

ROUND ROBIN – ROUND 10

TOSS-UP

1) Physical Science – *Short Answer* In the RGB additive color system, what color is complementary to green?

ANSWER: MAGENTA

BONUS

1) Physical Science – *Short Answer* To the nearest gram, what is the mass of two moles of nitrogen atoms?

ANSWER: 28

TOSS-UP

2) Math – *Multiple Choice* If m is an integer and $15m$ is divisible by 12, which of the following could be m ?

W) 2

X) 3

Y) 4

Z) 5

ANSWER: Y) 4

BONUS

2) Math – *Short Answer* If x varies inversely as the square root of y and x equals 20 when y equals 49, what is the value of x when $y = 64$?

ANSWER: $35/2$ (ACCEPT: $17\frac{1}{2}$, 17.5)

TOSS-UP

3) Earth & Space – *Short Answer* Most long-period comets are thought to originate in what part of the solar system?

ANSWER: OORT CLOUD (DO NOT ACCEPT: KUIPER [*KYE-pur*] BELT)

BONUS

3) Earth & Space – *Short Answer* Algol [*AL-gawl*] variables are binary star systems where the brightness of the system dips twice each orbital cycle. What phenomenon causes these dips?

ANSWER: ECLIPSES (ACCEPT: SYZYG *[suh-zih-GEE]*)

TOSS-UP

4) Energy – *Short Answer* Brookhaven National Lab scientists are exploiting the base pairing of DNA to attach nanoparticles to one another. Under normal base pairing rules, what DNA base is complementary to cytosine [*SIGH-toh-seen*]?

ANSWER: GUANINE (ACCEPT: G)

BONUS

4) Energy – *Short Answer* Researchers at Pacific Northwest National Lab are studying the chemistry of aluminum production, including the dissolution of aluminum hydroxide. What is the chemical formula for neutral aluminum hydroxide?

ANSWER: $\text{Al}(\text{OH})_3$

TOSS-UP

5) Physical Science – *Multiple Choice* Which of the following criteria is most important in determining if a lens is converging or diverging?

- W) Its composition
- X) The thickness of its center compared to its edges
- Y) Its index of refraction
- Z) The angle of incident light

ANSWER: X) THE THICKNESS OF ITS CENTER COMPARED TO ITS EDGES

BONUS

5) Physical Science – *Short Answer* Suppose that a 10-kilogram object is moving initially with a velocity of 10 meters per second across a surface, and experiences a frictional force that stops it in 2 seconds. What is the coefficient of kinetic friction, to one decimal place?

ANSWER: 0.5

TOSS-UP

6) Life Science – *Short Answer* What is the term for the specialized membrane-bound compartments in eukaryotic cells that carry out specific functions for the cell?

ANSWER: ORGANELLES

BONUS

6) Life Science – *Multiple Choice* Which of the following geologic periods was ended by a major mass extinction?

- W) Pennsylvanian
- X) Cretaceous [*kreh-TAY-shus*]
- Y) Jurassic
- Z) Silurian [*sil-UR-ee-an*]

ANSWER: X) CRETACEOUS [*kreh-TAY-shus*]

TOSS-UP

7) Math – *Multiple Choice* Which of the following translations changes the graph of $y = x^2$ into that of $y = \text{open parenthesis } x + 4 \text{ close parenthesis squared plus } 6$?

- W) 6 units down and 4 units to the left
- X) 6 units down and 4 units to the right
- Y) 6 units up and 4 units to the left
- Z) 6 units up and 4 units to the right

ANSWER: Y) 6 UNITS UP AND 4 UNITS TO THE LEFT

BONUS

7) Math – *Short Answer* One angle of an isosceles triangle measures 68 degrees. In degrees, what are the possible measures of the smallest angle of the triangle?

ANSWER: 44 AND 56

TOSS-UP

8) Physical Science – *Multiple Choice* Which of the following transformations is NOT a chemical change?

- W) Dissolving a salt in water
- X) Vaporizing a drop of ethanol
- Y) Mixing solutions of magnesium sulfate and barium nitrate
- Z) Heating calcium carbonate until it expels a gas

ANSWER: X) VAPORIZING A DROP OF ETHANOL

BONUS

8) Physical Science – *Multiple Choice* The atomic number of chlorine is 17. What does this necessarily imply about chlorine atoms?

