

## ROUND 2

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### TOSS-UP

1) Energy – *Multiple Choice* Nuclear power plants generate energy by which of the following processes?

- W) Fission
- X) Fusion
- Y) Formation
- Z) Fracture

ANSWER: W) FISSION

### BONUS

1) Energy – *Multiple Choice* Most of today's plug-in hybrid and all-electric vehicles incorporate a common battery. This battery is also onboard the Boeing 787 Dreamliner. What type is this battery?

- W) Lithium-ion
- X) Lead-acid
- Y) Nickel-metal hydride
- Z) Nickel cadmium

ANSWER: W) LITHIUM-ION

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### TOSS-UP

2) Life Science – *Multiple Choice* If both parents are heterozygous [*hetero-ZYE-gus*] for a Mendelian [*men-DAY-lee-an*] trait, what is the percent probability that an offspring is homozygous recessive for that trait?

- W) Zero
- X) 25
- Y) 50
- Z) 100

ANSWER: X) 25

### BONUS

2) Life Science – *Multiple Choice* Stromatolites [*stroh-MAT-oh-lite*] have been used to study the age of which of the following?

- W) Earliest life forms
- X) Oceans
- Y) The Earth
- Z) The Solar System

ANSWER: W) EARLIEST LIFE FORMS

**TOSS-UP**

3) Earth and Space – *Multiple Choice* The rings of Saturn are primarily composed of which of the following?

- W) Fine particles and dust
- X) Chunks of rock
- Y) Lumps of water ice
- Z) Hydrogen, helium, methane and other trace gases

ANSWER: Y) LUMPS OF WATER ICE

**BONUS**

3) Earth and Space – *Multiple Choice* Which of the following is the final phase of stellar evolution for our Sun and stars of similar size?

- W) Brown dwarf
- X) Red giant
- Y) Supergiant
- Z) White dwarf

ANSWER: Z) WHITE DWARF

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**TOSS-UP**

4) Math – *Multiple Choice* Which of the following types of triangles is impossible?

- W) Acute equilateral
- X) Obtuse equilateral
- Y) Obtuse isosceles
- Z) Right scalene

ANSWER: X) OBTUSE EQUILATERAL

**BONUS**

4) Math – *Short Answer* What are the coordinates of the vertex of the parabola with equation  $y = -3x^2 + 4x - 10$ ?

ANSWER: (2/3, -26/3) (ACCEPT: (2/3, -8 2/3))

### TOSS-UP

5) Physical Science – *Multiple Choice* How are ionically-bonded compounds generally named?

W) After the scientist who first created the compound

X) They end in "onium"

Y) By using the name of the positive ion followed by the name of the negative ion

Z) By using the name and Roman numeral associated with the metal involved

ANSWER: Y) BY USING THE NAME OF THE POSITIVE ION FOLLOWED BY THE NAME OF THE NEGATIVE ION

### BONUS

5) Physical Science – *Multiple Choice* A nucleus of Lithium containing 3 protons and 4 neutrons is surrounded by 4 electrons. Which of the following best describes this?

W) Tracer

X) Ion

Y) Isotope

Z) Neutral atom

ANSWER: X) ION

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### TOSS-UP

6) Life Science – *Multiple Choice* A blood cell is placed into a salt solution and is observed to shrink. What type of solution was the blood cell placed in?

W) Hypertonic [*high-pur-tawn-ik*]

X) Isotonic

Y) Hypotonic [*high-poh-tawnic*]

Z) Osmotic [*oz-MAW-tik*]

ANSWER: W) HYPERTONIC

### BONUS

6) Life Science – *Multiple Choice* In what state will a plant cell be if placed in a hypotonic [*high-poh-tawnic*] environment?

W) Lysis [*LYE-sis*]

X) Plasmolysis [*plazz-MAWL-ih-sis*]

Y) Turgor

Z) Shrinking

ANSWER: Y) TURGOR

**TOSS-UP**

7) Math – *Multiple Choice* A coin is flipped 6 times. The first five flips all result in heads. Which of the following statements is true about the result of the sixth flip?

