

## ROUND 9A

### TOSS-UP

1) Life Science – *Multiple Choice* In the process of meiosis, which of the following is the end product?

- W) One parent cell becomes two daughter cells
- X) One parent cell becomes four daughter cells
- Y) Two parent cells become one daughter cell
- Z) Two parent cells become two daughter cells

ANSWER: X) ONE PARENT CELL BECOMES FOUR DAUGHTER CELLS

### BONUS

1) Life Science – *Multiple Choice* Which of the following terms is used to describe a change in cell structure and function from generalized to specialized?

- W) Differentiation
- X) Development
- Y) Morphogenesis
- Z) Growth

ANSWER: W) DIFFERENTIATION

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### TOSS-UP

2) Math – *Short Answer* Simplify the following expression: open parenthesis  $2x^2$  close parenthesis squared.

ANSWER:  $4x^4$

### BONUS

2) Math – *Short Answer* Identify all of the following three statements regarding quadratic equations with real coefficients that are universally true: 1) When the discriminant is zero, the roots are real; 2) When the discriminant is positive, the roots are equal; 3) When the discriminant is positive, the roots are imaginary.

ANSWER: 1

### TOSS-UP

3) Physical Science – *Multiple Choice* An electrical generator converts:

- W) Solar energy to electric energy
- X) Thermal energy to electric energy
- Y) Chemical energy to electric energy
- Z) Mechanical energy to electric energy

ANSWER: Z) MECHANICAL ENERGY TO ELECTRIC ENERGY

### BONUS

3) Physical Science – *Short Answer* Identify all of the following three processes that are considered phase changes: 1) Sodium reacting with water and producing hydrogen gas; 2) Gold melting at high temperatures; 3) Carbon dioxide depositing to dry ice at low temperatures.

ANSWER: 2 AND 3

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### TOSS-UP

4) Earth and Space – *Multiple Choice* The objects that Carl Seyfert [*say-fert*] observed are examples of what?

- W) Variable stars
- X) Galaxies
- Y) Filaments
- Z) Clusters

ANSWER: X) GALAXIES

### BONUS

4) Earth and Space – *Multiple Choice* Ablation by sunlight would primarily affect which of the following objects?

- W) Pluton
- X) Volcano
- Y) Glacier
- Z) Thunderstorm

ANSWER: Y) GLACIER

**TOSS-UP**

5) General Science – *Short Answer* What is the term used to describe the dark, smooth areas of the moon, previously thought to be bodies of water?

ANSWER: MARIA (ACCEPT: MARE)

**BONUS**

5) General Science – *Short Answer* Magnetrons are generally found in which home device?

ANSWER: MICROWAVE OVENS



**TOSS-UP**

6) Math – *Short Answer* Identify all of the following three numbers that are rational: 1)  $\frac{6}{9}$ ; 2)  $(\sqrt{8})$  divided by  $(\sqrt{2})$ ; 3)  $(\sqrt{81})$  divided by 5

ANSWER: ALL OF THEM

**BONUS**

6) Math – *Multiple Choice* Anna buys used books for  $x$  dollars per dozen and sells them for  $\frac{x}{9}$  dollars per book. If she buys the books for \$72 per dozen, what is her profit per book?

- W) 1 dollar
- X) 2 dollars
- Y) 3 dollars
- Z) 4 dollars

Answer: X) 2 DOLLARS

### TOSS-UP

7) Physical Science – *Short Answer* A high-speed electron ejected from a nucleus during radioactive decay is referred to as what?

ANSWER: BETA PARTICLE (ACCEPT: BETA MINUS PARTICLE)

### BONUS

7) Physical Science – *Short Answer* A coin weighs 3.5 grams and when placed in water, displaces a volume of 0.50 milliliters. To two significant figures, what is the density of the coin in grams per milliliter?

ANSWER: 7.0

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### TOSS-UP

8) Energy – *Multiple Choice* What state produces the most coal in the U.S.?

- W) California
- X) Wyoming
- Y) Texas
- Z) Iowa

ANSWER: X) WYOMING

### BONUS

8) Energy – *Short Answer* What type of energy generation involves the usage of radioactive actinides?

ANSWER: NUCLEAR

### TOSS-UP

9) Earth and Space – *Multiple Choice* What is the term for igneous activity that occurs below the Earth's surface?

- W) Plutonic
- X) Extrusive
- Y) Unconformed
- Z) Conformed

ANSWER: W) PLUTONIC

### BONUS

9) Earth and Space – *Short Answer* What is the term for a catastrophic explosion of a massive star?

ANSWER: SUPERNOVA

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### TOSS-UP

10) Life Science – *Multiple Choice* Which of the following is a vascular plant?

- W) Spanish moss
- X) Oak tree
- Y) Green algae
- Z) Fern lichen

ANSWER: X) OAK TREE

### BONUS

10) Life Science – *Short Answer* What structural polysaccharide is found in fungal cell walls and the exoskeletons of insects?

ANSWER: CHITIN

**TOSS-UP**

11) General Science – *Multiple Choice* While there are over 300 species of sharks in the ocean, approximately what percentage are "vicious" or are known to attack unprovoked?

- W) 2
- X) 5
- Y) 10
- Z) 25

ANSWER: W) 2

**BONUS**

11) General Science – *Short Answer* To the nearest whole foot, how many feet does light travel in one nanosecond?

