

## ROUND 14

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### TOSS-UP

1) PHYSICAL SCIENCE *Multiple Choice* At sea level, what is the approximate atmospheric pressure at the ground in psi?

- W) 0.15
- X) 1.5
- Y) 15
- Z) 150

ANSWER: Y) 15

### BONUS

1) PHYSICAL SCIENCE *Short Answer* To calculate the escape velocity for an object when it is much smaller than the larger body, name all of the of the following that can be neglected:

1) drag force, 2) atmospheric pressure, and/or 3) relative angle at which the smaller object travels?

ANSWER: DRAG FORCE, ATMOSPHERIC PRESSURE, AND RELATIVE ANGLE AT WHICH THE SMALLER OBJECT TRAVELS (ACCEPT: 1, 2, 3, ALL)

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### TOSS-UP

2) LIFE SCIENCE *Short Answer* What is the spongy, glandular organ that secretes digestive enzymes and hormones, including insulin?

ANSWER: PANCREAS

### BONUS

2) LIFE SCIENCE *Multiple Choice* Which of the following statements about pancreatic cancer is NOT true?

- W) Early pancreatic cancer usually does not cause symptoms
- X) Pancreatic cancer often remains contained within the pancreas
- Y) Smoking is a risk factor for pancreatic cancer
- Z) Pancreatic cancer is difficult to cure

ANSWER: X) PANCREATIC CANCER OFTEN REMAINS CONTAINED WITHIN THE PANCREAS

**TOSS-UP**

3) MATH *Multiple Choice* Which of the following can be equal to positive 4?

W)  $|-3| \times |1|$  (read as: the absolute value of negative 3 times the absolute value of 1)

X)  $2^3$  (read as: 2 cubed)

Y)  $\sqrt{-16}$  (read as: the square root of negative 16)

Z)  $\sqrt{4^2}$  (read as: the square root of 4 squared)

ANSWER: Z)  $\sqrt{4^2}$

**BONUS**

3) MATH *Short Answer* A triangle has an area of  $9y^2 - 9y - 10$ . The base of the triangle is  $3y - 5$ . In terms of  $y$ , what is the height of the triangle?

ANSWER:  $6y + 4$

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**TOSS-UP**

4) ENERGY *Multiple Choice* Fuel cells produce electric currents by means of:

W) Nuclear reactions

X) Electro chemical reactions

Y) Electrical reactions

Z) Mechanical reactions

ANSWER: X) ELECTRO CHEMICAL REACTIONS

**BONUS**

4) ENERGY *Multiple Choice* What is the current approximate maximum percent efficiency fuel cells can obtain when provided with pure hydrogen?

W) 13%

X) 50%

Y) 64%

Z) 80%

ANSWER: Z) 80%

**TOSS-UP**

5) PHYSICAL SCIENCE *Multiple Choice* When an object slides across a horizontal surface, kinetic friction is proportional to which of the following quantities?

- W) Mass of the object
- X) Volume of the object
- Y) The object's surface area
- Z) The object's potential energy

ANSWER: W) MASS OF THE OBJECT

**BONUS**

5) PHYSICAL SCIENCE *Short Answer* What is the name for the amount of energy it takes to change a unit mass of a solid into the same mass of liquid?

ANSWER: THE LATENT HEAT OF FUSION

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**TOSS-UP**

6) MATH *Short Answer* What inequality would be represented by a number line with an open circle at -3, a closed circle at 10, and shading in between?

ANSWER:  $-3 < x \leq 10$  (NOTE: ANY VARIABLE IS FINE.  $x$  COULD BE REPLACED WITH ANY LETTER)

**BONUS**

6) MATH *Short Answer* On a coordinate grid, a dashed line passes through the points (-5, 0) and (0, 5), and everything is shaded beneath that line. What inequality is represented by this image?

ANSWER:  $y < x + 5$

**TOSS-UP**

7) LIFE SCIENCE *Short Answer* What do we call the injection of a weakened form of a pathogen, or a similar but less dangerous pathogen, to produce immunity?

