

ROUND 14A

TOSS-UP

1) Life Science – *Multiple Choice* Which of the following is not a succulent plant?

- W) Eucalyptus
- X) Cactus
- Y) Aloe
- Z) Yucca

ANSWER: W) EUCALYPTUS

BONUS

1) Life Science – *Short Answer* What part of the brain is responsible for controlling the internal environment of the body?

ANSWER: HYPOTHALAMUS

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### TOSS-UP

2) Math – *Multiple Choice* The sum of two numbers is  $a$ . If each number is quadrupled and then 6 is added to each number, what is the sum of the final two numbers?

- W)  $4a$
- X)  $4a + 6$
- Y)  $4a + 12$
- Z)  $8a + 6$

ANSWER: Y)  $4a + 12$

### BONUS

2) Math – *Short Answer* A custom mixture of nuts is composed of cashews worth \$8 a pound and almonds worth \$6 a pound. Ray purchases 9 pounds of the mixture for \$67. How many of these 9 pounds are cashews?

ANSWER: 6.5 (ACCEPT:  $6\frac{1}{2}$ ,  $13/2$ )

**TOSS-UP**

3) Earth and Space – *Short Answer* To what constellation does the Big Dipper belong?

ANSWER: URSA MAJOR

**BONUS**

3) Earth and Space – *Multiple Choice* Which of the following is true regarding the result of the Coriolis effect on Earth's ocean currents?

- W) Currents are deflected clockwise
- X) Currents are deflected counterclockwise
- Y) Currents are deflected to the left in the northern hemisphere and to the right in the southern hemisphere
- Z) Currents are deflected to the right in the northern hemisphere and to the left in the southern hemisphere

ANSWER: Z) CURRENTS ARE DEFLECTED TO THE RIGHT IN THE NORTHERN HEMISPHERE AND TO THE LEFT IN THE SOUTHERN HEMISPHERE



**TOSS-UP**

4) Math – *Short Answer* If a triangle has two sides with respective lengths of 12 and 7, what is the minimum possible integer length of the third side?

ANSWER: 6

**BONUS**

4) Math – *Short Answer* What is the sum of the integers between 70 and 89, inclusive?

ANSWER: 1590

### TOSS-UP

5) Energy – *Short Answer* Butterflies, lizards, and gemstones all use complex structures to create iridescent displays that humans find attractive. Scientists at Argonne National Lab used X-rays to discover how these microscopic structures work. What is the name of these structures?

ANSWER: PHOTONIC CRYSTALS

### BONUS

5) Energy – *Multiple Choice* In the modern American home, what represents the largest portion of energy usage?

- W) Refrigeration
- X) Electronics
- Y) Lighting
- Z) Heating

ANSWER: Z) HEATING

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TOSS-UP

6) Physical Science – *Multiple Choice* Which of the following is a Bronsted base, but not an Arrhenius [*ah-REE-nee-us*] base?

- W) Sodium carbonate
- X) Triethylamine [*try-ethyl-ah-MEEN*]
- Y) Lithium hydroxide
- Z) Potassium oxide

ANSWER: X) TRIETHYLAMINE

BONUS

6) Physical Science – *Short Answer* What is the term for a pair of non-bonding electrons in a molecule?

ANSWER: LONE PAIR (ACCEPT: NON-BONDING PAIR)

TOSS-UP

7) Life Science – *Short Answer* What organ in humans regulates blood glucose levels?

ANSWER: PANCREAS

BONUS

7) Life Science – *Short Answer* What is the term for the process by which smooth muscle in the arterioles [*ahr-TEER-ee-ohlz*] relaxes, resulting in a larger diameter?

ANSWER: VASODILATION

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**TOSS-UP**

8) Earth and Space – *Short Answer* If the distance to a star is tripled, by what factor is its apparent brightness multiplied?

ANSWER: 1/9

**BONUS**

8) Earth and Space – *Short Answer* What is the primary mode of ocean circulation below 1000 meters below sea level?

ANSWER: THERMOHALINE CIRCULATION (OR THERMOHALINE)

**TOSS-UP**

9) Math – *Short Answer* What is the greatest integer less than or equal to the square root of 700?

ANSWER: 26

**BONUS**

9) Math – *Short Answer* What is the median of the first 10 prime numbers?

ANSWER: 12



**TOSS-UP**

10) Energy – *Short Answer* Oxides of what two elements that can cause acid rain are emitted by coal-fired power plants and vehicles?

ANSWER: SULFUR AND NITROGEN

**BONUS**

10) Energy – *Multiple Choice* Humans introduce 30 billion tons of carbon dioxide into the atmosphere each year. DOE National Lab scientists have found that plants and oceans can absorb carbon dioxide and convert it to which of the following types of rock?

- W) Limestone
- X) Granite
- Y) Igneous [*IG-nee-us*]
- Z) Quartz

ANSWER: W) LIMESTONE

**TOSS-UP**

11) Physical Science – *Short Answer* What is the IUPAC name of N<sub>2</sub>O?

ANSWER: DINITROGEN MONOXIDE

**BONUS**

11) Physical Science – *Short Answer* What is the empirical formula of glucose?

ANSWER: CH<sub>2</sub>O

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TOSS-UP

12) Energy – *Multiple Choice* According to the U.S. Energy Information Administration, which of the following industrial sectors is responsible for the largest total energy use in the United States?

- W) Chemical production
- X) Steel making
- Y) Cement making
- Z) Petroleum refining

ANSWER: Z) PETROLEUM REFINING

BONUS

12) Energy – *Short Answer* Rank the following sectors by total annual energy consumption in the U.S., from least amount of energy consumed to greatest: 1) Residential; 2) Transportation; 3) Commercial; 4) Industrial.

