

ROUND ROBIN – ROUND 1

TOSS-UP

1) Life Science – *Short Answer* What general series of reactions do cells use to convert the energy in sugar into ATP?

ANSWER: RESPIRATION (ACCEPT: CELLULAR RESPIRATION)

BONUS

1) Life Science – *Short Answer* What type of biome is characterized by sparse vegetation and less than 25 centimeters of rainfall a year?

ANSWER: DESERT

TOSS-UP

2) Earth & Space – *Short Answer* What planet in our solar system has the furthest average distance from the Sun?

ANSWER: NEPTUNE

BONUS

2) Earth & Space – *Short Answer* Identify all of the following three statements about Jupiter and Saturn that are TRUE: 1) Jupiter is more massive than Saturn; 2) Hydrogen is the most abundant gas in the atmospheres of both planets; 3) Both planets have planetary rings.

ANSWER: ALL

TOSS-UP

3) Math – *Short Answer* How much longer is the circumference of a circle with radius 12 than the circumference of a circle with radius 10?

ANSWER: 4π

BONUS

3) Math – *Short Answer* The price of a shirt is marked up by 20%, and then the shirt goes on sale for 20% off the marked price. What is the percent discount on the shirt relative to the original price?

ANSWER: 4

TOSS-UP

4) Energy – *Multiple Choice* Researchers at the National Energy Technology Lab are developing membranes that absorb carbon dioxide. Which of the following terms most accurately describes dissimilar molecules sticking to one another?

- W) Cohesion
- X) Fusion
- Y) Adhesion
- Z) Erosion

ANSWER: Y) ADHESION

BONUS

4) Energy – *Multiple Choice* Brookhaven National Lab researchers are developing catalysts to break down sarin [*SAIR-in*] gas. Sarin is a poison that inhibits what neurotransmitter-related enzyme?

- W) Catalase [*CAT-ah-lace*]
- X) Acetyl-cholin-esterase [*ah-see-til-koh-lin-ES-tur-ace*]
- Y) ATP synthase [*SIN-thase*]
- Z) DNA polymerase [*pah-LIM-er-ace*]

ANSWER: X) ACETYL-CHOLIN-ESTERASE

TOSS-UP

5) Earth & Space – *Multiple Choice* What volcanic rock is characterized by abundant vesicles, a low density, and a light color?

- W) Pumice [*PUH-miss*]
- X) Granite
- Y) Scoria [*SKOR-ee-ah*]
- Z) Obsidian

ANSWER: W) PUMICE

BONUS

5) Earth & Space – *Short Answer* Identify all of the following three landforms that could be represented by closed contours on a topographic map: 1) Hill; 2) Basin; 3) Mountain range.

ANSWER: ALL

TOSS-UP

6) Physical Science – *Short Answer* What is the term for matter that is made of only one kind of atom?

ANSWER: ELEMENT

BONUS

6) Physical Science – *Short Answer* What is the SI derived unit, equal to one joule per coulomb, that is used to quantify electric potential?

ANSWER: VOLT

TOSS-UP

7) Life Science – *Multiple Choice* Which of the following structures is too small to be seen reliably with a basic light microscope with a 400-times objective?

- W) Frog egg
- X) Viral capsid
- Y) Chloroplast
- Z) Bacterial cell

ANSWER: X) VIRAL CAPSID

BONUS

7) Life Science – *Short Answer* Place the following three events in order from earliest to latest in the process of generating protein from a DNA sequence in eukaryotes: 1) Translocation of mRNA to the cytoplasm; 2) Transcription; 3) Translation.

ANSWER: 2, 1, 3

TOSS-UP

8) Earth & Space – *Short Answer* What is the name for the regions of the Moon where most of the early Apollo missions landed, which are characterized by smooth, basaltic lowland plains?

ANSWER: MARIA (ACCEPT: MARE)

BONUS

8) Earth & Space – *Short Answer* Mars has solid ice at its polar regions. Because of its low surface pressure, when the ice caps warm up, what type of phase change does the ice undergo?

