

ROUND 14

TOSS-UP

1) LIFE SCIENCE *Multiple Choice* Assume a cell is placed in a hypotonic solution. Which of the following will happen to the cell?

- W) The pressure inside the cell will increase
- X) The pressure inside the cell will remain the same
- Y) The pressure inside the cell will decrease
- Z) Dissolved particles outside the cell will move into the cell

ANSWER: W) THE PRESSURE INSIDE THE CELL WILL INCREASE

BONUS

1) LIFE SCIENCE *Short Answer* What are the four main classifications of tissue found in the human body?

ANSWER: EPITHELIUM, CONNECTIVE, MUSCLE AND NERVOUS

TOSS-UP

2) GENERAL SCIENCE *Short Answer* A chemist just discovered a jar of sodium hydroxide solution in a dark corner of his laboratory. He has no idea what the concentration of this sodium hydroxide solution is. However, he does have an indicator and a jar of 1 molar hydrochloric acid. What experiment could he use to determine the concentration of the sodium hydroxide solution?

ANSWER: TITRATION

BONUS

2) GENERAL SCIENCE *Short Answer* Bleach is a very strong disinfectant. It is a basic solution of NaOCl and, when mixed with water, forms ClO⁻ ions. Bleach should never be mixed with ammonia because the ClO⁻ ions react to form what deadly gas?

ANSWER: CHLORAMINE (ACCEPT: NH₂Cl or MONOCHLORAMINE; DO NOT ACCEPT: CHLORINE)

TOSS-UP

3) MATH *Multiple Choice* If a student takes a test consisting of 20 true-false questions and randomly guesses at all of the answers, which of the following is equal to the probability that all 20 guesses will be correct?

- W) $(1/2)^{20}$ [**one half to the power of 20**]
- X) $(1/2)^{10}$ [**one half to the power of 10**]
- Y) $1/2(20)$ [**the product of one half and 20**]
- Z) $1/2$

ANSWER: W) $(1/2)^{20}$

BONUS

3) MATH *Short Answer* The volume of a cube is $16\sqrt{2}$. What is its surface area?

ANSWER: 48

TOSS-UP

4) ENERGY *Multiple Choice* Which of the following statements is NOT true about the Inga Falls?

- W) They are in the Democratic Republic of Congo
- X) They are on the Zambezi River
- Y) They are the largest waterfall by volume in the world
- Z) A plant planned there would potentially generate twice as much electricity as China's Three Gorges Dam

ANSWER: X) THEY ARE ON THE ZAMBEZI RIVER

BONUS

4) ENERGY *Short Answer* Identify all of the following three dams that are arch dams: 1) Hoover, 2) Pensacola, 3) Grand Coulee.

ANSWER: 1, 2 (ACCEPT: HOOVER, PENSACOLA)

TOSS-UP

5) EARTH AND SPACE *Multiple Choice* The ozone layer is most effective as a defense against which of the following kinds of radiation?

- W) Infrared radiation
- X) Cosmic rays
- Y) UV-A
- Z) UV-B

ANSWER: Z) UV-B

BONUS

5) EARTH AND SPACE *Short Answer* In the hydrologic cycle, water is lost from the Earth's surface to the atmosphere, and returned to the surface again. What are three ways water can be lost to the atmosphere?

ANSWER: (ANY THREE) EVAPORATION, SUBLIMATION, TRANSPIRATION, EVAPOTRANSPIRATION, RESPIRATION

TOSS-UP

6) PHYSICAL SCIENCE *Short Answer* Give the phrase for the acronym L.A.S.E.R., describing the physical process through which laser light is produced.

ANSWER: LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION

BONUS

6) PHYSICAL SCIENCE *Short Answer* On the football field, a 90 kilogram man running at 10 kilometers per hour runs into a 110 kilogram man who is stationary. What is the final velocity, in kilometers per hour, after collision?

ANSWER: 4.5

TOSS-UP

7) LIFE SCIENCE *Short Answer* Proteorhodopsins [*proh-tee-uh-roh-DOP-sins*] are light-absorbing proteins that can help marine bacteria survive periods of starvation by pumping what outside of the cell to sustain the production of ATP?

ANSWER: PROTONS

BONUS

7) LIFE SCIENCE *Short Answer* Electron transport in photosynthesis is a series of steps to generate ATP, starting with an electron coming from hydrolyzed water to replace a lost electron in chlorophyll of photosystem II. By number, put the following four steps in order to summarize the movement of this electron.

