

**ROUND 12**

**TOSS-UP**

1) PHYSICAL SCIENCE *Short Answer* If the density of a metal alloy is 5,430 kilograms per cubic meter, what is its specific gravity, rounded to the second decimal place?

ANSWER: 5.43

**BONUS**

1) PHYSICAL SCIENCE *Short Answer* An Olympic runner braces himself against a stationary set of foot blocks and accelerates with a horizontal magnitude of 2 meters per second squared. How many newtons of horizontal force does the runner exert on the blocks to produce this acceleration if his mass is 70 kilograms?

ANSWER: 140

(Solution:  $F = MA$ ;  $F = 70 \times 2 = 140$ )

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**TOSS-UP**

2) EARTH SCIENCE *Multiple Choice* Which of the following best explains the relative lack of hydrogen in our atmosphere in spite of its abundance in the Universe:

- W) most of it is tied up in the water molecule
- X) most of it is consumed in photosynthesis
- Y) most of it escaped into space long ago because of its low mass
- Z) most of it was an unstable isotope that decayed into helium

ANSWER: Y) MOST OF IT ESCAPED INTO SPACE LONG AGO BECAUSE OF ITS LOW MASS

**BONUS**

2) EARTH SCIENCE *Multiple Choice* Which of the following locations contains relatively young coasts that formed as a consequence of continental rifting:

- W) southern coasts of the Aleutian Islands
- X) Gulf of California
- Y) Hawaii
- Z) northeastern Japan

ANSWER: X) GULF OF CALIFORNIA

**TOSS-UP**

3) MATH *Short Answer* What is the  $x$ -intercept of a graph of the following equation:  $y = -7x + 7$

ANSWER: 1 (ACCEPT: 1, 0)

**BONUS**

3) MATH *Short Answer* Multiply the polynomial,  $3x^2 - 4xy + y^2$ , by  $-3xy$ , and simplify:

ANSWER:  $-9x^3y + 12x^2y^2 - 3xy^3$

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**TOSS-UP**

4) GENERAL SCIENCE *Multiple Choice* Which of the following filters can withstand temperatures up to 1400°C:

- W) paper cellulosic
- X) borosilicate glass
- Y) polyester
- Z) ceramic

ANSWER: Z) CERAMIC

**BONUS**

4) GENERAL SCIENCE *Short Answer* Convert 60 miles per hour into feet per second:

ANSWER: 88

(Solution:  $(60 \text{ mi/hr})(5280 \text{ ft/mi})(1 \text{ hr}/3600 \text{ sec}) = 88 \text{ ft/s}$ )

**TOSS-UP**

5) LIFE SCIENCE *Multiple Choice* Which of the following BEST describes muscle tone:

- W) maximum strength of a muscle
- X) length versus width of a muscle
- Y) average energy use or oxygen use of a fully contracted muscle
- Z) amount of tension or contraction of a resting muscle

ANSWER: Z) AMOUNT OF TENSION OR CONTRACTION OF A RESTING MUSCLE

**BONUS**

5) LIFE SCIENCE *Multiple Choice* Which of the following terms most commonly refers to nerves leaving the brain:

- W) posterior
- X) rostral
- Y) efferent
- Z) involuntary

ANSWER: Y) EFFERENT

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**TOSS-UP**

6) PHYSICAL SCIENCE *Multiple Choice* Randy was precise in his lab experiment but he was not accurate. Which of the following best describes his measurements:

- W) his data was close to the true value but not reproducible
- X) his data was close to the true value and reproducible
- Y) his data was not close to the true value but reproducible
- Z) his data was not close to the true value and reproducible

ANSWER: Y) HIS DATA WAS NOT CLOSE TO THE TRUE VALUE BUT REPRODUCIBLE

**BONUS**

6) PHYSICAL SCIENCE *Short Answer* Using a gravitational acceleration of 10 meters per second and giving your answer in appropriate SI units, if dropped off a cliff, how fast will a rock be falling at the end of 2 seconds, if friction is ignored?

ANSWER: 20 METERS PER SECOND (must give units)

**TOSS-UP**

7) EARTH SCIENCE *Multiple Choice* The Earth's mantle is thought to be composed of which of the following:

- W) coal
- X) granite
- Y) slate
- Z) peridotite

ANSWER: Z) PERIDOTITE

**BONUS**

7) EARTH SCIENCE *Short Answer* Giving your answer in hours and minutes, how often will the entire tidal pattern on Earth be repeated?

