

ROUND 17

TOSS-UP

1) LIFE SCIENCE *Short Answer* A scientist is interested in inhibiting antibody production in humans. What cell should be targeted to ensure absolutely no antibody production?

ANSWER: PLASMA (ACCEPT: B CELL)

BONUS

1) LIFE SCIENCE *Short Answer* From which embryonic germ layer is the nervous system formed?

ANSWER: ECTODERM

TOSS-UP

2) EARTH AND SPACE *Multiple Choice* Approximately how many years ago was the last magnetic pole reversal?

- W) 1200
- X) 780,000
- Y) 2.5 million
- Z) 680 million

ANSWER: X) 780,000

BONUS

2) EARTH AND SPACE *Multiple Choice* Which of the following igneous rock textures would NOT be considered an intrusive texture?

- W) Phaneritic [*fan-uh-RIT-ik*]
- X) Pegmatitic
- Y) Aplitic
- Z) Aphanitic [*af-uh-NIT-ik*]

ANSWER: Z) APHANITIC

TOSS-UP

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following electrolyte solutions would provide the best conditions for the electrolysis of water?

- W) Sodium sulfate
- X) Sodium chloride
- Y) Hydrochloric acid
- Z) Potassium chloride

ANSWER: W) SODIUM SULFATE

BONUS

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements is NOT true of buckminsterfullerene [*buhk-min-ster-FOOL-uh-reen*]?

- W) It resembles a geodesic dome
- X) It can be found in soot
- Y) It exhibits wave-particle duality
- Z) It is an insulator

ANSWER: Z) IT IS AN INSULATOR

TOSS-UP

4) MATH *Short Answer* What is the eccentricity of the figure with equation $x = 2y^2$?

ANSWER: 1

BONUS

4) MATH *Short Answer* Quadrilateral ABCD has the following properties: angles D and BCA are right angles, CD = 7 meters, AD = 6 meters, and AB = 13 meters. Expressed in simplest form, what is the length of BC, in meters?

ANSWER: $2\sqrt{21}$

TOSS-UP

5) GENERAL SCIENCE *Short Answer* What is a standard tool for measuring turbidity with readings that may vary depending on cloud coverage or wave action?

ANSWER: SECCHI DISK

BONUS

5) GENERAL SCIENCE *Short Answer* Name all of the following five organisms that are sessile at some stage of their life cycle: 1) coral, 2) phytoplankton [*fy-tuh-PLANGK-tuhn*], 3) tuna, 4) lamprey, 5) jellyfish.

ANSWER: 1, 5 (ACCEPT: CORAL, JELLYFISH)

TOSS-UP

6) ENERGY *Multiple Choice* Why is a sinusoidal waveform used to transmit power to homes when the shape does not maximize efficiency in the circuit?

- W) The shape is distorted when capacitors and inductors are present in a circuit
- X) The shape is preserved when capacitors and inductors are present in a circuit
- Y) The need for capacitors and inductors is eliminated, making the power factor very close to 1
- Z) The shape guarantees that no power outages will occur

ANSWER: X) THE SHAPE IS PRESERVED WHEN CAPACITORS AND INDUCTORS ARE PRESENT IN A CIRCUIT

BONUS

6) ENERGY *Multiple Choice* Which of the following compounds has the highest boiling point?

- W) Potassium bromide
- X) Magnesium oxide
- Y) Sodium iodide
- Z) Sodium chloride

ANSWER: X) MAGNESIUM OXIDE

TOSS-UP

7) LIFE SCIENCE *Short Answer* What enzyme in the small intestine hydrolyzes fat molecules?

ANSWER: LIPASE

BONUS

7) LIFE SCIENCE *Short Answer* Sam has parasitic worms in his intestines. Which type of white blood cell discharges destructive enzymes to combat worms?

