

ROUND 9

TOSS-UP

1) LIFE SCIENCE *Multiple Choice* Which of the following birds depends almost entirely on man-made nesting boxes in the eastern United States?

- W) Yellow-bellied sapsucker
- X) Purple martin
- Y) Blue jay
- Z) Red-breasted nuthatch

ANSWER: X) PURPLE MARTIN

BONUS

1) LIFE SCIENCE *Multiple Choice* Which of the following statements is NOT true about the Iberian lynx?

- W) It is one of the most endangered cat species in the world
- X) It can leap more than 19 feet horizontally and more than 9 feet vertically
- Y) Its favorite food is rabbit
- Z) It has a characteristic beard around its face

ANSWER: X) IT CAN LEAP MORE THAN 19 FEET HORIZONTALLY AND MORE THAN 9 FEET VERTICALLY

TOSS-UP

2) MATH *Short Answer* A colony of bacteria is growing in a culture under controlled conditions with a doubling period of two days. If, on a given day, there are 100 bacteria present, how many bacteria will there be 8 days later?

ANSWER: 1600

BONUS

2) MATH *Short Answer* What is the vertex form of the equation $y = x^2 + 16x + 71$?

ANSWER: $y = (x + 8)^2 + 7$

TOSS-UP

3) PHYSICAL SCIENCE *Short Answer* A mass with velocity v accelerates when a force is applied to it. This is an illustration of which of Newton's laws of motion?

ANSWER: SECOND

BONUS

3) PHYSICAL SCIENCE *Multiple Choice* Which of the following compounds is binary?

- W) Molecular oxygen
- X) Calcium chloride
- Y) Sulfuric acid
- Z) Copper (II) nitrate

ANSWER: X) CALCIUM CHLORIDE

TOSS-UP

4) MATH *Short Answer* Find $g(1)$ [**g of 1**] when $g(a) = 3^{3a-2}$ [**g of a equals 3 to the power of the quantity 3 a minus 2**].

ANSWER: 3

BONUS

4) MATH *Short Answer* Providing your answer in simplest radical form, where does the graph of $y = 2x^2 - 5x - 1$ cross the x-axis?

ANSWER: $\frac{5 + \sqrt{33}}{4}$ AND $\frac{5 - \sqrt{33}}{4}$

TOSS-UP

5) GENERAL SCIENCE *Multiple Choice* Which of the following elements has the same Lewis dot structure as sulfur?

- W) Phosphorus
- X) Oxygen
- Y) Chlorine
- Z) Magnesium

ANSWER: X) OXYGEN

BONUS

5) GENERAL SCIENCE *Short Answer* Place the following four phases of cell division in order from first to last: 1) anaphase, 2) prophase, 3) metaphase, 4) telophase.

ANSWER: 2, 3, 1, 4 (ACCEPT: PROPHASE, METAPHASE, ANAPHASE, TELOPHASE)

TOSS-UP

6) ENERGY *Multiple Choice* Hydroelectric energy accounts for which of the following approximate proportions of the total energy consumed annually in the United States?

- W) 1%
- X) 8%
- Y) 30%
- Z) 65%

ANSWER: X) 8%

BONUS

6) ENERGY *Short Answer* What phenomenon is demonstrated when liquids heated inside a microwave oven are removed, do not appear to boil, but then suddenly and without warning, erupt?

ANSWER: SUPERHEATING

TOSS-UP

7) LIFE SCIENCE *Short Answer* What is the common name of the fungus that is rapidly killing many amphibians [*am-FIB-ee-uhns*] across Central and South America?

ANSWER: CHYTRID

BONUS

7) LIFE SCIENCE *Multiple Choice* Which of the following does NOT characterize dicotyledon [*dy-kot-I-EEd-n*] plants?

- W) Parallel veins on leaf
- X) Tap roots
- Y) Many leaves
- Z) 4 or 5 flower petals

ANSWER: W) PARALLEL VEINS ON LEAF

TOSS-UP

8) EARTH AND SPACE *Short Answer* What satellite of Jupiter is considered to be the most volcanically active body in our solar system?

ANSWER: IO

BONUS

8) EARTH AND SPACE *Multiple Choice* Which of the following is the adiabatic lapse rate of a dry air parcel for every kilometer it rises?

- W) 5° Fahrenheit
- X) 5° Celsius
- Y) 10° Fahrenheit
- Z) 10° Celsius

ANSWER: Z) 10° CELSIUS

TOSS-UP

9) PHYSICAL SCIENCE *Short Answer* Given that g is 10 meters per second squared, how much work in joules is done by gravity when an object with mass of 100 grams falls 5 meters?

ANSWER: 5

BONUS

9) PHYSICAL SCIENCE *Multiple Choice* How do alkali metals differ from alkaline [**AL-kuh-lyn**] earth metals?

