

## ROUND 8

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### TOSS-UP

1) EARTH AND SPACE *Short Answer* When saturated soil is shaken by an earthquake, the soil strength drops and can cause buildings to sink or collapse. What is the term for this phenomenon?

ANSWER: LIQUEFACTION

### BONUS

1) EARTH AND SPACE *Multiple Choice* Which of the following is NOT the name of a river-sea interface?

- W) Delta
- X) Estuary
- Y) Cenote [*suh-NOH-tee*]
- Z) Slough [*SLAOO*]

ANSWER: Y) CENOTE

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### TOSS-UP

2) LIFE SCIENCE *Multiple Choice* In humans, freely hanging earlobes is completely dominant to attached earlobes. If you have attached earlobes but both of your biological parents have freely hanging earlobes, then which of the following statements is true?

- W) At least one of your parents is homozygous [*hoh-muh-ZY-guhs*] for the dominant trait
- X) Both of your parents must be homozygous for the dominant trait
- Y) Neither of your parents is homozygous for the dominant trait
- Z) Nothing can be said about the genotype of your parents because there is not enough information

ANSWER: Y) NEITHER OF YOUR PARENTS IS HOMOZYGOUS FOR THE DOMINANT TRAIT

### BONUS

2) LIFE SCIENCE *Multiple Choice* Which of the following types of trees includes individuals that were saplings when the great pyramids were built and are still alive today?

- W) California redwood
- X) Bristlecone pine
- Y) Bald cypress
- Z) Norfolk pine

ANSWER: X) BRISTLECONE PINE

### TOSS-UP

3) MATH *Multiple Choice* If  $x/2$ ,  $x/5$ , and  $x/7$  are whole numbers,  $x$  may be which of the following?

- W) 20
- X) 70
- Y) 100
- Z) 8000

ANSWER: X) 70

### BONUS

3) MATH *Short Answer* Solve the following equation for  $x$  over the real numbers:  $\frac{1}{x^2} = 25$ ?

ANSWER: 1/5 AND -1/5 (ACCEPT: 0.2 AND -0.2)

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### TOSS-UP

4) ENERGY *Short Answer* A battery produces 1.5 volts. If four of these batteries are hooked up in series, what is the voltage of the circuit?

ANSWER: 6.0

### BONUS

4) ENERGY *Multiple Choice* Given that fuel cells operate on reduction-oxidation reaction pairs, which of the following occurs during the oxidation half-reaction?

- W) An electron is released
- X) An electron is gained
- Y) Oxygen is created by the reaction
- Z) Oxygen is removed from the reaction

ANSWER: W) AN ELECTRON IS RELEASED

### TOSS-UP

5) PHYSICAL SCIENCE *Multiple Choice* Which of the following phases of matter has atoms or molecules that assume the shape of their container and are NOT easily compressible?

- W) Liquid only
- X) Liquid and solid
- Y) Liquid and gas
- Z) Gas only

ANSWER: W) LIQUID ONLY

### BONUS

5) PHYSICAL SCIENCE *Short Answer* On a sunny day, the inside of a vehicle will heat up while the Sun shines on it and the windows and doors are closed. To what macroscopic effect of our atmosphere is this analogous?

ANSWER: THE GREENHOUSE EFFECT

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### TOSS-UP

6) GENERAL SCIENCE *Multiple Choice* Which of the following diseases is NOT caused by a bacteria or a virus and is usually NOT passed down in humans genetically?

- W) Mad cow
- X) Lyme
- Y) Shingles
- Z) Rabies

ANSWER: W) MAD COW

### BONUS

6) GENERAL SCIENCE *Short Answer* What respective base units are used in the International System of Units for each of the following four measurements: 1) length, 2) mass, 3) temperature, 4) time.

ANSWER: 1) LENGTH = METER, 2) MASS = KILOGRAM, 3) TEMPERATURE = KELVIN, 4) TIME = SECOND

### TOSS-UP

7) EARTH AND SPACE *Short Answer* What is the term for topographical highs that separate one watershed, or drainage basin, from another?

