

## ROUND 4

### TOSS-UP

1) BIOLOGY *Multiple Choice* Which of the following is TRUE:

- W) chimpanzees are an ancestor of *Homo sapiens*
- X) bipedal motion dominated hominoid ancestors by about 30 million years ago
- Y) humans and modern apes have a common ancestor
- Z) Neanderthals were ancestors to modern humans

ANSWER: Y) HUMANS AND MODERN APES HAVE A COMMON ANCESTOR

### BONUS

1) BIOLOGY *Short Answer* Order the following 5 taxonomic group with the MOST members to the one with the FEWEST members: genus; order; phylum; class; family

ANSWER: PHYLUM; CLASS; ORDER; FAMILY; GENUS

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### TOSS-UP

2) CHEMISTRY *Multiple Choice* Which of the following is an element that is very important to human life, is contained in vitamin B-12, belongs to a group of transition metals, and has magnetic properties like iron:

- W) selenium
- X) cobalt
- Y) zinc
- Z) manganese

ANSWER: X) COBALT

### BONUS

2) CHEMISTRY *Short Answer* What is the pH of a 1 molar NaOH solution at 25°C?

ANSWER: 14

**TOSS-UP**

3) PHYSICS *Multiple Choice* Which of the following is the most common instrument used for measuring gas pressure:

- W) manometer
- X) anemometer
- Y) tensitometer
- Z) flow-meter

ANSWER: W) MANOMETER

**BONUS**

3) PHYSICS *Multiple Choice* Which of the following is TRUE of a sound wave traveling in dry air at STP at a constant velocity:

- W) if frequency increases, wavelength increases
- X) if frequency increases, wavelength decreases
- Y) if frequency decreases, wavelength decreases
- Z) if frequency increases, wavelength stays the same

ANSWER: X) IF FREQUENCY INCREASES, WAVELENGTH DECREASES

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**TOSS-UP**

4) MATH *Short Answer* If the shortest leg of a 30-60-90 right triangle is 6 inches, what is the measure, in inches, of the other 2 sides?

ANSWER: 12 AND  $6\sqrt{3}$

**BONUS**

4) MATH *Short Answer* Consider triangle ABC, where the measure of angle A = 20°, B = 117°, and C = 43°. Arrange the 3 sides in order of increasing length:

ANSWER: BC; AB; AC

(Solution: the longer side is opposite the greater angle)

**TOSS-UP**

5) EARTH SCIENCE *Multiple Choice* Ocean tides of diminished range are called:

- W) spring tides
- X) neap tides
- Y) diurnal tides
- Z) semi-diurnal tides

ANSWER: X) NEAP TIDES

**BONUS**

5) EARTH SCIENCE *Multiple Choice* Which of the following was a time when glaciation was minimal on Earth:

- W) Cretaceous Period
- X) Quaternary Period
- Y) Holocene Epoch
- Z) Pleistocene Epoch

ANSWER: W) CRETACEOUS PERIOD

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**TOSS-UP**

6) GENERAL SCIENCE *Short Answer* 1 bar equals how many Pascals?

ANSWER: 100,000 (ACCEPT:  $1 \times 10^5$  or  $10^5$ )

**BONUS**

6) GENERAL SCIENCE *Short Answer* Meteorologists commonly use the hectopascal for air pressure. 1,000 hectopascals equals how many millibars?

ANSWER: 1,000

(Solution: 1 Hpa = 1 mb)

**TOSS-UP**

7) ASTRONOMY *Short Answer* What planet of our solar system has the most nitrogen-rich atmosphere?

ANSWER: EARTH

**BONUS**

7) ASTRONOMY *Multiple Choice* Most of the galaxies in the universe are classified as which of the following:

- W) spiral
- X) elliptical
- Y) irregular
- Z) dwarf

ANSWER: Z) DWARF

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**TOSS-UP**

8) BIOLOGY *Short Answer* What is the common name for the product of human lachrymal (read as: LACK-reh-mal) glands?