- W) It is more likely to be heads
- X) It is more likely to be tails
- Y) It is equally likely to be heads or tails
- Z) The probability of the result being tails is  $5/6$

ANSWER: Y) IT IS EQUALLY LIKELY TO BE HEADS OR TAILS

**BONUS**

7) Math – *Short Answer* A regular polygon with 15 sides has exterior angles of what degree measure?

ANSWER: 24

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**TOSS-UP**

8) Physical Science – *Short Answer* The liquefaction of what gas was recognized with the 1913 Nobel Prize in Physics?

ANSWER: HELIUM

**BONUS**

8) Physical Science – *Short Answer* What scientist used the data collected by Tycho Brahe [*TEE-koh BRAH-hay*] in order to formulate empirical laws regarding the motion of the planets?

ANSWER: JOHANNES KEPLER (ACCEPT: KEPLER)

### TOSS-UP

9) Earth and Space – *Multiple Choice* Important mineral deposits and large reservoirs of petroleum and natural gas are associated with which of the following?

- W) Ocean trenches
- X) Guyots
- Y) Rift zones
- Z) Continental shelves

ANSWER: Z) CONTINENTAL SHELVES

### BONUS

9) Earth and Space – *Short Answer* What is the term for reefs that form circular or horseshoe-shaped rings around lagoons?

ANSWER: ATOLLS (ACCEPT: CORAL ATOLL)

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### TOSS-UP

10) Life Science – *Short Answer* In what cellular organelle [*organ-ELL*] does photosynthesis occur?

ANSWER: CHLOROPLAST

### BONUS

10) Life Science – *Multiple Choice* A plant cell containing 0.1 molar sucrose and 0.2 molar glucose is placed in a 0.3 molar solution of sucrose. What type of solution is this?

- W) Super saturated
- X) Isotonic
- Y) Hypotonic [*high-poh-tawnic*]
- Z) Hypertonic [*high-pur-tawn-ik*]

ANSWER: X) ISOTONIC

**TOSS-UP**

11) Energy – *Multiple Choice* Which of the following is closest to the percentage of the electricity in the United States that is generated from wind?

- W) 4
- X) 10
- Y) 16
- Z) 22

ANSWER: W) 4

**BONUS**

11) Energy – *Multiple Choice* Scientists from two DOE labs, Pacific Northwest and Oak Ridge National Labs, have developed new methods for extracting uranium from seawater. Which of the following would this be used to fuel?

- W) Fission reactors
- X) Fusion reactors
- Y) Chemical reactors
- Z) Hybrid reactors

ANSWER: W) FISSION REACTORS

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**TOSS-UP**

12) Math – *Short Answer* What is the adjective for the type of formal reasoning that leads to a conclusion that logically follows from a set of premises?

ANSWER: DEDUCTIVE (DO NOT ACCEPT: DEDUCTION)

**BONUS**

12) Math – *Short Answer* Kaye makes widgets at a rate of 20 per hour and Jay makes them at a rate of 15 per hour. If Jay has a one-hour head start and they both then work continuously, after how many hours from the time she starts will Kaye have made the same number of widgets as Jay?

ANSWER: 3

### TOSS-UP

13) Physical Science – *Multiple Choice* What is the name for the SI derived unit for energy?

- W) Erg
- X) Electron-volt
- Y) Watt
- Z) Joule [*jool*]

ANSWER: Z) JOULE

### BONUS

13) Physical Science – *Multiple Choice* Which of the following is most closely related to the frequency of a wave?

- W) Amplitude
- X) Wavelength
- Y) Crest
- Z) Trough

ANSWER: X) WAVELENGTH

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### TOSS-UP

14) Life Science – *Multiple Choice* Which of the following is the target of alkylating [*AL-kil-lay-ting*] agents, such as mustard gas?

- W) DNA
- X) Proteins
- Y) Carbohydrates
- Z) Fatty acids

ANSWER: W) DNA

### BONUS

14) Life Science – *Multiple Choice* Lecithin is an example of which of the following?

