

## ROUND 8

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### TOSS-UP

1) MATH *Short Answer* What is the largest number of sides possible for a regular polygon that tessellates the plane?

ANSWER: 6

### BONUS

1) MATH *Short Answer* The hypotenuse of a right triangle is 9 feet, and one leg is 6 feet. What is the area, in square feet, of the triangle in simplest radical form?

ANSWER:  $9\sqrt{5}$

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### TOSS-UP

2) LIFE SCIENCE *Short Answer* Besides xylem and phloem (read as: FLŌE-ehm), what is the third tissue layer that comprises the stele in eudicot roots?

ANSWER: PERICYCLE

### BONUS

2) LIFE SCIENCE *Short Answer* Give the common names of two of the principal species of Pacific salmon.

ANSWER: (ACCEPT TWO) SOCKEYE, CHUM, COASTAL CUTTHROAT TROUT, CHINOOK, COHO, STEELHEAD, OR PINK

**TOSS-UP**

3) ENERGY *Short Answer* What is the term for the minimum amount of fissile material required for a chain reaction to be self-sustaining?

ANSWER: CRITICAL MASS

**BONUS**

3) ENERGY *Short Answer* What is the name of a device which consists of dissimilar metals joined together at one end that is used as a sensor for measuring temperature?

ANSWER: THERMOCOUPLE

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**TOSS-UP**

4) PHYSICAL SCIENCE *Multiple Choice* The mechanical advantage of a block and tackle depends on which of the following?

- W) The size of the rope
- X) The length of the rope
- Y) The diameter of the wheels
- Z) The number of sections of rope

ANSWER: Z) THE NUMBER OF SECTIONS OF ROPE

**BONUS**

4) PHYSICAL SCIENCE *Multiple Choice* Which of the following situations produces the MOST power?

- W) 160 newton force acting over 20 meters in 32 seconds
- X) 160 newton force acting over 2 meters in 3.2 seconds
- Y) 16 newton force acting over 20 meters in 3.2 seconds
- Z) 16 newton force acting over 200 meters in 3.2 seconds

ANSWER: Z) 16 NEWTON FORCE ACTING OVER 200 METERS IN 3.2 SECONDS

**TOSS-UP**

5) LIFE SCIENCE *Short Answer* Give the class of mollusks in which squid would be classified.

ANSWER: CEPHALOPODA

**BONUS**

5) LIFE SCIENCE *Multiple Choice* Unlike other mollusks , cephalopods (read as: SEH-fah-loh-pohds) have which of the following characteristics?

- W) Gills
- X) Radula
- Y) Open circulatory system
- Z) Closed circulatory system

ANSWER: Z) CLOSED CIRCULATORY SYSTEM

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**TOSS-UP**

6) MATH *Multiple Choice* Assuming that all of the following two dimensional shapes have the same area, which has the least perimeter?

- W) Triangle
- X) Circle
- Y) Trapezoid
- Z) Square

ANSWER: X) CIRCLE

**BONUS**

6) MATH *Short Answer* At a special showing of "The Magic Flute," all 300 tickets were sold for a total of \$5,360. If an adult ticket was \$20 and a youth ticket was \$12, how many adult tickets were sold?

ANSWER: 220

### TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* For a certain genetic disorder in humans, the mother always passes the disease to all of her children, but a father never passes it to any of his children. Which of the following explanations best explains this phenomenon?

- W) The gene for the disease is located on the X-chromosome
- X) The gene is dominant and is located on an autosomal chromosome
- Y) The gene is located on ribosomal (read as: RY-boh-sōem-ahl) DNA
- Z) The gene is located on mitochondrial (read as: my-toh-KOHN-dree-ahl) DNA

ANSWER: Z) THE GENE IS LOCATED ON MITOCHONDRIAL DNA

### BONUS

7) GENERAL SCIENCE *Short Answer* What is the most stable isotope of rutherfordium (read as: ruh-the(r)-FOHR-dee-uhm)?

ANSWER: RUTHERFORDIUM-267

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### TOSS-UP

8) EARTH AND SPACE SCIENCE *Short Answer* What kind of rock fragments are produced when magma is torn apart by volcanic eruptions?

ANSWER: PYROCLASTS

### BONUS

8) EARTH AND SPACE SCIENCE *Short Answer* What was the name of the space probe, launched in 2001, that orbited Mars to measure elements in its crust and search for signs of water?

ANSWER: MARS ODYSSEY

### TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Sediment with a diameter between 2 millimeters and 4 millimeters would be classified as which of the following?

