

## ROUND 14A

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### TOSS-UP

1) Life Science – *Short Answer* What transport proteins facilitate diffusion of water across plasma membranes in plants?

ANSWER: AQUAPORINS

### BONUS

1) Life Science – *Short Answer* What branch of the nervous system is responsible for “fight or flight” responses?

ANSWER: SYMPATHETIC

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### TOSS-UP

2) General Science – *Multiple Choice* Liquefaction can happen during which natural hazard?

- W) Earthquakes
- X) Volcanoes
- Y) Tsunamis
- Z) Floods

ANSWER: W) EARTHQUAKES

### BONUS

2) General Science – *Multiple Choice* Kerr, Reissner-Nostrdrom, and Schwarzschild refer to solutions of which of the following set of equations?

- W) Stokes law
- X) Einstein field equations
- Y) Poincare conjecture
- Z) ABC theorem

ANSWER: X) EINSTEIN FIELD EQUATIONS

**TOSS-UP**

3) Math – *Multiple Choice* Four daily high temperature readings in Blacksburg were 82°F, 79°F, 80°F, and 80°F. The temperature on the fifth day was 99°F. Which of the following temperature statistics was affected most by the 5th day’s temperature?

- W) First quartile
- X) Mean
- Y) Mode
- Z) Median

ANSWER: X) MEAN

**BONUS**

3) Math – *Short Answer* How many different (that is, non-congruent) isosceles triangles that are not equilateral have the length of each side being an integer between 1 and 4 inclusive?

ANSWER: 8



**TOSS-UP**

4) Physical Science – *Short Answer* What experiment disproved the existence of luminiferous ether?

ANSWER: MICHELSON-MORLEY EXPERIMENT

**BONUS**

4) Physical Science – *Multiple Choice* Which of the following is a unit of pressure?

- W) Newton
- X) Kilogram
- Y) Gram per centimeter cubed
- Z) Newton per meter squared

ANSWER: Z) NEWTON PER METER SQUARED

### TOSS-UP

5) Energy – *Short Answer* What type of rechargeable battery, often used in cell phones and laptop computers, includes a lithium-cobalt oxide cathode and a carbon cathode?

ANSWER: LITHIUM-ION (DO NOT ACCEPT: LITHIUM)

### BONUS

5) Energy – *Short Answer* Of the three isotopes of uranium found in nature, which is used most commonly for energy production?

ANSWER: URANIUM – 235 (ACCEPT: U– 235)



### TOSS-UP

6) Earth and Space – *Multiple Choice* Which of the following is a coarse-grained clastic rock that contains angular fragments?

- W) Conglomerate
- X) Limestone
- Y) Breccia [*breck-ee-uh*]
- Z) Sandstone

ANSWER: Y) BRECCIA

### BONUS

6) Earth and Space – *Short Answer* What is the name for the movement of a tectonic plate under the force of its own weight?

Answer: SLAB-PULL

### TOSS-UP

7) Life Science – *Short Answer* Synaptic vesicles contain what signaling molecules?

ANSWER: NEUROTRANSMITTERS

### BONUS

7) Life Science – *Short Answer* What phase of the cell cycle follows mitosis and is generally thought of as the time the cell performs normal, non-dividing functions?

ANSWER: INTERPHASE



### TOSS-UP

8) General Science – *Short Answer* Identify all of the following three observations that are examples of qualitative data: 1) The bird flew in a zigzag motion; 2) The temperature decreased from 20 degrees Celsius to 15 degrees Celsius; 3) The population of robins hatched an average of three chicks each.

ANSWER: 1

### BONUS

8) General Science – *Multiple Choice* Which of the following groups on the periodic table is generally known to be unreactive?

- W) Group 1
- X) Group 10
- Y) Group 15
- Z) Group 18

ANSWER: Z) GROUP 18

### TOSS-UP

9) Physical Science – *Multiple Choice* A spaceship starts at rest at the origin. Later, the spaceship is at coordinate (2000 meters, 0) with a velocity of 200 meters per second in the positive x direction. If the spaceship accelerated uniformly, what was the magnitude, in meters per second squared, of its acceleration during this interval?

- W) 5
- X) 10
- Y) 15
- Z) 20

ANSWER: X) 10

### BONUS

9) Physical Science – *Multiple Choice* Maxwell based his theory of electromagnetic waves on the hypothesis that a changing electric field gives rise to which of the following?

- W) An electric current
- X) A stream of electrons
- Y) A magnetic field
- Z) A universal constant

ANSWER: Y) A MAGNETIC FIELD



### TOSS-UP

10) Math – *Multiple Choice* Two angles will necessarily be equal in measure if they are which of the following?

- W) Alternate interior angles formed by a transversal
- X) Alternate exterior angles formed by a transversal
- Y) Corresponding angles formed by a transversal
- Z) Vertical angles

ANSWER: Z) VERTICAL ANGLES

### BONUS

10) Math – *Short Answer* To the nearest tenth, find the area of a circle that has a circumference of 4.

ANSWER: 1.3

### TOSS-UP

11) Earth and Space – *Short Answer* What term describes metamorphic rocks that are characterized by their layers and bands of minerals?

ANSWER: FOLIATED

### BONUS

11) Earth and Space – *Short Answer* The international treaties called the Montreal Protocols were agreements to ban the use of what chemicals?

ANSWER: CFCs (ALSO ACCEPT: CHLOROFLUOROCARBONS, HALOCARBONS, HFC's, HCFC's, OZONE-DEPLETING SUBSTANCES)

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### TOSS-UP

12) Energy – *Multiple Choice* Which of the following engines runs using the Otto, spelled O-T-T-O, cycle?

