

ROUND 15A

TOSS-UP

1) Math – *Multiple Choice* Which of the following is a negation of the statement “Some cats are cute”?

- W) All cats are cute
- X) No cats are cute
- Y) Not all cats are cute
- Z) Some cats are not cute

ANSWER: X) NO CATS ARE CUTE

BONUS

1) Math – *Short Answer* What is 173 times 147?

ANSWER: 25,431

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### TOSS-UP

2) Energy – *Short Answer* From 1973 to 2008, the percentage of the world's electricity produced by natural gas almost doubled. In the same period, the percentage produced by another fuel source dropped from 25% to 5%. What fuel source is this?

ANSWER: OIL

### BONUS

2) Energy – *Multiple Choice* Which of the following CANNOT be readily used as a source of energy in a fuel cell?

- W) Methane
- X) Oxygen
- Y) Methanol
- Z) Hydrogen

ANSWER: X) OXYGEN

**TOSS-UP**

3) Earth and Space – *Short Answer* Pitchblende is an important ore for what actinide?

ANSWER: URANIUM

**BONUS**

3) Earth and Space – *Multiple Choice* White and black smokers are both types of hydrothermal vents found on the sea floor. Which of the following are two main differences between the types of vents?

- W) Height and age of the chimneys formed at the vents
- X) Biological communities around the vent and ocean depth
- Y) Chemicals dissolved in the water and temperature
- Z) Type of volcanic activity and age of the surrounding oceanic crust

ANSWER: Y) CHEMICALS DISSOLVED IN THE WATER AND TEMPERATURE

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TOSS-UP

4) Physical Science – *Short Answer* What physical quantity is equal to the magnitude of velocity?

ANSWER: SPEED

BONUS

4) Physical Science – *Short Answer* Maggie drives 72 kilometers in 2 hours. In meters per second, what is her speed?

ANSWER: 10

TOSS-UP

5) Life Science – *Multiple Choice* Often, an enzyme requires the presence of another small molecule in order to function. What is the term for these small molecules?

- W) Inhibitors
- X) Haloproteins [*HAY-lo-proteins*]
- Y) Apofactors
- Z) Cofactors

ANSWER: Z) COFACTORS

BONUS

5) Life Science – *Short Answer* What is the term for the junction where neurons communicate with each other?

ANSWER: SYNAPSE

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**TOSS-UP**

6) Math – *Short Answer* For what value of  $x$  does the graph of the function  $y = 4x + 20$  cross the  $x$ -axis?

ANSWER: -5

**BONUS**

6) Math – *Short Answer* It took Marcos 3 hours to travel down the Amazon River by boat from his village to his friend's village. It took him 5 hours to travel up the river on his return trip. How many hours would it take him to make this same journey in still water?

ANSWER: 3.75 (ACCEPT:  $3\frac{3}{4}$ ,  $15/4$ )

**TOSS-UP**

7) Energy – *Short Answer* What technology incorporates both electricity production and use of waste thermal energy to provide system efficiencies above 70%?

ANSWER: COMBINED HEAT AND POWER (ACCEPT: CHP, COGENERATION)

**BONUS**

7) Energy – *Short Answer* The super-heavy synthetic element 116 was jointly discovered by scientists in Russia and a US Department of Energy National Laboratory. What is the IUPAC name for this element?

ANSWER: LIVERMORIUM

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TOSS-UP

8) Earth and Space – *Short Answer* What type of object do scientists think is at the center of the Milky Way?

ANSWER: BLACK HOLE

BONUS

8) Earth and Space – *Multiple Choice* What do the peaks and valleys in the Keeling curve represent?

- W) Years of economic recession and reduced carbon emissions
- X) Successful campaigns by environmental groups
- Y) Volcanic eruptions and offgassing from glacial melt
- Z) The seasonal variation of carbon uptake by land plants

ANSWER: Z) THE SEASONAL VARIATION OF CARBON UPTAKE BY LAND PLANTS

TOSS-UP

9) Energy – *Multiple Choice* Six tidal barrage power plants are currently operating throughout the world. Which of the following nations leads the world in installed tidal energy capacity?

- W) South Korea
- X) China
- Y) Canada
- Z) Russia

ANSWER: W) SOUTH KOREA

BONUS

9) Energy – *Multiple Choice* Which of the following changes will NOT increase the efficiency of a dehumidifier?

- W) A higher temperature evaporator
- X) Higher surface area of the coils
- Y) A higher coefficient of performance on the compressor
- Z) Better fan bearings

ANSWER: W) A HIGHER TEMPERATURE EVAPORATOR



TOSS-UP

10) Math – *Short Answer* Identify all of the following three numbers that are in the domain of the function f of x equals the square root of open parenthesis $36 - x^2$ close parenthesis: 1) -7 ; 2) -6 ; 3) -5 .

ANSWER: 2 and 3 (ACCEPT: -6 and -5)

BONUS

10) Math – *Short Answer* For what temperature, in degrees Fahrenheit to the nearest integer, is the Celsius temperature numerically twice the Fahrenheit temperature?

ANSWER: -12

TOSS-UP

11) Life Science – *Short Answer* In plants, what tissue is involved in the elongation of roots and shoots?

ANSWER: MERISTEMATIC TISSUE (ACCEPT: MERISTEMS)

BONUS

11) Life Science – *Short Answer* During DNA replication, what enzyme is responsible for unwinding the double helix?

