

## ROUND 15A

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### TOSS-UP

1) MATH *Multiple Choice* Which of the following figures can result when a plane intersects a cube?

- W) Circle
- X) Octagon
- Y) Line
- Z) Pentagon

ANSWER: Z) PENTAGON

### BONUS

1) MATH *Short Answer* If dog food can be purchased in packages of either 3 pounds or 5 pounds, in how many different ways can exactly 150 pounds be purchased?

ANSWER: 11

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### TOSS-UP

2) LIFE SCIENCE *Short Answer* In the Kingdom Animalia, what is the only phylum that lacks true tissues?

ANSWER: SPONGES (ACCEPT: PHYLUM PORIFERA)

### BONUS

2) LIFE SCIENCE *Multiple Choice* Which of the following processes is directly related to coral bleaching?

- W) Loss of the zooxanthellae [*zoh-uh-zan-THEL-ee*]
- X) Air pollution
- Y) Red tides
- Z) Climate change

ANSWER: W) LOSS OF THE ZOOXANTHELLAE

**TOSS-UP**

3) EARTH AND SPACE *Multiple Choice* Which of the following is a good way to prevent erosion?

- W) Moldboard plowing
- X) Growing crops in terraces
- Y) Disc plowing
- Z) River channelization

ANSWER: X) GROWING CROPS IN TERRACES

**BONUS**

3) EARTH AND SPACE *Short Answer* Tornado alley is a region in the Midwest including parts of Texas, Oklahoma, Kansas and Nebraska. Tornadoes are common here because of the confluence of cold dry air from the northwest and what from the Gulf of Mexico?

ANSWER: WARM MOIST AIR (ACCEPT: HUMIDITY)

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**TOSS-UP**

4) GENERAL SCIENCE *Short Answer* What is the name for the in vitro technique that rapidly generates large amounts of DNA from a small amount of template DNA?

ANSWER: POLYMERASE CHAIN REACTION (ACCEPT: PCR)

**BONUS**

4) GENERAL SCIENCE *Multiple Choice* Which of the following was NOT a component of the Earth's early atmosphere?

- W) Oxygen
- X) Hydrogen gas
- Y) Methane
- Z) Ammonia

ANSWER: W) OXYGEN

**TOSS-UP**

5) PHYSICAL SCIENCE *Short Answer* How is the speed of a wave affected when the amplitude increases?

ANSWER: IT REMAINS THE SAME (ACCEPT: IT IS UNCHANGED OR NO CHANGE)

**BONUS**

5) PHYSICAL SCIENCE *Multiple Choice* Which of the following are NOT emitted by radioactive materials?

- W) Gamma rays
- X) Phonons
- Y) Alpha particles
- Z) Electrons

ANSWER: X) PHONONS

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**TOSS-UP**

6) MATH *Short Answer* The volume of a cube with an edge that is an integer is represented by the value  $72n$ , where  $n$  is an integer. What is the smallest possible value for  $n$ ?

ANSWER: 3

**BONUS**

6) MATH *Short Answer* Suppose a two digit number is added to the number formed by interchanging its digits. The result is how many times the sum of the original digits?

ANSWER: 11

### TOSS-UP

7) ENERGY *Multiple Choice* Particle Man is attacking a video game hero with gamma rays. A shield made from which of the following would be most effective in protecting our hero?

- W) Paper
- X) A leaf
- Y) Aluminum
- Z) Lead

ANSWER: Z) LEAD

### BONUS

7) ENERGY *Short Answer* What is the difference in kinetic energy of a 10 pound object moving at 10 feet per second on Earth vs. the same object moving at 10 feet per second on the Moon?

ANSWER: THERE IS NO DIFFERENCE

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### TOSS-UP

8) LIFE SCIENCE *Short Answer* What age-related process in plants is characterized by fruits, flowers, and leaves falling from trees after they have completed development?

ANSWER: SENESCENCE (ACCEPT: BIOLOGICAL AGING)

### BONUS

8) LIFE SCIENCE *Multiple Choice* If a flower is said to be incomplete and perfect, which of the following would apply?

- W) The flower is missing petals
- X) The flower is missing carpels
- Y) The flower has extra sepals [**SEE-puhls**]
- Z) The flower is missing stamens [**STAY-muhns**]

ANSWER: W) THE FLOWER IS MISSING PETALS

### TOSS-UP

9) EARTH AND SPACE *Multiple choice* Which of the following is NOT true of a lahar?

- W) It can be very destructive
- X) It can occur long after the eruption that caused it
- Y) It must involve material at high temperatures
- Z) It contains more water than a pyroclastic flow

ANSWER: Y) IT MUST INVOLVE MATERIAL AT HIGH TEMPERATURES

### BONUS

9) EARTH AND SPACE *Multiple Choice* Compressive forces dominate which of the following tectonic plate boundaries?

- W) North American and Eurasian [*yoo-RAY-shuhn*]
- X) Arabian and Eurasian
- Y) Nazca and Antarctic
- Z) Indo-Australian and Antarctic

ANSWER: X) ARABIAN AND EURASIAN

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### TOSS-UP

10) GENERAL SCIENCE *Multiple Choice* Which of the following is the oldest mountain chain, geologically?