- W) Alkali metals have one electron in their outer shells; alkaline earth metals have two
- X) Alkali metals do not conduct electricity; alkaline earth metals do
- Y) Alkali metals are highly reactive; alkaline earth metals are not
- Z) Alkali metals are malleable [**MAL-ee-uh-buhl**]; alkaline earth metals are ductile

ANSWER: W) ALKALI METALS HAVE ONE ELECTRON IN THEIR OUTER SHELLS; ALKALINE EARTH METALS HAVE TWO

TOSS-UP

10) MATH *Short Answer* What is the determinant of the 2 by 2 matrix $\begin{bmatrix} -5 & 3 \\ 4 & 2 \end{bmatrix}$ [**first row negative 5, 3 and second row 4, 2**]?

ANSWER: -22

BONUS

10) MATH *Short Answer* Rebekah wants to fill a spherical piñata with candy. If the radius of her piñata is 6 inches, providing your answer in terms of pi, what is the volume in cubic inches of her piñata?

ANSWER: 288π

TOSS-UP

11) GENERAL SCIENCE *Short Answer* Considering just the human ABO blood antigens, how many different blood types are possible?

ANSWER: 4

BONUS

11) GENERAL SCIENCE *Multiple Choice* An environmental toxin introduced into a eukaryotic **[yoo-KAR-ee-oh-tik]** cell prevents the cell from producing ribosomes **[RY-buh-sohms]**, yet DNA replication still occurs. From this information, which of the following enzymes is likely affected?

- W) DNA polymerase **[POL-uh-muh-rays]**
- X) RNA polymerase
- Y) Helicase
- Z) Primase

ANSWER: X) RNA POLYMERASE

TOSS-UP

12) ENERGY *Multiple Choice* Which of the following is the main disadvantage of hydroelectric dams?

- W) They increase the potential for flooding
- X) They consume more energy than they produce
- Y) They disrupt previously existing ecosystems
- Z) They add pollutant byproducts to the water

ANSWER: Y) THEY DISRUPT PREVIOUSLY EXISTING ECOSYSTEMS

BONUS

12) ENERGY *Short Answer* What is the term for the process of carbon capture and storage by depositing it in underground reservoirs?

ANSWER: CARBON SEQUESTRATION

TOSS-UP

13) LIFE SCIENCE *Short Answer* Assuming Mendelian **[men-DEE-lee-uhn]** genetics, when two organisms with the genotype Aa **[big A, little a]** are crossed, what proportion of their offspring will express the “big A” phenotype?

ANSWER: 3/4 (ACCEPT: 75%)

BONUS

13) LIFE SCIENCE *Multiple Choice* Which of the following is the largest songbird in North America?

- W) Cedar waxwing
- X) Northern oriole
- Y) Common raven
- Z) Indigo bunting

ANSWER: Y) COMMON RAVEN

TOSS-UP

14) EARTH AND SPACE *Short Answer* If magma is cooled slowly, what generalization could you make about crystal size?

ANSWER: LARGER CRYSTALS (ACCEPT: BIGGER, INCREASED)

BONUS

14) EARTH AND SPACE *Multiple Choice* Which of the following types of horizontal magma intrusion is lens-shaped?

- W) Dike
- X) Sill
- Y) Laccolith **[LAK-uh-lith]**
- Z) Batholith **[BATH-uh-lith]**

ANSWER: Y) LACCOLITH

TOSS-UP

15) PHYSICAL SCIENCE *Short Answer* When the speed of sound in air is 344 meters per second, what is the wavelength in meters of a sound wave of frequency 172 hertz?

ANSWER: 2

BONUS

15) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements is NOT true of halogens?

- W) They are nonreactive metals at room temperature
- X) They only need one electron to fill their outer energy level
- Y) They can be used for disinfection of water and for preventing diseases of the thyroid gland
- Z) They naturally form diatomic molecules

ANSWER: W) THEY ARE NONREACTIVE METALS AT ROOM TEMPERATURE

TOSS-UP

16) MATH *Short Answer* Identify all of the following four statements that are always true about a square: 1) it is a rectangle; 2) it is a rhombus; 3) it is a parallelogram; 4) it is a quadrilateral.

ANSWER: ALL

BONUS

16) MATH *Short Answer* What is the slope of a line perpendicular to the line passing through the points with coordinates (-6, 0) and (-2, 3)?

ANSWER: -4/3

TOSS-UP

17) GENERAL SCIENCE *Multiple Choice* Which of the following deposits minerals in the deep ocean?

- W) Volcanoes
- X) Dissolved gases
- Y) Precipitation
- Z) Underground streams

ANSWER: Y) PRECIPITATION

BONUS

17) GENERAL SCIENCE *Multiple Choice* Earth's magnetic field is most heavily influenced by electric currents within which of the following layers of the Earth?

- W) Inner core
- X) Outer core
- Y) Atmosphere
- Z) Mantle

ANSWER: X) OUTER CORE

TOSS-UP

18) ENERGY *Multiple Choice* Which of the following will save the most energy per load of laundry using an electric washing machine?

- W) Using eco-friendly detergents
- X) Using the cold water setting on the washer
- Y) Skipping the spin cycle
- Z) Running small loads when possible

ANSWER: X) USING THE COLD WATER SETTING ON THE WASHER

BONUS

18) ENERGY *Short Answer* What term is used to describe the total estimated amount of producible oil in an oil reservoir [**REZ-er-vwohr**]?