- W) Carbohydrate
- X) Protein
- Y) Phospholipid [*faws-foe-lip-id*]
- Z) Nucleic [*new-CLAY-ik*] acid

ANSWER: Y) PHOSPHOLIPID

**TOSS-UP**

15) Earth and Space – *Multiple Choice* What was the name of the first U.S. satellite put in orbit around the Earth?

- W) Explorer I
- X) Sputnik
- Y) Vanguard
- Z) Telstar

ANSWER: W) EXPLORER I

**BONUS**

15) Earth and Space – *Short Answer* A cooler-than-normal sea surface temperature in the central and eastern Pacific Ocean, near the equator off the west coast of South America is known as what?

ANSWER: LA NIÑA

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**TOSS-UP**

16) Energy – *Multiple Choice* Which of the following percentages is closest to the typical efficiency of a steam turbine for electricity generation?

- W) 10
- X) 35
- Y) 60
- Z) 85

ANSWER: X) 35

**BONUS**

16) Energy – *Short Answer* What does the acronym OPEC stand for?

ANSWER: ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES



**TOSS-UP**

17) Math – *Short Answer* Simplify the fraction with numerator  $x^5y^6$  and denominator  $x^{-3}y^5$ .

ANSWER:  $x^8y$

**BONUS**

17) Math – *Short Answer* A manufacturing facility says that a 100% rate at its packing station is 200 shelves per day. Last week, Jordan's rates for 5 days were 50%, 60%, 45%, 70%, and 75%. What was the average daily number of shelves packed by Jordan during those 5 days?

ANSWER: 120

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**TOSS-UP**

18) Earth and Space – *Multiple Choice* Which of the following is closest to the ratio of the surface temperature of Aldebaran, a red giant, to that of the Sun?

- W) 0.5
- X) 1
- Y) 2
- Z) 3

ANSWER: W) 0.5

**BONUS**

18) Earth and Space – *Short Answer* Identify all of the following four rocks that would be considered well-sorted:  
1) Breccia; 2) Arkose; 3) Shale; 4) Quartz sandstone.

ANSWER: 2, 3, 4 (ACCEPT: ARKOSE, SHALE, QUARTZ SANDSTONE)

**TOSS-UP**

19) Life Science – *Short Answer* What type of microscope did van Leeuwenhoek [*LOO-wen-hook*] use when first observing cells?

ANSWER: LIGHT MICROSCOPE (ACCEPT: SINGLE-LENS MICROSCOPE)

**BONUS**

19) Life Science – *Short Answer* In what structure of the human lung does gas exchange occur?

ANSWER: ALVEOLI (ACCEPT: ALVEOLUS)

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**TOSS-UP**

20) Physical Science – *Multiple Choice* For two samples of mercury, one with a mass of 10 grams and the other with a mass of 20 grams, which of the following would NOT be the same?

- W) Boiling point
- X) Density
- Y) Melting point
- Z) Volume

ANSWER: Z) VOLUME

**BONUS**

20) Physical Science – *Short Answer* What type of elementary particle is thought not to exist in isolation because of color confinement?

ANSWER: QUARKS

**TOSS-UP**

21) Earth and Space – *Short Answer* What radiation belts surround the Earth due to charged particles becoming trapped by Earth's magnetic field?

ANSWER: VAN ALLEN BELTS

**BONUS**

21) Earth and Space – *Multiple Choice* Which of the following is the most significant benefit of the Earth's magnetic field to life on Earth?

W) It deflects dangerous particles emitted by the sun

X) It is used by migrating birds to find their way

Y) It is the source of our electric power

Z) It helps us find mineral deposits

ANSWER: W) IT DEFLECTS DANGEROUS PARTICLES EMITTED BY THE SUN

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**TOSS-UP**

22) Math – *Short Answer* Express the fraction  $11/8$  as a decimal.

ANSWER: 1.375

**BONUS**

22) Math – *Short Answer* What is the largest prime factor of 1035?

ANSWER: 23

**TOSS-UP**

23) Earth and Space – *Short Answer* What is the term for the point at which an orbiting body is closest to the Sun?

ANSWER: PERIHELION

**BONUS**

23) Earth and Space – *Short Answer* Occultation of background stars was used to discover what feature of Uranus?

ANSWER: RINGS