- 1) The electron-acceptor molecule transfers the electrons along a series of electron-carriers to photosystem I
- 2) Ferredoxin transfers the electrons to NADP⁺ to form NADPH
- 3) In photosystem II, light excited electrons move from chlorophyll to an electron-acceptor molecule in the thylakoid membrane
- 4) Photosystem I transfers the electrons to a protein complex

ANSWER: 3, 1, 4, 2

TOSS-UP

8) GENERAL SCIENCE *Short Answer* Ceratopsian [*ser-uh-TOP-see-uhn*] fossils have been found on what three continents?

ANSWER: ASIA, NORTH AMERICA, EUROPE

BONUS

8) GENERAL SCIENCE *Short Answer* Through studying earthquakes, scientists have discovered that there are certain regions along faults where the rock is locked and unable to move, the strain in the surrounding rock has increased, and no major earthquake has occurred in that location for a long period of time. What are these areas called?

ANSWER: SEISMIC GAPS

TOSS-UP

9) MATH *Short Answer* The midpoint of a segment is the point (-1, 5). If one endpoint of the segment is (-3, 2), what are the coordinates of the other endpoint?

ANSWER: (1, 8)

BONUS

9) MATH *Short Answer* Ted wants to put a fence around his garden to keep out rabbits. He has 600 feet of fencing and will use at least half of it. The garden is in the shape of a right triangle with sides in the ratio of 5 to 12 to 13. What are the minimum and maximum possible lengths for the shortest side of the triangular garden in feet, respectively?

ANSWER: MINIMUM = 50, MAXIMUM = 100

TOSS-UP

10) ENERGY *Multiple Choice* Which of the following statements is NOT true about energy in Mississippi?

- W) Mississippi generates about 10 percent of its electricity from renewable energy sources
- X) A liquefied natural gas import terminal in Pascagoula re-gassifies super-cooled natural gas
- Y) Its ethanol plant produces 54 million gallons of biofuel annually
- Z) Its Grand Gulf nuclear power plant generates about 18% of its electricity

ANSWER: W) MISSISSIPPI GENERATES ABOUT 10 PERCENT OF ITS ELECTRICITY FROM RENEWABLE ENERGY SOURCES

BONUS

10) ENERGY *Short Answer* In September 2012, the first power from any ocean energy project was delivered to a U.S. electric utility grid. What was the source of the energy, and in what state was it located?

ANSWER: TIDAL, MAINE

TOSS-UP

11) EARTH AND SPACE *Short Answer* Where do magnetic field lines exiting near the Earth's South Pole re-enter?

ANSWER: NEAR THE NORTH POLE (ACCEPT: NORTH POLE)

BONUS

11) EARTH AND SPACE *Short Answer* Name the four main layers of a tropical rainforest.

ANSWER: EMERGENT, CANOPY, UNDERSTORY, FLOOR

TOSS-UP

12) PHYSICAL SCIENCE *Multiple Choice* Two sound waves with the same frequency are traveling collinearly and off in phase by one half of one wavelength. Which of the following describes what an observer standing in the path of the waves would hear in comparison to if there were only one wave?

- W) Nothing
- X) Half the intensity of the single wave
- Y) The same intensity as the single wave
- Z) Double the intensity of the single wave

ANSWER: W) NOTHING

BONUS

12) PHYSICAL SCIENCE *Short Answer* Identify all of the following four elements that are naturally diatomic or polyatomic elements: 1) nitrogen, 2) silicon, 3) phosphorous, 4) selenium.

ANSWER: 1, 3, 4 (ACCEPT: NITROGEN, PHOSPHOROUS, SELENIUM)

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* When your body tissues need more calcium, what endocrine structure is activated to signal the release of more calcium into your blood?

- W) Follicular cells of the thyroid
- X) Parathyroid gland
- Y) Adrenal glands
- Z) Pituitary glands

ANSWER: X) PARATHYROID GLAND

BONUS

13) LIFE SCIENCE *Short Answer* Teleosts [**TEL-ee-osts**] is the name given to the wide variety of fishes with hard bones made from calcium. What is the name given to the group of fishes including sharks and rays that do not have hard bones?

ANSWER: CARTILAGINOUS FISH

TOSS-UP

14) GENERAL SCIENCE *Multiple Choice* Which of the following best describes a cyclotron?

- W) A circular nuclear reactor
- X) A circular atomic particle accelerator
- Y) A round cathode ray tube
- Z) A special x-ray machine that uses a circular exposure chamber

ANSWER: X) A CIRCULAR ATOMIC PARTICLE ACCELERATOR

BONUS

14) GENERAL SCIENCE *Multiple Choice* The membrane of a cell consists of a lipid bilayer. How are phospholipids [**fos-foh-LIP-ids**] oriented in the bilayer?

