

ROUND 1

TOSS-UP

1) PHYSICS *Short Answer* If a particle moves from a position of $x = 5$ meters out to $x = 200$ meters and back again to $x = 5$ meters, what is its displacement in meters?

ANSWER: 0

BONUS

1) PHYSICS *Short Answer* What are the two features of displacement?

ANSWER: MAGNITUDE AND DIRECTION

TOSS-UP

2) ENERGY *Multiple Choice* Which trophic level has the most energy?

- W) Consumers
- X) Decomposers
- Y) Producers
- Z) Scavengers

ANSWER: Y) PRODUCERS

BONUS

2) ENERGY *Multiple Choice* Which is the approximate percentage of energy transfer from one trophic level to the next?

- W) 10%
- X) 50%
- Y) 75%
- Z) 100%

ANSWER: W) 10%

TOSS-UP

3) MATH *Short Answer* What is the greatest common factor of the terms in the expression $3x^5y^2 + 6x^3y^5$ (read as: 3 x to the fifth y squared plus 6 x cubed y to the fifth)?

ANSWER: $3x^3y^2$

BONUS

3) MATH *Short Answer* At what value of x is there a minimum for the function $f(x) = x^2 - 6x$ (read as: f of x equals x squared minus $6x$)?

ANSWER: $x = 3$

TOSS-UP

4) ENERGY *Short Answer* If a 250 acre farm were leased for wind development with income of \$50 per acre per year, how much income would be produced each year?

ANSWER: \$12,500

BONUS

4) ENERGY *Multiple Choice* Wind energy is the conversion of wind power into electricity, using wind turbines. Which of the following statements is true about wind energy systems?

- W) Wind turbines convert kinetic energy from the wind
- X) Wind farms have to be located on unoccupied pieces of land
- Y) Wind energy systems have high impact on air emissions
- Z) Construction costs for wind-powered generators are minimal

ANSWER: W) WIND TURBINES CONVERT KINETIC ENERGY FROM THE WIND

TOSS-UP

5) EARTH AND SPACE *Multiple Choice* A compressional tectonic environment can result in all of the following, except:

- W) Folded mountains
- X) Basin and range
- Y) Volcanoes
- Z) Reverse faults

ANSWER: X) BASIN AND RANGE

BONUS

5) EARTH AND SPACE *Multiple Choice* The source of energy that drives a tsunami wave onto a shore originated:

- W) From the gravitational attraction between the Earth and the Moon
- X) Along the ocean floor
- Y) From tidal waves
- Z) In Earth's interior

ANSWER: Z) IN EARTH'S INTERIOR

TOSS-UP

6) BIOLOGY *Multiple Choice* When sound waves travelling through the air reach the human ear, the cochlea (read as: KŌE-lee-ah) converts the sound wave into:

- W) A chemical response transmitted through the blood stream
- X) An electrical impulse sent to the brain
- Y) A lower frequency wave, which resonates within the ear
- Z) Many small wave vectors that are separately communicated to the brain

ANSWER: X) AN ELECTRICAL IMPULSE SENT TO THE BRAIN

BONUS

6) BIOLOGY *Multiple Choice* How does neural transmission across a synaptic gap occur?

- W) Neural impulses cause the release of neurotransmitters that diffuse across the gap
- X) Neural impulses open potassium-gated channels, allowing sodium to move across the gap
- Y) Neural impulses travel across the gap as unidirectional electrical currents
- Z) Neural impulses travel across the gap as multidirectional electrical currents

ANSWER: W) NEURAL IMPULSES CAUSE THE RELEASE OF NEUROTRANSMITTERS THAT DIFFUSE ACROSS THE GAP

TOSS-UP

7) MATH *Short Answer* Name a real number that does not have a multiplicative inverse.

ANSWER: 0

BONUS

7) MATH *Short Answer* Given the function $y = 4x - x^2$, what are the two values of x for which the corresponding value for y is 0?

ANSWER: 0 AND 4

TOSS-UP

8) EARTH AND SPACE *Multiple Choice* Which of the following statements is true about the Andes mountains?

- W) They are folded mountains
- X) They are volcanic mountains
- Y) They are near a spreading center
- Z) They are found along a transform boundary

ANSWER: X) THEY ARE VOLCANIC MOUNTAINS

BONUS

8) EARTH AND SPACE *Multiple Choice* The tectonic environment of Iceland is:

- W) A subduction zone
- X) Folded mountains
- Y) A mid-ocean ridge
- Z) A mid-plate hot spot

ANSWER: Y) A MID-OCEAN RIDGE

TOSS-UP

9) MATH *Short Answer* As a fraction in lowest terms, what is the probability of rolling 1 or 3 on a standard 6-sided die?

