

ROUND 1

TOSS-UP

1) GENERAL SCIENCE *Short Answer* Providing your answer as a decimal to the nearest hundredth, what is the density in grams per cubic centimeter of a material with a mass of 2.02 grams and a volume of 0.500 cubic centimeters?

ANSWER: 4.04

BONUS

1) GENERAL SCIENCE *Short Answer* By number, identify all of the following four characteristics that are TRUE of hail: 1) most hail is less than 5 inches in diameter; 2) it is formed of partially frozen raindrops; 3) it is formed from chunks of ice; 4) it falls from the clouds as rain.

ANSWER: 1 AND 3

TOSS-UP

2) MATH *Short Answer* In triangle ABC, angle C is a right angle, side AC is equal to 15 units, and side BC is equal to 8 units. What is the length, in units, of side AB?

ANSWER: 17

BONUS

2) MATH *Short Answer* By how much is the sum of the first 10 even positive integers greater than the sum of the first 10 positive integers?

ANSWER: 55

TOSS-UP

3) PHYSICAL SCIENCE *Short Answer* How many protons are in an atom of carbon-14?

ANSWER: 6

BONUS

3) PHYSICAL SCIENCE *Short Answer* Given g as 10 meters per second squared, what is the weight, in newtons, of a crate with a mass of 10 kilograms being raised from the floor at a steady speed?

ANSWER: 100

TOSS-UP

4) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following determines the size of the image formed by a telescope?

- W) The focal length of the main lens or mirror
- X) The thickness of the lens
- Y) The size of the aperture
- Z) The size of the mirror

ANSWER: W) THE FOCAL LENGTH OF THE MAIN LENS OR MIRROR

BONUS

4) EARTH AND SPACE SCIENCE *Short Answer* By name or number, identify all of the following four moon phases in which a neap tide can occur: 1) first quarter, 2) last quarter, 3) new moon, 4) full moon.

ANSWER: FIRST QUARTER AND LAST QUARTER (ACCEPT: 1 AND 2)

TOSS-UP

5) GENERAL SCIENCE *Short Answer* A female who is heterozygous for a dominant, X-linked trait crosses with a male who also displays this trait phenotypically. What percentage of their sons will display this trait?

ANSWER: 50%

BONUS

5) GENERAL SCIENCE *Short Answer* By name or number, identify all of the following four choices that are unsaturated hydrocarbons: 1) propane, 2) ethene, 3) acetylene, 4) benzene.

ANSWER: ETHENE, ACETYLENE, BENZENE (ACCEPT: 2, 3, AND 4)

TOSS-UP

6) PHYSICAL SCIENCE *Short Answer* How many valence electrons are in beryllium?

ANSWER: 2

BONUS

6) PHYSICAL SCIENCE *Multiple Choice* Which of the following compounds is LEAST soluble in water?

- W) Ammonia
- X) Molecular nitrogen
- Y) Sodium chloride
- Z) Methanol

ANSWER: X) MOLECULAR NITROGEN

TOSS-UP

7) EARTH AND SPACE SCIENCE *Short Answer* In which geologic period did reptiles first appear in Earth's history?

ANSWER: CARBONIFEROUS

BONUS

7) EARTH AND SPACE SCIENCE *Short Answer* The stratopause is the boundary between which two atmospheric layers?

ANSWER: STRATOSPHERE AND MESOSPHERE

TOSS-UP

8) PHYSICAL SCIENCE *Short Answer* When an electron or proton is accelerated through a potential difference of 1 volt, how much energy does it gain in electron volts?

ANSWER: 1

BONUS

8) PHYSICAL SCIENCE *Multiple Choice* Lanthanides are elements with which of the following orbitals partially filled?

- W) S
- X) P
- Y) D
- Z) F

ANSWER: Z) F

TOSS-UP

9) ENERGY *Multiple Choice* Which of the following is NOT a characteristic of the Tampa Bay desalination plant?

- W) It can produce up to 25 million gallons of drinking water per day
- X) It uses the process of reverse osmosis to produce drinking water from saltwater
- Y) Concentrated seawater is directed back to the power plant, where it is mixed with cooling water and returned to the Bay
- Z) Increased salinity in Tampa Bay is a proven environmental hazard of this operation

ANSWER: Z) INCREASED SALINITY IN TAMPA BAY IS A PROVEN ENVIRONMENTAL HAZARD OF THIS OPERATION

BONUS

9) ENERGY *Multiple Choice* Which of the following processes involves the scattering of a photon off of an electron?

