the kinetic energy of the mass in joules?

ANSWER: 900

TOSS-UP

15) LIFE SCIENCE *Multiple Choice* Which of the following plant cell components is responsible for making a connection between the cytoplasm of adjacent cells?

- W) Peroxisome (read as: peh-ROHK-si-sōem)
- X) Microfilaments
- Y) Plasmodesmata (read as: plahz-moh-DEHZ-mah-tah)
- Z) Centrosome

ANSWER: Y) PLASMODESMATA

BONUS

15) LIFE SCIENCE *Short Answer* By number, identify all of the following five characteristics which are TRUE of lancelets: 1) they are filter feeders; 2) they have an open circulatory system; 3) their blood is colorless; 4) they have no heart; 5) they have a tail.

ANSWER: 1, 3, 4, 5

TOSS-UP

16) MATH *Short Answer* Simplify $12 + (\sqrt{25} - \sqrt{16})^2$ (read as: 12 plus open parenthesis the square root of 25 minus the square root of 16 close parenthesis squared).

ANSWER: 13

BONUS

16) MATH *Short Answer* Sam pays \$33 each for 47 watches. How many must he sell for \$37 each to begin making a profit?

ANSWER: 42

TOSS-UP

17) LIFE SCIENCE *Short Answer* What is the term for an invasive malignant tumor that consists of transformed epithelial (read as: eh-pi-THEE-lee-ahl) cells?

ANSWER: CARCINOMA (DO NOT ACCEPT: CANCER)

BONUS

17) LIFE SCIENCE *Short Answer* What structure is created during plant cell mitosis (read as: my-TŌE-sis) that is NOT present in the splitting of animal cells?

ANSWER: CELL PLATE

TOSS-UP

18) ENERGY *Short Answer* In producing clean coal, sulfur dioxide emissions react with a mixture of limestone and water in order to produce what substance used in the construction industry?

ANSWER: GYPSUM

BONUS

18) ENERGY *Short Answer* By name or number, rank the following four states from least to greatest in terms of predicted mean annual wind speeds at an altitude of 80 meters: 1) Florida, 2) Nebraska, 3) Maine, 4) Minnesota.

ANSWER: FLORIDA, MAINE, MINNESOTA, NEBRASKA (ACCEPT: 1, 3, 4, 2)

TOSS-UP

19) LIFE SCIENCE *Short Answer* Sea stars belong to which phylum (read as: FY-luhm)?

ANSWER: ECHINODERMATA

BONUS

19) LIFE SCIENCE *Multiple Choice* Which of the following is typically the most detrimental type of point mutation?

- W) Silent mutation
- X) Small nucleotide polymorphism
- Y) Intronic mutation
- Z) Frameshift mutation

ANSWER: Z) FRAMESHIFT MUTATION

TOSS-UP

20) EARTH AND SPACE SCIENCE *Short Answer* What major nonsilicate rock-forming mineral is the primary constituent of limestone?

ANSWER: CALCITE

BONUS

20) EARTH AND SPACE SCIENCE *Short Answer* What is the main mineral component of Gabbro?

ANSWER: PLAGIOCLASE FELDSPAR

TOSS-UP

21) MATH *Short Answer* What is the numerical value of 94 times 86?

ANSWER: 8084

BONUS

21) MATH *Short Answer* A regular hexagon is inscribed in a circle with diameter 16 centimeters. What is the perimeter, in centimeters, of the hexagon?

ANSWER: 48

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Which of the following statements is true regarding the gravitational force of the Sun on an asteroid that orbits it?

- W) It is not dependent on the mass of the Sun
- X) It is not dependent on the mass of the asteroid
- Y) It is equal and opposite with respect to the gravitational force exerted by the asteroid on the Sun
- Z) It is greater than the gravitational force exerted by the asteroid on the Sun

ANSWER: Y) IT IS EQUAL AND OPPOSITE WITH RESPECT TO THE GRAVITATIONAL FORCE EXERTED BY THE ASTEROID ON THE SUN

BONUS

22) GENERAL SCIENCE *Multiple Choice* A new protein is discovered and scientists have deduced its chemical formula. To determine the 3-D shape of the protein, which of the following would be the appropriate step to take?

- W) Use computers to determine the 3-D shape based on its amino acid composition
- X) Solidify it and use X-ray crystallography
- Y) Use a microscope to determine its tertiary and quaternary structures
- Z) Chemically break up the protein into smaller components to determine the overall structure

ANSWER: X) SOLIDIFY IT AND USE X-RAY CRYSTALLOGRAPHY

TOSS-UP

23) EARTH AND SPACE SCIENCE *Short Answer* The Yellowstone Volcano is created by what type of anomalously hot volcanic center?

ANSWER: MANTLE PLUME (ACCEPT: HOT SPOT)

BONUS

23) EARTH AND SPACE SCIENCE *Short Answer* If when viewing the Moon in the Southern Hemisphere, the crescent's endpoints point toward the observer's right side, what will be the next phase of the Moon?

ANSWER: QUARTER MOON

TOSS-UP

24) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a major contributor to ocean mixing?

- W) Changes in temperature
- X) Heavy rainfall
- Y) Major storms
- Z) Changes in density

ANSWER: X) HEAVY RAINFALL

BONUS

24) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT one of the substituents attached to the asymmetric carbon of an amino acid?

- W) Carboxyl group
- X) Carbonyl group
- Y) Amine group
- Z) Hydrogen atom

ANSWER: X) CARBONYL GROUP

TOSS-UP

25) PHYSICAL SCIENCE *Short Answer* With respect to atomic orbitals, what is the maximum number of electrons in the second energy level?

ANSWER: 8

BONUS

25) PHYSICAL SCIENCE *Multiple Choice* Which of the following best describes the law of multiple proportions?

- W) When two pure substances react to form a compound, they do so in a definite proportion by mass
- X) When two substances react with each other to form a compound, they do so in multiple proportions according to their mass
- Y) When one element can combine with another to form more than one compound, the mass ratios of the elements in the compounds are simple whole-number ratios of each other
- Z) There is no change in total mass during a chemical change

ANSWER: Y) WHEN ONE ELEMENT CAN COMBINE WITH ANOTHER TO FORM MORE THAN ONE COMPOUND, THE MASS RATIOS OF THE ELEMENTS IN THE COMPOUNDS ARE SIMPLE WHOLE-NUMBER RATIOS OF EACH OTHER