ANSWER: 3, 1, 2, 4 (COMMERCIAL, RESIDENTIAL, TRANSPORTATION, INDUSTRIAL)

TOSS-UP

13) Physical Science – *Short Answer* In a game of tug of war, the left team pulls with 200 newtons of force while the right team pulls with 183 newtons of force. What is the magnitude, in newtons, of the resultant pull on the rope exerted by both teams?

ANSWER: 17

BONUS

13) Physical Science – *Short Answer* Rank the following three elements from least to greatest in terms of their electronegativity; 1) Oxygen; 2) Boron [**BOAR-on**]; 3) Nitrogen.

ANSWER: 2, 3, 1

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### TOSS-UP

14) Math – *Short Answer* A right circular cone has radius 2 and height 6. What is its volume?

ANSWER:  $8\pi$

### BONUS

14) Math – *Short Answer* At what value of  $y$  does the line that contains the points (2, 4) and (5, 12) cross the  $y$ -axis?

ANSWER:  $-4/3$  (ACCEPT:  $-1 \frac{1}{3}$ )

**TOSS-UP**

15) Life Science – *Short Answer* What blood cells are fragments of bone marrow cells and are responsible for clotting?

ANSWER: THROMBOCYTES (ACCEPT: PLATELETS)

**BONUS**

15) Life Science – *Short Answer* Sarcomeres [*SAHR-koh-meers*] compose the basic unit of what type of muscle?

ANSWER: SKELETAL MUSCLE



**TOSS-UP**

16) Earth and Space – *Multiple Choice* Which of the following terms best describes Earth's magnetic field?

- W) Bipolar
- X) Dipolar
- Y) Antipolar
- Z) Nonpolar

ANSWER: X) DIPOLAR

**BONUS**

16) Earth and Space – *Short Answer* Rank the following three reservoirs of unfrozen fresh water in decreasing order of volume: 1) Rivers; 2) Lakes; 3) Atmosphere.

ANSWER: 2, 3, 1

**TOSS-UP**

17) Physical Science – *Short Answer* On a pressure-temperature diagram, what point refers to the conditions under which gas, liquid, and solid coexist?

ANSWER: TRIPLE POINT

**BONUS**

17) Physical Science – *Short Answer* Identify all of the following three statements that are true of enthalpy [*EN-thul-pee*]: 1) Enthalpy is a state function; 2) Enthalpy is defined by the 2nd law of thermodynamics; 3) Enthalpy always increases.

ANSWER: 1



**TOSS-UP**

18) Earth and Space – *Short Answer* To the nearest integer, how many times as much energy does a Richter magnitude 3.5 earthquake release as a magnitude 2.5 earthquake?

ANSWER: 32

**BONUS**

18) Earth and Space – *Short Answer* Order the four terrestrial planets in order of increasing planetary radius.

ANSWER: MERCURY, MARS, VENUS, EARTH

### TOSS-UP

19) Life Science – *Short Answer* What type of skeletons do beetles have?

ANSWER: EXOSKELETON

### BONUS

19) Life Science – *Short Answer* Under what phylum [*FYE-lum*] are jellyfish classified?

ANSWER: CNIDARIA

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TOSS-UP

21) Physical Science – *Multiple Choice* Which of the following nitrogen-containing functional groups also contains oxygen?

- W) Amide [*AM-ide*]
- X) Amine [*ah-MEEN*]
- Y) Imine [*IH-meen*]
- Z) Nitrile [*NYE-trial*]

ANSWER: W) AMIDE

BONUS

21) Physical Science – *Multiple Choice* Phosphorus pentachloride [*penta-KLOOR-ide*] gas is in a container in which it is in equilibrium with liquid phosphorous trichloride [*try-KLOOR-ide*] and chlorine gas. Which of the following statements would be true if the pressure inside the container were doubled by adding argon gas, holding the temperature constant?

- W) The amount of chlorine gas would increase
- X) The amount of chlorine gas would decrease
- Y) The amount of chlorine gas would remain the same
- Z) Solid phosphorus argonite [*AR-gah-nite*] would form

ANSWER: Y) THE AMOUNT OF CHLORINE GAS WOULD REMAIN THE SAME

TOSS-UP

20) Math – *Short Answer* If a \$100 item is reduced by 30% and then the reduced price is reduced again by 40%, then, in dollars, what is the final price?

ANSWER: 42

BONUS

20) Math – *Short Answer* To the nearest integer, what is the length of the hypotenuse of a right triangle with legs of length 11 and 15?

ANSWER: 19

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**TOSS-UP**

22) Earth and Space – *Short Answer* What gas is the primary constituent of Saturn's atmosphere?

ANSWER: HYDROGEN

**BONUS**

22) Earth and Space – *Short Answer* In stellar structure, identify all of the following four elements that are considered metals: 1) Carbon; 2) Oxygen; 3) Silicon; 4) Iron.

ANSWER: ALL (ACCEPT: 1, 2, 3, AND 4)

**TOSS-UP**

23) Life Science – *Short Answer* In humans, what type of cells are responsible for carrying oxygen to tissues?

ANSWER: ERYTHROCYTES (ACCEPT: RED BLOOD CELLS)

**BONUS**

23) Life Science – *Short Answer* In humans, in order to neutralize the acidic stomach juices as they enter the small intestine, what organ produces bicarbonate as a base?

ANSWER: PANCREAS