ANSWER: 1/3

BONUS

9) MATH *Short Answer* If you roll a standard 6-sided die 2 times, how many different outcomes are possible?

ANSWER: 36

TOSS-UP

10) CHEMISTRY *Multiple Choice* Which of the following units can be used to express the volume of a liquid?

- W) Micrometers
- X) Milligrams
- Y) Grams per cubic centimeter
- Z) Nanoliters

ANSWER: Z) NANOLITERS

BONUS

10) CHEMISTRY *Short Answer* What is the process by which electricity is used to split water into hydrogen and oxygen?

ANSWER: ELECTROLYSIS

TOSS-UP

11) PHYSICS *Multiple Choice* Which of the following choices is NOT an example of a rigid body?

- W) Slinky
- X) Wheel
- Y) Pool ball
- Z) CD

ANSWER: W) SLINKY

BONUS

11) PHYSICS *Short Answer* Which of the following are transmitted by electromagnetic waves: 1) radio, 2) television, 3) Rayleigh, or 4) P-waves?

ANSWER: RADIO, TELEVISION (ACCEPT: 1, 2)

TOSS-UP

12) EARTH AND SPACE *Multiple Choice* Which of the following is the best way to get a good view of a meteor shower?

- W) Watch it during a full moon
- X) Watch it from a city
- Y) Get as far away from urban light pollution as possible
- Z) Wear light clothing

ANSWER: Y) GET AS FAR AWAY FROM URBAN LIGHT POLLUTION AS POSSIBLE

BONUS

12) EARTH AND SPACE *Short Answer* When a meteoroid enters the earth's atmosphere, it glows. Sometimes, the earth meets a number of meteoroids, creating a meteor shower. Most streams and swarms of meteoroids are believed to be fragments of what celestial body?

ANSWER: COMET

TOSS-UP

13) BIOLOGY *Multiple Choice* The combined genetic information of all the members of a particular population is known as the:

- W) Allele (read as: ah-LEEL) frequency
- X) Genome
- Y) Directional selection
- Z) Gene pool

ANSWER: Z) GENE POOL

BONUS

13) BIOLOGY *Multiple Choice* The black fur allele B (read as: big b), is dominant over the white fur allele b (read as: little b). Two mice with black fur mate, producing four offspring: one is white and three are black. What are the likely genotypes of the two parents?

- W) Bb and Bb
- X) BB and Bb
- Y) BB and BB
- Z) BB and bb

ANSWER: W) Bb AND Bb

TOSS-UP

14) BIOLOGY *Short Answer* What is the process by which particles move from an area of higher concentration to an area of lower concentration, not requiring cellular energy?

ANSWER: DIFFUSION

BONUS

14) BIOLOGY *Multiple Choice* Which of the following substances is transported into cells via carrier-assisted transport?

- W) Water
- X) Carbon dioxide
- Y) Oxygen
- Z) Sodium ion

ANSWER: Z) SODIUM ION

TOSS-UP

15) CHEMISTRY *Multiple Choice* For a series of chemical reactions, Hess's law provides a method for the summation of which property?

- W) Heat of formation
- X) Entropy
- Y) Equilibrium constant
- Z) Reaction rate

ANSWER: W) HEAT OF FORMATION

BONUS

15) CHEMISTRY *Multiple Choice* What is the difference between heat and temperature?

- W) Temperature is a form of heat, while heat is a measurement
- X) Temperature is a measurement of molecular kinetic energy, while heat is a form of energy
- Y) Heat and temperature have different wavelengths
- Z) Heat and temperature have similar wavelengths but different amplitudes

ANSWER: X) TEMPERATURE IS A MEASUREMENT OF MOLECULAR KINETIC ENERGY, WHILE HEAT IS A FORM OF ENERGY

TOSS-UP

16) PHYSICS *Short Answer* If a car is accelerating along a road, the force acting on the car that causes it to move forward is the reaction force from the car pushing on the ground. What is this reaction force due to?

ANSWER: FRICTION BETWEEN THE TIRE AND THE GROUND (ACCEPT: FRICTION)

BONUS

16) PHYSICS *Short Answer* If a car is accelerating along a road, what force due to the air does the frictional force have to oppose?

ANSWER: DRAG

TOSS-UP

17) EARTH AND SPACE *Short Answer* What is a Robonaut?

