

ROUND 15

TOSS-UP

1) MATH *Short Answer* How many cubic yards of concrete are needed to pour a sidewalk measuring 4 feet wide, 54 feet long, and 3 inches deep?

ANSWER: 2

BONUS

1) MATH *Short Answer* You have a cylinder with a radius of b and a height of $(2b + 4)$. A rectangular prism has the same volume as the cylinder. The rectangular prism has a square base with side lengths of $2b$. What is the height of the rectangular prism in terms of π ?

ANSWER: $\pi/2 b + \pi$ [ACCEPT: $\pi(\frac{1}{2} b + 1)$]

TOSS-UP

2) LIFE SCIENCE *Multiple Choice* Plant metabolism must:

- W) Produce carbon dioxide and consume oxygen
- X) Neither produce nor consume carbon dioxide or oxygen
- Y) Consume carbon dioxide and produce oxygen
- Z) Both produce and consume carbon dioxide and oxygen

ANSWER: Z) BOTH PRODUCE AND CONSUME CARBON DIOXIDE AND OXYGEN

BONUS

2) LIFE SCIENCE *Multiple Choice* If you were to take a section of a leaf, which of the following statements correctly aligns the part of the leaf and its function?

- W) Mesophyll (read as: MEH-zoh-fil): Opening through which air brings carbon dioxide
- X) Thylakoid (read as: THY-lah-kohid): Captures light
- Y) Epidermis: Region where most photosynthesis takes place
- Z) Stoma: Protect and support the leaf

ANSWER: X) THYLAKOID: CAPTURES LIGHT

TOSS-UP

3) ENERGY *Multiple Choice* When the ambient temperature increases, the value of resistance for a typical resistor:

- W) Is greater
- X) Is smaller
- Y) Does not change
- Z) May change depending on the flow of charges

ANSWER: W) IS GREATER

BONUS

3) ENERGY *Multiple Choice* At high temperatures, the capacitance of a capacitor will:

- W) Not increase, because the magnetic field is too strong
- X) Not increase because the value of capacitance is unaffected by temperature
- Y) Increase slightly
- Z) Increase greatly

ANSWER: X) NOT INCREASE BECAUSE THE VALUE OF CAPACITANCE IS UNAFFECTED BY TEMPERATURE

TOSS- UP

4) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following natural resources is most abundant in the continental United States?

- W) Natural gas
- X) Petroleum
- Y) Coal
- Z) Uranium

ANSWER: Y) COAL

BONUS

4) EARTH AND SPACE SCIENCE *Short Answer* What is the term for the structural geologic feature in which there is an increased dip in otherwise gently dipping strata?

ANSWER: MONOCLINE

TOSS-UP

5) MATH *Short Answer* What values of p make the following inequality true: $-p / 3 < -12$ (read as: negative p over 3 is less than negative 12)?

ANSWER: $p > 36$

BONUS

5) MATH *Short Answer* A circle circumscribes a regular hexagon with side lengths of 8 centimeters. In terms of pi, what is the circumference of the circle?

ANSWER: 16π

TOSS-UP

6) LIFE SCIENCE *Multiple Choice* What is the organ system that delivers hormones, oxygen, and nutrients to cells and transports waste products away from cells?

- W) Lymphatic system
- X) Endocrine system
- Y) Respiratory system
- Z) Circulatory system

ANSWER: Z) CIRCULATORY SYSTEM

BONUS

6) LIFE SCIENCE *Short Answer* Name the protein that transports oxygen to cells via the circulatory system.

ANSWER: HEMOGLOBIN

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* Name the body system to which tonsils belong.

- W) Digestive system
- X) Circulatory system
- Y) Immune/lymphatic system
- Z) Excretory system

ANSWER: Y) IMMUNE/LYMPHATIC SYSTEM

BONUS

7) GENERAL SCIENCE *Short Answer* By name or number, identify which of the following organisms demonstrate a catadromous life cycle: 1) sockeye salmon; 2) coho salmon; 3) American eel; and/or 4) peacock flounder.

ANSWER: AMERICAN EEL (ACCEPT: 3)

TOSS-UP

8) EARTH AND SPACE SCIENCE *Multiple Choice* What most likely constitutes the majority of the Earth's center, also known as the inner core?

- W) Hydrogen gas
- X) Molten rock
- Y) Molten iron
- Z) Solid iron

ANSWER: Z) SOLID IRON

BONUS

8) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is an index mineral?

- W) Chalcopyrite (read as: kahl-koh-PY-ryt)
- X) Andalusite (read as: ahn-dah-LUH-syt)
- Y) Azurite (read as: AH-zuh-ryt)
- Z) Sphene (read as: SFEEN)

ANSWER: X) ANDALUSITE

TOSS-UP

9) MATH *Short Answer* Convert 50 degrees Fahrenheit to Celsius.

