

**TOSS-UP**

1) BIOLOGY *Multiple Choice* Which of the following groups can exist in extremely salty environments?

W) Thermophiles

X) Halophiles

Y) Stenophiles

Z) Neutrophiles

ANSWER: X) Halophiles

**BONUS**

1) BIOLOGY *Short Answer* What is the name for the sticky layer between primary and secondary cell walls?

ANSWER: Middle Lamella

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**TOSS-UP**

2) CHEMISTRY *Short Answer* By name or number, identify the following five elements that are metalloids.

1. Boron

2. Aluminum

3. Silicon

4. Antimony

5. Tin

ANSWER: 1, 3, 4

**BONUS**

2) CHEMISTRY *Short Answer* As of 2015, how many known elements are there?

ANSWER: 115

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**TOSS-UP**

3) EARTH SCIENCE *Multiple Choice* What is the name of the ocean that holds the Mariana's Trench?

- W) Arctic Ocean
- X) Indian Ocean
- Y) Atlantic Ocean
- Z) Pacific Ocean

ANSWER: Z) Pacific Ocean

### BONUS

3) EARTH SCIENCE *Short Answer Multiple Choice* What is the largest animal (and whale) on Earth?

- W) Blue whale
- X) Orca
- Y) Humpback whale
- Z) Narwhal

ANSWER: W) Blue whale

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### TOSS-UP

4) MATH *Short Answer* What is the positive difference between the area of square with side lengths of 3 cm and the area of a right triangle with legs of lengths 6 cm and 8 cm? Express your answer in square centimeters.

ANSWER: 15 square centimeters

### BONUS

4) MATH *Multiple Choice* Which of the following states that every non-constant single variable polynomial with complex coefficients has at least one complex root?

- W) Pythagorean Theorem
- X) Fundamental Theorem of Algebra
- Y) Fermat's Last Theorem
- Z) Binomial Theorem

ANSWER: X) Fundamental Theorem of Algebra

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**TOSS-UP**

5) PHYSICS *Short Answer* As opposed to Thomas Edison and his DC electrical power, Nikola Tesla pushed for the use of what kind of electric power?

ANSWER: AC (accept: alternating current)

**BONUS**

5) PHYSICS *Multiple Choice* Which of the following is 1 micrometer?

W) 1 m

X)  $10^{-3}$  m (read as: ten to the minus third meters)

Y)  $10^{-6}$  m

Z)  $10^{-9}$  m

ANSWER: Y)  $10^{-6}$  m

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**TOSS-UP**

6) BIOLOGY *Short Answer* What endocrine gland is most affected in a person suffering from Grave's disease?

ANSWER: Thyroid

**BONUS**

6) BIOLOGY *Short Answer* If 500 human red blood cells were placed in Ringer's solution, which of the following would happen to them:

1. Swell and burst
2. Shivel
3. Nothing

ANSWER: 3

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**TOSS-UP**

7) CHEMISTRY *Short Answer* How many atoms are there in an oxygen molecule? (Raghav)

ANSWER: 2

**BONUS**

7) CHEMISTRY *Short Answer* The electrically neutral Molecule X and Molecule Z donate and accept a proton from each other respectively. What term may be used to describe Molecule Z directly after this change has occurred?

ANSWER: Conjugate Acid

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**TOSS-UP**

8) EARTH AND SPACE *Short Answer* What rank is corundum on Mohs Hardness Scale?

ANSWER: 9

**BONUS**

8) EARTH AND SPACE *Short Answer* Name the law, first proposed by Nicolas Steno, that states that in any undeformed sequence of rock, the oldest strata will be at the bottom.

ANSWER: Law of Superposition

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**TOSS-UP**

9) MATH *Short Answer* What is the cube root of 343?

ANSWER: 7

**BONUS**

9) MATH *Multiple Choice* Which of the following numbers is prime?

W) 119

X) 127

Y) 161

Z) 187

ANSWER: X) 127

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**TOSS-UP**

10) PHYSICS *Multiple Choice* Which of the following is closest to the speed of light?

W)  $3 \times 10^5$  m/s

X)  $3 \times 10^8$  m/s

Y)  $3 \times 10^{11}$  m/s

Z)  $3 \times 10^{14}$  m/s

ANSWER: X)  $3 \times 10^8$  m/s

**BONUS**

10) PHYSICS *Multiple Choice* What is conserved in an inelastic collision?

W) Velocity

X) Energy

Y) Momentum

Z) Acceleration

ANSWER: Y) Momentum

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**TOSS-UP**

11) BIOLOGY *Short Answer* In a typical Mendelian dihybrid cross, what is the expected ratio in the F1 generation of offspring that express the dominant trait for both traits?

ANSWER:  $\frac{9}{16}$

**BONUS**

11) BIOLOGY *Multiple Choice* A colorblind male is planning to have a child with his non-colorblind wife whose father was colorblind. Assuming that colorblindness is a sex-linked recessive gene, what is the probability that their next child will be a colorblind son?

W) 0

X) 1/4

Y) 1/2

Z) 3/4

ANSWER: X) 1/4

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**TOSS-UP**

12) CHEMISTRY *Short Answer* Given that the pH of a substance is 5, what is its pOH?

ANSWER: 9

**BONUS**

12) CHEMISTRY *Short Answer* What is the chemical formula of potassium nitrate?

ANSWER: KNO<sub>3</sub>

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**TOSS-UP**

13) EARTH AND SPACE *Short Answer* What planet has the largest amount of currently known moons?