ANSWER: ONE



**TOSS-UP**

12) Earth and Space – *Short Answer* What two planets in the Solar System do not have any moons?

ANSWER: MERCURY AND VENUS

**BONUS**

12) Earth and Space – *Multiple Choice* Which of the following types of rocks hosts the best-preserved fossils?

- W) Conglomerate
- X) Sandstone
- Y) Breccia [*brech-ee-uh*]
- Z) Black shale

ANSWER: Z) BLACK SHALE

**TOSS-UP**

13) General Science – *Multiple Choice* Growth of plants in the ocean is generally limited by which of the following?

- W) Salt and sunlight
- X) Oxygen and carbon
- Y) Nitrogen and phosphorus
- Z) Hydrogen and sulfur

ANSWER: Y) NITROGEN AND PHOSPHORUS

**BONUS**

13) General Science – *Short Answer* Rectification is the conversion of alternating current to direct current. What process converts direct current to alternating current?

ANSWER: INVERSION



**TOSS-UP**

14) Life Science – *Short Answer* Identify all of the following organisms that are considered autotrophs: 1) plants; 2) cyanobacteria; 3) humans.

ANSWER: 1 AND 2 (ACCEPT: PLANTS AND CYANOBACTERIA)

**BONUS**

14) Life Science – *Short Answer* What type of molecules are secreted by the endocrine system?

ANSWER: HORMONES

### TOSS-UP

15) Physical Science – *Short Answer* What is the molar volume, to the nearest tenth of a liter, of an ideal gas at standard pressure?

ANSWER: 22.4

### BONUS

15) Physical Science – *Multiple Choice* The chemical behavior of an atom is determined by its:

- W) Atomic number
- X) Nuclear binding energy
- Y) Mass number
- Z) Number of isotopes

ANSWER: W) ATOMIC NUMBER

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### TOSS-UP

16) Math – *Short Answer* A circle has a circumference of  $6\pi$ . What is its radius?

ANSWER: 3

### BONUS

16) Math – *Short Answer* Given that  $f = -1$ ,  $g = 7$ , and  $h = -10$ , what is  $h^2 + fgh$ ?

ANSWER: 170



### TOSS-UP

17) Energy – *Short Answer* Coal can be burned to produce energy. It can also be chemically combined with oxygen or air in a more controlled way that yields lower harmful gas emissions. What is this alternative method of processing coal for energy called?

ANSWER: COAL GASIFICATION (ACCEPT: GASIFICATION)

### BONUS

17) Energy – *Short Answer* In geologic sequestration, carbon dioxide is often pumped back into the ground to replace other substances that are being removed. Identify all of the following replacements that are currently taking place: 1) CO<sub>2</sub> replaces methane gas; 2) CO<sub>2</sub> replaces crude oil; 3) CO<sub>2</sub> replaces potable water.

ANSWER: 1 and 2

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### TOSS-UP

18) Math – *Multiple Choice* Laura wants to find the distance between two cities. The distance on a map is 18 inches. The scale on the map is 3 inches to 5 miles. How many miles is it between the two cities?

- W) 5 miles
- X) 15 miles
- Y) 30 miles
- Z) 40 miles

ANSWER: Y) 30 MILES

### BONUS

18) Math – *Short Answer* What is the area of a trapezoid with the following properties: its altitude is 12, and it has parallel sides of length 25 and 50, with nonparallel opposite sides of length 15 and 20?

ANSWER: 450

### TOSS-UP

19) Physical Science – *Multiple Choice* A chemical change occurs when a substance:

- W) Changes state
- X) Gains or loses electrons
- Y) Reaches its boiling point
- Z) Is ground into a powder

ANSWER: X) GAINS OR LOSES ELECTRONS

### BONUS

19) Physical Science – *Short Answer* The energy associated with a photon is related to its frequency by what fundamental physical constant?

ANSWER: PLANCK'S CONSTANT

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### TOSS-UP

20) Life Science – *Short Answer* What fluid fills the spaces between cells in animals?

ANSWER: INTERSTITIAL FLUID (ACCEPT: EXTRACELLULAR FLUID)

### BONUS

20) Life Science – *Short Answer* What parts of plants, located at the tips of the roots and shoots, contain cells that are actively growing in length?

ANSWER: MERISTEMS

### TOSS-UP

21) General Science – *Short Answer* What graduated piece of glassware is used for delivering known volume of a liquid, especially during titrations?

ANSWER: BURETTE

### BONUS

21) General Science – *Short Answer* What country is the world's leading overall emitter of greenhouse gas?

ANSWER: CHINA



### TOSS-UP

22) Earth and Space – *Multiple Choice* Which of the following cannot be classified as an igneous rock?

- W) Granite
- X) Rhyolite
- Y) Coal
- Z) Obsidian

Answer: Y) COAL

### BONUS

22) Earth and Space – *Short Answer* What layer of the atmosphere is the transition between atmosphere and space?

ANSWER: EXOSPHERE

### **TOSS-UP**

23) Energy – *Short Answer* What is the source of most of the energy on Earth?

ANSWER: SUN

### **BONUS**

23) Energy – *Short Answer* The Advanced Light Source at the Lawrence Berkeley National Laboratory produces bright electromagnetic radiation in the ultraviolet range and what other range?

ANSWER: X-RAYS