

ROUND 12A

TOSS-UP

1) Physical Science – *Multiple Choice* Which of the following isotopes was responsible for the only known naturally occurring fission reactors, the Oklo Fossil Reactors?

- W) Uranium-233
- X) Plutonium-239
- Y) Uranium-235
- Z) Plutonium-238

ANSWER: Y) URANIUM-235

BONUS

1) Physical Science – *Multiple Choice* Bernoulli's equation describes which of the following?

- W) Vorticity
- X) Behavior of harmonic oscillators
- Y) Behavior of real gases
- Z) Fluid dynamics

ANSWER: Z) FLUID DYNAMICS

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### TOSS-UP

2) Life Science – *Multiple Choice* A tick sucks blood from a cow. Which of the following is this species interaction?

- W) Competition
- X) Mutualism
- Y) Parasitism
- Z) Predation

ANSWER: Y) PARASITISM

### BONUS

2) Life Science – *Multiple Choice* If a DNA template has the sequence TAC-ACA-GGG, which one of the following would be the correct messenger RNA codon sequence?

- W) ATG-TGT-CCC
- X) ATG-UGU-GGG
- Y) AUG-UGU-CCC
- Z) UAC-UGU-CCC

ANSWER: Y) AUG-UGU-CCC

**TOSS-UP**

3) Earth and Space – *Multiple Choice* Which of the following is the underlying cause of most volcanoes on Jupiter's moon Io?

- W) Meteor impacts
- X) Tidal forces
- Y) Plate tectonics
- Z) Weather patterns

ANSWER: X) TIDAL FORCES

**BONUS**

3) Earth and Space – *Multiple Choice* Which of the following bodies of water does an atoll usually enclose?

- W) Lake
- X) River
- Y) Swamp
- Z) Lagoon

ANSWER: Z) LAGOON

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TOSS-UP

4) Energy – *Short Answer* What type of power plant only needs to be refueled once a year?

ANSWER: NUCLEAR

BONUS

4) Energy – *Short Answer* Of the four major types of coal mined in the US, which has the lowest energy content?

ANSWER: LIGNITE

TOSS-UP

5) Math – *Multiple Choice* What is the square root of one trillion?

- W) Ten thousand
- X) One hundred thousand
- Y) One million
- Z) Ten million

ANSWER: Y) ONE MILLION

BONUS

5) Math – *Short Answer* A right circular cylinder has a radius of 2 and a height of 10. A second right circular cylinder has a radius of 3 and a height of 6. What is the larger lateral surface area of the two cylinders?

ANSWER: 40 pi

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**TOSS-UP**

6) General Science – *Short Answer* In a population pyramid, what information does the width of the base give about the population?

ANSWER: BIRTH RATE

**BONUS**

6) General Science – *Multiple Choice* Which of the following pairs of events occurred in the same decade?

- W) Whitney invented the cotton gin and Jenner discovered a smallpox vaccine
- X) A Jarvik artificial heart was successfully implanted in a human and the first satellite capable of data transmission went into orbit
- Y) Dubois discovered Java man in Indonesia and Hall discovered the two moons of Mars
- Z) Eastman invented the box camera and Curie discovered radium

ANSWER: W) WHITNEY INVENTED THE COTTON GIN AND JENNER DISCOVERED A SMALLPOX VACCINE

**TOSS-UP**

7) Physical Science – *Multiple Choice* What is the term for a transfer of heat due to direct contact?

- W) Conduction
- X) Radiation
- Y) Convection
- Z) Induction

ANSWER: W) CONDUCTION

**BONUS**

7) Physical Science – *Multiple Choice* Hooke's law is most directly related to the behavior of what?

- W) Inclined planes
- X) Wedges
- Y) Springs
- Z) Projectiles

ANSWER: Y) SPRINGS

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TOSS-UP

8) Energy – *Short Answer* How many strokes are in a complete cycle for typical small engines found in leaf blowers, hedge trimmers, and go-carts?