- W) Compton scattering
- X) Møller scattering
- Y) Pair production
- Z) Bhabha scattering

ANSWER: W) COMPTON SCATTERING

TOSS-UP

10) MATH *Short Answer* Given that a plane is at an angle between 1 and 89 degrees to the axis of a right circular cylinder, what is the name of the curve formed at their intersection?

ANSWER: ELLIPSE

BONUS

10) MATH *Short Answer* To be labeled "sugar free," a candy must contain less than 0.5 grams of sugar per 40 grams. If a serving of sugar free candy is 25 grams, what is the maximum amount of sugar allowed, to the nearest hundredth of a gram?

ANSWER: 0.31

TOSS-UP

11) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following is a depositional feature formed by a glacier?

- W) Arête (read as: ah-RATE)
- X) Horn
- Y) Cirque
- Z) Kame (read as: CAME)

ANSWER: Z) KAME

BONUS

11) EARTH AND SPACE SCIENCE *Multiple Choice* Iceland is very tectonically active; which of the following does NOT contribute to its interesting geologic and tectonic past and present?

- W) Location atop a divergent boundary
- X) Location adjacent to a subduction zone
- Y) Location atop a hot spot
- Z) Abundant transform faults

ANSWER: X) LOCATION ADJACENT TO A SUBDUCTION ZONE

TOSS-UP

12) PHYSICAL SCIENCE *Multiple Choice* The kinetic energy of an object is proportional to which of the following?

- W) Its velocity
- X) The square of its velocity
- Y) Its momentum
- Z) Its angular momentum

ANSWER: X) THE SQUARE OF ITS VELOCITY

BONUS

12) PHYSICAL SCIENCE *Short Answer* One liter of oxygen and two liters of hydrogen are reacted in a closed container to form a gaseous product. If the temperature within the container is the same before and after the reaction, what is the ratio of final pressure to initial pressure in the container?

ANSWER: 2 : 3 (ACCEPT: 2 TO 3, 2/3)

TOSS-UP

13) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following events are associated with the highest tides?

- W) Spring tides
- X) Neap tides
- Y) Slack tides
- Z) Ebb tides

ANSWER: W) SPRING TIDES

BONUS

13) EARTH AND SPACE SCIENCE *Short Answer* By name or number, rank the following sedimentary rocks in order of increasing grain size: 1) conglomerate, 2) sandstone, 3) shale.

ANSWER: SHALE, SANDSTONE, CONGLOMERATE (ACCEPT: 3, 2, 1)

TOSS-UP

14) ENERGY *Short Answer* What is the name of the device that relies on sunshine to cook food when firewood is scarce?

ANSWER: SOLAR COOKER (ACCEPT: SOLAR OVEN)

BONUS

14) ENERGY *Short Answer* Which U.S. state will have the first wave-power farm?

ANSWER: OREGON

TOSS-UP

15) LIFE SCIENCE *Short Answer* What kinds of leaves do not possess a petiole (read as: PEH-tee-ōel)?

ANSWER: SESSILE

BONUS

15) LIFE SCIENCE *Short Answer* Match the terms serrate, entire, and lobed with the numbers of the following leaf descriptions: 1) they have little bent teeth like those of a saw; 2) they have divisions that do not arrive at the center of half of the blade; 3) they have a smooth margin.

ANSWER: SERRATE = 1; ENTIRE = 3; AND LOBED = 2

TOSS-UP

16) MATH *Short Answer* Bob is building shelves 18 inches long. He uses a saw with a kerf, or cut width, of an eighth of an inch. Considering the kerf, how many shelves exactly 18 inches long can he make from a board that is 72 inches long?

ANSWER: 3

BONUS

16) MATH *Short Answer* What is the perimeter, in inches, of an isosceles (read as: eye-SOHS-leez) trapezoid with parallel sides measuring 4 inches and 10 inches and a height of 4 inches?

ANSWER: 24

TOSS-UP

17) LIFE SCIENCE *Multiple Choice* Which of the following best describes the position of a gene on a chromosome?

- W) Chiasma (read as: ky-AHZ-mah)
- X) Allele
- Y) Histone
- Z) Locus

ANSWER: Z) LOCUS

BONUS

17) LIFE SCIENCE *Short Answer* What are the common names of the two generally accepted families of living owls?

ANSWER: TRUE (ACCEPT: TYPICAL) OWLS AND BARN OWLS

TOSS-UP

18) ENERGY *Multiple Choice* Which of the following tectonic settings is MOST conducive to geothermal power generation?