ANSWER: DIVIDE (ACCEPT: DRIANAGE DIVIDE or WATER DIVIDE)

### BONUS

7) EARTH AND SPACE *Multiple Choice* If water percolating through permeable material is stopped by a lens of non-porous material, which of the following would form?

- W) Artesian well
- X) Unconfined aquifer **[AK-wuh-fer]**
- Y) Perched aquifer
- Z) Aquiclude

ANSWER: Y) PERCHED AQUIFER

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### TOSS-UP

8) LIFE SCIENCE *Multiple Choice* Suppose your biological mother has blood type A and your biological father has blood type AB. Which of the following is definitely NOT your blood type?

- W) A
- X) B
- Y) AB
- Z) O

ANSWER: Z) O

### BONUS

8) LIFE SCIENCE *Short Answer* Of the three taxonomic domains, there is evidence that two of these domains are more closely related when compared to the third domain. Which two domains are most closely related?

ANSWER: EUKARYA (ACCEPT: EUKARYOTA) AND ARCHAEA

### TOSS-UP

9) MATH *Short Answer* What fractional part of a week is equivalent to 4 hours?

ANSWER: 1/42

### BONUS

9) MATH *Short Answer* Factor completely over the integers:  $x^3 + 3x^2 - 4x - 12$ .

ANSWER:  $(x - 2)(x + 2)(x + 3)$

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### TOSS-UP

10) ENERGY *Multiple Choice* Given that an object falls from the top of a building, at which of the following points during its fall does it have the most kinetic energy?

- W) Before it starts falling
- X) The instant it starts falling
- Y) Halfway down to the ground
- Z) The instant before impact

ANSWER: Z) THE INSTANT BEFORE IMPACT

### BONUS

10) ENERGY *Short Answer* To be able to quantify the energy produced by a solar collector, the following formula is utilized:  $Q = (m)(C_p)(T_r - T_s)$  [**Q equals m times C sub p times the quantity T sub r minus T sub s**], where  $Q$  is the collector heat rate;  $m$  is the mass flowrate,  $C_p$  is the specific heat,  $T_r$  is the temperature of the liquid in the return path, and  $T_s$  is the temperature of the liquid in the supply path. Using 3000 operating hours in a year, compute the yearly heat rate production in kilojoules of a solar collector if  $m = 2$  kilograms per hour,  $C_p = 4$  kilojoules over kilograms Kelvin,  $T_r = 425$  Kelvin, and  $T_s = 375$  Kelvin.

ANSWER: 1,200,000

### TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following is a halogen?

- W) Boron
- X) Fluorine
- Y) Calcium
- Z) Tin

ANSWER: X) FLUORINE

### BONUS

11) PHYSICAL SCIENCE *Short Answer* Two capacitors, each of capacitance 2 microfarads, are connected in series. What is their effective capacitance in microfarads?

ANSWER: 1

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### TOSS-UP

12) GENERAL SCIENCE *Multiple Choice* A flame test is conducted during which different chemical compounds are lit on fire and the resulting colors are observed. A flame that is primarily blue in color with green on the outer parts of the flame would most likely be indicative of which of the following elements in the compound?

- W) Copper
- X) Calcium
- Y) Strontium
- Z) Sodium

ANSWER: W) COPPER

### BONUS

12) GENERAL SCIENCE *Short Answer* What is the name of the theory that explains the evolution of cell organelles in terms of the engulfment of other cells, resulting in a permanent relationship?

ANSWER: ENDOSYMBIOTIC THEORY (ACCEPT: ENDOSYMBIOSIS)

### TOSS-UP

13) EARTH AND SPACE *Short Answer* What kind of front occurs when a cold front catches up to a preceding warm front?

ANSWER: OCCLUDED

### BONUS

13) EARTH AND SPACE *Multiple Choice* Many people buy fancy “granite” counter tops for their kitchen. However, many of these countertops are dark in color with distinctly visible crystals of grey, green and black minerals. Which of the following is the appropriate rock name for a countertop fitting this description?