ANSWER: 10° CELSIUS

BONUS

9) MATH *Short Answer* A pyramid is 14 meters tall and has a square base that is approximately 15 meters on a side. What is its volume in cubic meters?

ANSWER: 1050

TOSS-UP

10) EARTH AND SPACE SCIENCE *Multiple Choice* What is the original energy source that drives the transfer of water in the ocean to water vapor in the atmosphere?

- W) The Sun
- X) Nuclear energy
- Y) Wind power
- Z) Tidal power

ANSWER: W) THE SUN

BONUS

10) EARTH AND SPACE SCIENCE *Multiple Choice* A cubic meter of H₂O has the greatest amount of energy in which of the following situations?

- W) Ice in a Rocky Mountain glacier
- X) Water vapor in an air mass over Kansas
- Y) Water in the Gulf of Mexico
- Z) Water in Lake Michigan

ANSWER: X) WATER VAPOR IN AN AIRMASS OVER KANSAS

TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following would best describe a 14-karat gold bracelet?

- W) Pure metal
- X) Nonmetal
- Y) Alloy
- Z) Amalgam

ANSWER: Y) ALLOY

BONUS

11) PHYSICAL SCIENCE *Multiple Choice* In order for a compound to be analyzed using infrared spectroscopy, the molecule must exhibit a change in which of the following?

- W) Ionization energy
- X) Dipole moment
- Y) Polarizability
- Z) Atomic radius

ANSWER: X) DIPOLE MOMENT

TOSS-UP

12) GENERAL SCIENCE *Short Answer* What color does copper burn in a flame?

ANSWER: GREEN

BONUS

12) GENERAL SCIENCE *Short Answer* What is the term for the process of removal of inorganic and organic substances from the "A" soil horizon by leaching?

ANSWER: ELUVIATION

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* Which of the following processes represents asexual reproduction in bacteria?

- W) Sporulation
- X) Budding
- Y) Binary fission
- Z) Regeneration

ANSWER: Y) BINARY FISSION

BONUS

13) LIFE SCIENCE *Multiple Choice* Which of the following represents the primary symptom from the chytrid fungus infecting amphibians?

- W) The fungus attacks the skin, making respiration difficult
- X) The fungal spores cause paralysis
- Y) The fungal spores enter through the eyes, causing permanent blindness
- Z) The fungus is ingested and produces repeated regurgitation followed by death

ANSWER: W) THE FUNGUS ATTACKS THE SKIN, MAKING RESPIRATION DIFFICULT

TOSS-UP

14) EARTH AND SPACE SCIENCE *Short Answer* Although a number of environmental factors help shape land features, identify the one factor that typically produces valleys with a U-shape.

ANSWER: VALLEY GLACIERS (ACCEPT: GLACIERS, ICE SHEETS, ICE, GLACIATIONS)

BONUS

14) EARTH AND SPACE SCIENCE *Multiple Choice* Sixteen thousand years ago, the landscape of the Midwest was very different than it is today. Glaciers were retreating, but much of the Midwestern United States was under ice. Which of the following statements is NOT true about the Midwest 16,000 years ago?

- W) Spruce grew throughout much of the Midwest south of the glaciers
- X) Summers were significantly cooler than they are today
- Y) Winter temperatures were dramatically cooler than they are today
- Z) Ground sloths browsed on trees and shrubs

ANSWER: Y) WINTER TEMPERATURES WERE DRAMATICALLY COOLER THAN THEY ARE TODAY

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Which of the following animals is a ruminant herbivore?

- W) Rhinoceros
- X) Lion
- Y) Giraffe
- Z) Zebra

ANSWER: Y) GIRAFFE

BONUS

15) GENERAL SCIENCE *Short Answer* What type of symmetry is associated with adult echinoderms (read as: i-KY-neh-dehrms)?

ANSWER: RADIAL SYMMETRY (ACCEPT 5-FOLD OR PENTARADIAL SYMMETRY, SECONDARY RADIAL SYMMETRY)

TOSS-UP

16) ENERGY *Multiple Choice* In the world of circuits and electronics, it is possible to add, subtract, multiply, and divide signals by the use of:

- W) An operational amplifier
- X) A power supply
- Y) Wires
- Z) Soldering iron

ANSWER: W) AN OPERATIONAL AMPLIFIER

BONUS

16) ENERGY *Multiple Choice* Operational amplifiers can be used in combination with inductors and capacitors and their energy storage abilities to create:

- W) A protection device
- X) A transversal amplifier
- Y) An AM radio
- Z) A memory stick

ANSWER: Y) AN AM RADIO

TOSS-UP

17) GENERAL SCIENCE *Short Answer* What are the names for the two transport tissues in plants?

ANSWER: XYLEM AND PHLOEM

BONUS

17) GENERAL SCIENCE *Multiple Choice* Which of the following flowers is NOT a monocot?

