

ROUND 5

TOSS-UP

1) MATH *Multiple Choice* Which of the following does NOT represent a function?

W) $x = 4$

X) $y = 4$

Y) $y = x^2$

Z) $y = 2x - 8$

ANSWER: W) $x = 4$

BONUS

1) MATH *Short Answer* You have a right circular cylinder with a radius of 6 inches and a height of 6 inches. You drop a ball with a radius of 3 inches into the cylinder. How much empty space, in cubic inches and in terms of π , remains in the cylinder?

ANSWER: 180π

TOSS-UP

2) EARTH AND SPACE SCIENCE *Multiple Choice* If you walked the full extent of each of the following lines, which would be the shortest in length?

W) 0° Latitude

X) 0° Longitude

Y) 45°N Latitude

Z) 45°E Longitude

ANSWER: Y) 45°N LATITUDE

BONUS

2) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following pairs of rocks are formed by volcanic froth creating a vesicular texture?

W) Obsidian (read as: ohb-SI-dee-ahn) and pumice

X) Pumice and scoria

Y) Scoria and shale

Z) Feldspar and quartz

ANSWER: X) PUMICE AND SCORIA

TOSS-UP

3) ENERGY *Multiple Choice* Which of the following statements is NOT true about modern evaporative coolers?

- W) They cool the air through the evaporation of water
- X) They produce an odor of algae
- Y) They are well suited for climates where the air is hot and the humidity is low
- Z) They provide little thermal comfort in highly humid climates

ANSWER: X) THEY PRODUCE AN ODOR OF ALGAE

BONUS

3) ENERGY *Short Answer* What kind of device is powered by moving water but is different from traditional hydropower turbines in that it is placed directly in a river, ocean, or tidal current?

ANSWER: HYDROKINETIC TURBINE

TOSS-UP

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following is NOT a naturally occurring polymer?

- W) Protein
- X) Cellulose
- Y) Sucrose
- Z) Deoxyribonucleic (read as: dee-OHK-si-ry-bōe-NUH-kleye-ik) acid

ANSWER: Y) SUCROSE

BONUS

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following is closest to the theoretical mechanical advantage of a screw with a mean diameter of 1 centimeter and a lead of 2 millimeters?

- W) 2
- X) 5
- Y) 8
- Z) 16

ANSWER: Z) 16

TOSS-UP

5) LIFE SCIENCE *Short Answer* What structural component of the cell cytoskeleton is shaped like a hollow tube?

ANSWER: MICROTUBULE

BONUS

5) LIFE SCIENCE *Short Answer* By name or number, identify all of the following four choices that are NOT considered lipids: 1) cholesterol, 2) steroids, 3) cellulose, 4) sex hormones.

ANSWER: CELLULOSE (ACCEPT: 3)

TOSS-UP

6) MATH *Multiple Choice* Which of the following lines has the steepest slope?

W) $y = 2x - 4$

X) $-x + y = 4$

Y) $2y = 3x + 8$

Z) $4y = 5x + 12$

ANSWER: W) $y = 2x - 4$

BONUS

6) MATH *Short Answer* What is the surface area, in square feet, of a box that measures half of a foot by half of a foot by a quarter of a foot?

ANSWER: 1

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* You want to chill a can of soda. You should place it in a bucket filled with which of the following for it to chill the fastest?

- W) Ice
- X) Fresh water and ice
- Y) Ice with salt
- Z) Salty water and ice

ANSWER: Z) SALTY WATER AND ICE

BONUS

7) GENERAL SCIENCE *Short Answer* What is the name of the process that causes an electrical current in a changing magnetic field?

ANSWER: ELECTROMAGNETIC INDUCTION (ACCEPT: INDUCTION)

TOSS-UP

8) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is the name of the glacial deposit that is formed as a stream flows underneath a glacier?

- W) Drumlin
- X) Kame (read as: CAME)
- Y) Esker
- Z) Erratic

ANSWER: Y) ESKER

BONUS

8) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following best represents why two igneous rocks may have the same minerals but different names?

- W) Found in different places
- X) Different sizes
- Y) Different colors
- Z) Different textures

ANSWER: Z) DIFFERENT TEXTURES

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* A pure tone is played softly, and then the volume is increased. Which of the following statements best describes what occurs with respect to the sound waves given off when the volume is increased?