- W) Silt
- X) Coarse sand
- Y) Medium sand
- Z) Cobble

ANSWER: Y) MEDIUM SAND

### BONUS

9) GENERAL SCIENCE *Short Answer* When a free neutron undergoes beta decay, what three particles does it form?

ANSWER: ELECTRON, PROTON, AND ELECTRON ANTINEUTRINO (DO NOT ACCEPT: ELECTRON NEUTRINO)

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### TOSS-UP

10) LIFE SCIENCE *Multiple Choice* Which of the following is the most likely effect on the remaining bacteria after killing 90% of bacteria with antibacterial soap?

- W) They will reproduce and form a colony of bacteria that are more resistant
- X) They will die because there are not enough bacteria left to reproduce
- Y) They will relocate
- Z) They can no longer cause infections because their numbers are too low

ANSWER: W) THEY WILL REPRODUCE AND FORM A COLONY OF BACTERIA THAT ARE MORE RESISTANT

### BONUS

10) LIFE SCIENCE *Short Answer* Give the scientific names of the three small bones found in the human ear.

ANSWER: MALLEUS, INCUS, AND STAPES

### TOSS-UP

11) GENERAL SCIENCE *Multiple Choice* Which of the following characteristics is NOT true of cannonball jellyfish?

- W) They can make up more than 16% of biomass in shallow inshore areas off the southeastern coast of the United States
- X) They commonly sting humans
- Y) One of their main predators is the leatherback sea turtle
- Z) They can reproduce both sexually and asexually

ANSWER: X) THEY COMMONLY STING HUMANS

### BONUS

11) GENERAL SCIENCE *Short Answer* What is the genus of the oldest known vertebrate to show viviparity (read as: vy-vi-PAH-rit-ee)?

ANSWER: *MATERPISCIS*

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### TOSS-UP

12) MATH *Short Answer* Evaluate:  $\frac{10!}{8!3!}$  (read as: 10 factorial over the quantity 8 factorial times 3 factorial).

ANSWER: 15

### BONUS

12) MATH *Short Answer* Harry bought a shirt that was marked 50% off the sale price, which was 40% off the original price. Providing your answer as a decimal to the nearest tenth, after paying a tax of 8%, what percent of the original sticker price did he pay?

ANSWER: 32.4%

### TOSS-UP

13) PHYSICAL SCIENCE *Multiple Choice* In a transverse wave, the medium vibrates in which of the following ways?

- W) In a direction opposite the wave direction
- X) At right angles to the wave direction
- Y) In the same direction as the wave
- Z) At a 45 degree angle to the wave direction

ANSWER: X) AT RIGHT ANGLES TO THE WAVE DIRECTION

### BONUS

13) PHYSICAL SCIENCE *Short Answer* Name three ferromagnetic elements.

ANSWER: (ACCEPT THREE) IRON, NICKEL, COBALT, DYSPROSIUM, PLUTONIUM, AND GADOLINIUM

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### TOSS-UP

14) LIFE SCIENCE *Short Answer* What is the name of the branch of science specifically concerned with the study of fungi?

ANSWER: MYCOLOGY

### BONUS

14) LIFE SCIENCE *Short Answer* The beta-galactosidase (read as: gah-lahk-TÖE-si-days) enzyme aids in lactose digestion by separating lactose into what two monosaccharide (read as: moh-noh-SAH-kah-ryd) molecules?

ANSWER: GALACTOSE AND GLUCOSE

**TOSS-UP**

15) GENERAL SCIENCE *Multiple Choice* Which of the following nutrients is most often limiting in freshwater aquatic ecosystems?

- W) Carbon
- X) Nitrogen
- Y) Phosphorus
- Z) Sulfur

ANSWER: Y) PHOSPHORUS

**BONUS**

15) GENERAL SCIENCE *Short Answer* What is the common name of the only penguin that lives north of the equator in the wild?

ANSWER: GALAPAGOS PENGUIN

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**TOSS-UP**

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following does the slope on a distance-time graph represent?

- W) Velocity
- X) Acceleration
- Y) Displacement
- Z) Motion

ANSWER: W) VELOCITY

**BONUS**

16) PHYSICAL SCIENCE *Short Answer* In a second-class lever, where is the fulcrum located:  
1) between the input and the output forces; 2) closer to the output force than the input force; or  
3) closer to the input force than the output force?

ANSWER: CLOSER TO THE OUTPUT FORCE THAN THE INPUT FORCE (ACCEPT: 2)



**TOSS-UP**

17) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following types of sediments came from shells and skeletons of animals?

