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)
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

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

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

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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

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: \( y = -3x - 2 \)

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