ANSWER: VACCINATION

**BONUS**

7) LIFE SCIENCE *Short Answer* What disease was the first vaccination intended to prevent?

ANSWER: SMALLPOX

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**TOSS-UP**

8) ENERGY *Multiple Choice* The Moon orbits the Earth due to which of the following characteristics of the Earth?

- W) More volume
- X) More density
- Y) Older age
- Z) Greater mass

ANSWER: Z) GREATER MASS

**BONUS**

8) ENERGY *Multiple Choice* Imagine you are playing a game on your Nintendo Wii and all of a sudden the TV and Wii turn off unexpectedly, then turn back on 5 seconds later. This indicates a power quality problem; there was a voltage:

- W) Swell
- X) Sag
- Y) Flicker
- Z) Brilliance

ANSWER: X) SAG

### TOSS-UP

9) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following sedimentary rocks is often formed in a tropical ocean?

- W) Sandstone
- X) Limestone
- Y) Breccia (read as: BREH-ch(ee)ah)
- Z) Shale

ANSWER: X) LIMESTONE

### BONUS

9) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following types of physical weathering is referred to as onion skin weathering, where concentric shells of weathered material form around a rock?

- W) Freeze/thaw
- X) Exfoliation
- Y) Unloading
- Z) Thermal expansion

ANSWER: X) EXFOLIATION

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### TOSS-UP

10) MATH *Short Answer* What is the degree of the polynomial function  $f(x) = 7$  (read as: f of x equals 7)?

ANSWER: 0

### BONUS

10) MATH *Multiple Choice* A 10-foot ladder leaned against a wall reaches a window. If the base of the ladder is 3 feet from the wall, how high up is the window?

- W) Between 6 and 7 feet
- X) Between 7 and 8 feet
- Y) Between 8 and 9 feet
- Z) Between 9 and 10 feet

ANSWER: Z) BETWEEN 9 AND 10 FEET

**TOSS-UP**

11) LIFE SCIENCE *Short Answer* What is the most abundant molecule in a human cell?

ANSWER: WATER

**BONUS**

11) LIFE SCIENCE *Multiple Choice* In which of the following parts of the kidney does filtration occur?

- W) Renal corpuscle
- X) Tubule
- Y) Collecting duct
- Z) Dendrites

ANSWER: W) RENAL CORPUSCLE

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**TOSS-UP**

12) GENERAL SCIENCE *Short Answer* Alpha decay occurs when an atom emits an alpha particle. What is an alpha particle?

ANSWER: 2 PROTONS AND 2 NEUTRONS (ACCEPT: HELIUM NUCLEUS)

**BONUS**

12) GENERAL SCIENCE *Short Answer* Arrange the following types of radiation in order from lowest to highest frequency: visible light, ultraviolet radiation, radio waves, and infrared radiation.

ANSWER: RADIO WAVES, INFRARED RADIATION, VISIBLE LIGHT, ULTRAVIOLET RADIATION

### TOSS-UP

13) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following statements about heating air is true?

- W) Air over land is heated faster than air over water at the same location
- X) Air over a light colored sandy beach is heated to a higher temperature than air over the black asphalted parking lot
- Y) Air over water is heated faster than air over land at the same location
- Z) Air over ice is heated faster than air over water at the same location

ANSWER: W) AIR OVER LAND IS HEATED FASTER THAN AIR OVER WATER AT THE SAME LOCATION

### BONUS

13) EARTH AND SPACE SCIENCE *Multiple Choice* You experience an ocean breeze when you stand on the beach on a summer afternoon because:

- W) Wind always comes into land off the water because air moves more over the ocean
- X) Air currents are stronger over land
- Y) Air over land is heated more, causing it to rise and make room for the cooler ocean air
- Z) Air over water is heated during the day, rises, and then flows inland to the land, where the air is cooler

ANSWER: Y) AIR OVER LAND IS HEATED MORE, CAUSING IT TO RISE AND MAKE ROOM FOR THE COOLER OCEAN AIR

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### TOSS-UP

14) MATH *Short Answer*

What is  $\sqrt[4]{3^4}$  (read as: the fourth root of 3 to the fourth)?

