

ROUND 13A

TOSS-UP

1) Math – *Multiple Choice* Which of the following describes the lines represented by the equations $5x + 3y = 15$ and $-10x - 6y = 60$?

- W) They are parallel
- X) They are skew
- Y) They intersect at exactly one point
- Z) They are the same line

ANSWER: W) THEY ARE PARALLEL

BONUS

1) Math – *Short Answer* Nelly bought a mixture of two types of her favorite candies, costing 40 cents and 50 cents per ounce, respectively. The cost of 50 ounces of her mixture was \$21.80. How many ounces of the 50-cent candy were in the mixture?

ANSWER: 18

TOSS-UP

2) General Science – *Multiple Choice* Which of the following instruments is best for measuring humidity?

- W) Hygrometer
- X) Barometer
- Y) Anemometer
- Z) Hydrometer

ANSWER: W) HYGROMETER

BONUS

2) General Science – *Short Answer* The diamond-shaped NFPA Symbol on chemical containers includes 4 smaller diamonds, representing 4 hazard areas. Name 2 of them.

ANSWER: Any two of HEALTH, FLAMMABILITY, INSTABILITY, AND SPECIAL HAZARDS (ACCEPT: FIRE for FLAMMABILITY, REACTIVITY for INSTABILITY)

TOSS-UP

3) Life Science – *Short Answer* What is the main structural material found in a skate's skeleton?

ANSWER: CARTILAGE

BONUS

3) Life Science – *Short Answer* The keel is a broad surface for muscle attachment that protrudes from what bone in a bird's body?

ANSWER: STERNUM

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**TOSS-UP**

4) Energy – *Multiple Choice* Which of the following electricity generation methods would work best as a peaker plant?

- W) Coal-fired
- X) Natural gas-fired
- Y) Nuclear
- Z) Geothermal

ANSWER: X) NATURAL GAS-FIRED

**BONUS**

4) Energy – *Multiple Choice* In a standard lithium-ion battery, from what substance is the anode made?

- W) Carbon
- X) Lithium cobalt oxide
- Y) Lithium iron phosphate
- Z) Copper

ANSWER: W) CARBON

**TOSS-UP**

5) Earth and Space – *Multiple Choice* The rings of Saturn are mostly made of which of the following substances?

- W) Iron
- X) Ice
- Y) Rock
- Z) Gas

ANSWER: X) ICE

**BONUS**

5) Earth and Space – *Short Answer* Order the following four reservoirs of Earth's freshwater from the smallest to the largest : 1) Ice caps and glaciers; 2) Groundwater; 3) Atmosphere; 4) Lakes.

ANSWER: 3, 4, 2, 1 (ACCEPT: ATMOSPHERE, LAKES, GROUNDWATER, ICE CAPS AND GLACIERS)



**TOSS-UP**

6) Physical Science – *Short Answer* What is it called when all forces acting on an object are balanced?

ANSWER: EQUILIBRIUM (ACCEPT: TRANSLATIONAL EQUILIBRIUM)

**BONUS**

6) Physical Science – *Short Answer* Three resistors of 2, 3, and 4 ohms, respectively, are wired in parallel, and the resulting combination is in series with a 5-ohm resistor. What is the equivalent resistance, in ohms, of the entire circuit?

ANSWER: 77/13 (ACCEPT: 5 12/13)

**TOSS-UP**

7) General Science – *Multiple Choice* Which of the following is a geographical region characterized by hills, plateaus, and mountains?

- W) Continental shelf
- X) Altitude
- Y) Highland
- Z) Cliff

ANSWER: Y) HIGHLAND

**BONUS**

7) General Science – *Short Answer* What is the term used to describe an experiment in which neither the subjects nor the experimenters know which subjects are in the control and treatment groups?

ANSWER: DOUBLE-BLIND

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TOSS-UP

8) Life Science – *Multiple Choice* Which of the following traits is NOT a characteristic of modern birds?