ANSWER: EOSINOPHILS (ACCEPT: MAST CELLS, BASOPHILS)

TOSS-UP

8) EARTH AND SPACE *Multiple Choice* Which of the following is a type of dune that forms at right angles to the wind when there is abundant sand, a lack of vegetation, and a constant wind direction?

- W) Barchan [**bahr-KAHN**]
- X) Transverse
- Y) Parabolic
- Z) Star

ANSWER: W) BARCHAN

BONUS

8) EARTH AND SPACE *Multiple Choice* Suppose you find a rock with angular clasts. Which of the following is the correct classification?

- W) Breccia [**BRECH-ee-uh**]
- X) Conglomerate
- Y) Slate
- Z) Basalt

ANSWER: W) BRECCIA

TOSS-UP

9) PHYSICAL SCIENCE *Short Answer* What kind of organic compound is formed by the reaction of an organic acid and an alcohol?

ANSWER: ESTER

BONUS

9) PHYSICAL SCIENCE *Multiple Choice* Disregarding the effects of convection and evaporation, 100 kilograms of which of the following substances in the same container will take longer to cool to room temperature if the initial temperature for each is 97° Celsius?

- W) Water
- X) Ethanol
- Y) Concrete
- Z) Sand

ANSWER: W) WATER

TOSS-UP

10) MATH *Short Answer* The average measure of the interior angles of a convex polygon is 108°. How many sides does this polygon have?

ANSWER: 5

BONUS

10) MATH *Short Answer* What is your overall savings in cents per ounce if you buy a 1 pound 2 ounce box of detergent at \$9.72, instead of a 9 ounce box at \$6.75?

ANSWER: 21

TOSS-UP

11) GENERAL SCIENCE *Short Answer* How many carbon atoms are there in glyceraldehyde-3-phosphate [*glis-uh-RAL-duh-hyd 3 FOS-fayt*]?

ANSWER: 3

BONUS

11) GENERAL SCIENCE *Short Answer* What type of bond is responsible for maintaining the secondary structure of a protein?

ANSWER: HYDROGEN

TOSS-UP

12) ENERGY *Multiple Choice* The connection scheme used to connect a renewable energy source to the utility grid is usually called which of the following?

- W) Distributed power
- X) Distributed generation
- Y) Lumped generation
- Z) Grid tie power

ANSWER: X) DISTRIBUTED GENERATION

BONUS

12) ENERGY *Multiple Choice* Wind turbines use which of the following principles of fluid mechanics when producing energy?

- W) Law of continuity
- X) Law of energy conversion
- Y) Faraday's law and Lenz's law
- Z) Maxwell's equations

ANSWER: W) LAW OF CONTINUITY

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Human pregnancy tests detect levels of which of the following hormones?

- W) Estrogen
- X) Progesterone
- Y) Chorionic gonadotropin [*kohr-ee-ON-ik goh-nad-uh-TROH-pin*]
- Z) Luteinizing hormone [*loo-tee-uh-NY-zing*]

ANSWER: Y) CHORIONIC GONADOTROPIN

BONUS

13) LIFE SCIENCE *Short Answer* Which main class of antibodies is found in body secretions, such as saliva, tears, and sweat?

ANSWER: IgA (ACCEPT: IMMUNOGLOBULIN A)

TOSS-UP

14) EARTH AND SPACE *Short Answer* What region on the edge of the solar system contains masses of ice and icy rock and is believed to be the source of short period comets?

ANSWER: KUIPER BELT

BONUS

14) EARTH AND SPACE *Short Answer* Put the following four ocean floor features and zones in the order you are likely to encounter them as you sail from the coast of North Carolina toward Bermuda: 1) continental slope, 2) open ocean, 3) intertidal zone, 4) neritic zone.

ANSWER: 3, 4, 1, 2 (ACCEPT: INTERTIDAL ZONE, NERITIC ZONE, CONTINENTAL SLOPE, OPEN OCEAN)

TOSS-UP

15) PHYSICAL SCIENCE *Multiple Choice* Which of the following types of force occurs between two parallel wires carrying currents in the same direction?