- W) Diesel engine
- X) Gasoline engine
- Y) Refrigerator motor
- Z) Steam engine

ANSWER: X) GASOLINE ENGINE

### BONUS

12) Energy – *Short Answer* Identify all of the following three gases that would be reacted in the catalytic converter of an automobile: 1) Carbon monoxide; 2) Propane; 3) Nitrogen dioxide.

ANSWER: ALL OF THEM

**TOSS-UP**

13) Math – *Multiple Choice* Which of the following subsets of the real numbers contains the square root of 2?

- W) Integers
- X) Whole numbers
- Y) Rational numbers
- Z) Irrational numbers

ANSWER: Z) IRRATIONAL NUMBERS

**BONUS**

13) Math – *Short Answer* If angle ABC is inscribed in a circle and measures 65 degrees, what is the degree measure of arc ABC?

ANSWER: 230



**TOSS-UP**

14) Earth and Space – *Short Answer* What type of stars are found at the lower left of the H-R diagram?

ANSWER: WHITE DWARF

**BONUS**

14) Earth and Space – *Short Answer* Identify all of the following three planets that are Jovian: 1) Mars; 2) Neptune; 3) Earth.

ANSWER: 2

### TOSS-UP

15) Physical Science – *Short Answer* What ions are formed during the reaction between carbon dioxide and water?

ANSWER: HYDROGEN CARBONATE (ACCEPT BICARBONATE) AND HYDROGEN

### BONUS

15) Physical Science – *Short Answer* Order the following four elements from least electronegative to most electronegative: 1) carbon; 2) oxygen; 3) nitrogen; 4) fluorine.

ANSWER: CARBON, NITROGEN, OXYGEN, FLUORINE (ACCEPT: 1, 3, 2, 4)

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### TOSS-UP

16) General Science – *Short Answer* Varicella [*var-ih-sell-uh*] zoster is the causative agent of which childhood disease?

ANSWER: CHICKEN POX

### BONUS

16) General Science – *Multiple Choice* Which two valves are located between the atria and ventricles of the heart?

- W) Aortic and mitral
- X) Pulmonary and aortic
- Y) Mitral and tricuspid
- Z) Tricuspid and pulmonary

ANSWER: Y) MITRAL AND TRICUSPID



### TOSS-UP

17) Life Science – *Multiple Choice* Pepsin is most active in the stomach due to the presence of which of the following acids?

- W) Hydroiodic
- X) Sulfuric
- Y) Hydrofluoric
- Z) Hydrochloric

ANSWER: Z) HYDROCHLORIC

### BONUS

17) Life Science – *Short Answer* What cellular organelle is responsible for packaging and transporting proteins outside of the cell?

ANSWER: GOLGI BODY (ACCEPT: GOLGI APPARATUS, GOLGI, GOLGI COMPLEX)



### TOSS-UP

18) Energy – *Short Answer* Steam reforming is used to produce hydrogen from what fuel?

ANSWER: NATURAL GAS (ACCEPT: METHANE)

### BONUS

18) Energy – *Short Answer* Derricks and drilling rigs are used to mine what natural resource?

ANSWER: OIL (Accept: PETROLEUM)

### TOSS-UP

19) Life Science – *Short Answer* Sponges capture food particles suspended in water as it flows through their body. This type of organism is known as what type of feeder?

ANSWER: FILTER FEEDER (ACCEPT: SUSPENSION FEEDER)

### BONUS

19) Life Science – *Short Answer* Identify all of the following four diseases that are caused by nematodes: 1) Chagas disease; 2) Toxoplasmosis; 3) Elephantiasis; 4) Heartworm disease.

ANSWER: 3 AND 4

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### TOSS-UP

20) Math – *Short Answer* What is  $61^2$ ?

ANSWER: 3721

### BONUS

20) Math – *Short Answer* Coach Myers bought pizza for her basketball team. She bought 8 pizzas. Each pizza contained 12 slices. Each player ate  $\frac{1}{3}$  of a pizza. If there were  $2\frac{2}{3}$  pizzas left, how many players were on the team?

ANSWER: 16

### TOSS-UP

21) Physical Science – *Short Answer* A rope inclined upward at 45 degrees pulls a suitcase horizontally across 100 meters while exerting a constant force of 20 newtons. To the nearest hundred joules, how much work does the rope do?

ANSWER: 1400

### BONUS

21) Physical Science – *Multiple Choice* A quantum number is not associated with an atomic electron's:

- W) Energy
- X) Mass
- Y) Spin
- Z) Angular momentum

ANSWER: X) MASS

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### TOSS-UP

22) General Science – *Multiple Choice* Which of the following conversions between English and metric units is exact?

- W) One quart equals .946 liter
- X) One pound equals .454 kilogram
- Y) One inch equals 2.54 centimeters
- Z) One mile equals 1.61 kilometers

ANSWER: Y) ONE INCH EQUALS 2.54 CENTIMETERS

### BONUS

22) General Science – *Short Answer* What is the binomial scientific name of the common fruit fly?

ANSWER: DROSOPHILA MELANOGASTER

### **TOSS-UP**

23) Earth and Space – *Short Answer* What element is the most abundant in Earth's crust?

ANSWER: OXYGEN

### **BONUS**

23) Earth and Space – *Short Answer* The measure of the level of particles such as sediment, plankton or organic by-products in a body of water is called what?

ANSWER: TURBIDITY