ANSWER: ROBOTIC ASTRONAUT

BONUS

17) EARTH AND SPACE *Short Answer* The Earth's tilt wobbles over a period of approximately 26,000 years. In 10,000 to 13,000 years, what bright star will the axis point to next?

ANSWER: VEGA

TOSS-UP

18) MATH *Short Answer* Given the equation $2x - y + 5 = 0$, find the slope and y-intercept of the line it represents.

ANSWER: SLOPE = 2; Y-INTERCEPT = 5 OR (0, 5)

BONUS

18) MATH *Multiple Choice* The equation $x^2 + y^2 = 121$ with $x > 0$ and $y < 0$ would result in the graph of:

- W) A semicircle below the x-axis
- X) A quarter circle in the 2nd quadrant
- Y) A quarter circle in the 4th quadrant
- Z) A complete circle with a radius of 11

ANSWER: Y) A QUARTER CIRCLE IN THE 4TH QUADRANT

TOSS-UP

19) BIOLOGY *Multiple Choice* Some plants spread their pollen via the wind while others use animals to spread their pollen. When a plant uses an animal to spread its pollen, this type of pollination is called:

- W) Vector pollination
- X) Seed dispersal
- Y) Evolutionary adaptation
- Z) Reproductive guarantee

ANSWER: W) VECTOR POLLINATION

BONUS

19) BIOLOGY *Short Answer* What is the most common term for the stage of photosynthesis (read as: fōe-tōe-SIN-teh-sis) during which carbon fixation occurs?

ANSWER: CALVIN CYCLE

TOSS-UP

20) CHEMISTRY *Short Answer* What is the oxidation state of Hydrogen in H_2 ?

ANSWER: 0

BONUS

20) CHEMISTRY *Short Answer* What is the oxidation state of Hydrogen in $LiAlH_4$?

ANSWER: -1

TOSS-UP

21) PHYSICS *Short Answer* What are the two forms of electrical current?

ANSWER: ALTERNATING AND DIRECT CURRENT (ACCEPT: AC AND DC)

BONUS

21) PHYSICS *Multiple Choice* Which of the following is the most common method of producing alternating current?

- W) Circuits varying from parallel to series
- X) Switches automatically turning on and off
- Y) Turbines rotating backwards and forwards
- Z) Magnets spinning in a coil of wire

ANSWER: Z) MAGNETS SPINNING IN A COIL OF WIRE

TOSS-UP

22) CHEMISTRY *Multiple Choice* Which of the following relationships is true?

- W) 1 food calorie is equal to 4.18 kilojoules
- X) 1 joule is equal to 1 food calorie
- Y) 1 joule is equal to 4.18 food calories
- Z) 1 food calorie is equal to 4.18 joules

ANSWER: W) 1 FOOD CALORIE IS EQUAL TO 4.18 KILOJOULES

BONUS

22) CHEMISTRY *Multiple Choice* In order to calculate the heat of fusion for a piece of ice placed in warm water, you must know:

- W) The energy released by the warm water and the mass of the water
- X) The energy released by the warm water and the mass of the ice
- Y) The energy released by the ice and the mass of the warm water
- Z) The energy released by the ice and the mass of ice

ANSWER: X) THE ENERGY RELEASED BY THE WARM WATER AND THE MASS OF THE ICE

TOSS-UP

23) MATH *Short Answer* If the distribution graph of a set of data has a positive skew, then which tail of the graph is longer?

ANSWER: RIGHT

BONUS

23) MATH *Short Answer* Give the median for the following data set: 1, 2, 7, 7, 8, 9, 10, 11.

ANSWER: 7.5

TOSS-UP

24) ENERGY *Multiple Choice* A kilowatt-hour is a unit of:

- W) Charge
- X) Power
- Y) Energy
- Z) Electric potential

ANSWER: Y) ENERGY

BONUS

24) ENERGY *Short Answer* What is the Gibbs free energy, in joules, of chlorine gas formation?

ANSWER: 0

TOSS-UP

25) EARTH AND SPACE *Multiple Choice* Consider two beaches, both with source material from the same granitic mountains. The beach located further from the mountains would have:

- W) Dark, more angular particles
- X) Dark, rounder particles
- Y) Pink, more poorly sorted sediments
- Z) Lighter-colored, more well-rounded, finer particles

ANSWER: Z) LIGHTER-COLORED, MORE WELL-ROUNDED, FINER PARTICLES

BONUS

25) EARTH AND SPACE *Multiple Choice* Which of the following is NOT a mechanism of physical and chemical weathering?

- W) Mass wasting
- X) Glaciation
- Y) Frost wedging
- Z) Groundwater

ANSWER: W) MASS WASTING