ANSWER: SUBLIMATION

TOSS-UP

9) Physical Science – *Multiple Choice* Sarah launches a projectile over flat ground at 10 meters per second at an angle of 15 degrees. If Jake wants to launch a projectile the same horizontal distance, which of the following launch parameters would be appropriate?

- W) 5 meters per second at 45 degrees
- X) 5 meters per second at 75 degrees
- Y) 10 meters per second at 45 degrees
- Z) 10 meters per second at 75 degrees

ANSWER: Z) 10 METERS PER SECOND AT 75 DEGREES

BONUS

9) Physical Science – *Short Answer* A circuit consists of an 18-volt battery wired in series with a 4-ohm resistor. In watts, how much power is dissipated by the resistor?

ANSWER: 81

TOSS-UP

10) Energy – *Short Answer* DOE-funded researchers are studying the crystalline properties of a potential solar cell material, boron arsenide. What is the chemical formula of boron arsenide?

ANSWER: BAs

BONUS

10) Energy – *Short Answer* Researchers at Brookhaven National Lab are seeking to better understand high-temperature superconductors made from cuprates [*KYU-prayts*]. What two elements comprise cuprates?

ANSWER: COPPER AND OXYGEN

TOSS-UP

11) Math – *Short Answer* If Mr. Malone buys $1\frac{5}{12}$ pounds of bananas and $1\frac{1}{4}$ pounds of apples, how many pounds of fruit does he buy?

ANSWER: $2\frac{2}{3}$ (ACCEPT: $\frac{8}{3}$)

BONUS

11) Math – *Short Answer* A trapezoid has area 360. If its height is 12 and one base has length 12, what is the length of the second base?

ANSWER: 48

TOSS-UP

12) Physical Science – *Multiple Choice* Which of the following has the lowest energy wavelength?

- W) Radio waves
- X) Blue light
- Y) Infrared light
- Z) Gamma rays

ANSWER: W) RADIO WAVES

BONUS

12) Physical Science – *Short Answer* When you hang a box from a spring with a spring constant of 30 newtons per meter, the spring is extended by 1.3 meters. To the nearest kilogram, what is the mass of the box?

ANSWER: 4

TOSS-UP

13) Life Science – *Short Answer* What human organ system is responsible for transporting blood throughout the body?

ANSWER: CARDIOVASCULAR (ACCEPT: CIRCULATORY)

BONUS

13) Life Science – *Short Answer* What is the term for the genetic interaction in which two alleles are both equally expressed, resulting in a phenotype such as AB blood type that has properties of both traits?

ANSWER: CODOMINANCE (DO NOT ACCEPT: INCOMPLETE DOMINANCE)

TOSS-UP

14) Math – *Short Answer* What is a slope of the line that contains the points $(-1, 3)$ and $(3, -5)$?

ANSWER: -2

BONUS

14) Math – *Short Answer* For the universal set consisting of the integers from 1 through 10, what is the sum of the elements in the union of the set of all prime numbers and the set of all odd numbers?

ANSWER: 27

TOSS-UP

15) Earth & Space – *Multiple Choice* Which form of precipitation is typically produced in large cumulonimbus [*KYOOM-yoo-loh-NIM-bus*] clouds when small ice pellets collect supercooled water droplets as they fall through the cloud?

- W) Glaze
- X) Sleet
- Y) Hail
- Z) Rime

ANSWER: Y) HAIL

BONUS

15) Earth & Space – *Multiple Choice* Which of the following minerals commonly has either a metallic or dull luster and produces a red streak?

- W) Plagioclase [*PLAY-jee-oh-klaze*]
- X) Pyroxene [*pie-ROX-een*]
- Y) Hematite
- Z) Gold

ANSWER: Y) HEMATITE

TOSS-UP

16) Physical Science – *Multiple Choice* Laser A has a wavelength of 400 nanometers, and laser B has a wavelength of 800 nanometers. Which of the following is NOT true?