- W) No force
- X) Repulsive
- Y) Attractive
- Z) Sinusoidal

ANSWER: Y) ATTRACTIVE

BONUS

15) PHYSICAL SCIENCE *Multiple Choice* Imagine evenly spaced radial lines emanating from a point source that represents the Earth. If 9 force lines pass through a plane x meters from the source, how many force lines pass through a plane of the same size $3x$ meters away?

- W) 1
- X) 3
- Y) 4.5
- Z) 9

ANSWER: W) 1

TOSS-UP

16) MATH *Multiple Choice* A hula hoop with radius of 18 inches is cut into 12 equal pieces. Which of the following is the arc length in inches of each piece?

- W) 3π
- X) 9π
- Y) 18π
- Z) 36π

ANSWER: W) 3π

BONUS

16) MATH *Short Answer* How many positive integer factors does 120 have?

ANSWER: 16

TOSS-UP

17) GENERAL SCIENCE *Multiple Choice* At which of the following locations in the human body does the Krebs cycle occur?

- W) Ribosome [*RY-buh-sohm*]
- X) Mitochondrial matrix [*my-tuh-KON-dree-uhl*]
- Y) Cytosol [*SY-tuh-sol*]
- Z) Phospholipid bilayer [*fos-foh-LIP-id*]

ANSWER: X) MITOCHONDRIAL MATRIX

BONUS

17) GENERAL SCIENCE *Multiple Choice* When using a psychrometer, at which of the following points is relative humidity 100%?

- W) When the wet bulb and dry bulb thermometers give equivalent readings
- X) When the wet bulb thermometer reading is higher than the dry bulb thermometer
- Y) When the wet bulb thermometer reading is lower than the dry bulb thermometer
- Z) When the wet bulb and dry bulb thermometers give a zero reading

ANSWER: W) WHEN THE WET BULB AND DRY BULB THERMOMETERS GIVE EQUIVALENT READINGS

TOSS-UP

18) ENERGY *Multiple Choice* In a fast nuclear reactor, why would coolant other than water be needed?

- W) Water has poor thermal properties
- X) Water absorbs neutrons too readily
- Y) Water slows fast neutrons down
- Z) Water cannot be used with the fast nuclear turbines

ANSWER: Y) WATER SLOWS FAST NEUTRONS DOWN

BONUS

18) ENERGY *Short Answer* In recent years, the Pentagon has been trying to kick-start a new biofuel industry. The Air Force has already approved F-15 fighters, F-16 fighters, and C-17 transport planes to use 50% biofuel. What is the name of the plant that will be used to produce this jet biofuel?

ANSWER: CAMELINA

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following amino acids is NOT made by the human body?

- W) Alanine [**AL-uh-need**]
- X) Asparagine [**uh-SPAR-uh-jeen**]
- Y) Cysteine [**SIS-tee-eeen**]
- Z) Phenylalanine [**fen-i-AL-uh-need**]

ANSWER: Z) PHENYLALANINE

BONUS

19) LIFE SCIENCE *Short Answer* During post-transcriptional processing, what nitrogenous base is added to the 3' [**3 prime**] end of the new RNA strand?

ANSWER: ADENINE

TOSS-UP

20) EARTH AND SPACE *Multiple Choice* The presence of which of the following compounds helps stabilize the pH of the ocean?

- W) Calcium carbonate
- X) Calcium chloride
- Y) Sodium chloride
- Z) Magnesium chloride

ANSWER: W) CALCIUM CARBONATE

BONUS

20) EARTH AND SPACE *Multiple Choice* Which of the following rocks would be the best choice for use as a building material, considering its resistance to chemical weathering?

- W) Limestone
- X) Pyrite
- Y) Granite
- Z) Shale

ANSWER: Y) GRANITE

TOSS-UP

21) PHYSICAL SCIENCE *Multiple Choice* Which of the following does NOT affect the pressure of an incompressible fluid in a container at a specific point?