ANSWER: 24 HOURS AND 50 MINUTES

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**TOSS-UP**

8) MATH *Short Answer* What is the common ratio of the geometric series with the first three terms,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$

ANSWER:  $\frac{1}{2}$

**BONUS**

8) MATH *Short Answer* What is the least common multiple of the numbers 30, 45, and 60?

ANSWER: 180

**TOSS-UP**

9) GENERAL SCIENCE *Multiple Choice* Which of the following best describes a coelacanth (read as: SEE-la-canth):

- W) living fossil fish
- X) extinct amphibian
- Y) extinct mammal
- Z) an air-breathing extinct fish

ANSWER: W) LIVING FOSSIL FISH

**BONUS**

9) GENERAL SCIENCE *Short Answer* Which of the following 3 choices are reference scales commonly used in describing the hardness of materials: Rockwell; Austenite; Ferrule

ANSWER: ROCKWELL

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**TOSS-UP**

10) LIFE SCIENCE *Multiple Choice* Into which of the following does a typical fern spore most directly develop:

- W) sporophyte
- X) egg cell
- Y) gametophyte
- Z) sperm cell

ANSWER: Y) GAMETOPHYTE

**BONUS**

10) LIFE SCIENCE *Short Answer* Name all of the following 4 plants that are conifers: pine; hemlock; palm; maple

ANSWER: PINE; HEMLOCK

**TOSS-UP**

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following most likely occurs when one molecule is oxidized:

- W) another molecule is reduced
- X) there is a release in work
- Y) the system becomes more ordered
- Z) the reaction is at equilibrium

ANSWER: W) ANOTHER MOLECULE IS REDUCED

**BONUS**

11) PHYSICAL SCIENCE *Short Answer* Arrange the following 3 pure substances in order of INCREASING evaporation rates at 1 atmosphere of pressure and at room temperature: water; acetone; aluminum

ANSWER: ALUMINUM; WATER; ACETONE

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**TOSS-UP**

12) EARTH SCIENCE *Multiple Choice* Which of the following were NOT produced by the eruption of Mount Saint Helens in 1980:

- W) lahar (read as: lah-HAR) flows
- X) pyroclastic flows
- Y) significant ashfall deposits
- Z) basic lava

ANSWER: Z) BASIC LAVA

**BONUS**

12) EARTH SCIENCE *Short Answer* All of the volcanoes of Hawaii belong to which one of the 3 basic types?

ANSWER: SHIELD

**TOSS-UP**

13) MATH *Short Answer* Reduce the following expression to lowest terms:  $\frac{3x + y}{xy}$

ANSWER:  $\frac{3x + y}{xy}$  (ACCEPT: CANNOT BE REDUCED)

**BONUS**

13) MATH *Short Answer* Find the prime factorization of 90:

ANSWER:  $2 \times 3 \times 3 \times 5$  (ACCEPT:  $2 \times 3^2 \times 5$ )

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**TOSS-UP**

14) GENERAL SCIENCE *Multiple Choice* Which of the following is a native American fruit that is typically grown in bogs and harvested in the fall:

- W) cherries
- X) blueberries
- Y) cranberries
- Z) huckleberries

ANSWER: Y) CRANBERRIES

**BONUS**

14) GENERAL SCIENCE *Multiple Choice* Which of the following is the pigment responsible for the characteristic red color of the cranberry:

- W) red dye number 2
- X) carotene
- Y) carmine red
- Z) anthocyanin

ANSWER: Z) ANTHOCYANIN

**TOSS-UP**

15) LIFE SCIENCE *Multiple Choice* Which of the following is a theory of heredity postulated by Lamarck:

- W) characteristics acquired after birth are passed on to following generations
- X) nature selects for the best characteristic
- Y) only the fittest organisms survive through natural selection
- Z) genes determine the phenotype

ANSWER: W) CHARACTERISTICS ACQUIRED AFTER BIRTH ARE PASSED ON TO FOLLOWING GENERATIONS

**BONUS**

15) LIFE SCIENCE *Short Answer* By words or numbers, name all of the following 3 choices that are found in the *E. coli* bacterium: 1) mitochondria; 2) chloroplasts; 3) ribosomes

ANSWER: 3) RIBOSOMES

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**TOSS-UP**

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following molecules is considered the most polar:

- W) CH<sub>4</sub>
- X) HF
- Y) F<sub>2</sub>
- Z) CO<sub>2</sub>

ANSWER: X) HF

**BONUS**

16) PHYSICAL SCIENCE *Short Answer* In addition to oxygen and sodium, what other element is a major constituent of borax?