ANSWER: TWO

BONUS

8) Energy – *Multiple Choice* A low-e window will have greater performance in comparison to a standard home window in what regard?

- W) It will allow more infrared energy into the home
- X) It will allow less ultraviolet energy into the home
- Y) It will emit less radiant energy from the home
- Z) It will allow more visible light into the home

ANSWER: Y) IT WILL EMIT LESS RADIANT ENERGY FROM THE HOME

TOSS-UP

9) Life Science – *Short Answer* Based on genetic evidence, which two taxonomic domains are most closely related to one another?

ANSWER: ARCHAEA AND EUKARYA

BONUS

9) Life Science – *Multiple Choice* Muscle cells in our heart are constantly working. Which of the following organelles would they have in larger quantities than other cells in the body?

- W) Vacuoles
- X) Mitochondria
- Y) Chloroplasts
- Z) Nucleoli

ANSWER: X) MITOCHONDRIA

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**TOSS-UP**

10) Earth and Space – *Multiple Choice* Which of the following gases does NOT contribute significantly to the greenhouse effect?

- W) Methane
- X) Carbon dioxide
- Y) Nitrogen
- Z) Water vapor

ANSWER: Y) NITROGEN

**BONUS**

10) Earth and Space – *Short Answer* What is the most abundant extrusive igneous rock in Earth's crust?

ANSWER: BASALT

**TOSS-UP**

11) General Science – *Short Answer* What formula predicts the energy yield of fission, where a quantity of mass is annihilated?

ANSWER:  $E=MC^2$  (ACCEPT: MASS-ENERGY EQUIVALENCE)

**BONUS**

11) General Science – *Multiple Choice* Which of the following units is NOT part of the SI system, but is important and widely used?

- W) Liter
- X) Mole
- Y) Kilogram
- Z) Candela

ANSWER: W) LITER

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TOSS-UP

12) Math – *Short Answer* When the radius of a circle is tripled, by what factor is its area multiplied?

ANSWER: 9

BONUS

12) Math – *Short Answer* What number is required to complete the square for the polynomial $4x^2 + 10x$?

ANSWER: $25/4$ (ACCEPT: $6\frac{1}{4}$, 6.25)

TOSS-UP

13) Physical Science – *Short Answer* What class of lever has the force of effort located between the force of the load and the fulcrum?

ANSWER: THIRD

BONUS

13) Physical Science – *Multiple Choice* Which of the following scientific principles is based on the conservation of electric charge?

- W) Kirchhoff's current law
- X) Maxwell's equations
- Y) Spin selection rules
- Z) Coulomb's law

ANSWER: W) KIRCHHOFF'S CURRENT LAW

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**TOSS-UP**

14) Math – *Short Answer* What is the  $x$ -intercept of the line with equation  $5x - 3y = -30$ ?

ANSWER:  $(-6, 0)$  (ACCEPT:  $-6$ )

**BONUS**

14) Math – *Short Answer* Given the prime factorizations of the following two numbers, what is their greatest common divisor:  $2^5$  times 3 times  $5^2$  and  $2^3$  times  $3^3$  times 5 times 7.

ANSWER: 120

**TOSS-UP**

15) Energy – *Multiple Choice* What country made the largest monetary investment in solar, wind, biofuels, and other low-carbon energy technologies in 2014?

- W) China
- X) Brazil
- Y) United States
- Z) Canada

ANSWER: W) CHINA

**BONUS**

15) Energy – *Short Answer* What mountainous region of the United States contains the largest proven natural gas reserves?

ANSWER: APPALACHIAN (ACCEPT: APPALACHIA)

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TOSS-UP

16) General Science – *Short Answer* What variable is measured at time intervals during a calorimetry experiment?

ANSWER: TEMPERATURE (DO NOT ACCEPT: ENERGY, HEAT)

BONUS

16) General Science – *Multiple Choice* Which of the following pairs correctly associates the scientist with his or her area of discovery?