ANSWER: TEARS

**BONUS**

8) BIOLOGY *Short Answer* Name all of the following 4 plants that have their seeds typically dispersed by wind: dandelion; milkweed; maize; lupine

ANSWER: DANDELION; MILKWEED

### TOSS-UP

9) CHEMISTRY *Multiple Choice* Which of the following is a weak electrolyte:

- W) ammonia
- X) dilute sulfuric acid
- Y) 1 molar sodium chloride
- Z) dilute perchloric acid

ANSWER: W) AMMONIA

### BONUS

9) CHEMISTRY *Multiple Choice* A molecular solid will most typically have which of the following melting points:

- W) very high
- X) high to very high
- Y) low
- Z) variable

ANSWER: Y) LOW

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### TOSS-UP

10) PHYSICS *Short Answer* What particle of an atom is most directly responsible for the emission of light when an atom is excited by electromagnetic radiation?

ANSWER: ELECTRON

### BONUS

10) PHYSICS *Short Answer* What is the wavelength, in meters, of a wave moving at 500 meters per second if its frequency is 20 Hertz?

ANSWER: 25

(Solution:  $\lambda = \text{wave speed}/f$ ;  $500/20 = 25 \text{ m}$ )

**TOSS-UP**

11) MATH *Short Answer* Simplify the following expression:  $x^{\frac{1}{2}}x^{\frac{2}{5}}$

ANSWER:  $x^{\frac{9}{10}}$  (ACCEPT:  $\sqrt[10]{x^9}$ )

**BONUS**

11) MATH *Short Answer* What is the slope of a line perpendicular to the line given by the graph of the equation,  $-5x = -6y + 4$

ANSWER:  $-\frac{6}{5}$

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**TOSS-UP**

12) EARTH SCIENCE *Multiple Choice* When rain freezes into pellets while falling to the ground during a winter storm, the most accurate forecast would have predicted:

- W) hail
- X) snow
- Y) freezing rain
- Z) sleet

ANSWER: Z) SLEET

**BONUS**

12) EARTH SCIENCE *Short Answer* Identify each of the following 3 rocks, respectively, as igneous, metamorphic, or sedimentary: marble; pumice; conglomerate

ANSWER: MARBLE = METAMORPHIC; PUMICE = IGNEOUS; CONGLOMERATE = SEDIMENTARY

**TOSS-UP**

13) GENERAL SCIENCE *Multiple Choice* Bioluminescence is a phenomenon most common in which of the following environments:

- W) marine
- X) fresh water
- Y) land
- Z) atmosphere

ANSWER: W) MARINE

**BONUS**

13) GENERAL SCIENCE *Multiple Choice* Which of the following is a mixing incompatibility of common household products that can produce toxic products:

- W) vinegar and baking soda
- X) vinegar and bleach
- Y) vinegar and borax
- Z) castile soap and salt

ANSWER: X) VINEGAR AND BLEACH

(Solution: small amounts of vinegar can be added to bleach to acidify the bleach, but it's generally not a good idea to mix these two solutions)

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**TOSS-UP**

14) ASTRONOMY *Multiple Choice* Which of the following is the primary characteristic of the Jovian planets:

- W) high axial spin rates
- X) low mean density
- Y) retrograde orbits
- Z) prominent layer of liquid-metallic hydrogen

ANSWER: X) LOW MEAN DENSITY

**BONUS**

14) ASTRONOMY *Short Answer* Which one of the Gas Giant planets emits the LEAST amount of energy?

ANSWER: URANUS

### TOSS-UP

15) BIOLOGY *Multiple Choice* Eggs exit a chicken's body through what specific structure:

- W) rectal plexus
- X) cloaca (read as: KLO-aye-ka)
- Y) rostrum
- Z) spiculum

ANSWER: X) CLOACA

### BONUS

15) BIOLOGY *Multiple Choice* In which of the following areas of the human body is the zygomatic (read as: ZYE-go-MAT-ick) arch found:

- W) shoulder
- X) pelvis
- Y) head
- Z) knee

ANSWER: Y) HEAD

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### TOSS-UP

16) CHEMISTRY *Short Answer* What is the bond order between the 2 carbon atoms in acetylene?

ANSWER: 3

### BONUS

16) CHEMISTRY *Short Answer* According to standard chemical nomenclature and indicating the proper charge, what is the formula for the sulfite ion?

ANSWER:  $\text{SO}_3^{2-}$  (ACCEPT:  $\text{SO}_3^{-2}$ )



**TOSS-UP**

17) PHYSICS *Short Answer* How many neutrons does the most common isotope of hydrogen have?

