

## **ROUND 1**

---

### **TOSS-UP**

1) Energy – *Multiple Choice* Which of the following appliances typically uses the most electricity per unit time?

- W) Vacuum cleaner
- X) Hair dryer
- Y) 60-watt incandescent light bulb
- Z) Desktop computer in active mode

ANSWER: X) HAIR DRYER

### **BONUS**

1) Energy – *Multiple Choice* Research at Lawrence Livermore National Laboratory is aimed at reducing methane emissions. According to the Energy Information Administration, which of the following fractions is closest to the estimate of the 100-year net global warming potential of methane?

- W) One-one-hundredth
- X) One-fourth
- Y) Three-fourths
- Z) Nine-tenths

ANSWER: X) ONE-FOURTH

---

### **TOSS-UP**

2) Earth and Space – *Multiple Choice* Which of the following is not considered a type of wetland?

- W) Fen
- X) Bog
- Y) Swamp
- Z) Bay

ANSWER: Z) BAY

### **BONUS**

2) Earth and Space – *Multiple Choice* In our solar system, how many moons does the fourth planet from the Sun have?

- W) 0
- X) 1
- Y) 2
- Z) 4

ANSWER: Y) 2

## **TOSS-UP**

3) Math – *Multiple Choice* Which of the following statements about a right triangle is NOT necessarily true?

- W) One angle measures 90 degrees
- X) The hypotenuse is the longest side
- Y) It has at least one obtuse angle
- Z) It has two acute angles

ANSWER: Y) IT HAS AT LEAST ONE OBTUSE ANGLE

## **BONUS**

3) Math – *Short Answer* If  $p$  and  $q$  are consecutive integers, identify all of the following four numbers that are always odd: 1)  $p + q$ ; 2)  $pq$ ; 3)  $pq + 1$ ; 4) open parenthesis  $p + q$  close parenthesis squared.

ANSWER: 1, 3, 4

---

## **TOSS-UP**

4) Life Science – *Multiple Choice* A diver finds an underwater cave filled with bacteria that seem to feed on volcanic sulfur vents. What type of organisms are these?

- W) Heterotroph [**HEH-turoh-trohf**]
- X) Hemotroph [**HEMO-trohf**]
- Y) Chemotroph [**KEEMOH-trohf**]
- Z) Phototroph [**PHOTO-trohf**]

ANSWER: Y) CHEMOTROPH

## **BONUS**

4) Life Science – *Multiple Choice* A liver cell has stopped functioning and a scientist observes that it is producing lactic acid. Failure of what organelle [**organ-ELL**] most likely caused the liver cell to stop functioning?

- W) Mitochondrion [**my-tow-KON-dree-un**]
- X) Nucleus
- Y) Ribosome [**RYE-beh-sohm**]
- Z) Golgi [**GOAL-jee**] Body

ANSWER: W) MITOCHONDRION

### **TOSS-UP**

5) Physical Science – *Multiple Choice* Which of the following is a unit for sound intensity level?

- W) Amplitude
- X) Watt
- Y) Decibel
- Z) Hertz

ANSWER: Y) DECIBEL

### **BONUS**

5) Physical Science – *Multiple Choice* In which of the following cases will the displacement of the object be the least?

- W) A 1.2-kilogram object moving 4 meters up an incline of 45 degrees
- X) A 3.1-kilogram object moving 3 meters on a flat surface
- Y) A 0.5-kilogram object moving 6 meters along a circle with circumference 6 meters
- Z) Cannot be determined from the information given

ANSWER: Y) A 0.5-KILOGRAM OBJECT MOVING 6 METERS ALONG A CIRCLE WITH CIRCUMFERENCE 6 METERS

---

### **TOSS-UP**

6) Earth and Space – *Multiple Choice* Which of the following is true about the water table?

- W) It is deeper in summer than winter
- X) It does not vary under high pumping rates
- Y) It varies due to precipitation amounts
- Z) It is constant throughout the year

ANSWER: Y) IT VARIES DUE TO PRECIPITATION AMOUNTS

### **BONUS**

6) Earth and Space – *Multiple Choice* Which of the following best approximates the ratio of the volume of Olympus Mons to that of Mauna Loa?

- W) 10
- X) 50
- Y) 100
- Z) 1000

ANSWER: Y) 100

## **TOSS-UP**

7) Math – *Short Answer* What is  $300 + 200 - 333$ ?