- W) Terrigenous (read as: teh-RI-jeh-nuhs)
- X) Sulfurous
- Y) Hydrogenous
- Z) Calcareous (read as: kahl-KAHR-ee-uhs)

ANSWER: Z) CALCAREOUS

**BONUS**

17) EARTH AND SPACE SCIENCE *Short Answer* What are the names of the two irregularly shaped moons of Mars?

ANSWER: PHOBOS AND DEIMOS

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**TOSS-UP**

18) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements has the highest melting point at standard atmospheric pressure?

- W) Tungsten
- X) Thallium
- Y) Gold
- Z) Copper

ANSWER: W) TUNGSTEN

**BONUS**

18) PHYSICAL SCIENCE *Short Answer* What is the kinetic energy, in joules, of a 70 kilogram tiger running at a speed of 8 meters per second?

ANSWER: 2240

### TOSS-UP

19) ENERGY *Multiple Choice* Which of the following countries generates the greatest share of its electricity from wind power?

- W) Denmark
- X) Spain
- Y) Germany
- Z) United States

ANSWER: W) DENMARK

### BONUS

19) ENERGY *Short Answer* By name or number, rank from greatest to least the total amount of each of the following four products produced from crude oil in the U.S. in 2009: 1) jet fuel, 2) gasoline, 3) diesel, 4) heating oil.

ANSWER: GASOLINE, DIESEL, JET FUEL, HEATING OIL (ACCEPT: 2, 3, 1, 4)

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### TOSS-UP

20) MATH *Multiple Choice* If a polyhedron had seven faces, exactly six of which were triangles, which of the following could it be?

- W) Hexagonal prism
- X) Hexagonal pyramid
- Y) Pentagonal prism
- Z) Pentagonal pyramid

ANSWER: X) HEXAGONAL PYRAMID

### BONUS

20) MATH *Short Answer* Solve for real numbers  $x$  if  $\sqrt{9x - x^2} > 0$  (read as: the square root of the quantity  $9x$  minus  $x$  squared is greater than 0).

ANSWER:  $0 < x < 9$

**TOSS-UP**

21) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is an example of a well-known group of extinct marine arthropods that existed in abundance during the lower Paleozoic?

- W) Brachiopods
- X) Ammonites
- Y) Trilobites
- Z) Nautiluses

ANSWER: Y) TRILOBITES

**BONUS**

21) EARTH AND SPACE SCIENCE *Short Answer* If due north is 0°, what degree is the intercardinal direction southwest?

ANSWER: 225°

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**TOSS-UP**

22) PHYSICAL SCIENCE *Multiple Choice* Which of the following best describes how the frequency of an ocean wave changes as its wavelength changes?

- W) It increases as the wavelength increases
- X) It increases as the wavelength decreases
- Y) It decreases as the wavelength decreases
- Z) It decreases as the wavelength increases

ANSWER: X) IT INCREASES AS THE WAVELENGTH DECREASES

**BONUS**

22) PHYSICAL SCIENCE *Short Answer* If a sound wave traveling through water has a speed of 1,450 meters per second and a frequency of 2900 hertz, providing your answer as a decimal to the nearest tenth, what is its wavelength in meters?

ANSWER: 0.5

### TOSS-UP

23) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following characteristics is generally NOT used for classification of ocean waves?

- W) Disturbing force
- X) Wavelength
- Y) Wave height
- Z) Restoring force

ANSWER: Y) WAVE HEIGHT

### BONUS

23) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is a characteristic of a turbidite?

- W) Graded bedding
- X) Lived during the Cambrian
- Y) Found in alkaline bodies of water
- Z) Often found in caves

ANSWER: W) GRADED BEDDING

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### TOSS-UP

24) ENERGY *Multiple Choice* Which of the following states produces the most coal?

- W) Wyoming
- X) West Virginia
- Y) Georgia
- Z) Montana

ANSWER: W) WYOMING

### BONUS

24) ENERGY *Short Answer* Many factors affect the overall price of gasoline. By name or number, arrange the following four factors based on the extent to which their costs influence the price of gasoline in descending order: 1) taxes, 2) distribution, 3) crude oil, 4) refining.

ANSWER: CRUDE OIL, TAXES, REFINING, DISTRIBUTION (ACCEPT: 3, 1, 4, 2)

### **TOSS-UP**

25) LIFE SCIENCE *Short Answer* By name or number, identify all of the following four substances that emulsify fat during digestion: 1) gastrin, 2) amylase, 3) motilin, 4) bile.

ANSWER: BILE (ACCEPT: 4)

### **BONUS**

25) LIFE SCIENCE *Short Answer* When genetic drift results from the colonization of a new habitat by only a few individuals, what is the name of the resulting loss of genetic variation?

ANSWER: FOUNDER EFFECT