

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

TOSS-UP

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 : $\underline{\text{open parenthesis } 4x - 3 \text{ close parenthesis squared}} = 25$.

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-TRA W-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 of $x = 4x^2 - 3$ and g of $x = \frac{4}{x-5}$, calculate g of f of 3.

ANSWER: 1/7

TOSS-UP

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-KA WL-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

13) Life Science – *Multiple Choice* Many antibiotics inhibit bacterial protein synthesis, but not eukaryotic [*YOU-care-ee-AW-tic*] protein synthesis. Which of the following best explains why?

- 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

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) ENDOTHERMIC

BONUS

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

ANSWER: ENERGY

TOSS-UP

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

ANSWER: 7/12

BONUS

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

ANSWER: 308

TOSS-UP

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

- W) Hydrogen
- X) Lawrencium [*lah-REN-see-um*]
- Y) Gold
- Z) Californium [*cal-ih-FOR-nee-um*]

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

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

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