ANSWER: 167

## **BONUS**

7) Math – *Short Answer* What is the radius of the circle with equation  $x^2 + 4x + y^2 = 12$ ?

ANSWER: 4

---

## **TOSS-UP**

8) Physical Science – *Multiple Choice* The length of a meter was re-defined in 1983 to be based on what physical quantity?

- W) A wavelength of krypton-86 radiation
- X) The distance light travels in a specific fraction of a second in a vacuum
- Y) The length of a one-kilogram bar of iridium [*ih-RID-ee-um*]
- Z) A specific fraction of the length of the meridian through Paris from the North Pole to the Equator

ANSWER: X) THE DISTANCE LIGHT TRAVELS IN A SPECIFIC FRACTION OF A SECOND IN A VACUUM

## **BONUS**

8) Physical Science – *Short Answer* In meters per second squared, what is the acceleration experienced by a 10-kilogram mass if it is being pushed by a 15-newton force?

ANSWER: 1.5

## **TOSS-UP**

9) Earth and Space – *Multiple Choice* Calling a tsunami a tidal wave is misleading because of what characteristic of a tsunami?

- W) It is not a wave
- X) It is not caused by tides
- Y) It does not occur in the ocean
- Z) It only occurs during ebb tides

ANSWER: X) IT IS NOT CAUSED BY TIDES

## **BONUS**

9) Earth and Space – *Short Answer* The thin, upper fraction of the pelagic zone is known as what?

ANSWER: EPIPELAGIC ZONE

---

## **TOSS-UP**

10) Life Science – *Short Answer* What is the term for proteins that act as catalysts in chemical reactions?

ANSWER: ENZYMES

## **BONUS**

10) Life Science – *Multiple Choice* In a human heart, through what structure does oxygenated blood first pass?

- W) Right Atrium
- X) Right Ventricle
- Y) Left Atrium
- Z) Left Ventricle

ANSWER: Y) LEFT ATRIUM

### **TOSS-UP**

11) Math – *Multiple Choice* If the discriminant of a quadratic equation is –9, which of the following best describes the roots of the equation?

- W) No roots
- X) 3 and -3
- Y) Irrational
- Z) Complex

ANSWER: Z) COMPLEX

### **BONUS**

11) Math – *Short Answer* If Y is a point outside square ABCD, and triangle BYC is equilateral, what is the degree measure of angle BYA?

ANSWER: 15

---

### **TOSS-UP**

12) Physical Science – *Multiple Choice* Which of the following materials is the best thermal conductor?

- W) Glass
- X) A sheet of plastic
- Y) A block of aluminum
- Z) An air mattress

ANSWER: Y) A BLOCK OF ALUMINUM

### **BONUS**

12) Physical Science – *Short Answer* What is the adjective for a process that occurs at constant pressure?

ANSWER: ISOBARIC

## **TOSS-UP**

13) Energy – *Multiple Choice* What is the term for the process of burning a fuel?

- W) Conduction
- X) Combustion
- Y) Explosion
- Z) Transformation

ANSWER: X) COMBUSTION

## **BONUS**

13) Energy – *Multiple Choice* As a spring is compressed, which of the following best describes what happens to the amount of elastic potential energy stored in the spring?

- W) It increases
- X) It decreases
- Y) It is unchanged
- Z) It decreases, then increases

ANSWER: IT INCREASES

---

## **TOSS-UP**

14) Energy – *Multiple Choice* In the United States, which of the following renewable energy sources provides the smallest annual energy output?

- W) Solar
- X) Hydroelectric
- Y) Biomass
- Z) Wind

ANSWER: W) SOLAR

## **BONUS**

14) Energy – *Multiple Choice* Which of the following is not a potential environmental concern related to concentrating solar plants?

- W) Generation of high temperatures
- X) Wildlife strikes with turbines
- Y) Use of large land areas
- Z) Use of water for cooling

ANSWER: X) WILDLIFE STRIKES WITH TURBINES

## **TOSS-UP**

15) Life Science – *Multiple Choice* Which of the major groups of plants contains no vasculature [*VASS-kyu-lah-chur*]?

- W) Bryophytes [*BRYE-oh-fites*]
- X) Gymnosperms [*JIM-no-sperms*]
- Y) Angiosperms [*AN-jee-oh-sperms*]
- Z) Embryophytes [*EM-bree-oh-fites*]

ANSWER: W) BRYOPHYTES

## **BONUS**

15) Life Science – *Multiple Choice* Which of the following is NOT a difference between archaeans and eubacteria?