- W) Light from laser A is blue, and light from laser B is near infrared
- X) Photons from laser A have half the energy of those from laser B
- Y) Light from laser A has twice the frequency of laser B
- Z) Light from lasers A and B travel at the same speed in vacuum

ANSWER: X) PHOTONS FROM LASER A HAVE HALF THE ENERGY OF THOSE FROM LASER B

BONUS

16) Physical Science – *Short Answer* A 1200-kilogram car is parked on a 30-degree incline. If the car remains parked for eight hours, how much work, in joules, is done by the brakes to keep it from rolling down the incline?

ANSWER: ZERO

TOSS-UP

17) Math – *Short Answer* Rounded to the nearest whole number, what is 105 divided by 9?

ANSWER: 12

BONUS

17) Math – *Short Answer* A cylinder of radius 3 and height 5 is capped with a hemisphere on one end. What is the total volume of this solid?

ANSWER: 63π

TOSS-UP

18) Life Science – *Short Answer* The information that encodes a protein sequence is located in what group of macromolecules, of which DNA and RNA are examples?

ANSWER: NUCLEIC ACIDS

BONUS

18) Life Science – *Short Answer* What structure connects the middle ear to the throat?

ANSWER: EUSTACHIAN TUBE (ACCEPT: AUDITORY TUBE, PHARYNGOTYMPANIC TUBE)

TOSS-UP

19) Earth & Space – *Short Answer* In planetary formation, what is the process in which a dispersed cloud of particles coalesces [*koh-ah-LESS-eh*] into a spherical mass?

ANSWER: ACCRETION

BONUS

19) Earth & Space – *Short Answer* Nicolaus Copernicus [*kah-PER-nah-kus*] introduced what model of the solar system to explain the retrograde motion of the planets?

ANSWER: HELIOCENTRIC

TOSS-UP

20) Energy – *Short Answer* Researchers at Sandia National Laboratory are enhancing artificial neural networks by taking inspiration from biology. In their new system, artificial neurons transmit a yes or no status instead of a floating-point number. This corresponds to what biological function of real neurons?

ANSWER: SPIKING (ALSO ACCEPT: FIRING, ACTION POTENTIAL)

BONUS

20) Energy – *Short Answer* Scientists at Jefferson Lab are studying plants with PET imaging. What does PET stand for?

ANSWER: POSITRON EMISSION TOMOGRAPHY

TOSS-UP

21) Math – *Short Answer* Convert $4\frac{2}{7}$ [**4 and two-sevenths**] to an improper fraction.

ANSWER: 30/7

BONUS

21) Math – *Short Answer* A team of three factory workers tighten 1285 bolts in 9 minutes. To the nearest whole number, what is the average number of bolts each worker tightened per minute?

ANSWER: 48

TOSS-UP

22) Life Science – *Multiple Choice* Which of the following pairs is NOT a correct matching of an organism with its external symmetry classification?

- W) Heliozoan [**heel-ee-oh-ZOH-en**] and spherical
- X) Crocodile and bilateral
- Y) Starfish and radial
- Z) Lobster and biradial

ANSWER: Z) LOBSTER AND BIRADIAL

BONUS

22) Life Science – *Short Answer* Place the following three locations in chronological order that a breath of air will pass through during human inhalation: 1) Larynx [**lair-inx**]; 2) Pharynx [**fair-inx**]; 3) Bronchi [**BRONK-eye**].

ANSWER: 2, 1, 3

TOSS-UP

23) Physical Science – *Multiple Choice* Which of the following is the shortest amount of time?

W) 5 microseconds

X) 1 nanosecond

Y) 2000 picoseconds [*PEE-coh-seconds*]

Z) 15 milliseconds

ANSWER: X) 1 NANOSECOND

BONUS

23) Physical Science – *Short Answer* How much power, in watts, is used by a laptop computer with a 12-volt battery and a current draw of 5 amps?

ANSWER: 60