ANSWER: ZERO

**BONUS**

17) PHYSICS *Short Answer* How many neutrons and how many protons are present in a single oxygen-15 nucleus, respectively?

ANSWER: NEUTRONS = 7; PROTONS = 8

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**TOSS-UP**

18) MATH *Multiple Choice* Which of the following is NOT a Pythagorean triple:

- W) 15, 20, 25
- X) 10, 24, 26
- Y) 16, 24, 30
- Z) 33, 44, 55

ANSWER: Y) 16, 24, 30

**BONUS**

18) MATH *Short Answer* Evaluate the following expression when  $a = \frac{1}{3}$ ,  $b = 4$ ,  $c = -1$ , and  $d = -5$ :  $2[3a - (b + c) - 4d]$

ANSWER: 36

**TOSS-UP**

19) EARTH SCIENCE *Multiple Choice* Cirrus clouds are typically found at elevations of:

- W) 20,000 feet and above
- X) 10,000 to 20,000 feet
- Y) 5,000 to 10,000 feet
- Z) 2,000 to 5,000 feet

ANSWER: W) 20,000 FEET AND ABOVE

**BONUS**

19) EARTH SCIENCE *Multiple Choice* Andesitic magmas typically erupt above:

- W) hot spots
- X) divergent plate boundaries
- Y) subduction zones
- Z) fissure eruptions

ANSWER: Y) SUBDUCTION ZONES

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**TOSS-UP**

20) GENERAL SCIENCE *Multiple Choice* Which of the following is the main reason why Africanized honey bees are much more dangerous to humans and animals than European honey bees:

- W) they defend their nests more intensely
- X) their venom is 10-times more potent
- Y) they can sting multiple times
- Z) they are larger and carry more venom

ANSWER: W) THEY DEFEND THEIR NESTS MORE INTENSELY

**BONUS**

20) GENERAL SCIENCE *Short Answer* In most cars, what acts as the circuit ground?

ANSWER: THE BODY (ACCEPT: FRAME or CHASSIS)

**TOSS-UP**

21) ASTRONOMY *Multiple Choice* From mid-northern latitudes, during which of the following months would the constellation Orion be most prominent in the southern sky at about 10 PM:

- W) April
- X) July
- Y) August
- Z) December

ANSWER: Z) DECEMBER

**BONUS**

21) ASTRONOMY *Short Answer* What is the most common term for the apparent dividing line between night and day on the Moon?

ANSWER: TERMINATOR

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**TOSS-UP**

22) BIOLOGY *Multiple Choice* From which of the following is the cell wall of plants mostly composed:

- W) protein
- X) lipid monolayer
- Y) lipid bilayer
- Z) polysaccharide

ANSWER: Z) POLYSACCHARIDE

**BONUS**

22) BIOLOGY *Short Answer* What is the common biological name for the product of human sublingual glands?

ANSWER: SALIVA

### TOSS-UP

23) CHEMISTRY *Multiple Choice* Which of the following is the atomic sublevel with the next highest energy after the 4p sublevel:

- W) 4d
- X) 4f
- Y) 5s
- Z) 5p

ANSWER: Y) 5s

### BONUS

23) CHEMISTRY *Short Answer* Give the electronic configuration for sulfur, located in Period 3 and Group 16 of the Periodic Table:

ANSWER:  $1s^2 2s^2 2p^6 3s^2 3p^4$  (ACCEPT:  $[\text{Ne}] 3s^2 3p^4$ )

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### TOSS-UP

24) PHYSICS *Short Answer* Jan is riding her bike northward on Main Street at 20 kilometers per hour and applies her brakes. In what direction would a physicist MOST likely record her acceleration?

ANSWER: SOUTH

### BONUS

24) PHYSICS *Short Answer* If 200 coulombs pass through a wire in 0.5 seconds, what is the average current, in amps, passing through the wire?

ANSWER: 400

### **TOSS-UP**

25) **BIOLOGY** *Short Answer* What is the most common color for the calyx (read as: KAL-IX) of angiosperms?

ANSWER: GREEN

### **BONUS**

25) **BIOLOGY** *Short Answer* Name all of the following 4 diseases that are caused by viruses: measles; AIDS; tuberculosis; leprosy

ANSWER: MEASLES; AIDS