- W) The depth of the point in the fluid
- X) The width of the container at the point
- Y) The density of the fluid
- Z) The force of gravity

ANSWER: X) THE WIDTH OF THE CONTAINER AT THE POINT

BONUS

21) PHYSICAL SCIENCE *Short Answer* Calculate the gravitational acceleration to the nearest whole number of meters per second squared on the surface of a small planet with a mass of 2×10^{23} kilograms and a radius of 2000 kilometers, given 6.7×10^{-11} meters cubed per kilogram second squared as the gravitational constant G.

ANSWER: 3

TOSS-UP

22) MATH *Short Answer* What is the standard form of the equation of the circle with center $(-1, 0)$ and radius 4?

ANSWER: $(x + 1)^2 + y^2 = 16$

BONUS

22) MATH *Short Answer* If you travel from your house 15 miles due east, return, then proceed to travel 15 miles due west and return, what are your average speed and the magnitude of your average velocity in miles per hour, if your travels occurred over a 6-hour period?

ANSWER: AVERAGE SPEED = 10, MAGNITUDE OF AVERAGE VELOCITY = 0

TOSS-UP

23) GENERAL SCIENCE *Multiple Choice* Which of the following terms describes the relationship between L-ascorbic acid and D-ascorbic acid?

- W) Diastereomers [*dy-uh-STER-ee-uh-mers*]
- X) Constitutional isomers
- Y) Enantiomers [*i-NAN-tee-uh-mers*]
- Z) Epimers

ANSWER: Y) ENANTIOMERS

BONUS

23) GENERAL SCIENCE *Multiple Choice* Which of the following describes the chemical ability of a plant to prevent seeds of another species from germinating?

- W) Allelopathy [*uh-lee-LOP-uh-thee*]
- X) Oligotrophy [*ol-i-GO-truh-fee*]
- Y) Autophagy [*AW-tuh-FAY-jee*]
- Z) Autotrophy [*AW-tuh-TRO-fee*]

ANSWER: W) ALLELOPATHY

TOSS-UP

24) MATH *Multiple Choice* How many real numbers b are there such that the equation $3^x + 3^{-x} = b$ [**3 to the power of x plus 3 to the power of negative x equals b**] has a unique real solution x ?

- W) There are no such values of b
- X) There is exactly one such value of b
- Y) There are exactly two such values of b
- Z) There are infinitely many such values of b

ANSWER: X) THERE IS EXACTLY ONE SUCH VALUE OF b

BONUS

24) MATH *Multiple Choice* Given a is a fixed real number that is greater than one, how many real numbers b are there such that the equation $a^x + a^{-x} = b$ [**a to the power of x plus a to the power of negative x equals b**] has a unique real solution x ?

- W) There are no such values of b
- X) There is exactly one such value of b
- Y) There are infinitely many such values of b
- Z) The number of such values of b depends on the value of a

ANSWER: Y) THERE ARE INFINITELY MANY SUCH VALUES OF b

TOSS-UP

25) LIFE SCIENCE *Multiple Choice* Polyp and medusa are two stages in the life cycle of which of the following?

- W) Nematocysts [**NEM-uh-tuh-sists**]
- X) Anthozoa
- Y) Cnidarians [**ny-DAIR-ee-uhns**]
- Z) Ganglia [**GANG-gee-uh**]

ANSWER: Y) CNIDARIANS

BONUS

25) LIFE SCIENCE *Multiple Choice* In Alzheimer's disease, which of the following brain regions shows the first signs of protein aggregation?

- W) Central amygdala [**uh-MIG-duh-luh**]
- X) Mediolateral frontal lobe
- Y) Ventral lateral hypothalamus [**hy-puh-THAL-uh-muhs**]
- Z) CA1 of the hippocampus [**hip-uh-KAM-puhs**]

ANSWER: Z) CA1 OF THE HIPPOCAMPUS