ANSWER: OIL RESERVES

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* Which of the following is a genetic disorder caused by aneuploidy [*an-yoo-PLOI-dee*]?

- W) Cystic fibrosis
- X) Down syndrome
- Y) Muscular dystrophy
- Z) Polio

ANSWER: X) DOWN SYNDROME

BONUS

19) LIFE SCIENCE *Multiple Choice* You have discovered a new bacterium. You notice that this bacterium can use light to create ATP, but is reliant on other prokaryotes [*proh-KAR-ee-ohts*] to obtain organic carbon. The bacterium is most likely which of the following?

- W) Photoautotrophic
- X) Chemoautotrophic
- Y) Photoheterotrophic
- Z) Chemoheterotrophic

ANSWER: Y) PHOTOHETEROTROPHIC

TOSS-UP

20) EARTH AND SPACE *Short Answer* What is the most abundant element in Earth's crust?

ANSWER: OXYGEN

BONUS

20) EARTH AND SPACE *Multiple Choice* Which of the following processes is a type of chemical weathering?

- W) Mineral dissolution
- X) Frost-wedging
- Y) Pressure unloading
- Z) Organism action

ANSWER: W) MINERAL DISSOLUTION

TOSS-UP

21) PHYSICAL SCIENCE *Short Answer* If a chemical reaction occurs spontaneously, what is the sign of its Gibbs free energy change?

ANSWER: NEGATIVE

BONUS

21) PHYSICAL SCIENCE *Short Answer* When magnesium and fluorine react, what type of bond is formed?

ANSWER: IONIC

TOSS-UP

22) MATH *Short Answer* What is the interior angle sum in degrees in a regular dodecagon?

ANSWER: 1800° (ACCEPT: 1800 WITHOUT DEGREE SIGN)

BONUS

22) MATH *Short Answer* A ball bounces to half its height when dropped from a 20 foot porch. What is the total distance, in feet, the ball will have traveled when it hits the ground for the third time?

ANSWER: 50

TOSS-UP

23) LIFE SCIENCE *Short Answer* If a DNA double strand contains seven A-T pairs and fourteen C-G pairs, assuming all nucleotides are read, how many amino acids are formed?

ANSWER: 7

BONUS

23) LIFE SCIENCE *Multiple Choice* Of the following, which is NOT considered a type of vascular tissue in plants?

- W) Sclerenchyma [*skli-RENG-kuh-muh*]
- X) Parenchyma [*puh-RENG-kuh-muh*]
- Y) Xylem [*ZY-luhm*]
- Z) Phloem [*FLOH-em*]

ANSWER: W) SCLERENCHYMA

TOSS-UP

24) EARTH AND SPACE *Multiple Choice* Which of the following types of electromagnetic energy is least likely to make it through Earth's atmosphere?

- W) X-rays
- X) Microwave radiation
- Y) Ultraviolet radiation
- Z) Radio waves

ANSWER: W) X-RAYS

BONUS

24) EARTH AND SPACE *Multiple Choice* Which of the following was NOT cited by Wegner as evidence for continental drift?

- W) The continents fit together
- X) Fossils are similar on South America and Africa
- Y) Matching paleoclimate indicators on South America and Africa
- Z) Similar bathymetry of the sea floor on opposite sides of the Mid-Atlantic Ridge

ANSWER: Z) SIMILAR BATHYMETRY OF THE SEA FLOOR ON OPPOSITE SIDES OF THE MID-ATLANTIC RIDGE

TOSS-UP

25) GENERAL SCIENCE *Multiple Choice* In the human body, which of the following processes is considered to be anabolic?

- W) Glycolysis [*gly-KOL-uh-sis*]
- X) The breakdown of fatty acids in the process of beta oxidation
- Y) The synthesis of glycogen [*GLY-kuh-juhn*] in the liver from glucose
- Z) The breakdown of polypeptides [*pol-ee-PEP-tyds*] in the stomach

ANSWER: Y) THE SYNTHESIS OF GLYCOGEN IN THE LIVER FROM GLUCOSE

BONUS

25) GENERAL SCIENCE *Multiple Choice* A person has to push with greater force to begin moving a heavy crate across the floor. However, once the crate has begun to move, the person can push with less force in order to move the object across the floor at a constant rate. Which of the following best explains such a phenomenon?

- W) The coefficient of static friction is greater than the coefficient of kinetic friction, resulting in a greater frictional force before the object has begun to move
- X) The coefficient of static friction is greater than the coefficient of kinetic friction, resulting in a greater frictional force after the object has begun to move
- Y) The coefficient of kinetic friction is greater than the coefficient of static friction, resulting in a greater frictional force before the object has begun to move
- Z) The coefficient of kinetic friction is greater than the coefficient of static friction, resulting in a greater frictional force after the object has begun to move

ANSWER: W) THE COEFFICIENT OF STATIC FRICTION IS GREATER THAN THE COEFFICIENT OF KINETIC FRICTION, RESULTING IN A GREATER FRICTIONAL FORCE BEFORE THE OBJECT HAS BEGUN TO MOVE