- W) The amplitude increases
- X) The frequency increases
- Y) The amplitude decreases
- Z) The frequency decreases

ANSWER: W) THE AMPLITUDE INCREASES

BONUS

9) GENERAL SCIENCE *Short Answer* By name or number, identify all of the following four choices that are amorphous solids: 1) glass, 2) rubber, 3) ice, 4) wax.

ANSWER: GLASS, RUBBER, AND WAX (ACCEPT: 1, 2, AND 4)

TOSS-UP

10) LIFE SCIENCE *Multiple Choice* Which of the following factors does NOT affect the rate of photosynthesis?

- W) Temperature
- X) Amount of free oxygen
- Y) Amount of carbon dioxide
- Z) Light intensity

ANSWER: X) AMOUNT OF FREE OXYGEN

BONUS

10) LIFE SCIENCE *Short Answer* The light-dependent reactions of photosynthesis occur on which membrane-bound compartment inside chloroplasts?

ANSWER: THYLAKOID

TOSS-UP

11) GENERAL SCIENCE *Short Answer* In what direction does an observer have to look in order to see Venus at sunset?

ANSWER: WEST

BONUS

11) GENERAL SCIENCE *Multiple Choice* Which of the following serves as the reproductive location for the American eel?

- W) Baltic Sea
- X) Sargasso Sea
- Y) Pacific Ocean
- Z) Hudson Bay

ANSWER: X) SARGASSO SEA

TOSS-UP

12) MATH *Short Answer* The point (-3, -2) is reflected through the line $y = -x$. What are the coordinates of its image?

ANSWER: (2, 3)

BONUS

12) MATH *Short Answer* Providing your answer in simplest radical form, what is the distance, in units, between the points (2, 3) and (-2, 8)?

ANSWER: $\sqrt{41}$

TOSS-UP

13) PHYSICAL SCIENCE *Short Answer* How many valence electrons do the alkaline earth metals possess?

ANSWER: 2

BONUS

13) PHYSICAL SCIENCE *Short Answer* By name or number, rank the following five substances from lowest to highest on the pH scale: 1) water, 2) soap, 3) stomach acid, 4) blood, 5) soda pop.

ANSWER: STOMACH ACID, SODA POP, WATER, BLOOD, SOAP (ACCEPT: 3, 5, 1, 4, 2)

TOSS-UP

14) LIFE SCIENCE *Short Answer* What is the name of the junction between two neurons?

ANSWER: SYNAPSE

BONUS

14) LIFE SCIENCE *Multiple Choice* If a cell is placed in a hypotonic solution, what effect will osmosis have on the cell?

- W) It will remain the same
- X) It will become turgid or lyse
- Y) It will lose ions
- Z) It will shrivel or plasmolyze

ANSWER: X) IT WILL BECOME TURGID OR LYSE

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* A student waters a plant with salt water and measures growth over the course of two weeks. She creates a graph of her data. Which variables should she put on the x and y axes?

- W) Time on the x axis and amount of salt on the y axis
- X) Amount of salt on the x axis and plant size on the y axis
- Y) Plant size on the x axis and time on the y axis
- Z) Time on the x axis and plant size on the y axis

ANSWER: Z) TIME ON THE X AXIS AND PLANT SIZE ON THE Y AXIS

BONUS

15) GENERAL SCIENCE *Multiple Choice* If a Celsius thermometer shows a temperature reading of 41°, which of the following is the closest temperature in degrees Fahrenheit?

- W) 97
- X) 102
- Y) 106
- Z) 111

ANSWER: Y) 106

TOSS-UP

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following mixtures is made of liquids that are miscible?

- W) Salad dressing
- X) Pizza
- Y) Gasoline
- Z) Water

ANSWER: Y) GASOLINE

BONUS

16) PHYSICAL SCIENCE *Short Answer* If you suspend two empty aluminum soda cans next to each other and blow quickly between them, how will the cans move with respect to each other?

ANSWER: THEY WILL MOVE TOWARDS EACH OTHER

TOSS-UP

17) EARTH AND SPACE SCIENCE *Multiple Choice* Where is the water along a stream's meander expected to move most quickly?

- W) Along the bottom waters
- X) Along the surface waters
- Y) Along the outside bank
- Z) Along the inside bank

ANSWER: Y) ALONG THE OUTSIDE BANK

BONUS

17) EARTH AND SPACE SCIENCE *Multiple Choice* Igneous rocks that contain the last minerals to crystallize from magma, and consist mainly of sodium and potassium feldspars and quartz are said to have which of the following compositions?

