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 × 2 = 140)

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: \(-9x^3y + 12x^2y^2 - 3xy^3\)

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

**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

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

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

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: \( 2 \times 3^2 \times 5 \))

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

TOSS-UP

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

W) CH₄  
X) HF  
Y) F₂  
Z) CO₂  

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

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

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: H₂)

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)

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

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