- W) Himalayas
- X) Rockies
- Y) Appalachians
- Z) Alps

ANSWER: Y) APPALACHIANS

### BONUS

10) GENERAL SCIENCE *Short Answer* List the four lobes of the cerebral cortex.

ANSWER: FRONTAL, PARIETAL, OCCIPITAL, AND TEMPORAL

### TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* The production of water from barium hydroxide and ammonium chloride is an example of what type of reaction?

- W) Endothermic
- X) Isothermic
- Y) Exothermic
- Z) Xerothermic

ANSWER: W) ENDOTHERMIC

### BONUS

11) PHYSICAL SCIENCE *Multiple Choice* Assume the acceleration due to gravity is 10 meters per second squared, and you are holding a 5 newton weight hanging from a relatively weightless string. You pull up on the string, causing both the string and mass to accelerate upwards at a rate of 4 meters per second squared. How many newtons of tension exist in the string during this motion?

- W) 3
- X) 5
- Y) 7
- Z) 9

ANSWER: Y) 7

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### TOSS-UP

12) MATH *Multiple Choice* If  $\sqrt{x} = \sqrt{a} + \sqrt{b}$  [**the square root of x equals the square root of a plus the square root of b**], then which of the following is equivalent to  $x$ ?

- W)  $a + b + 2\sqrt{ab}$  [**a plus b plus two times the square root of the product of a and b**]
- X)  $a + b + 2ab$  [**a plus b plus two a b**]
- Y)  $a + b + ab$  [**a plus b plus a b**]
- Z)  $a + b$  [**a plus b**]

ANSWER: W)  $a + b + 2\sqrt{ab}$

### BONUS

12) MATH *Short Answer* Arrange the following four in historical order, earliest to most recent: 1) Newton's calculus, 2) Euclidean geometry, 3) Pythagorean theorem, 4) Boolean algebra.

ANSWER: PYTHAGOREAN THEOREM, EUCLIDEAN GEOMETRY, NEWTON'S CALCULUS, BOOLEAN ALGEBRA (ACCEPT: 3, 2, 1, 4)

### TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Photosynthesis has both light and dark reactions. Which of the following occurs WITHOUT the presence of light?

- W) Water is split to produce oxygen
- X) Carbon dioxide is transformed to sugar
- Y) NADP<sup>+</sup> is converted to NADPH
- Z) ADP is converted to ATP

ANSWER: X) CARBON DIOXIDE IS TRANSFORMED TO SUGAR

### BONUS

13) LIFE SCIENCE *Short Answer* You come home from school to discover your grandmother making fresh bread from scratch. You tell her that you don't want to eat it because it contains a fungus. To what specific ingredient do you object?

ANSWER: YEAST (ACCEPT: SACCHAROMYCES OR SACCHAROMYCES CEREVISIAE, OR BAKER'S YEAST)

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### TOSS-UP

14) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is NOT a mechanism of erosion?

- W) Flowing water
- X) Freeze thaw cycles
- Y) Photolytic breakdown [*foht-l-IT-ik*]
- Z) Movement of dust by wind

ANSWER: Y) PHOTOLYTIC BREAKDOWN

### BONUS

14) EARTH AND SPACE *Short Answer* A space plasma is a combination of what two things?

ANSWER: ELECTRONS AND IONS (ACCEPT: POSITIVE IONS)

**TOSS-UP**

15) GENERAL SCIENCE *Short Answer* What term is used to refer to all of a person's genetic information, including the DNA in chromosomes and the mitochondria [*my-tuh-KON-dree-uh*]?

ANSWER: HUMAN GENOME (ACCEPT: GENOME)

**BONUS**

15) GENERAL SCIENCE *Multiple Choice* Which of the following diseases is NOT caused by a microbial infection?

- W) Trypanosomiasis [*tri-pan-uh-soh-MY-uh-sis*]
- X) Lyme disease
- Y) Cystic fibrosis
- Z) Coccidiomycosis [*kok-si-dee-dy-uh-my-KOH-sis*]

ANSWER: Y) CYSTIC FIBROSIS

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**TOSS-UP**

16) ENERGY *Multiple Choice* What is the major source of energy for protostars?

- W) Gravitational potential energy
- X) Fusion
- Y) Fission
- Z) Thermal energy

ANSWER: W) GRAVITATIONAL POTENTIAL ENERGY

**BONUS**

16) ENERGY *Short Answer* What is the temperature, in degrees Fahrenheit, of 15 pounds of water at atmospheric pressure after 40 minutes, if the initial temperature of the water was 192°F and 15 BTU per minute is added?

ANSWER 212



### TOSS-UP

17) PHYSICAL SCIENCE *Multiple Choice* Copper is known for many properties, two of which in particular make it excellent for power lines. One of them is that it has a rather high electrical conductivity. The other property is that it is relatively easy to stretch it into great lengths of wire without breaking. What is the scientific name of the latter property?