- W) Lithic
- X) Mafic
- Y) Felsic
- Z) Gneissic (read as: NYS-ik)

ANSWER: Y) FELSIC

TOSS-UP

18) PHYSICAL SCIENCE *Short Answer* Four identical 4 ohm resistors are connected in series. What is the total resistance in ohms?

ANSWER: 16

BONUS

18) PHYSICAL SCIENCE *Multiple Choice* In 1986, the Chernobyl nuclear power plant released several radioactive isotopes into the environment. Which of the following radioactive isotopes is most likely to have replaced the calcium in the bones of people who lived near Chernobyl?

- W) Strontium
- X) Iodine
- Y) Cesium
- Z) Plutonium

ANSWER: W) STRONTIUM

TOSS-UP

19) ENERGY *Short Answer* What is the term for the solid, organic by-products of wastewater treatment?

ANSWER: BIOSOLIDS (ACCEPT: TREATED SLUDGE)

BONUS

19) ENERGY *Multiple Choice* Which of the following is NOT a benefit of using biosolids in compost?

- W) They retain moisture
- X) They have nutrient-rich composition
- Y) They promote microbial diversity
- Z) They generate bioaerosols which add additional nutrients into nearby soils

ANSWER: Z) THEY GENERATE BIOAEROSOLS WHICH ADD ADDITIONAL NUTRIENTS INTO NEARBY SOILS

TOSS-UP

20) MATH *Multiple Choice* Which of the following angles in degrees cannot be constructed using only compass and straightedge?

- W) 15
- X) 20
- Y) 30
- Z) 45

ANSWER: X) 20

BONUS

20) MATH *Short Answer* Consider the line $y = 2x + 1$. For what values of x will x and y have the same sign?

ANSWER: x IS LESS THAN $-\frac{1}{2}$ OR x IS GREATER THAN 0

TOSS-UP

21) EARTH AND SPACE SCIENCE *Multiple Choice* Soils that have an abundance of which of the following generally have the greatest rate of permeability?

- W) Sand
- X) Silt
- Y) Clay
- Z) Humus

ANSWER: W) SAND

BONUS

21) EARTH AND SPACE SCIENCE *Short Answer* Titan, one of Saturn's moons, has an average temperature far below the triple point of water. Instead, it has solid, liquid, and vapor phases of what compound?

ANSWER: METHANE

TOSS-UP

22) PHYSICAL SCIENCE *Short Answer* What is the SI unit of inductance?

ANSWER: HENRY

BONUS

22) PHYSICAL SCIENCE *Short Answer* If a car goes from 0 to 20 meters per second in 8 seconds, providing your answer as a decimal to the nearest tenth, what is its average acceleration in meters per second squared?

ANSWER: 2.5

TOSS-UP

23) EARTH AND SPACE SCIENCE *Short Answer* What occurs when air is rapidly superheated by lightning and expands, cools, and then contracts?

ANSWER: THUNDER

BONUS

23) EARTH AND SPACE SCIENCE *Short Answer* Due to the presence of folds in the Appalachian Mountains, what type of drainage would you expect to find there?

ANSWER: TRELLIS

TOSS-UP

24) ENERGY *Multiple Choice* Which of the following animals requires the most energy to survive?

- W) Marmot
- X) Lizard
- Y) Salmon
- Z) Frog

ANSWER: W) MARMOT

BONUS

24) ENERGY *Short Answer* Name two radioactive isotopes released from the Fukushima Daiichi nuclear power plant, crippled by the March 11, 2011 earthquake and tsunami.

ANSWER: IODINE-131 AND CESIUM-137 (ACCEPT: IODINE-132, CESIUM-134, TELLURIUM-132)

TOSS-UP

25) LIFE SCIENCE *Multiple Choice* Which of the following best describes a karyotype (read as: KAH-ree-oh-ty)?

- W) A region of the chromosome where the two sister chromatids are held together
- X) An organized visual profile of the chromosomes
- Y) Chromosomes that occur singly
- Z) Chromosomes found in mitochondria (read as: my-toh-KOHN-dree-ah) and chloroplasts

ANSWER: X) AN ORGANIZED VISUAL PROFILE OF THE CHROMOSOMES

BONUS

25) LIFE SCIENCE *Multiple Choice* For which of the following situations would active transport be required?

- W) Movement of ethanol across a cell membrane
- X) Releasing oxygen produced by photosynthesis
- Y) Releasing carbon dioxide produced by respiration
- Z) Moving molecules against a concentration gradient

ANSWER: Z) MOVING MOLECULES AGAINST A CONCENTRATION GRADIENT