

ROUND 10

TOSS-UP

1) MATH *Multiple Choice* Barb and Zack start walking around a track at the same time. It takes Barb 10 minutes to complete one lap. Zack completes one lap in 8 minutes. After how many minutes will they be at the starting point together?

- W) 18
- X) 30
- Y) 40
- Z) 80

ANSWER: Y) 40

BONUS

1) MATH *Short Answer* What is the difference between the smallest prime number greater than 100 and the largest prime number less than 100?

ANSWER: 4

TOSS-UP

2) LIFE SCIENCE *Multiple Choice* An ecologist notices that there are two distinct populations of sparrows that cannot interbreed due to infertility. This demonstrates which of the following types of isolation?

- W) Mechanical
- X) Genetic
- Y) Gametic
- Z) Hybrid breakdown

ANSWER: Y) GAMETIC

BONUS

2) LIFE SCIENCE *Short Answer* Various parts of the human body show differences in relative growth rates. What principle explains this phenomenon?

ANSWER: ALLOMETRIC GROWTH

TOSS-UP

3) GENERAL SCIENCE *Multiple Choice* In which of the following locations do most ocean trenches occur?

- W) Mid-ocean ridge
- X) Abyssal plains
- Y) Continental shelf
- Z) Convergent boundaries

ANSWER: Z) CONVERGENT BOUNDARIES

BONUS

3) GENERAL SCIENCE *Short Answer* Given the combustion equation $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow$ **[yields]** $8\text{CO}_2 + 10\text{H}_2\text{O}$, how many moles of water can be produced by reacting 12.5 moles of C_4H_{10} with excess oxygen?

ANSWER: 62.5

TOSS-UP

4) MATH *Short Answer* If a wheel has 15 spokes, how many total spaces will this form between spokes?

ANSWER: 15

BONUS

4) MATH *Short Answer* Sam is going to sky dive out of a plane that is 8000 feet above sea level. Using $g = 32$ feet per second squared, find Sam's height above sea level in feet after he has fallen 10 seconds.

ANSWER: 6400

TOSS-UP

5) PHYSICAL SCIENCE *Short Answer* What type of reaction is $2\text{Al} + \text{Fe}_2\text{O}_3$ yields $2\text{Fe} + \text{Al}_2\text{O}_3$?

ANSWER: REPLACEMENT (ACCEPT: SINGLE REPLACEMENT OR DISPLACEMENT)

BONUS

5) PHYSICAL SCIENCE *Short Answer* If an atom has an electron in a d subshell, then what is the smallest principal quantum number the electron may possess?

ANSWER: 3

TOSS-UP

6) EARTH AND SPACE *Short Answer* What type of coal is extremely hard and brittle, is almost pure carbon, and gives off a great amount of heat when it burns?

ANSWER: ANTHRACITE

BONUS

6) EARTH AND SPACE *Multiple Choice* Which of the following are the dark debris lines down the center of glaciers caused by rocks scoured from surrounding valley walls?

- W) Cirques [**SURKS**]
- X) Horns
- Y) Arêtes [**uh-REYTS**]
- Z) Medial moraines

ANSWER: Z) MEDIAL MORAINES

TOSS-UP

7) LIFE SCIENCE *Multiple Choice* In which of the following locations found in the human body is the hormone somatotropin produced?

- W) Thyroid
- X) Pituitary [*pi-TOO-i-ter-ee*]
- Y) Thymus
- Z) Adrenal

ANSWER: X) PITUITARY

BONUS

7) LIFE SCIENCE *Short Answer* Which organelle is the principal site of membrane protein synthesis in eukaryotic [*yoo-KAR-ee-oh-tik*] cells?

ANSWER: ROUGH ENDOPLASMIC RETICULUM

TOSS-UP

8) ENERGY *Multiple Choice* Which of the following countries produces over 90% of its energy through geothermal resources?

- W) Iceland
- X) United States
- Y) China
- Z) Russia

ANSWER: W) ICELAND

BONUS

8) ENERGY *Multiple Choice* What happens to a 180 watt solar panel's power output when the solar irradiance is lower than the one specified at standard temperature and pressure?

- W) The power is converted from AC to DC
- X) The power is converted from DC to AC
- Y) It produces more than 180 watts
- Z) It produces less than 180 watts

ANSWER: Z) IT PRODUCES LESS THAN 180 WATTS

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Which of the following reproductive structures would be found only in gymnosperms?

- W) Cones
- X) Sori
- Y) Flowers
- Z) Pistils

ANSWER: W) CONES

BONUS

9) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT one of the five principles of evolution?