ANSWER: 3 (DO NOT ACCEPT: - 3)

### BONUS

14) MATH *Short Answer* If  $n$  is positive, write the following in standard polynomial form:  $(5n^2 - 500) \div (n + 10)$  (read as: the quantity 5  $n$  squared minus 500 divided by the quantity  $n$  plus 10)?

ANSWER:  $5n - 50$

### TOSS-UP

15) EARTH AND SPACE SCIENCE *Multiple Choice* Glaciers can have quite an effect on Earth's surface. They can:

- W) Stop volcanoes from erupting
- X) Carve away rock from mountains
- Y) Sink to the bottom of the ocean then grow until they reach the surface
- Z) Create new mountain ranges

ANSWER: X) CARVE AWAY ROCK FROM MOUNTAINS

### BONUS

15) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following statements is true about glaciers?

- W) Glaciers are generally full of rocks and sediments and can move these objects far from their sources
- X) When a glacier retreats, it moves backwards
- Y) Humans did not exist when glaciers were covering much of North America
- Z) There is more glacial ice today than there has been in the past 100 years

ANSWER: W) GLACIERS ARE GENERALLY FULL OF ROCKS AND SEDIMENTS AND CAN MOVE THESE OBJECTS FAR FROM THEIR SOURCES

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### TOSS-UP

16) PHYSICAL SCIENCE *Multiple Choice* Amy is pulling a heavy cart. It is harder to start pulling the cart than to keep the cart in motion, because kinetic friction:

- W) Has decreased
- X) Is zero once the cart is moving
- Y) Is only present when the cart is first pulled
- Z) Is less than static friction

ANSWER: Z) IS LESS THAN STATIC FRICTION

### BONUS

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following forms of electromagnetic radiation has the highest energy?

- W) Infrared
- X) Long UV
- Y) Gamma rays
- Z) Short UV

ANSWER: Y) GAMMA RAYS



**TOSS-UP**

17) GENERAL SCIENCE *Short Answer* What is the name of our current geologic epoch?

ANSWER: HOLOCENE

**BONUS**

17) GENERAL SCIENCE *Multiple Choice* Which of the following relative dating principles relies on fossils for dating?

- W) Original horizontality
- X) Lateral continuity
- Y) Faunal succession
- Z) Cross-cutting relationships

ANSWER: Y) FAUNAL SUCCESSION

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**TOSS-UP**

18) LIFE SCIENCE *Multiple Choice* All of the following cells undergo mitosis EXCEPT:

- W) Epidermal cells
- X) Red blood cells
- Y) Kidney cells
- Z) Pancreatic cells

ANSWER: X) RED BLOOD CELLS

**BONUS**

18) LIFE SCIENCE *Multiple Choice* Which of the following cell types undergo meiosis?

- W) Primary spermatocyte
- X) Epidermal cells
- Y) Kidney cells
- Z) Liver cells

ANSWER: W) PRIMARY SPERMATOCYTE

### TOSS-UP

19) EARTH AND SPACE SCIENCE *Short Answer* Two planets of the same mass are orbiting around the same star. Planet A is three times as far away from the star as Planet B. How does the star's gravitational force on Planet A compare to the gravitational force on Planet B?

ANSWER: 1/9 (DO NOT ACCEPT: 9 TIMES LESS)

### BONUS

19) EARTH AND SPACE SCIENCE *Multiple Choice* The radius of Planet C is close to half that of Earth, and both have the same average density. Compared to Earth's gravitational acceleration at the surface, approximately what will Planet C's gravity be at its surface?

- W) 4 *g*
- X)  $g/4$
- Y) *g*
- Z)  $g/2$

ANSWER: Z)  $g/2$

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### TOSS-UP

20) GENERAL SCIENCE *Multiple Choice* Which of the following animals do not belong to the phylum of animals called echinoderms (read as: i-KY-neh-dehrms)?

