

ROUND ROBIN – ROUND 14

TOSS-UP

1) Life Science – *Short Answer* Inflammation can be driven by what signaling molecule that is contained within mast cells, and whose inhibitors are commonly used as allergy medications?

ANSWER: HISTAMINE (DO NOT ACCEPT: HISTIDINE)

BONUS

1) Life Science – *Short Answer* The Cambrian Explosion documents the sudden increase in diversity primarily in what kingdom of life?

ANSWER: ANIMALIA (ACCEPT: ANIMALS, METAZOA)

TOSS-UP

2) Math – *Short Answer* What is the least common multiple of 4, 14, and 21?

ANSWER: 84

BONUS

2) Math – *Short Answer* What is the volume in liters of a circular cylindrical container with a radius of 30 centimeters and a height of 1.7 meters?

ANSWER: 153π

TOSS-UP

3) Energy – *Short Answer* Researchers at Argonne National Lab are exploring the possibility of using neutrino detectors to search for dark matter. What is the electric charge of a neutrino?

ANSWER: 0

BONUS

3) Energy – *Multiple Choice* Lawrence Berkeley National Lab researchers are developing new techniques to visualize chemical reactions. In their experimental setup, laser light passes through a sample and contacts a device called a CCD. Which of the following roles does the CCD play?

- W) Lens
- X) Diffraction grating
- Y) Camera
- Z) Shutter

ANSWER: Y) CAMERA

TOSS-UP

4) Earth & Space – *Short Answer* What star in the night sky has the largest proper motion?

ANSWER: BARNARD'S STAR

BONUS

4) Earth & Space – *Short Answer* Identify all of the following three geologic processes that are currently active on the Moon: 1) Volcanic eruptions; 2) Mountain formation; 3) Rifting.

ANSWER: NONE

TOSS-UP

5) Life Science – *Multiple Choice* Plasmids that are used in laboratory methods typically originate from which of the following groups of organisms?

- W) Bacteria
- X) Flies
- Y) Mice
- Z) Plants

ANSWER: W) BACTERIA

BONUS

5) Life Science – *Short Answer* Epinephrine [*eh-pih-NEH-frin*] and norepinephrine [*NOR-eh-pih-NEH-frin*], which are responsible for the fight or flight response, are primarily synthesized in what organ?

ANSWER: ADRENAL GLANDS (ACCEPT: SUPRARENAL GLANDS)

TOSS-UP

6) Physical Science – *Short Answer* Magnetic fields such as those exhibited by permanent magnets, are created via the motion of what subatomic particle?

ANSWER: ELECTRON

BONUS

6) Physical Science – *Short Answer* While observing exoplanets, an astronomer notes that planet A orbits a star with a semimajor axis of 4 AU, and has an orbital period of 5 years. If planet B orbits the same star at a semimajor axis of 16 AU, then, in years, what is its orbital period?

ANSWER: 40

TOSS-UP

7) Math – *Short Answer* What is log base 625 of 25?

ANSWER: $\frac{1}{2}$ (ACCEPT: 0.5)

BONUS

7) Math – *Short Answer* A rhombus has sides of length 8 and largest angle of measure 120 degrees. What is its area?

ANSWER: $32\sqrt{3}$

TOSS-UP

8) Life Science – *Multiple Choice* Which of following correctly pairs a monomer with one of its corresponding polymers?

- W) Lactose and allolactose
- X) Sucrose and glycogen
- Y) Glucose and cellulose
- Z) Mannose and mannitol

ANSWER: Y) GLUCOSE AND CELLULOSE

BONUS

8) Life Science – *Short Answer* For pea plants, yellow seed color is dominant to green seed color. Identify all of the following three statements that are ALWAYS true if you breed two yellow-seeded plants: 1) All of the offspring will have yellow seeds; 2) None of the offspring will have green seeds; 3) Some of the offspring will have intermediate yellowish-green seeds.

ANSWER: NONE

TOSS-UP

9) Physical Science – *Short Answer* When a pot of water heats on the stovetop, the hot water at the bottom rises to the top, causing cold water to settle to the bottom to replace it. Of what process is this an example?

ANSWER: CONVECTION

BONUS

9) Physical Science – *Short Answer* What is the state function that quantifies the spontaneity of a chemical reaction and equals enthalpy minus the product of temperature and entropy?

ANSWER: GIBBS FREE ENERGY

TOSS-UP

10) Energy – *Short Answer* Scientists at the National Renewable Energy Laboratory are using computational approximations to predict the behavior of what subatomic particle found in orbitals?

ANSWER: ELECTRONS

BONUS

10) Energy – *Multiple Choice* Scientists at Brookhaven National Lab are studying the physical properties of B mesons and their antiparticles. Which of the following pairs of quarks would make up a meson that has negative electric charge?

- W) Up, anti-bottom
- X) Down, anti-bottom
- Y) Anti-strange, bottom
- Z) Anti-charm, bottom

ANSWER: Z) ANTI-CHARM, BOTTOM

TOSS-UP

11) Earth & Space – *Short Answer* In what eon are we currently living?

ANSWER: PHANEROZOIC [*fah-NAIR-oh-zoh-ik*]

BONUS

11) Earth & Space – *Short Answer* Identify all of the following three heat sources that contribute significantly to the heat budget of Earth's interior: 1) Tidal friction from the Sun; 2) Radioactive decay; 3) Tidal friction from the Moon.

ANSWER: 2

TOSS-UP

12) Physical Science – *Short Answer* What color of light is produced when red and green light overlap?