- W) Evolution occurs more rapidly at some times than others
- X) Evolution proceeds at the same rate in all types of organisms
- Y) Evolution is not always from the simple to the complex
- Z) Evolution occurs in populations in a gradual process over very long periods of time

ANSWER: X) EVOLUTION PROCEEDS AT THE SAME RATE IN ALL TYPES OF ORGANISMS

TOSS-UP

10) MATH *Short Answer* The volume of a cube is 27,000 cubic feet. What is the length of an edge in yards?

ANSWER: 10

BONUS

10) MATH *Short Answer* A circular pizza costs \$19.99. Given that the diameter of the pizza is 36 centimeters, what is the cost to the nearest whole number of cents of one square centimeter of pizza?

ANSWER: 2

TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following best describes nuclear potential energy?

- W) The average total potential energy of all the protons and neutrons in an atomic nucleus
- X) The mutual electrostatic energy of two charges
- Y) The electric potential energy divided by a charge associated with a static electric field
- Z) A force on electrically charged objects near a nucleus

ANSWER: W) THE AVERAGE TOTAL POTENTIAL ENERGY OF ALL THE PROTONS AND NEUTRONS IN AN ATOMIC NUCLEUS

BONUS

11) PHYSICAL SCIENCE *Multiple Choice* The Sun shines on a lake at an oblique angle. Compared to your view on the shore, in which of the following ways does a fish see the Sun?

- W) Higher in the sky
- X) Lower in the sky
- Y) The same location in the sky
- Z) Total internal reflection blocks the appearance of the Sun

ANSWER: W) HIGHER IN THE SKY

TOSS-UP

12) EARTH AND SPACE *Short Answer* What is the name for the lines on a weather map that join places of the same air pressure?

ANSWER: ISOBARS

BONUS

12) EARTH AND SPACE *Multiple Choice* Which combination of characteristics allows the greatest amount of water to permeate the ground?

- W) Steep slopes, silty soils, and cool temperatures
- X) Low slopes, sandy soils, and cool temperatures
- Y) Steep slopes, sandy soils, and hot temperatures
- Z) Low slopes, clay-rich soils, and hot temperatures

ANSWER: X) LOW SLOPES, SANDY SOILS, AND COOL TEMPERATURES

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Human infants weighing more or less than the average birth weight of 6 to 8 pounds have a greater chance of mortality. Which of the following types of natural selection describes this phenomenon?

- W) Diversifying
- X) Stabilizing
- Y) Directional
- Z) Disruptive

ANSWER: X) STABILIZING

BONUS

13) LIFE SCIENCE *Short Answer* After gram staining, what color should *Escherichia [esh-uh-RIK-ee-uh] coli* bacteria appear under the microscope?

ANSWER: PINK (ACCEPT: RED)

TOSS-UP

14) ENERGY *Multiple Choice* Plasmas are typically described as glowing substances that are which of the following?

- W) Non-conductive
- X) Conductive
- Y) Neutral
- Z) Non-superconductive

ANSWER: X) CONDUCTIVE

BONUS

14) ENERGY *Multiple Choice* Which of the following has the highest kinetic energy?

- W) A 35-gram bullet traveling at 1.20×10^3 meters per second
- X) A 35-kilogram cheetah running at 30 meters per second
- Y) An 875-kilogram car traveling at 5 meters per second
- Z) A 148-gram pitched baseball moving at 45 meters per second

ANSWER: W) A 35-GRAM BULLET TRAVELING AT 1.20×10^3 METERS PER SECOND

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Scientists theorize that Jupiter's core is which of the following?

- W) Rock
- X) Water vapor
- Y) Ammonia and methane
- Z) Hydrogen and helium

ANSWER: W) ROCK

BONUS

15) GENERAL SCIENCE *Short Answer* For a given reaction in which A and B react to create C, doubling the concentration of A will cause the reaction rate to be multiplied by 3, while doubling the concentration of B will result in the reaction rate being multiplied by 4. If the concentration of A and B are both quadrupled, by what numerical factor will the rate of the reaction be multiplied?

ANSWER: 144

TOSS-UP

16) MATH *Multiple Choice* Which of the following regular polygons could NOT be used to completely tile the floor of a video game center?

- W) Hexagon
- X) Pentagon
- Y) Quadrilateral
- Z) Triangle

ANSWER: X) PENTAGON

BONUS

16) MATH *Short Answer* The first row in a theatre contains 8 seats. Each row contains 2 seats more than the one in front of it. How many total people can sit in the first 6 rows?

ANSWER: 78

TOSS-UP

17) PHYSICAL SCIENCE *Short Answer* What is the name of the amount of energy required to remove an electron from the highest occupied orbital of an atom?

ANSWER: IONIZATION ENERGY

BONUS

17) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements possesses the highest ionization energy?

- W) Oxygen
- X) Silicon
- Y) Neon
- Z) Chlorine

ANSWER: Y) NEON

TOSS-UP

18) EARTH AND SPACE *Multiple Choice* In which of the following locations is the densest ocean water on Earth found?