ANSWER: HELICASE



TOSS-UP

12) Physical Science – *Short Answer* In electrochemistry, what electrode potential is defined as 0 volts?

ANSWER: HYDROGEN ELECTRODE (ACCEPT: STANDARD HYDROGEN ELECTRODE or HYDROGEN)

BONUS

12) Physical Science – *Short Answer* A star has two planets, one with an orbital period of 500 days, and the second with an orbital period of 1000 days. If the first is located 1 AU from the star, what is the distance, in AU, of the second planet?

ANSWER: CUBE ROOT OF 4

TOSS-UP

13) Life Science – *Short Answer* In 1933, the first virus was isolated from an extract from its host. What virus was this?

ANSWER: TOBACCO MOSAIC VIRUS

BONUS

13) Life Science – *Short Answer* What structure does a male bird use to pass sperm to a female bird?

ANSWER: CLOACA (DO NOT ACCEPT: INTROMITTENT ORGAN)

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**TOSS-UP**

14) Physical Science – *Short Answer* What fundamental force is responsible for holding together protons and neutrons in the nucleus?

ANSWER: STRONG (ACCEPT: STRONG NUCLEAR)

**BONUS**

14) Physical Science – *Short Answer* A 10-pound mass and a 100-pound mass are coupled by a compressed massless spring and rest motionless on a frictionless surface. After the spring is released you measure the speed of the 100-pound weight to be 1 foot per second. What would you measure as the speed, in feet per second, of the center of mass of the 10-pound and 100-pound system?

ANSWER: 0

**TOSS-UP**

15) Math – *Short Answer* Triangle  $ABC$  has all interior angles with integer degree measures. If the measure of angle  $A$  is 83 degrees, what is the largest possible degree measure of angle  $B$ ?

ANSWER: 96

**BONUS**

15) Math – *Short Answer* Given the linear function  $f$  of  $x = -3x + b$ , if  $f$  of 2 = 7, what is  $f$  of 10?

ANSWER: -17

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TOSS-UP

16) Earth and Space – *Multiple Choice* Which of the following symptoms is LEAST likely to occur during an astronaut's long-term stay in the International Space Station?

- W) Reduction in heart muscle strength
- X) Periorbital puffiness
- Y) Reduction in bone mass
- Z) Reduction in body height

ANSWER: Z) REDUCTION IN BODY HEIGHT

BONUS

16) Earth and Space – *Short Answer* Sirius, the Sun, and Proxima Centauri are all found on what band of the Hertzsprung-Russell diagram?

ANSWER: MAIN SEQUENCE

TOSS-UP

17) Life Science – *Short Answer* What type of glands are connected to the epithelium [*eh-pih-THEEL-ee-um*] via ducts, and include sweat glands?

ANSWER: EXOCRINE

BONUS

17) Life Science – *Short Answer* Of plants, animals and fungi [*fun-ji*], which kingdom contains organisms that produce two-nucleus reproductive cells called a dikaryons [*dye-KAIR-ee-uns*]?

ANSWER: FUNGI

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**TOSS-UP**

18) Earth and Space – *Short Answer* How many times per year will an amictic lake mix from top to bottom?

ANSWER: ZERO

**BONUS**

18) Earth and Space – *Short Answer* Lenticular galaxies have an intermediate structure between what two other types of galaxies?

ANSWER: SPIRAL AND ELLIPTICAL

**TOSS-UP**

19) Math – *Short Answer* What is  $71^2$ ?

ANSWER: 5041

**BONUS**

19) Math – *Short Answer* A right circular cone has volume 72 cubic inches. A second cone has 3 times the radius and one-sixth the height of the first cone. In cubic inches, what is the volume of the second cone?

ANSWER: 108

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TOSS-UP

20) Earth and Space – *Multiple Choice* Which of the following is not a star in the summer triangle?

- W) Deneb [*DEN-ebb*]
- X) Draco
- Y) Vega
- Z) Altair

ANSWER: X) DRACO

BONUS

20) Earth and Space – *Short Answer* Jupiter's strong magnetosphere originates primarily from the rotation of what element?

ANSWER: HYDROGEN

TOSS-UP

21) Life Science – *Short Answer* The mixing of fats with bile salts solubilizes the fats for digestion. Where is bile stored before it enters the intestines?

ANSWER: GALL BLADDER

BONUS

21) Life Science – *Short Answer* What specific acid causes the human stomach to have a low pH?

ANSWER: HYDROCHLORIC ACID (ACCEPT: HCL)

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**TOSS-UP**

22) Physical Science – *Short Answer* What is the SI derived unit used to express frequency?

ANSWER: HERTZ

**BONUS**

22) Physical Science – *Short Answer* What is the momentum, in newton-seconds, of a 30-gram body moving at 6 meters per second?

ANSWER: 0.18 (ACCEPT: 9/50)

### TOSS-UP

23) Physical Science – *Short Answer* What is the molecular geometry of phosphorus pentachloride [*penta-KLOOR-ide*]?

ANSWER: TRIGONAL BIPYRAMID

### BONUS

23) Physical Science – *Short Answer* A scientist dissolves 1 mole of a certain acid in 100 grams of water at 25 degrees Celsius and finds that the temperature increases by 7 degrees. In kilojoules [*kill-oh-jools*] per mole to two significant figures, what is the enthalpy [*EN-thul-pee*] of dissolution of the acid?

ANSWER: -2.9