ROUND 8A

TOSS-UP

1) Life Science – *Multiple Choice*  From what source does the energy required for photosynthesis come?

W) Water  
X) Oxygen  
Y) Carbon Dioxide  
Z) Sunlight

ANSWER: Z) SUNLIGHT

BONUS

1) Life Science – *Short Answer*  What compartment of the heart pumps blood to the lungs?

ANSWER: RIGHT VENTRICLE

2) Energy – *Short Answer*  Most ethanol in the U.S. is produced from what crop?

ANSWER: CORN

BONUS

2) Energy – *Multiple Choice*  Which of the following types of coal is produced in the smallest amount in the U.S.?

W) Anthracite [*AN-thrah-site*]  
X) Bituminous [*bih-TOOM-in-us*]  
Y) Lignite  
Z) Subbituminous [*sub-bih-TOOM-in-us*]

ANSWER: W) ANTHRACITE
TOSS-UP

3) Earth and Space – Short Answer  The often brackish feature formed where a river meets the sea is called what?

ANSWER: ESTUARY

BONUS

3) Earth and Space – Short Answer  What is the term for the production of usable energy directly from inorganic molecules?

ANSWER: CHEMOSYNTHESIS

TOSS-UP

4) Life Science – Short Answer  What scientist posited the idea of natural selection in his book On the Origin of Species?

ANSWER: CHARLES DARWIN (ACCEPT: DARWIN)

BONUS

4) Life Science – Short Answer  What is the structure capable of transporting water only upward in plants?

ANSWER: XYLEM
TOSS-UP

5) Math – Short Answer  A map has a scale of 2 cm to 9 kilometers. What is the distance, in kilometers, between 2 cities that are 12 cm apart on the map?

ANSWER: 54

BONUS

5) Math – Short Answer  Solve the following equation for x: \((4x - 3)^2 = 25\).

ANSWER: –1/2 or 2 (MUST GIVE BOTH ANSWERS; ACCEPT –0.5 for –1/2)

TOSS-UP

6) Physical Science – Multiple Choice  Of the following choices, where would one most likely find a charge-coupled device?

W) Mass spectrometer [spek-TRAW-meter]
X) Camera
Y) Multimeter [multi-meter]
Z) Motor

ANSWER: X) CAMERA

BONUS

6) Physical Science – Short Answer  A 5-kilogram mass was held in place at a height of 2 meters above the ground. To the nearest newton, what force was required to hold it there?

ANSWER: 49
TOSS-UP

7) Earth and Space – Short Answer What scientist developed the theory of continental drift?

ANSWER: ALFRED WEGENER

BONUS

7) Earth and Space – Short Answer What two planets in our solar system do not have natural satellites?

ANSWER: VENUS AND MERCURY

TOSS-UP

8) Physical Science – Multiple Choice Which of the following properties best determines the difference between a liquid and a gas?

W) Malleability [mal-ee-ability]
X) Density
Y) Volume
Z) Pressure

ANSWER: X) DENSITY

BONUS

8) Physical Science – Short Answer What law relates the force applied by a spring to its deformation?

ANSWER: HOOKE’S LAW
TOSS-UP

9) Energy – Short Answer  While the United States has the largest known coal reserves on Earth, what country produces the most coal annually, accounting for roughly half of the coal produced worldwide?

ANSWER: CHINA

BONUS

9) Energy – Short Answer  Lawrence Livermore Lab researchers have developed 3D-printed graphene aerogel electrodes for supercapacitors. What do supercapacitors store?

ANSWER: ELECTRICITY (ACCEPT: ELECTRICAL ENERGY, ELECTRICAL CHARGE)

TOSS-UP

10) Math – Short Answer  What is the multiplicative inverse of \(-7/3\)?

ANSWER: \(-3/7\)

BONUS

10) Math – Multiple Choice  A student makes the following conjecture: “If a quadrilateral is a rhombus, then it must be a parallelogram.” If someone doesn’t believe this conjecture is true, which of the following would be necessary to have a counterexample to it?

W) A rhombus that is a parallelogram
X) A parallelogram that is a rhombus
Y) A rhombus that is not a parallelogram
Z) A parallelogram that is not a rhombus

ANSWER: Y) A RHOMBUS THAT IS NOT A PARALLELOGRAM
TOSS-UP

11) Life Science – Short Answer  A patient complains of having watery diarrhea. What organ would a doctor most likely think might be affected?

ANSWER: SMALL INTESTINES

BONUS

11) Life Science – Short Answer  Over the course of their lives, plants will build significant carbon-based biomass without reducing the mass of the soil they are growing in. From what molecule does the carbon for this biomass come?

ANSWER: CARBON DIOXIDE (ACCEPT: CO2)

TOSS-UP

12) Math – Short Answer  What is the greatest integer less than or equal to the log base 3 of 579?

ANSWER: 5

BONUS

12) Math – Short Answer  Given \( f(x) = 4x^2 - 3 \) and \( g(x) = 4 \text{ over open parenthesis } x - 5 \text{ close parenthesis} \), calculate \( g(f(3)) \).