- W) The nonpolar phosphate end faces the exterior of the membrane
- X) The nonpolar phosphate end faces the interior of the membrane
- Y) The hydrophilic fatty acid chain faces the interior of the membrane
- Z) The hydrophobic fatty acid chain faces the interior of the membrane

ANSWER: Z) THE HYDROPHOBIC FATTY ACID CHAIN FACES THE INTERIOR OF THE MEMBRANE

TOSS-UP

15) MATH *Multiple Choice* Solve the following equation for x over the real numbers: $8^x = 16$ [**8 to the power of x equals 16**]?

W) $\frac{1}{2}$

X) $\frac{3}{4}$

Y) $\frac{4}{3}$

Z) 2

ANSWER: Y) $\frac{4}{3}$

BONUS

15) MATH *Short Answer* Mary hikes 7 kilometers north, then 6 kilometers west, then 5 kilometers north again, and finally 4 kilometers west again. To the nearest whole kilometer, how far is Mary from the starting point of her hike?

ANSWER: 16

TOSS-UP

16) ENERGY *Multiple Choice* In an average home, which of the following end uses would be most likely to use three-phase power?

W) Microwave

X) Kitchen lights

Y) Dryer

Z) Television

ANSWER: Y) DRYER

BONUS

16) ENERGY *Short Answer* Given the same thickness of frying pan, rank the following four materials that will allow heat from the burner to heat an egg from quickest to slowest: 1) copper, 2) cast iron, 3) aluminum, 4) Pyrex glass.

ANSWER: 1, 3, 2, 4 (ACCEPT: COPPER, ALUMINUM, CAST IRON, PYREX GLASS)

TOSS-UP

17) EARTH AND SPACE *Multiple Choice* From a geological perspective, what is the tallest mountain on Earth?

- W) Mauna Kea
- X) Mount Kilimanjaro
- Y) K2
- Z) Mount Everest

ANSWER: W) MAUNA KEA

BONUS

17) EARTH AND SPACE *Short Answer* What are three main factors that influence wave heights?

ANSWER: (ACCEPT THREE) FETCH, WIND SPEED, WIND DURATION, DEPTH

TOSS-UP

18) PHYSICAL SCIENCE *Multiple Choice* Which of the following sets of information would NOT be sufficient to calculate the acceleration of an object with an initial velocity of 0?

- W) The final velocity of the object and the time taken to reach that velocity
- X) The final velocity and the displacement of the object
- Y) The final speed, displacement, and time taken to reach that speed
- Z) The final speed, final position, and time taken to reach that position

ANSWER: Z) THE FINAL SPEED, FINAL POSITION, AND TIME TAKEN TO REACH THAT POSITION

BONUS

18) PHYSICAL SCIENCE *Multiple Choice* Field lines can be difficult to represent in a drawing because they are actually three-dimensional. Which of the following is a common mistake you might make when drawing field lines?

- W) Starting on a negative charge and ending on a positive surface
- X) Placing lines close together for stronger fields
- Y) Drawing the lines going out to infinity for an isolated charged body
- Z) Drawing shorter lines when further from the source charge

ANSWER: W) STARTING ON A NEGATIVE CHARGE AND ENDING ON A POSITIVE SURFACE

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following types of carbohydrate is found in animals and is considered to be structural?

- W) Glycogen [**GLY-kuh-juhn**]
- X) Cellulose
- Y) Chitin [**KY-tin**]
- Z) Fructose

ANSWER: Y) CHITIN

BONUS

19) LIFE SCIENCE *Short Answer* The world's smallest cetacean [**si-TAY-shuhn**] is endemic to the Sea of Cortez. What is its common name?

ANSWER: VAQUITA

TOSS-UP

20) GENERAL SCIENCE *Multiple Choice* Which of the following is a polysaccharide [**pol-ee-SAK-uh-ryd**] that is used for storing energy in plants?

- W) Glycogen [**GLY-kuh-juhn**]
- X) Chitin [**KY-tin**]
- Y) Amylose [**AM-uh-lohs**]
- Z) Fructose

ANSWER: Y) AMYLOSE

BONUS

20) GENERAL SCIENCE *Multiple Choice* Children with a certain disease known as Cri du Chat [**KREE doo SHAT**] syndrome have a distinctive cat-like cry, along with cognitive impairments, motor and speech impairments, behavioral problems, and unusual facial features. What is the underlying cause of this disease?