- W) Masonoriety [*may-SUHN-oh-REE-e-tee*]
- X) Malleability
- Y) Ductility
- Z) Softness

ANSWER: Y) DUCTILITY

### BONUS

17) PHYSICAL SCIENCE *Short Answer* In a sample of a radioactive element, 75% of the nuclei have undergone radioactive decay after 10 years. What is the half-life of this element?

ANSWER: 5 YEARS

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### TOSS-UP

18) MATH *Multiple Choice* Mrs. Brooks gave Devon and Coco each a red rod and a blue rod. Each red rod was equal in measure, and the blue rods were equal in measure. She told them to create a triangle using these side lengths. The third side could be any length they wanted. She also told them one angle of their triangle must measure 50 degrees. Which of the following statements best describes their triangles?

- W) Possibly but not necessarily congruent
- X) Definitely similar but not necessarily congruent
- Y) Definitely congruent but not necessarily similar
- Z) Definitely both congruent and similar

ANSWER: W) POSSIBLY BUT NOT NECESSARILY CONGRUENT

### BONUS

18) MATH *Short Answer* Solve the following inequality for  $d$ :  $|(7 + 8d)| < 14$  [*absolute value of the quantity 7 plus 8d is less than 14*].

ANSWER:  $-21/8 < d < 7/8$  (ACCEPT:  $-2\ 5/8 < d < 7/8$  OR  $-2.625 < d < .875$ )

**TOSS-UP**

19) LIFE SCIENCE *Short Answer* What small, regularly-shaped cell fragments circulate in the blood of mammals and lead to the formation of blood clots?

ANSWER: PLATELETS (ACCEPT: THROMBOCYTES)

**BONUS**

19) LIFE SCIENCE *Multiple Choice* What do mad-cow disease, hantavirus, and malaria all have in common?

- W) They all affect the nervous system
- X) They all have mortality rates of 100%
- Y) They are diseases that primarily affect people living in tropical environments
- Z) They are all passed from animals to humans

ANSWER: Z) THEY ARE ALL PASSED FROM ANIMALS TO HUMANS

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**TOSS-UP**

20) ENERGY *Multiple Choice* What is the primary reason for irradiating food?

- W) To make the food taste better
- X) To increase the shelf life of food
- Y) To kill pathogens in the food
- Z) To make the food more interesting visually

ANSWER: Y) TO KILL PATHOGENS IN THE FOOD

**BONUS**

20) ENERGY *Short Answer* What is a tremendous source of natural gas in the U.S. that is responsible for the current low prices of natural gas?

ANSWER: MARCELLUS SHALE (ACCEPT: MARCELLUS FORMATION)

### TOSS-UP

21) EARTH AND SPACE *Short Answer* Saturn's moon, Enceladus [**en-SEL-uh-duhs**], has a surface reflectivity of about 100% and an average surface temperature of 75 Kelvin. What does this indicate about the chemical surface composition?

ANSWER: IT IS ICE (ACCEPT: WATER ICE)

### BONUS

21) EARTH AND SPACE *Multiple Choice* Which of the follow is NOT true about terrigenous [**te-RIJ-uh-nuhs**] ocean sediments?

- W) They are formed through chemical and physical weathering processes on land
- X) They are transported by surface water, often rivers, to the ocean
- Y) Bed load tends to settle out and be deposited along river beds before rivers meet the ocean
- Z) Fine clay particles from rivers can remain in suspension for years in the ocean

ANSWER: Y) BED LOAD TENDS TO SETTLE OUT AND BE DEPOSITED ALONG RIVER BEDS BEFORE RIVERS MEET THE OCEAN

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### TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Mitosis is the process by which nuclei [**NOO-klee-eye**] divide, creating two new nuclei, each with identical sets of DNA. Meiosis [**my-OH-sis**] is the process that involves only which of the following types of cells?

- W) Skin cells
- X) Sex cells
- Y) Parenchyma cells [**puh-RENG-kuh-muh**]
- Z) Bacteria

ANSWER: X) SEX CELLS

### BONUS

22) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT part of humans' innate immune system?

- W) Skin
- X) Antibodies
- Y) Phagocytic cells [**fag-uh-SIT-ik**]
- Z) Mucous membranes

ANSWER: X) ANTIBODIES

### TOSS-UP

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following types of radiation has the greatest ability to penetrate matter?

- W) Gamma rays
- X) Beta particles
- Y) Alpha particles
- Z) Positrons

ANSWER: W) GAMMA RAYS

### BONUS

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements best describes a vehicle traveling at 60 miles per hour on a uniform circular track, assuming the vehicle stays on the track?

- W) The vehicle experiences zero net acceleration, as it continually travels at a speed of 60 miles per hour
- X) The vehicle experiences zero net acceleration because the circular track does not move
- Y) The vehicle experiences a forward acceleration as it must speed up to continue moving in a circle
- Z) The vehicle experiences an acceleration toward the center of the circle

ANSWER: Z) THE VEHICLE EXPERIENCES AN ACCELERATION TOWARD THE CENTER OF THE CIRCLE