- W) Gabbro
- X) Andesite [**AN-duh-syt**]
- Y) Granite
- Z) Pumice

ANSWER: W) GABBRO

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### TOSS-UP

14) LIFE SCIENCE *Multiple Choice* Which of the following animals would you have to eat in order to ingest a potentially lethal dose of tetrodotoxin [**te-troh-duh-TOK-sin**]?

- W) Snowflake eel
- X) King cobra
- Y) Puffer fish
- Z) Platypus

ANSWER: Y) PUFFER FISH

### BONUS

14) LIFE SCIENCE *Short Answer* What shared trait do the following four possess: auks, moas, passenger pigeons, and Carolina parakeets?

ANSWER: THEY ARE EXTINCT

### TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Diamond, graphite, and fullerenes [**FOOL-uh-reens**] are all examples of which of the following?

- W) Isotopes of carbon
- X) Allotropes of carbon
- Y) Formula units of carbon
- Z) Compounds of carbon

ANSWER: X) ALLOTROPES OF CARBON

### BONUS

15) GENERAL SCIENCE *Short Answer* Outgassing is a process by which gases are released into the atmosphere from the Earth's mantle. During the formation of the Earth's early atmosphere, what was the primary means by which outgassing occurred?

ANSWER: VOLCANIC ERUPTIONS

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### TOSS-UP

16) MATH *Multiple Choice* The price of an item was reduced by 10%, and then later reduced by 20%. The two reductions were equivalent to a single reduction of which of the following percentages?

- W) 15%
- X) 28%
- Y) 30%
- Z) 72%

ANSWER: X) 28%

### BONUS

16) MATH *Multiple Choice* If the operation "star" is defined by  $a*b = a^b - b^a$  [**a star b equals a to the b minus b to the a**], which of the following is the largest?

- W)  $2*5$  [**2 star 5**]
- X)  $3*2$  [**3 star 2**]
- Y)  $3*4$  [**3 star 4**]
- Z)  $4*3$  [**4 star 3**]

ANSWER: Y)  $3*4$



### TOSS-UP

17) PHYSICAL SCIENCE *Multiple Choice* Which of the following observations would show that soil has a high pH?

- W) When mixed with wet baking soda, it forms carbon dioxide
- X) It turns red litmus paper blue
- Y) It turns blue litmus paper red
- Z) It has a sour taste

ANSWER: X) IT TURNS RED LITMUS PAPER BLUE

### BONUS

17) PHYSICAL SCIENCE *Short Answer* How many electrons are present in nitrogen-14, when nitrogen as atomic number seven is in its three minus oxidation state?

ANSWER: 10

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### TOSS-UP

18) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a method of genetic recombination in bacteria?

- W) Transduction of genetic material via phage
- X) Homologous [**huh-MOL-uh-guhs**] recombination through meiosis [**my-OH-sis**]
- Y) Uptake of genetic material from the environment
- Z) Exchange of plasmids by conjugation with other bacteria

ANSWER: X) HOMOLOGOUS RECOMBINATION THROUGH MEIOSIS

### BONUS

18) GENERAL SCIENCE *Multiple Choice* Which of the following does NOT describe phospholipid functionality?

- W) Amphipathic [**am-fuh-PATH-ik**]
- X) Cell membrane component
- Y) Signal transduction participant
- Z) Enhances cell membrane fluidity

ANSWER: Z) ENHANCES CELL MEMBRANE FLUIDITY

### TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following trees is NOT a gymnosperm [**JIM-nuh-spurm**]?

- W) Cypress
- X) Ginkgo
- Y) Magnolia
- Z) Lodge pole pine

ANSWER: Y) MAGNOLIA

### BONUS

19) LIFE SCIENCE *Short Answer* In marine biology, the acronym HAB is used to describe population increases of cyanobacteria [**sy-uh-noh-bak-TEER-ee-uh**], dinoflagellates [**din-uh-FLAJ-uh-layts**] and other similar life forms. HAB stands for what phrase?