- W) A chromosome 5 deletion
- X) Trisomy 21
- Y) Prenatal alcohol exposure
- Z) An extra Y chromosome

ANSWER: W) A CHROMOSOME 5 DELETION

TOSS-UP

21) MATH *Short Answer* What are the coordinates of the point that is two-thirds of the way from (8, 13) to (-7, 1)?

ANSWER: (-2, 5)

BONUS

21) MATH *Short Answer* Given that x is positive, $x - y = 4$ and $xy = 60$, what is $x + y$?

ANSWER: 16

TOSS-UP

22) EARTH AND SPACE *Multiple Choice* Which of the following is a characteristic adaptation of a desert plant?

- W) Permeable leaves
- X) Decreased leaf size
- Y) Short tap roots
- Z) Decreased water storage

ANSWER: X) DECREASED LEAF SIZE

BONUS

22) EARTH AND SPACE *Short Answer* On the Equinox, if the Sun crosses the meridian at 12 noon, at what time would a full moon rise?

ANSWER: 6 P.M.

TOSS-UP

23) GENERAL SCIENCE *Multiple Choice* A hillside composed of clastic sediments exposes a thick band of deep red color. Which of the following was likely present when this sediment formed?

- W) Large quantities of oxygen and iron
- X) Large quantities of carbon dioxide dissolved in lifeless ocean water
- Y) A frigid atmosphere
- Z) Plant matter that accumulated in a reducing environment

ANSWER: W) LARGE QUANTITIES OF OXYGEN AND IRON

BONUS

23) GENERAL SCIENCE *Multiple Choice* Which of the following artificial sweeteners must be avoided by people who suffer from phenylketonuria [*fen-l-kee-toh-NOOR-ee-uh*]?

- W) Sucralose [*SOO-kruh-lohs*]
- X) Saccharin [*SAK-er-in*]
- Y) Aspartame [*uh-SPAHR-taym*]
- Z) Cyclamate

ANSWER: Y) ASPARTAME

TOSS-UP

24) LIFE SCIENCE *Short Answer* What is the structure found in the bark of woody stems where gaseous exchange occurs?

ANSWER: LENTICEL

BONUS

24) LIFE SCIENCE *Multiple Choice* In 1986, Lynn Margulis proposed the endosymbiont [*en-doh-SIM-be-ont*] theory. Which of the following is NOT evidence for this recent theory?

- W) Mitochondria [*my-tuh-KON-dree-uh*] and chloroplasts reproduce by fission
- X) Mitochondria and chloroplasts contain their own DNA, which is arranged in a circular pattern as found in prokaryotes [*proh-KAR-ee-ohts*]
- Y) Mitochondria and chloroplasts contain peptidoglycan [*pep-TI-doh-GLY-kuhn*] in their outer membranes like some prokaryotes
- Z) Mitochondria and chloroplasts contain ribosomes that resemble ribosomes [*RY-buh-sohms*] in prokaryotes

ANSWER: Y) MITOCHONDRIA AND CHLOROPLASTS CONTAIN PEPTIDOGLYCAN IN THEIR OUTER MEMBRANES LIKE SOME PROKARYOTES

TOSS-UP

25) PHYSICAL SCIENCE *Multiple Choice* Which of the following is true of the gravitational force between two point masses?

- W) When two masses are half as far apart, the force exerted on one by the other will be two times as large
- X) When one mass is twice as large as the other, the force exerted on the smaller mass is twice as large as the force exerted on the larger mass
- Y) The absolute value of the universal gravitational constant is not known with high accuracy relative to other natural constants
- Z) The universal gravitational constant of the Earth is larger than the universal gravitational constant of the Moon

ANSWER: Y) THE ABSOLUTE VALUE OF THE UNIVERSAL GRAVITATIONAL CONSTANT IS NOT KNOWN WITH HIGH ACCURACY RELATIVE TO OTHER NATURAL CONSTANTS

BONUS

25) PHYSICAL SCIENCE *Multiple Choice* Most sounds are point sources or line sources. Which of the following is true of a line source?

- W) The sound produces spherical spreading and noise level decreases by 3 decibels when distance is doubled
- X) The sound produces spherical spreading and noise level decreases by 6 decibels when distance is doubled
- Y) The sound produces cylindrical spreading and noise level decreases by 3 decibels when distance is doubled
- Z) The sound produces cylindrical spreading and noise level decreases by 6 decibels when distance is doubled

ANSWER: Y) THE SOUND PRODUCES CYLINDRICAL SPREADING AND NOISE LEVEL DECREASES BY 3 DECIBELS WHEN DISTANCE IS DOUBLED