- W) Plate boundaries
- X) Passive margins
- Y) Continental shields
- Z) Denudation

ANSWER: W) PLATE BOUNDARIES

BONUS

18) ENERGY *Short Answer* You want to design a battery pack filled with many cell phone lithium (read as: LI-thee-uhm) ion batteries capable of storing 10 megawatt hours of energy to offset a gas turbine power plant. If the battery pack operates at a constant voltage of 4 volts, how much capacity, in ampere hours, would you need to store 10 megawatt hours of energy?

ANSWER: 2,500,000

TOSS-UP

19) PHYSICAL SCIENCE *Short Answer* What is the term for the reactant used up first in a reaction?

ANSWER: LIMITING REAGENT

BONUS

19) PHYSICAL SCIENCE *Multiple Choice* A spring lies flat on a frictionless table and oscillates with a mass attached to the end of it. Which of the following is NOT true regarding this system?

- W) Kinetic energy is greatest at the equilibrium position
- X) Potential energy is greatest at two different displacements
- Y) Potential energy is least at the equilibrium position
- Z) Increasing the mass of the attached object will increase the magnitude of the spring force

ANSWER: Z) INCREASING THE MASS OF THE ATTACHED OBJECT WILL INCREASE THE MAGNITUDE OF THE SPRING FORCE

TOSS-UP

20) LIFE SCIENCE *Multiple Choice* Which of the following ocean animals' eggs hatch at low tide?

- W) Sea turtle
- X) Sea star
- Y) Grunion
- Z) Sea anemone

ANSWER: W) SEA TURTLE

BONUS

20) LIFE SCIENCE *Short Answer* What is the name of a small, circular piece of bacterial DNA that contains only a few genes?

ANSWER: PLASMID

TOSS-UP

21) MATH *Short Answer* Identify the real zeros of the function $f(x) = \sqrt{x^2 - 4}$ (read as: f of x equals the square root of the quantity x squared minus 4).

ANSWER: -2 AND 2

BONUS

21) MATH *Multiple Choice* Which of the following points lies on the curve with equation $y = 2x^3 - |5x| + 3$ (read as: y equals 2 x cubed minus the absolute value of 5 x plus 3)?

W) (-2, 29)

X) (-2, 1)

Y) (-2, 9)

Z) (-2, -23)

ANSWER: Z) (-2, -23)

TOSS-UP

22) GENERAL SCIENCE *Short Answer* By name or number, identify all of the following four organisms that are mollusks : 1) squid, 2) sea star, 3) chiton (read as: KY-tun), 4) sea cucumber.

ANSWER: SQUID AND CHITON (ACCEPT: 1 AND 3)

BONUS

22) GENERAL SCIENCE *Short Answer* By name or number, identify which of the following three coral reef types is directly attached to a shore, or borders it with an intervening shallow channel or lagoon: 1) atoll, 2) barrier, 3) fringing.

ANSWER: FRINGING (ACCEPT: 3)

TOSS-UP

23) EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following minerals has the highest density?

- W) Chromite
- X) Galena (read as: gah-LEE-nah)
- Y) Platinum
- Z) Pyrite (read as: PY-ryt)

ANSWER: Y) PLATINUM

BONUS

23) EARTH AND SPACE SCIENCE *Short Answer* Kyanite (read as: KY-ah-nyt) is a metamorphic mineral that forms at temperatures greater than 600° Celsius. Assuming a geothermal gradient of 20° Celsius per kilometer, what is the minimum depth, in kilometers, at which kyanite (read as: KY-ah-nyt) will form?

ANSWER: 30

TOSS-UP

24) GENERAL SCIENCE *Short Answer* By name or number, identify all of the following three properties that would be the same at both sea level and the top of Mount Everest: 1) mass, 2) specific heat, 3) weight.

ANSWER: MASS AND SPECIFIC HEAT (ACCEPT: 1 AND 2)

BONUS

24) GENERAL SCIENCE *Short Answer* What type of photoreceptor is most abundant in the human eye?

ANSWER: RODS

TOSS-UP

25) LIFE SCIENCE *Short Answer* What type of tree has cones and needlelike leaves?

ANSWER: CONIFER (ACCEPT: EVERGREEN)

BONUS

25) LIFE SCIENCE *Short Answer* What element is most commonly used as the final electron acceptor during oxidative phosphorylation (read as: fahs-fohr-i-LAY-shohn)?

ANSWER: OXYGEN