

ROUND 12A

TOSS-UP

1) Earth and Space – *Multiple Choice* What type of nebula consists primarily of hot, ionized gas that radiates light?

- W) Planetary nebula
- X) Emission nebula
- Y) Reflection nebula
- Z) H1 [*H-1*] region

ANSWER: X) EMISSION NEBULA

BONUS

1) Earth and Space – *Short Answer* Order the following three gases from least common to most common in the atmosphere of Mars: 1) Oxygen; 2) Argon; 3) Carbon dioxide.

ANSWER: 1, 2, 3

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### TOSS-UP

2) Energy – *Multiple Choice* Which of the following sectors in the United States uses the most petroleum?

- W) Industry
- X) Residential
- Y) Transportation
- Z) Construction

ANSWER: Y) TRANSPORTATION

### BONUS

2) Energy – *Short Answer* What form of energy provides about 14% of the world's electricity, with France, Belgium, and Hungary having a much greater proportion?

ANSWER: NUCLEAR

**TOSS-UP**

3) Math – *Short Answer* What is the  $x$ -intercept of the line with the equation  $4x - 3y = 48$ ?

ANSWER: 12

**BONUS**

3) Math – *Short Answer* A right triangle has sides of length 7, 24, and 25. What is the length of the altitude to the hypotenuse?

ANSWER:  $168/25$  (ACCEPT:  $6\ 18/25$ , 6.72)



**TOSS-UP**

4) Life Science – *Short Answer* What network of microtubules, microfilaments, and intermediate filaments extends throughout the cytoplasm and provides structural and functional properties to the cell?

ANSWER: CYTOSKELETON

**BONUS**

4) Life Science – *Short Answer* In humans, what organ is responsible for producing glucagon?

ANSWER: PANCREAS

### TOSS-UP

5) Physical Science – *Multiple Choice* As a solid undergoes a phase change to a liquid state, it:

- W) Releases heat while remaining at a constant temperature
- X) Absorbs heat while remaining at a constant temperature
- Y) Releases heat as the temperature increases
- Z) Absorbs heat as the temperature increases

ANSWER: X) ABSORBS HEAT WHILE REMAINING AT A CONSTANT TEMPERATURE

### BONUS

5) Physical Science – *Short Answer* What is the chemical name of  $\text{Al}_2\text{O}_3$ ?

ANSWER: ALUMINUM OXIDE

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TOSS-UP

6) General Science – *Multiple Choice* Which of the following compartments is responsible for the large amount of greenhouse gas emissions from cattle?

- W) Rumen
- X) Reticulum
- Y) Abomasum
- Z) Omasum

ANSWER: W) RUMEN

BONUS

6) General Science – *Short Answer* What phenomenon do noise-cancelling headphones use in order to cancel out repetitive sound waves?

ANSWER: DESTRUCTIVE INTERFERENCE (ALSO ACCEPT: SUPERPOSITION OF WAVES)

TOSS-UP

7) Physical Science – *Short Answer* When solutions of silver nitrate and potassium chloride are reacted, a solid precipitate forms. What is the precipitate?

ANSWER: SILVER CHLORIDE

BONUS

7) Physical Science – *Short Answer* Using the appropriate units, what is the momentum of a 14 kilogram bicycle traveling at 2 meters per second?

ANSWER: 28 KILOGRAM-METERS PER SECOND



TOSS-UP

8) Math – *Multiple Choice* Which of the following types of quadrilaterals may have some opposite sides that are not congruent?

- W) Parallelogram
- X) Square
- Y) Trapezoid
- Z) Rectangle

ANSWER: Y) TRAPEZOID

BONUS

8) Math – *Short Answer* What is the y-intercept of the line that contains the points (1, 4) and (5, 10)?

ANSWER: $5/2$ (ACCEPT: 2.5, $2\frac{1}{2}$)

TOSS-UP

9) Earth and Space – *Short Answer* The Fujita scale is used to measure the intensity of what weather phenomena?

ANSWER: TORNADOES

BONUS

9) Earth and Space – *Short Answer* Rank the following three minerals from least to most in terms of the Mohs scale of hardness: 1) Feldspar; 2) Calcite; 3) Topaz.

ANSWER: 2, 1, 3



TOSS-UP

10) General Science – *Multiple Choice* Human skin is mostly composed of what tissue type?

- W) Connective
- X) Nervous
- Y) Muscular
- Z) Epithelial

ANSWER: Z) EPITHELIAL

BONUS

10) General Science – *Multiple Choice* Alkenes and radical initiators are generally used for forming which of the following?

- W) Aromatic rings
- X) Saturated hydrocarbons
- Y) Polymers
- Z) Diamines

ANSWER: Y) POLYMERS

TOSS-UP

11) Life Science – *Multiple Choice* Which of the following would be the best outgroup when building a phylogenetic tree of cats?

- W) Leopard
- X) Lion
- Y) Domestic cat
- Z) Wolf

ANSWER: Z) WOLF

BONUS

11) Life Science – *Multiple Choice* Which of the following is the most important function of fiber tracheids [*tray-key-ids*] in woody plants?

- W) Energy storage
- X) Structural support
- Y) Sugary sap movement
- Z) Absorption of nutrients from the soil

ANSWER: X) STRUCTURAL SUPPORT

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### TOSS-UP

12) Energy – *Short Answer* Ribulose bisphosphate is part of what bioenergetics cycle that takes place in plants?

ANSWER: CALVIN CYCLE

### BONUS

12) Energy – *Multiple Choice* Which of the following correctly explains why electrolysis is not used for the industrial production of hydrogen?