- W) Feathers
- X) A three-chambered heart
- Y) A beak with no teeth
- Z) A lightweight but strong skeleton

ANSWER: X) A THREE-CHAMBERED HEART

BONUS

8) Life Science – *Short Answer* Book lungs would most likely be found in what class of animals?

ANSWER: ARACHNIDA

TOSS-UP

9) Physical Science – *Multiple Choice* As you walk, which of the following forces is the most directly responsible for propelling you forward?

- W) The normal force of the ground on your foot
- X) The force of your foot pushing on the ground
- Y) The friction between your foot and the ground
- Z) The reaction force of the ground on your foot

ANSWER: Z) THE REACTION FORCE OF THE GROUND ON YOUR FOOT

BONUS

9) Physical Science – *Short Answer* A speck of dust sits on the edge of a 12-inch diameter LP record. If the record rotates at 45 rotations per minute, what is the linear speed, in inches per minute, of the speck of dust?

ANSWER: 540π



TOSS-UP

10) Math – *Short Answer* What is the degree of the product of the three binomials $x + 2$, $x^4 + x^2$, and $x^2 + 3$?

ANSWER: 7

BONUS

10) Math – *Short Answer* A bag contains 9 different mini candy bars. How many different sets of 3 of them can be selected?

ANSWER: 84

TOSS-UP

11) Energy – *Short Answer* Compact fluorescent lightbulbs should be recycled because they contain what harmful element?

ANSWER: MERCURY (ACCEPT: Hg)

BONUS

11) Energy – *Multiple Choice* Research at Argonne National Laboratory has been done on nuclear fuel recycling. After a nuclear fuel rod has been removed from a reactor, which of the following is closest to the percentage of the unused uranium that is still present in the rod and could be recycled?

- W) 25
- X) 50
- Y) 75
- Z) 95

ANSWER: Z) 95

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**TOSS-UP**

12) Earth and Space – *Short Answer* Which of Hubble’s four categories of galaxies does not have a distinct spiral or elliptical shape?

ANSWER: IRREGULAR

**BONUS**

12) Earth and Space – *Multiple Choice* Which of the following types of plate tectonic boundaries is associated with shallow earthquakes, but not with volcanism?

- W) Convergent
- X) Divergent
- Y) Passive
- Z) Transform

ANSWER: Z) TRANSFORM

### TOSS-UP

13) Physical Science – *Multiple Choice* The Rutherford Experiment was actually carried out by Hans Geiger [*GYE-gur*] and Ernest Marsden at the request of Rutherford. Which of the following statements is NOT true about this work?

- W) Rutherford inferred the gold electrons were responsible for deflecting the alpha particles by small angles
- X) Rutherford inferred the gold nuclei were responsible for deflecting the alpha particles by large angles
- Y) The deflected alpha particles were detected as points of light on a fluorescent screen
- Z) Approximately 1 in 20,000 alpha particles was deflected by 90 degrees or more

ANSWER: W) RUTHERFORD INFERRED THE GOLD ELECTRONS WERE RESPONSIBLE FOR DEFLECTING THE ALPHA PARTICLES BY SMALL ANGLES

### BONUS

13) Physical Science – *Multiple Choice* An object is placed between the focal point and curvature center of a concave mirror. How does the image compare to the object?

- W) Upside down and smaller
- X) Upside down and larger
- Y) Right side up and smaller
- Z) Right side up and larger

ANSWER: X) UPSIDE DOWN AND LARGER

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TOSS-UP

14) Energy – *Multiple Choice* Which of the following fuels used for electricity production produces radioactive waste?

- W) Wind
- X) Natural gas
- Y) Geothermal
- Z) Coal

ANSWER: Z) COAL

BONUS

14) Energy – *Short Answer* What U. S. river has the most potential to generate electricity using existing dams?

ANSWER: OHIO

TOSS-UP

15) Life Science – *Multiple Choice* Which of the following is TRUE regarding the differences between RNA and DNA?