- W) Pasteur and antiseptics
- X) Einstein and the photoelectric effect
- Y) Rutherford and wave mechanics
- Z) Curie and x-rays

ANSWER: X) EINSTEIN AND THE PHOTOELECTRIC EFFECT

TOSS-UP

17) Earth and Space – *Multiple Choice* Which of the following is NOT true of continental glaciers?

- W) They form along mountain slopes at high elevations
- X) They have a lens-like shape
- Y) Their weight depresses the underlying land
- Z) They can be found in Antarctica and Greenland

ANSWER: W) THEY FORM ALONG MOUNTAIN SLOPES AT HIGH ELEVATIONS

BONUS

17) Earth and Space – *Short Answer* Identify all of the following three statements that are true about stars: 1) Red stars are cooler than blue stars; 2) The Sun is considered a yellow star; 3) The Sun's surface temperature is approximately 60,000 kelvins.

ANSWER: 1 AND 2

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**TOSS-UP**

18) Physical Science – *Multiple Choice* The sum of the number of protons and neutrons in an atom of an element is referred to as the element's what?

- W) Mass number
- X) Atomic weight
- Y) Isotopic number
- Z) Atomic number

ANSWER: W) MASS NUMBER

**BONUS**

18) Physical Science – *Short Answer* A jet becomes airborne when its speed reaches 100 meters per second. If a jet, starting at rest, accelerates at a rate of 2.6 meters per second squared, how many seconds will elapse, to the nearest second, before it becomes airborne?

ANSWER: 38

**TOSS-UP**

19) Earth and Space – *Multiple Choice* Which of the following is the largest unit of time on the geologic time scale?

- W) Eon
- X) Era
- Y) Period
- Z) Epoch

ANSWER: W) EON

**BONUS**

19) Earth and Space – *Short Answer* What type of speleothem hangs from the ceiling?

ANSWER: STALACTITES

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TOSS-UP

20) Physical Science – *Short Answer* A circuit contains a single lightbulb rated for 27 watts of power using a 9-volt battery. Under these conditions, what is the current, in amps, through the lightbulb?

ANSWER: 3

BONUS

20) Physical Science – *Multiple Choice* Sterling silver contains 92.5% silver and 7.5% copper. Which of the following substances is the solute?

- W) Metals can't form a solution
- X) Silver
- Y) Copper
- Z) Gold

ANSWER: Y) COPPER

TOSS-UP

21) Math – *Short Answer* For what real numbers is the following rational function not defined: the fraction with numerator x times open parenthesis $x^2 - 4$ close parenthesis and denominator open parenthesis $x + 2$ close parenthesis times open parenthesis $x - 5$ close parenthesis?

ANSWER: -2 and 5

BONUS

21) Math – *Short Answer* A rhombus has diagonals of length 14 and 18. What is its area?

ANSWER: 126

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**TOSS-UP**

22) Life Science – *Short Answer* Coral reefs are made predominately of what mineral?

ANSWER: CALCIUM CARBONATE

**BONUS**

22) Life Science – *Multiple Choice* Which of the following types of diversity is the most difficult to effectively and sustainably improve?

- W) Genetic diversity
- X) Microscopic species diversity
- Y) Macroscopic species diversity
- Z) Ecosystem diversity

ANSWER: Z) ECOSYSTEM DIVERSITY

**TOSS-UP**

23) Life Science – *Multiple Choice* Which of the following is a disadvantage of inbreeding?

- W) Farmers get to choose what organisms to breed
- X) The inbred organism is sterile
- Y) The inbred organism may have genetic disorders due to similar alleles
- Z) Unlike hybrids, inbred organisms are not very valuable to people

ANSWER: Y) THE INBRED ORGANISM MAY HAVE GENETIC DISORDERS DUE TO SIMILAR ALLELES

**BONUS**

23) Life Science – *Multiple Choice* A biologist observes that different species of mice have different species of flea parasites. Which term best describes this scenario?

- W) Fusion
- X) Mutation
- Y) Divergence
- Z) Coevolution

ANSWER: Z) COEVOLUTION