- W) They have a mass number of 34
- X) They contain 17 protons
- Y) They contain 17 neutrons
- Z) They contain 17 electrons

ANSWER: X) THEY CONTAIN 17 PROTONS

TOSS-UP

9) Life Science – *Short Answer* Archaeopteryx [*ark-ee-AWP-tur-ix*] was a dinosaur that is thought to be one of the first members of what modern-day class of animals?

ANSWER: AVES (ACCEPT: BIRDS)

BONUS

9) Life Science – *Short Answer* What muscle in the human body causes extension at the elbow joint?

ANSWER: TRICEPS (ACCEPT: TRICEPS BRACHII)

TOSS-UP

10) Math – *Short Answer* What is the degree of the product of the three binomials $x^2 + 5$, $x^6 + x^2$, and $7x - 6$?

ANSWER: 9

BONUS

10) Math – *Short Answer* A bag contains 200 identically-sized marbles. Exactly 10% are purple, 20% are blue, 30% are orange, and the rest are red. What is the probability of randomly selecting first an orange marble, replacing it, and then selecting a blue one?

ANSWER: 6% (ACCEPT: 0.06, 3/50)

TOSS-UP

11) Earth & Space – *Short Answer* The Hadley cell is associated with what set of prevailing winds found in tropical latitudes?

ANSWER: TRADE WINDS

BONUS

11) Earth & Space – *Short Answer* Identify all of the following three rock types that contain a significant proportion of calcium carbonate: 1) Limestone; 2) Travertine [*TRAV-ur-teen*]; 3) Coquina [*koh-KEE-nah*].

ANSWER: ALL

TOSS-UP

12) Energy – *Short Answer* Researchers at Brookhaven National Lab have developed a new catalyst for the combustion of ethanol in fuel cells. Other than high-energy electrons that can be used for power, what are the two primary chemical products of this reaction?

ANSWER: CARBON DIOXIDE AND WATER (ACCEPT IN ANY ORDER; ACCEPT: CO₂ FOR CARBON DIOXIDE AND H₂O FOR WATER)

BONUS

12) Energy – *Multiple Choice* Researchers at Oak Ridge National Lab are developing methods to prevent damage to tokamaks [*TOH-kah-maks*] during operation. For what application are tokamaks designed?

- W) Containment of antimatter
- X) Generation of high-pressure environments
- Y) Creation of high-intensity ion beams
- Z) Sustained nuclear fusion

ANSWER: Z) SUSTAINED NUCLEAR FUSION

TOSS-UP

13) Life Science – *Multiple Choice* Which of the following terms is used to describe the extra copy of a chromosome synthesized during S phase prior to mitosis?

- W) Homologous [*ha-MAWL-uh-gus*] chromosome
- X) Sister chromatid
- Y) Centromere [*SEN-troh-meer*]
- Z) Mitotic [*my-TAW-dik*] spindle

ANSWER: X) SISTER CHROMATID

BONUS

13) Life Science – *Short Answer* What type of mimicry [*MIH-mik-kree*] involves two distasteful species resembling each other?

ANSWER: MÜLLERIAN

TOSS-UP

14) Math – *Short Answer* If a right triangle has an exterior angle of measure 160 degrees, what is the degree measure of the larger of its acute interior angles?

ANSWER: 70

BONUS

14) Math – *Short Answer* The graph of the line with equation $y = 3x - 4$ is reflected through the y -axis. What is the slope-intercept equation of the reflected line?

ANSWER: $y = -3x - 4$

TOSS-UP

15) Earth & Space – *Multiple Choice* A star's apparent magnitude is most directly related to which of its properties?

- W) Brightness
- X) Temperature
- Y) Size
- Z) Age

ANSWER: W) BRIGHTNESS

BONUS

15) Earth & Space – *Short Answer* What process is primarily responsible for the ongoing heating and volcanic activity that occurs on some of Jupiter's moons?

ANSWER: TIDAL HEATING (ACCEPT: TIDAL FRICTION)

TOSS-UP

16) Physical Science – *Short Answer* What is the SI unit for luminous intensity?

ANSWER: CANDELA

BONUS

16) Physical Science – *Short Answer* Identify all of the following three statements that are true of water solubility: 1) Increasing the temperature increases solubility of sugar; 2) Increasing the temperature increases the rate of dissolving of sugar; 3) Increasing the temperature increases the solubility of calcium carbonate.