- W) Archaeans have a nucleus, while eubacteria do not
- X) Eubacteria have peptidoglycan [*peptihdo-GLY-can*] in their cell walls, while Archaeans do not
- Y) Archaeans can have introns, while eubacteria do not
- Z) Archaeans have several different RNA polymerases [*paw-LIM-er-aces*], while eubacteria have just one

ANSWER: W) ARCHAEANS HAVE A NUCLEUS, WHILE EUBACTERIA DO NOT

---

## **TOSS-UP**

16) Physical Science – *Multiple Choice* Which of the following has the highest pH?

- W) Sea water
- X) Lemon juice
- Y) Baking soda
- Z) Chlorine bleach

ANSWER: Z) CHLORINE BLEACH

## **BONUS**

16) Physical Science – *Short Answer* What type of radioactive decay occurs when carbon-14 decays to nitrogen-14?

ANSWER: BETA DECAY

**TOSS-UP**

17) Math – *Short Answer* Identify all of the following 3 types of numbers that both  $\pi$  and  $\sqrt{2}$  are:  
1) Rational; 2) Irrational; 3) Real.

ANSWER: 2, 3 (ACCEPT: IRRATIONAL AND REAL)

**BONUS**

17) Math – *Short Answer* If the length of each edge of a 3-centimeter cube is tripled, what is the volume, in cubic centimeters, of the resulting cube?

ANSWER: 729

---

**TOSS-UP**

18) Earth and Space – *Short Answer* What is the term for the percentage of light reflected by an object?

ANSWER: ALBEDO

**BONUS**

18) Earth and Space – *Multiple Choice* Which of the following is an asterism as opposed to a constellation?

- W) Orion
- X) Big Dipper
- Y) Crux
- Z) Ursa Minor

ANSWER: X) BIG DIPPER

**TOSS-UP**

19) Math – *Short Answer* Calculate the mean of the following 4 numbers: 20, 10, 30, 40

ANSWER: 25

**BONUS**

19) Math – *Short Answer* Simplify the following expression: 3 times the square root of 8, minus the square root of 50, plus the square root of 32.

ANSWER:  $5\sqrt{2}$

---

**TOSS-UP**

20) Earth and Space – *Short Answer* What is the name for the part of the Sun that, by definition, is completely hidden in a total eclipse?

ANSWER: PHOTOSPHERE

**BONUS**

20) Earth and Space – *Multiple Choice* What is the name for a strong ground-level wind system that emanates from a point source above and blows radially from the point of contact at ground level?

- W) Waterspout
- X) Downburst
- Y) Fire storm
- Z) Jet stream

ANSWER: X) DOWNBURST

## **TOSS-UP**

21) Life Science – *Multiple Choice* Which of the following taxonomic categories is the highest rank, including all of the other choices?

- W) Order
- X) Class
- Y) Species
- Z) Phylum [*FYE-lum*]

ANSWER: Z) PHYLUM

## **BONUS**

21) Life Science – *Multiple Choice* Which of the following organisms has radial symmetry?

- W) Sea urchin
- X) Sea horse
- Y) Sea otter
- Z) Sea turtle

ANSWER: W) SEA URCHIN

---

## **TOSS-UP**

22) Life Science – *Short Answer* What cellular organelle [*organ-ELL*] encloses the cell with a lipid bilayer and separates the internal environment from the outside?

ANSWER: PLASMA MEMBRANE (ACCEPT: CELL MEMBRANE)

## **BONUS**

22) Life Science – *Short Answer* What process introduces genetic variation during meiosis [*my-OH-sis*] and does not occur during mitosis [*my-TOW-sis*]?

ANSWER: CROSSING OVER (ACCEPT: CHROMOSOMAL CROSSOVER)

### **TOSS-UP**

23) Earth and Space – *Short Answer* You are a mountaineer preparing to summit Mt. Everest. Over the course of your climb, you notice that the mountain is losing snow cover without any signs of physical removal from wind or melting. What phase change are you observing?

ANSWER: SUBLIMATION

### **BONUS**

23) Earth and Space – *Short Answer* To the nearest tenth of a day, how long is a sidereal month?

ANSWER: 27.3