- W) Hydrogen gas produced by electrolysis is relatively impure
- X) Hydrogen gas is produced very slowly by electrolysis
- Y) Hydrogen gas produced by electrolysis is relatively expensive
- Z) Hydrogen gas produced by electrolysis is unreactive

ANSWER: Y) Hydrogen gas produced by electrolysis is relatively expensive

### TOSS-UP

13) Life Science – *Multiple Choice* Honeybees and other pollinators transfer pollen from the:

- W) Anther to the Stigma of the Flower
- X) Stigma to the Anther of the Flower
- Y) Filament to the Sepal of the Flower
- Z) Sepal to the Filament of the Flower

ANSWER: W) ANTHER TO THE STIGMA OF THE FLOWER

### BONUS

13) Life Science – *Short Answer* During what time in geological history did many present-day phyla of animals appear in the fossil record and the first large, hard-bodied animals emerge?

ANSWER: CAMBRIAN EXPLOSION

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TOSS-UP

14) Physical Science – *Multiple Choice* When do water molecules move back and forth between the liquid and the gaseous state?

- W) Only when the air is saturated
- X) Only at the boiling point
- Y) Only when the outward movement of vapor molecules produces a pressure equal to the atmospheric pressure
- Z) At all times

ANSWER: Z) AT ALL TIMES

BONUS

14) Physical Science – *Short Answer* What type of bond between atoms is defined to be an equal sharing of electrons?

ANSWER: COVALENT BOND (ACCEPT: NONPOLAR COVALENT BOND)

TOSS-UP

15) Math – *Short Answer* How many points of intersection do the graphs of the functions $f(x) = x^2$ and $g(x) = x^4$ have?

ANSWER: 3

BONUS

15) Math – *Short Answer* Marc is flying a kite in the shape of a rhombus with one diagonal measuring 10 and the other measuring 5. What is the area of the kite?

ANSWER: 25



TOSS-UP

16) Earth and Space – *Short Answer* The moons of what planet are named for Shakespearean characters?

ANSWER: URANUS

BONUS

16) Earth and Space – *Multiple Choice* During perihelion, the Earth is approximately what percent closer to the Sun than average?

- W) 30%
- X) 10%
- Y) 2%
- Z) 0.50%

ANSWER: Y) 2%

TOSS-UP

17) General Science – *Multiple Choice* An object's weight is a relationship between the object's mass and its:

- W) Density
- X) Molecular structure
- Y) Gravitational acceleration
- Z) Gravitational force

ANSWER: Y) GRAVITATIONAL ACCELERATION

BONUS

17) General Science – *Short Answer* Identify all of the following three pairings where the species is NOT paired with the correct domain of life: 1) Archaea and Methanosarcina [*meth-an-o-sar-sin-ah*] barkeri [*bar-ker-ee*]; 2) Bacteria and Caenorhabditis [*see-no-rab-die-tis*] elegans [*el-ah-gahns*]; 3) Eukarya and Saccharomyces [*sack-ah-row-my-seas*] cerevisiae [*sara-vis-ee-eye*].

ANSWER: 2

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### TOSS-UP

18) Math – *Short Answer* Identify all of the following three logical conclusions that follow from the statement “all A are B”: 1) All B are A; 2) If C is A, then C is also B; 3) If C is not A, then C is not B.

ANSWER: 2

### BONUS

18) Math – *Multiple Choice* Which of the following points lies inside the circle defined by the equation  $x^2 + y^2 = 25$ ?

- W) (3, 4)
- X) (4, -3)
- Y) (4, 2 times square root of 2)
- Z) (4, 3 times square root of 2)

ANSWER: Y) (4, 2 TIMES SQUARE ROOT OF 2)

**TOSS-UP**

19) General Science – *Short Answer* Fjords are created by what land features?

ANSWER: GLACIERS

**BONUS**

19) General Science – *Short Answer* By what process do organisms adapt to changes in their natural environment that subject the organism to physiological stress?

ANSWER: ACCLIMATIZATION



**TOSS-UP**

20) Life Science – *Short Answer* Ethylene and cytokines are hormones in what type of organisms?

ANSWER: PLANTS

**BONUS**

20) Life Science – *Short Answer* What term in leaf classification is used to describe leaves consisting of leaflets or lobes radiating from the base?

ANSWER: PALMATE

### TOSS-UP

21) Earth and Space – *Multiple Choice* Which of the following explains why the same side of the Moon always faces the Earth?

- W) The Moon is tidally locked to the Earth
- X) The Moon rotates around its axis once every 12 hours
- Y) The Moon rotates around its axis once every 24 hours
- Z) The Moon is gravitationally uncoupled from the Earth

ANSWER: W) THE MOON IS TIDALLY LOCKED TO THE EARTH

### BONUS

21) Earth and Space – *Short Answer* Project Mercury was a US program that aimed to build a spacecraft to orbit what planet?

ANSWER: EARTH



### TOSS-UP

22) Energy – *Multiple Choice* Tetraethyllead was banned as an anti-knocking additive to gasoline due to concerns that it released dangerous heavy metal emissions into the environment. During what decade did the phaseout of leaded gasoline begin?

- W) The 1950's
- X) The 1960's
- Y) The 1970's
- Z) The 1980's

ANSWER: Y) THE 1970's

### BONUS

22) Energy – *Short Answer* Engine fuel is rated on what scale, which uses n-heptane and 2,2,4-trimethylpentane as the standards for scores of 0 and 100, respectively?

ANSWER: OCTANE RATING

### TOSS-UP

23) Physical Science – *Short Answer* What form of highly-purified coal is used in smelting iron ore to make steel?

ANSWER: COKE

### BONUS

23) Physical Science – *Short Answer* What is the common name of the acid  $\text{HClO}_2$ ?

ANSWER: CHLOROUS ACID