- W) RNA is used as a catalyst, while DNA is not
- X) RNA cannot be replicated, but DNA can
- Y) RNA is always single-stranded, while DNA is always double-stranded
- Z) RNA is more stable than DNA

ANSWER: W) RNA IS USED AS A CATALYST, WHILE DNA IS NOT

BONUS

15) Life Science – *Multiple Choice* Which of these bones is fused in a bird's body?

- W) Radius
- X) Clavicle
- Y) Humerus
- Z) Scapula

ANSWER: X) CLAVICLE

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**TOSS-UP**

16) Math – *Short Answer* What is the least common multiple of 3, 10, and 20?

ANSWER: 60

**BONUS**

16) Math – *Short Answer* A hiker traveled 4 kilometers east, proceeded 11 kilometers south, then 6 kilometers west, and finally 6 kilometers north. How far, in kilometers, is the hiker from the starting point?

ANSWER:  $\sqrt{29}$

**TOSS-UP**

17) General Science – *Short Answer* What device uses high rotational speed to increase the fraction of the fissile isotope of uranium needed for nuclear fuel?

ANSWER: CENTRIFUGE

**BONUS**

17) General Science – *Multiple Choice* Which of the following would NOT be considered raw data?

- W) Geographic coordinates of a mountain
- X) Efficiency of a solar cell
- Y) Satellite images of a storm
- Z) Temperature of a fish tank

ANSWER: X) EFFICIENCY OF A SOLAR CELL

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TOSS-UP

18) Earth and Space – *Short Answer* What is the next brightest star in the night sky, after Sirius?

ANSWER: CANOPUS

BONUS

18) Earth and Space – *Multiple Choice* In which of the following rock types are you most likely to find cross-bedding?

- W) Sandstone
- X) Basalt
- Y) Gneiss
- Z) Granite

ANSWER: W) SANDSTONE

TOSS-UP

19) Math – *Short Answer* If a number is increased by 40%, by what percent is its square increased?

ANSWER: 96

BONUS

19) Math – *Short Answer* The graph of the line with equation $y = 3x + 2$ is reflected through the x -axis. What is the slope-intercept equation of the reflected line?

ANSWER: $y = -3x - 2$

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**TOSS-UP**

20) Physical Science – *Short Answer* What quantum number was adopted in 1925 to explain closely-spaced pairs of emission lines?

ANSWER: SPIN (ACCEPT: S)

**BONUS**

20) Physical Science – *Multiple Choice* In general, metals do NOT have which of the following properties?

- W) Contain 1, 2, or 3 valance electrons
- X) Low ionization energies
- Y) High electron affinities
- Z) Low electronegativities

ANSWER: Y) HIGH ELECTRON AFFINITIES

**TOSS-UP**

21) Life Science – *Multiple Choice* Why do invasive species tend to outcompete native species?

- W) Invasive species are better adapted to the area
- X) Invasive species have no native predators
- Y) Invasive species remove competition from the area
- Z) Invasive species reduce predation pressure on other species

ANSWER: X) INVASIVE SPECIES HAVE NO NATIVE PREDATORS

**BONUS**

21) Life Science – *Short Answer* Identify all of the following four amino acids that you would NOT expect to find buried in the core of a folded protein: 1) Asparagine; 2) Phenylalanine; 3) Methionine; 4) Lysine.

ANSWER: 1, 4 (ACCEPT: ASPARAGINE, LYSINE)

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TOSS-UP

22) Math – *Short Answer* The measure of an exterior angle of a regular polygon is 20° . How many sides does the polygon have?

ANSWER: 18

BONUS

22) Math – *Short Answer* A prism with 12 edges has how many faces?

ANSWER: 6

TOSS-UP

23) Earth and Space – *Multiple Choice* Which of the following is NOT an evaporite mineral?

- W) Halite
- X) Gypsum
- Y) Corundum
- Z) Borax

ANSWER: Y) CORUNDUM

BONUS

23) Earth and Space – *Short Answer* Identify all of the following four geologic time intervals that can be identified in the rock record using index fossils: 1) Hadean [**HAY-dee-en**]; 2) Devonian; 3) Neolithic; 4) Jurassic.

ANSWER: 2 AND 4