ANSWER: HARMFUL ALGAE (or ALGAL) BLOOM

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### TOSS-UP

20) EARTH AND SPACE *Multiple Choice* What atmospheric measurement is used to categorize hurricanes according to the Saffir-Simpson scale?

- W) Observed damage
- X) Precipitation amount
- Y) Wind speed
- Z) Storm surge

ANSWER: Y) WIND SPEED

### BONUS

20) EARTH AND SPACE *Multiple Choice* Which of the following types of sediment deposits are formed primarily by wind processes?

- W) Alluvial [**uh-LOO-vee-uhl**]
- X) Eolian [**ee-OH-lee-uhn**]
- Y) Lacustrine [**luh-KUHS-trin**]
- Z) Fluvial

ANSWER: X) EOLIAN

### TOSS-UP

21) MATH *Multiple Choice* Express the number with the following property in terms of  $b$ ,  $y$ , and  $t$ : if the product of the number and  $b$  is increased by  $y$ , the result is  $t$ .

W)  $(t - y)/b$

X)  $(y - t)/b$

Y)  $(b + y)/t$

Z)  $t - by$

ANSWER: W)  $(t - y)/b$

### BONUS

21) MATH *Short Answer* What is the geometric mean of 8 and 4?

ANSWER:  $4\sqrt{2}$

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### TOSS-UP

22) ENERGY *Short Answer* A mixture of 80% water and 20% ice is held in a glass. Much later there is only 1% ice in the glass. In degrees Fahrenheit, what is the temperature of the mixture in the glass?

ANSWER: 32°

### BONUS

22) ENERGY *Short Answer* An old electric motor is 85% efficient and costs \$2.00 per hour to run. A newly designed motor of the same horsepower is 97% efficient. What is the approximate cost, to the nearest \$0.25, of running the new motor per hour?

ANSWER: \$1.75

### TOSS-UP

23) LIFE SCIENCE *Short Answer* What is the name of the highly specialized oxygen-transport molecule in the blood that carbon monoxide binds with much more tightly than oxygen does?

ANSWER: HEMOGLOBIN

### BONUS

23) LIFE SCIENCE *Multiple Choice* Which of the following plant groups includes mosses, liverworts, and hornworts?

- W) Gymnosperm [*JIM-nuh-spurm*]
- X) Pteridophyta [*tuh-rid-uh-FY-tuh*]
- Y) Bryophyta [*bry-uh-FY-tuh*]
- Z) Angiosperm [*AN-jee-uh-spurm*]

ANSWER: Y) BRYOPHYTA

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### TOSS-UP

24) PHYSICAL SCIENCE *Short Answer* Neon has an atomic number of 10. Assuming neon is in its ground state, how many valence electrons occupy its outermost shell?

ANSWER: 8

### BONUS

24) PHYSICAL SCIENCE *Short Answer* You measure the displacement with respect to time of a block every second for 10 seconds and graph the results with time on the  $x$ -axis and displacement on the  $y$ -axis. The resultant graph shows a straight line with a slope of  $-2$ . What is the acceleration in meters per second squared of the block at time  $t = 5$  seconds?

ANSWER: 0

### TOSS-UP

25) GENERAL SCIENCE *Multiple Choice* Disaccharides [**dy-SAK-uh-ryds**] are sugars that are composed of two monosaccharide [**mon-uh-SAK-uh-ryd**] monomers. Which of the following types of reaction occurs during the formation of a disaccharide from two monosaccharides?

- W) Dehydration
- X) Hydrolysis
- Y) Double replacement
- Z) Single replacement

ANSWER: W) DEHYDRATION

### BONUS

25) GENERAL SCIENCE *Multiple Choice* What scientist is credited with showing that all cells come from preexisting cells?

- W) Antony van Leeuwenhoek [**LAY-vuhn-hook**]
- X) Theodor Schwann
- Y) Robert Hooke
- Z) Rudolf Virchow [**FIR-khof**]

ANSWER: Z) RUDOLF VIRCHOW