ANSWER: 1/7
13) Life Science — *Multiple Choice* Which of the following correctly explains why glucose is converted to glucose-6-phosphate in the first step of glycolysis [glye-CAWL-eh-sis]? 

W) The cell membrane is impermeable to large, negatively-charged molecules  
X) It enables the splitting of glucose in half during the next step  
Y) The isomerization [eye-saw-mor-eyes-AY-shun] of glucose is less favorable than that of glucose-6-phosphate  
Z) Glucose-6-phosphate can also be incorporated into glycogen [GLYE-koh-jen]  

**ANSWER:** W) THE CELL MEMBRANE IS IMPERMEABLE TO LARGE, NEGATIVELY-CHARGED MOLECULES

**BONUS**


W) The antibiotics cut up bacterial mRNA, but not eukaryotic mRNA  
X) Eukaryotes [YOU-care-ee-oats] have enzymes to destroy the antibiotics, but bacteria do not  
Y) Eukaryotes can export the antibiotics, preventing them from damaging the cell  
Z) The antibiotics affect bacterial but not eukaryotic ribosomes  

**ANSWER:** Z) THE ANTIBIOTICS AFFECT BACTERIAL BUT NOT EUKARYOTIC RIBOSOMES

**TOSS-UP**

14) Earth and Space — *Short Answer* Eskers are left behind by what geological features?  

**ANSWER:** GLACIERS

**BONUS**

14) Earth and Space — *Short Answer* Quiescent prominences observed on the Sun are long, thin, vertical sheets of what state of matter?  

**ANSWER:** PLASMA
TOSS-UP

15) Physical Science – *Multiple Choice*  Which of the following does not affect the reaction rate of the Haber synthesis of ammonia?

W) Physical state of the reactants  
X) Humidity  
Y) Temperature  
Z) Concentration

**ANSWER:** X) HUMIDITY

**BONUS**

15) Physical Science – *Short Answer*  Friction converts mechanical energy into what other form of energy?

**ANSWER:** HEAT

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TOSS-UP

16) Energy – *Multiple Choice*  A reaction where the system absorbs energy is known as which of the following?

W) Exothermic  
X) Endothermic  
Y) Nuclear  
Z) Thermodynamic

**ANSWER:** X) ENDOOTHERMIC

**BONUS**

16) Energy – *Short Answer*  What quantity is equal to the product of power and time?

**ANSWER:** ENERGY
17) Math – Short Answer  What is $\frac{7}{9}$ times $\frac{3}{4}$?

ANSWER: $\frac{7}{12}$

**BONUS**

17) Math – Short Answer  What is the area of a rhombus with diagonals of length 22 and 28?

ANSWER: 308

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18) Physical Science – Multiple Choice  Which of the following elements has the highest atomic number?

W) Hydrogen  
X) Lawrencium  
Y) Gold  
Z) Californium

ANSWER: X) LAWRENCIUM

**BONUS**

18) Physical Science – Short Answer  When a superconductor becomes perfectly diamagnetic, what effect is it exhibiting?

ANSWER: MEISSNER EFFECT
TOSS-UP

19) Life Science — Short Answer  What is the name of the process responsible for bursting red blood cells when they are placed in pure water?

ANSWER: OSMOSIS

BONUS

19) Life Science — Short Answer  What organ in the human body is involved in filtering out extra solutes in the blood?

ANSWER: KIDNEY

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TOSS-UP

20) Earth and Space — Multiple Choice  Which of the following best describes the intercloud medium in space?

W) Hot and high density
X) Hot and low density
Y) Cold and high density
Z) Cold and low density

ANSWER: X) HOT AND LOW DENSITY

BONUS

20) Earth and Space — Multiple Choice  A stream is dammed, raising its base level. Which of the following is most likely to happen?

W) The stream deposits sediment upstream of the dam
X) The stream's velocity increases
Y) The stream's discharge increases
Z) The gradient of the stream increases

ANSWER: W) THE STREAM DEPOSITS SEDIMENT UPSTREAM OF THE DAM
TOSS-UP

21) Physical Science – Short Answer You travel in a car 1 mile north, then 1 mile east, then 1 mile south. What is the net displacement of your trip?

ANSWER: 1 MILE EAST (NOTE: EAST IS NECESSARY IN THE ANSWER)

BONUS

21) Physical Science – Short Answer The distance between crests of a wave is 2 centimeters. If the wave travels at 10 meters per second, what is its frequency in Hertz?

ANSWER: 500

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TOSS-UP

22) Math – Short Answer What is the circumference of a circle of radius 9?

ANSWER: 18π

BONUS

22) Math – Short Answer What is the least common multiple of 12, 16, and 22?

ANSWER: 528
TOSS-UP

23) Earth and Space – Short Answer  What objects are created via calving?

ANSWER: ICEBERGS

BONUS

23) Earth and Space – Short Answer  Desert pavement is a feature created due to the action of what erosional agent?

ANSWER: WIND