- W) Jellyfish
- X) Sea cucumbers
- Y) Sea lilies
- Z) Sea stars

ANSWER: W) JELLYFISH

### BONUS

20) GENERAL SCIENCE *Short Answer* To which phylum do jellyfish currently belong?

ANSWER: CNIDARIA (DO NOT ACCEPT: COELENTERATA)

### TOSS-UP

21) ENERGY *Multiple Choice* A resonant circuit has a combination of resistors, capacitors and inductors. It is possible to have the inductor and capacitor continuously charge and discharge and create a:

- W) Regulator
- X) Alternator
- Y) Rectifier
- Z) Oscillator

ANSWER: Z) OSCILLATOR

### BONUS

21) ENERGY *Multiple Choice* Which of the following is true of a step-down transformer?

- W) The number of turns in the primary coil is less than the number of turns in the secondary coil
- X) The number of turns in the primary and secondary coils are the same
- Y) The number of turns in the primary coil is greater than the number of turns in the secondary coil
- Z) The action of a step-down transformer does not depend on the number of turns in the primary and secondary coils

ANSWER: Y) THE NUMBER OF TURNS IN THE PRIMARY COIL IS GREATER THAN THE NUMBER OF TURNS IN THE SECONDARY COIL

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### TOSS-UP

22) GENERAL SCIENCE *Short Answer* What is the outer part of the Sun's atmosphere called?

ANSWER: CORONA

### BONUS

22) GENERAL SCIENCE *Multiple Choice* Which of the following statements is NOT true about the solar wind?

- W) It escapes the Sun primarily through sun spots
- X) It is comprised of high-speed charged particles constantly blowing off of the Sun
- Y) It blows at a speed of about one million miles per hour
- Z) It can produce storms in the Earth's magnetosphere

ANSWER: W) IT ESCAPES THE SUN PRIMARILY THROUGH SUN SPOTS

### TOSS-UP

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements exists as a diatomic molecule in its lowest energy state?

- W) Beryllium
- X) Boron
- Y) Carbon
- Z) Nitrogen

ANSWER: Z) NITROGEN

### BONUS

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following is a metalloid?

- W) Beryllium
- X) Nitrogen
- Y) Carbon
- Z) Silicon

ANSWER: Z) SILICON

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### TOSS-UP

24) EARTH AND SPACE SCIENCE *Multiple Choice* As water freezes it often supercools, which means that it:

- W) Remains liquid below the freezing point
- X) Cools very quickly
- Y) Rapidly cools the surrounding environment
- Z) Becomes a solid above the freezing point

ANSWER: W) REMAINS LIQUID BELOW THE FREEZING POINT

### BONUS

24) EARTH AND SPACE SCIENCE *Multiple Choice* As water begins changing phase from liquid to solid, what is happening with the energy of the system, including the ice and the surrounding water?

- W) No energy is being exchanged
- X) Energy from the forming ice is given off to the surrounding water
- Y) Energy from the surrounding water is given off to the forming ice
- Z) The whole system loses energy rapidly, becoming supercooled

ANSWER: X) ENERGY FROM THE FORMING ICE IS GIVEN OFF TO THE SURROUNDING WATER

### TOSS-UP

25) MATH *Multiple Choice* Which of the following is a polynomial?

W)  $a^2 - \frac{4}{a} + 3$  (read as:  $a$  squared minus 4 over  $a$  plus 3)

X)  $3a^2 - a^{-2} + 1$  (read as: 3  $a$  squared minus  $a$  to the minus 2 plus one)

Y)  $15a^2 - a^{1.5} - 3$  (read as: 15  $a$  squared minus  $a$  to the 1.5 minus three)

Z)  $a^3$

ANSWER: Z)  $a^3$

### BONUS

25) MATH *Short Answer* What is the equation of the line, in slope intercept form, which passes through the points (-3, 2) and (-5, 6)?

ANSWER:  $y = -2x - 4$