- W) Geranium
- X) Lily
- Y) Iris
- Z) Tulip

ANSWER: W) GERANIUM

TOSS-UP

18) PHYSICAL SCIENCE *Short Answer* A box weighing 20 newtons is moving at a constant speed along a flat surface. It is being pushed with a force of 10 newtons. What is the coefficient of friction?

ANSWER: 0.5

BONUS

18) PHYSICAL SCIENCE *Multiple Choice* If each of the following objects is allowed to roll down a ramp without slipping, which reaches the bottom with the greatest speed?

- W) Solid cylinder
- X) Hollow cylinder
- Y) Solid sphere
- Z) Hollow sphere

ANSWER: Y) SOLID SPHERE

TOSS-UP

19) EARTH AND SPACE SCIENCE *Multiple Choice* Why couldn't sailing explorers from Europe and Asia sail directly along the latitude that cuts across the middle of the North Atlantic or North Pacific to get to America?

W) Wind and water currents do not flow directly along the latitude that cuts across the middle of these oceans

X) Winds blow so hard near the middle of the ocean that it is impossible to maintain a straight course

Y) Near the center of the oceans, the winds often blow in one direction, while the water currents flow in the opposite direction, making it difficult to traverse

Z) The currents are so strong in the middle of the gyres that it is difficult to sail through them

ANSWER: W) WIND AND WATER CURRENTS DO NOT FLOW DIRECTLY ALONG THE LATITUDE THAT CUTS ACROSS THE MIDDLE OF THESE OCEANS

BONUS

19) EARTH AND SPACE SCIENCE *Multiple Choice* What is the source of the northeast trade winds in the North Atlantic?

W) Florida

X) North Africa

Y) Brazil

Z) Canada

ANSWER: X) NORTH AFRICA

TOSS-UP

20) MATH *Short Answer* What is the first and last number of every row of Pascal's triangle?

ANSWER: 1

BONUS

20) MATH *Short Answer* A rectangular landscape box has a base measuring 2 feet by 6 feet, with a height of one foot. If 9 cubic feet of potting soil are placed in the box and evenly spread with a consistent depth, what will be the height in inches of the soil?

ANSWER: 9

TOSS-UP

21) PHYSICAL SCIENCE *Multiple Choice* Which of the following does NOT depend on a chemical reaction?

- W) Your voice squeaking when you breathe helium
- X) Rusty nails
- Y) Halloween lightsticks
- Z) Fizzing of an Alka-Seltzer in water

ANSWER: W) YOUR VOICE SQUEAKING WHEN YOU BREATHE HELIUM

BONUS

21) PHYSICAL SCIENCE *Multiple Choice* Although this is dangerous, if you hypothetically were to breathe in xenon or krypton instead of helium, what would happen to the sound of your voice?

- W) It would be lower than when you breathe helium and also lower than your regular voice
- X) It would be lower than when you breathe helium, but higher than your regular voice
- Y) It would be the same as when you breathe helium
- Z) It would be higher than when you breathe helium

ANSWER: W) IT WOULD BE LOWER THAN WHEN YOU BREATHE HELIUM AND ALSO LOWER THAN YOUR REGULAR VOICE

TOSS-UP

22) LIFE SCIENCE *Multiple Choice* Which of the following processes represents the restoration of severed appendages?

- W) Sporulation
- X) Regeneration
- Y) Vegetative propagation
- Z) Budding

ANSWER: X) REGENERATION

BONUS

22) LIFE SCIENCE *Short Answer* What part of the brain links the endocrine and nervous systems?

ANSWER: HYPOTHALAMUS

TOSS-UP

23) MATH *Multiple Choice* Which of the following statements is NOT correct?

- W) A triangle can be both acute and equilateral (read as: ee-kwi-LAH-the-rah!)
- X) A triangle can be both right and isosceles
- Y) A triangle can be both acute and right
- Z) A triangle can be both scalene and right

ANSWER: Y) A TRIANGLE CAN BE BOTH ACUTE AND RIGHT

BONUS

23) MATH *Short Answer* What is the length of the hypotenuse in a right triangle with legs of length 14 and 48?

ANSWER: 50

TOSS-UP

24) ENERGY *Multiple Choice* For a machine, what does the product of power and time divided by distance equal?

- W) Energy
- X) Force
- Y) Velocity
- Z) Work

ANSWER: X) FORCE

BONUS

24) ENERGY *Multiple Choice* About how many watts does a 10 horsepower lawn mower engine produce?

- W) 36
- X) 320
- Y) 4890
- Z) 7460

ANSWER: Z) 7460

TOSS-UP

25) PHYSICAL SCIENCE *Short Answer* Oxidation-reduction reactions involve the transfer of which charged subatomic particles?

ANSWER: ELECTRONS

BONUS

25) PHYSICAL SCIENCE *Short Answer* What is the oxidation state of copper in copper sulfate?

ANSWER: +2