ANSWER: YELLOW

BONUS

12) Physical Science – *Multiple Choice* Which of the following methods of electricity generation use the kinetic energy of steam to turn a turbine?

- W) Nuclear power
- X) Hydroelectric power
- Y) Photovoltaics [*photo-vawl-TAY-ix*]
- Z) Tidal power

ANSWER: W) NUCLEAR POWER

TOSS-UP

13) Energy – *Short Answer* Scientists at the Joint Genome Institute are studying the organism that causes dry rot in homes. In what kingdom is this organism?

ANSWER: FUNGI

BONUS

13) Energy – *Multiple Choice* Scientists at Los Alamos National Lab are using terahertz radiation for short-range communication. Which of the following is closest to the wavelength of this terahertz radiation?

- W) 1 millimeter
- X) 1 decimeter
- Y) 1 meter
- Z) 1 decameter

ANSWER: W) 1 MILLIMETER

TOSS-UP

14) Math – *Short Answer* What is the slope of a line perpendicular to the line with equation $7x - 3y = 21$?

ANSWER: $-3/7$

BONUS

14) Math – *Short Answer* Express the following as the logarithm of a single number:
 $2 \log 32 + \log 40 - 3 \log 8$

ANSWER: $\log 80$

TOSS-UP

15) Physical Science – *Short Answer* What is the term for the energy required to start a chemical reaction and form the transition state?

ANSWER: ACTIVATION ENERGY

BONUS

15) Physical Science – *Short Answer* Identify all of the following three molecules that are examples of alkenes: 1) Propene; 2) Cyclopropene; 3) Cyclohexane.

ANSWER: 1, 2

TOSS-UP

16) Earth & Space – *Short Answer* What tail of a comet points straight away from the Sun at all times?

ANSWER: GAS TAIL (ACCEPT: PLASMA TAIL, ION TAIL)

BONUS

16) Earth & Space – *Short Answer* Identify all of the following three statements about sunspots that are true: 1) They are hotter than other locations on the Sun's surface; 2) They occur in one-year cycles; 3) They result from the Sun's magnetic properties.

ANSWER: 3

TOSS-UP

17) Life Science – *Short Answer* What part of the nervous system consists of the spinal cord and brain?

ANSWER: CNS (ACCEPT: CENTRAL NERVOUS SYSTEM)

BONUS

17) Life Science – *Multiple Choice* One of the types of finches Darwin observed is the warbler finch, which has a long, sharp, and narrow beak. What type of food does the warbler finch primarily consume?

- W) Cactuses
- X) Large seeds
- Y) Insects
- Z) Flower nectar

ANSWER: Y) INSECTS

TOSS-UP

18) Math – *Short Answer* A rectangle has dimensions square root 6 and square root 19. What is the length of its diagonal?

ANSWER: 5

BONUS

18) Math – *Short Answer* To the nearest integer, what is the geometric mean of 9 and 55?

ANSWER: 22

TOSS-UP

19) Earth & Space – *Multiple Choice* A large magnitude earthquake occurs just off the coast of Alaska, immediately triggering a tsunami warning in Hawaii. Which of the following is closest to the number of hours that Hawaiians would have to prepare for the tsunami arrival?

- W) 4
- X) 20
- Y) 36
- Z) 52

ANSWER: W) 4

BONUS

19) Earth & Space – *Short Answer* In Bowen's reaction series, the continuous series of crystallization is used to describe the composition of plagioclase [*PLAY-jee-oh-klaze*] feldspar. The first plagioclase minerals to precipitate from a cooling magma chamber will be calcium-rich plagioclase. As cooling continues, what metal will substitute for calcium in the plagioclase structure?

ANSWER: SODIUM (ACCEPT: Na)

TOSS-UP

20) Physical Science – *Short Answer* What is the pH, to the nearest integer, of a solution that was prepared by adding 1 microliter of a 1 molar hydrochloric acid solution to 10 milliliters of water?

ANSWER: 4

BONUS

20) Physical Science – *Short Answer* Starting from rest, a bike accelerates at 5 meters per second squared for 3 seconds. In meters, what distance did it travel over this interval?

ANSWER: 22.5 (ACCEPT: 45/2, 22 1/2)

TOSS-UP

21) Life Science – *Multiple Choice* Thigmotropism [*thig-moh-TROHP-ism*] in vines can allow them to wrap around other branches to grow higher. This form of taxis occurs in response to which of the following stimuli?

- W) Light
- X) Gravity
- Y) Touch
- Z) Heat

ANSWER: Y) TOUCH

BONUS

21) Life Science – *Short Answer* How many fatty acid chains are attached to glycerol in a typical fat molecule in vegetable oil?

ANSWER: THREE

TOSS-UP

22) Math – *Short Answer* The same-month birthdates of Laura, Vince, and Dean form an arithmetic sequence. If two of the dates are 6 and 28, what is the third date?

ANSWER: 17

BONUS

22) Math – *Short Answer* Using the origin as center, the point $(-2, -1)$ is dilated by a factor of 4, and then the result is rotated by 90 degrees counterclockwise. What are the coordinates of the final image point?

ANSWER: $(4, -8)$ (ACCEPT: $x = 4$ AND $y = -8$)

TOSS-UP

23) Earth & Space – *Short Answer* What constant relates the recessional velocity of a galaxy to its distance from us?

ANSWER: HUBBLE CONSTANT

BONUS

23) Earth & Space – *Short Answer* One model for the end of the Universe involves the gravitational attraction between galaxies eventually overcoming the metric expansion of space and collapsing. What is the name for this event?

ANSWER: BIG CRUNCH