- W) Mediterranean Sea
- X) Off the coast of Antarctica
- Y) Off the coast of Peru
- Z) Off the coast of Hawaii

ANSWER: X) OFF THE COAST OF ANTARCTICA

BONUS

18) EARTH AND SPACE *Short Answer* What group of minerals has the following characteristics: 1) they can be gemstones or abrasives; 2) they are found in many colors; 3) they have a hardness of about 6.5 to 7.5; and 4) they are nesosilicates ***[nee-soh-SIL-i-kayts]***.

ANSWER: GARNET

TOSS-UP

19) LIFE SCIENCE *Multiple Choice* When using the gel electrophoresis technique, which of the following DNA segments will migrate the furthest from where they were loaded?

- W) The largest
- X) The smallest
- Y) The most negatively charged
- Z) The most positively charged

ANSWER: X) THE SMALLEST

BONUS

19) LIFE SCIENCE *Short Answer* Name two of the three pyrimidine nucleotides [*py-RIM-i-deen NOO-klee-uh-tyds*].

ANSWER: (ANY TWO) THYMINE, URACIL, CYTOSINE

TOSS-UP

20) ENERGY *Multiple Choice* The first public demonstration of vegetable-oil-based diesel fuel took place at the 1900 World's Fair. What type of oil was used?

- W) Corn
- X) Sunflower
- Y) Peanut
- Z) Canola

ANSWER: Y) PEANUT

BONUS

20) ENERGY *Short Answer* Given that stopping a bus requires 0.19 liters of fuel, and cars consume 0.076 liters per kilometer, how long in kilometers would your bus commute need to be to save an amount of gasoline equivalent to stopping the bus once?

ANSWER: 2.5

TOSS-UP

21) GENERAL SCIENCE *Multiple Choice* Which of the following statements is NOT true about electric eels?

- W) They are not eels, but fish
- X) They use electrical fields to navigate and explore their surroundings
- Y) They are endangered
- Z) They can produce up to 600 volts of electricity

ANSWER: Y) THEY ARE ENDANGERED

BONUS

21) GENERAL SCIENCE *Multiple Choice* When you look at coral on a reef, which of the following are you seeing?

- W) Sodium bicarbonate that precipitates from the seawater
- X) Deposits from fish and other marine vertebrates
- Y) Zoantharian [*zo-ahn-THA-ree-an*] corals extending from their calcareous [*kal-KAIR-ee-uhs*] caps
- Z) Minerals deposited as a result of runoff from nearby mainlands

ANSWER: Y) ZOANTHARIAN CORALS EXTENDING FROM THEIR CALCAREOUS CAPS

TOSS-UP

22) MATH *Multiple Choice* The radius of a bicycle tire is 10 inches. How far in inches does the wheel travel in six revolutions?

- W) 120π
- X) 90π
- Y) 60π
- Z) 45π

ANSWER: W) 120π

BONUS

22) MATH *Short Answer* Given a line segment in a plane, how many different isosceles right triangles in the plane have the given line segment as a side?

ANSWER: 6

TOSS-UP

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following molecules is an alkene [**AL-keen**]?

- W) CH₄
- X) C₂H₄
- Y) C₃H₈
- Z) C₅H₁₂

ANSWER: X) C₂H₄

BONUS

23) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements has the largest electron affinity?

- W) Lithium
- X) Beryllium
- Y) Fluorine
- Z) Nitrogen

ANSWER: Y) FLUORINE

TOSS-UP

24) EARTH AND SPACE *Multiple Choice* A psychrometer is used by meteorologists to most directly measure which of the following?

- W) Wind chill
- X) Relative humidity
- Y) Wind direction
- Z) Barometric pressure at high altitudes

ANSWER: X) RELATIVE HUMIDITY

BONUS

24) EARTH AND SPACE *Multiple Choice* If you were to build a pond in your back yard, which of the following materials should you use to line the bottom of the pond?

- W) Clay
- X) Sand
- Y) Silt
- Z) A mixture of sand, silt, and clay

ANSWER: W) CLAY

TOSS-UP

25) LIFE SCIENCE *Multiple Choice* Which of the following is the pH of the normal human stomach lumen?

- W) 2-3
- X) 4-5
- Y) 6-7
- Z) 8-9

ANSWER: W) 2-3

BONUS

25) LIFE SCIENCE *Multiple Choice* Unlike eukaryotes [**yoo-KAR-ee-ohts**], prokaryotes [**proh-KAR-ee-ohts**] typically have only one chromosome. Which of the following is a unique characteristic of prokaryotic [**proh-KAR-ee-oht-ik**] genomes?

- W) Exons
- X) Telomeres
- Y) Circular chromosomes
- Z) Presence of genes

ANSWER: Y) CIRCULAR CHROMOSOMES