ANSWER: Jupiter

**BONUS**

13) EARTH AND SPACE *Short Answer* What is the name of the rock that makes up most of the ocean floor and volcanic ocean islands?

ANSWER: Basalt

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**TOSS-UP**

14) MATH *Short Answer* Three dice are rolled. What is the probability that all 3 come up as 6?

ANSWER:  $\frac{1}{216}$

**BONUS**

14) MATH *Short Answer* What is the area of an equilateral triangle with side length 10?

ANSWER:  $25\sqrt{3}$

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**TOSS-UP**

15) PHYSICS *Short Answer* If I apply a net force of 6 N on an object, and it undergoes an acceleration of  $3 \text{ m/s}^2$ , what is its mass?

ANSWER: 2 kg

**BONUS**

15) PHYSICS *Multiple Choice* What describes a constant temperature thermodynamic process?

W) Isothermal

X) Isochoric

Y) Isobaric

Z) Isovolumetric

ANSWER: W) Isothermal

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**TOSS-UP**

16) BIOLOGY *Multiple Choice* What is the common name for the shape of DNA?

W) Rung formation

X) Twisted ring

Y) Double helix

Z) Beta-pleated sheet

ANSWER: Y) Double helix

### BONUS

16) BIOLOGY *Short Answer* By name or number, list all of the following which are products of photosynthesis.

1. O<sub>2</sub>

2. CO<sub>2</sub>

3. H<sub>2</sub>O

4. Sugar

ANSWER: 1, 4

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### TOSS-UP

17) CHEMISTRY *Multiple Choice* Which of the following temperatures best approximates the melting point of table sugar?

W) 50 C

X) 200 C

Y) 500 C

Z) 1000 C

ANSWER: X) 200 C (btw the answer is 186 C)

### BONUS

17) CHEMISTRY *Multiple Choice* Which of the following classes of salts does NOT always form soluble compounds in water?

W) Nitrates

X) Acetates

Y) Carbonates

Z) Chlorates

ANSWER: Y) Carbonates

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**TOSS-UP**

18) EARTH AND SPACE *Multiple Choice* Amy's time zone is 3 hours away from Derek's time zone. Approximately how many degrees of longitude are between them?

W) 15

X) 20

Y) 30

Z) 45

ANSWER: Z) 45

**BONUS**

18) EARTH AND SPACE *Short Answer* Justin is standing at 42 degrees west on the equator, while Ann is standing at 90 degrees and 01 minute east on the equator. How far apart are they, in nautical miles?

ANSWER: 7921

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**TOSS-UP**

19) MATH *Multiple Choice* A right triangle has leg lengths of 5 inches and 12 inches. What is the length of its hypotenuse?

W) 5 inches

X) 12 inches

Y) 13 inches

Z) 15 inches

ANSWER: Y) 13 inches

**BONUS**

19) MATH *Short Answer* What is the area of a triangle with side lengths 9, 40 and 41?

ANSWER: 180

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**TOSS-UP**

20) PHYSICS *Multiple Choice* What did Albert Einstein win a Nobel Prize for?

W) Special Relativity

X) Photoelectric Effect

Y) General Relativity



Z) Brownian Motion

ANSWER: X) Photoelectric Effect

**BONUS**

20) PHYSICS *Short Answer* To the nearest tenth, what is the gravitational acceleration constant on Earth?

ANSWER: 9.8 m/s<sup>2</sup>

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**TOSS-UP**

21) BIOLOGY *Multiple Choice* The sugar that helps form the backbone of DNA is called what?

W) Ribose sugar

X) Deoxyribose sugar

Y) Detoxyribose sugar (to reader: accentuate the “t” in this answer)

Z) Deoxyglucose sugar

ANSWER: X) Deoxyribose sugar

**BONUS**

21) BIOLOGY *Short Answer* What is the name of the enzyme that uses an electrochemical gradient to create ATP?

ANSWER: ATP synthase

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**TOSS-UP**

22) CHEMISTRY *Multiple Choice* Which of the following substances has the lowest pH?

W) Sea Water

X) Vinegar

Y) Bleach

Z) Pure Water

ANSWER: X) Vinegar

**BONUS**

22) CHEMISTRY *Short Answer* What is the bond angle of Ozone to the nearest ten degrees?

ANSWER: 120 (btw actual answer is 117)

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**TOSS-UP**

23) EARTH SCIENCE *Multiple Choice* What is the name for the ocean current located off the eastern coast of North America that brings warm water from the equator northward?

W) Gulf Stream

X) Canary Current

Y) Benguela Current

Z) Agulhas Current

ANSWER: W) Gulf Stream

**BONUS**

23) EARTH SCIENCE *Multiple Choice* Which of the following rocks is an example of a sedimentary rock?

W) Diorite

X) Basalt

Y) Conglomerate

Z) Marble

ANSWER: Y) Conglomerate

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**TOSS-UP**

24) MATH *Short Answer* What is the product of the LCM of 6 and 12 and the GCF of 6 and 12?

ANSWER: 72

**BONUS**

24) MATH *Short Answer* John buys 10 chickens and 3 TVs for \$211. Thomas buys 8 chicken and 2 TVs for \$146. How much does 3 chicken and 1 TV cost?

ANSWER: \$69

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**TOSS-UP**

25) PHYSICS *Short Answer* How many SI base units exist?

ANSWER: 7

**BONUS**

25) PHYSICS *Short Answer* Give the SI Unit of luminous intensity.

ANSWER: Candela

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