ANSWER: BORON



**TOSS-UP**

17) EARTH SCIENCE *Multiple Choice* A Beaufort number of 4 indicates:

- W) a moderate earthquake
- X) a moderate breeze
- Y) a strong tornado
- Z) a mineral similar in hardness to fluorite

ANSWER: X) A MODERATE BREEZE

**BONUS**

17) EARTH SCIENCE *Multiple Choice* If cumulus mammatus clouds are heading in your direction, you may soon experience:

- W) clearing skies
- X) severe weather
- Y) high pressure conditions
- Z) snow

ANSWER: X) SEVERE WEATHER

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**TOSS-UP**

18) MATH *Short Answer* Find the sum of 7 times 23, and 3 times 23:

ANSWER: 230

(Solution:  $(7 + 3)(23) = 230$ )

**BONUS**

18) MATH *Short Answer* Solve the following equation for  $x$ :

$$(4x - 8) - (5x + 6) = (2x - 9) - (4x + 1)$$

ANSWER: 4

**TOSS-UP**

19) GENERAL SCIENCE *Short Answer* What human disease is caused by infection with the rhinovirus?

ANSWER: COMMON COLD (ACCEPT: COLD)

**BONUS**

19) GENERAL SCIENCE *Short Answer* Name all of the following 4 diseases for which effective vaccines are currently available: chicken pox; malaria; diphtheria; HIV

ANSWER: CHICKEN POX; DIPHTHERIA

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**TOSS-UP**

20) LIFE SCIENCE *Multiple Choice* Which of the following is LEAST likely to be found in or on a root of a flowering plant:

- W) stomata
- X) epidermis
- Y) xylem
- Z) phloem

ANSWER: W) STOMATA

**BONUS**

20) LIFE SCIENCE *Short Answer* What is the common name for the protective layers of cells that cover the tip of a growing root, allowing it to make its way through difficult soils?

ANSWER: ROOT CAP

**TOSS-UP**

21) PHYSICAL SCIENCE *Short Answer* When aluminum filings are added to a beaker containing concentrated sulfuric acid, what gas is produced?

ANSWER: HYDROGEN (ACCEPT: H<sub>2</sub>)

**BONUS**

21) PHYSICAL SCIENCE *Short Answer* Rounded to the first decimal place, what is the current, in amperes, for a 60-watt bulb running on a 120-volt power source?

ANSWER: 0.5

(Solution: current = watts/volts; 60/120 = 0.5 amperes)

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**TOSS-UP**

22) EARTH SCIENCE *Short Answer* In which of the 5 main layers of Earth's atmosphere does the Space Shuttle orbit?

ANSWER: THERMOSPHERE

**BONUS**

22) EARTH SCIENCE *Short Answer* Order the following 4 life forms from the EARLIEST to appear on Earth to the most RECENT: crocodile; jawless fish; jawed fish; antelope

ANSWER: JAWLESS FISH; JAWED FISH; CROCODILE; ANTELOPE

**TOSS-UP**

23) MATH *Short Answer* Any triangle inscribed within a semicircle is always what type of triangle if one of its sides is the diameter of the semicircle?

ANSWER: RIGHT

**BONUS**

23) MATH *Short Answer* Provide the prime factors over the integers for the following expression:  
 $25x^4 - 16y^2$

ANSWER:  $(5x^2 + 4y)(5x^2 - 4y)$

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**TOSS-UP**

24) GENERAL SCIENCE *Short Answer* Which of the following 4 star types is believed to be the most common in the universe: neutron; blue giant; red dwarf; pulsar

ANSWER: RED DWARF

**BONUS**

24) GENERAL SCIENCE *Short Answer* Which one of the following 5 spectral classes of stars is the HOTTEST: A; F; G; K; O

ANSWER: O

**TOSS-UP**

25) LIFE SCIENCE *Short Answer* What sugar is found in the backbone of DNA?

ANSWER: DEOXYRIBOSE (ACCEPT: RIBOSE)

**BONUS**

25) LIFE SCIENCE *Short Answer* Name all of the following 4 trees that produce true flowers:  
hemlock; palm; maple; pine

ANSWER: PALM; MAPLE