ANSWER: 1, 2

TOSS-UP

17) Energy – *Short Answer* Scientists at the National Renewable Energy Lab collaborated with counterparts at Lawrence Berkeley National Lab to map electronic relationships between ternary metal nitrides [*NYE-trides*], such as the compound zinc antimony [*AN-tih-moh-nee*] nitride. In most of these compounds, what is the oxidation state of the nitrogen atom?

ANSWER: –3

BONUS

17) Energy – *Multiple Choice* Researchers at Lawrence Livermore National Lab recently studied a new phase of water ice in the lab. What type of bond is responsible for holding together adjacent water molecules in normal water ice?

- W) Hydrogen bond
- X) Covalent bond
- Y) Ionic bond
- Z) Metallic bond

ANSWER: W) HYDROGEN BOND

TOSS-UP

18) Life Science – *Multiple Choice* Eusociality [*yoo-soh-shee-AL-ih-dee*] and intraspecies communication are most apparent in which of the following groups of insects?

- W) Flies
- X) Grasshoppers
- Y) Ants
- Z) Beetles

ANSWER: Y) ANTS

BONUS

18) Life Science – *Multiple Choice* Which of the following parts of the brain is responsible for controlling heart rate and breathing?

- W) Cerebrum [*SEH-reh-brum*]
- X) Cerebellum [*seh-reh-BELL-um*]
- Y) Thalamus [*THAL-uh-mus*]
- Z) Medulla [*meh-DULL-ah*]

ANSWER: Z) MEDULLA

TOSS-UP

19) Earth & Space – *Short Answer* What name is given to the study of ocean depth and seafloor topography?

ANSWER: BATHYMETRY [*bah-THIM-eh-tree*]

BONUS

19) Earth & Space – *Short Answer* Identify all of the following three features of a geologic section that could be used to determine the relative age of a series of rocks: 1) Strike and dip; 2) Intrusion of dikes; 3) Cross-cutting relationships.

ANSWER: ALL

TOSS-UP

20) Physical Science – *Short Answer* The pH value of a solution is defined as the negative log of the concentration of what ion?

ANSWER: HYDRONIUM (ACCEPT: HYDROGEN, H⁺, H₃O⁺)

BONUS

20) Physical Science – *Short Answer* All objects that have a temperature above absolute zero release some energy by emitting photons. What is the term for this type of energy?

ANSWER: RADIANT (ACCEPT: RADIATION)

TOSS-UP

21) Life Science – *Multiple Choice* Which of the following genetic disorders results from a chromosomal trisomy [*TRY-soh-mee*]?

- W) Red-green colorblindness
- X) Down syndrome
- Y) Polydactyly [*poly-DAK-til-ee*]
- Z) Tay-Sachs [*TAY-saks*] disease

ANSWER: X) DOWN SYNDROME

BONUS

21) Life Science – *Multiple Choice* Which of the following scenarios is the LEAST likely to result in allopatric [*al-oh-PAT-trik*] speciation?

- W) Two species of wolves living on either side of a now-underwater isthmus
- X) Two bird species living on nearby islands formed by rising sea levels
- Y) Two species of ground squirrels separated by a large canyon formed by an earthquake
- Z) Two species of fish moving back and forth across a tropical reef system

ANSWER: Z) TWO SPECIES OF FISH MOVING BACK AND FORTH ACROSS A TROPICAL REEF SYSTEM

TOSS-UP

22) Earth & Space – *Short Answer* Pulsars were first discovered from observations in what region of the electromagnetic spectrum?

ANSWER: RADIO

BONUS

22) Earth & Space – *Short Answer* Identify all of the following three types of solar activity that are associated with the photosphere: 1) Sunspots; 2) Flares; 3) CMEs.

ANSWER: 1

TOSS-UP

23) Math – *Short Answer* A car travels 350 miles in 9 hours. To the nearest mile per hour, over the nine-hour period, what is the average speed of the car?

ANSWER: 39

BONUS

23) Math – *Short Answer* A flower bed is formed in the shape of a 120-degree sector of a circle of radius 10 feet. To the nearest foot, what is the perimeter of the flower bed?

ANSWER: 41