

ROUND 7

TOSS-UP

1) MATH *Multiple Choice* Given that time t has values 0, 1, and 2, and distance d has corresponding respective values 60, 110, and 160, which of the following equations represents the linear relationship between t and d ?

- W) $d = 50t$
- X) $d = 50t + 60$
- Y) $d = 60t$
- Z) $d = 60t + 50$

ANSWER: X) $d = 50t + 60$

BONUS

1) MATH *Short Answer* What is the inverse of the 2 by 2 matrix: $\begin{bmatrix} 1 & -5 \\ 2 & -11 \end{bmatrix}$ [**the first row is 1, negative 5 and second row is 2, negative 11**]?

ANSWER: $\begin{bmatrix} 11 & -5 \\ 2 & -1 \end{bmatrix}$

TOSS-UP

2) PHYSICAL SCIENCE *Multiple Choice* Which of the following equations represents Dalton's law?

- W) $PV = nRT$
- X) $P_1V_1 = P_2V_2$
- Y) $P_T = P_A + P_B + P_C...$
- Z) $V_1/n_1 = V_2/n_2$ [**V 1 over n 1 equals V 2 over n 2**]

ANSWER: Y) $P_T = P_A + P_B + P_C...$

BONUS

2) PHYSICAL SCIENCE *Multiple Choice* Which of the following statements is NOT true about arch bridges?

- W) Its structure distributes compression through its entire form
- X) Weight is diverted onto its abutments
- Y) The curve of the arch reduces the effects of tension
- Z) Each half-arch has its own structural integrity

ANSWER: Z) EACH HALF-ARCH HAS ITS OWN STRUCTURAL INTEGRITY

TOSS-UP

3) GENERAL SCIENCE *Multiple Choice* Which reaction type occurs when an acid and base react to produce a salt and water?

- W) Acidification
- X) Neutralization
- Y) Ammonification
- Z) Basification

ANSWER: X) NEUTRALIZATION

BONUS

3) GENERAL SCIENCE *Multiple Choice* Sulfuric acid is spilled on a laboratory bench. Which of the following chemicals would be useful for neutralizing the acid?

- W) Silver iodide
- X) Aluminum chloride
- Y) Sodium bicarbonate
- Z) Potassium nitrate

ANSWER: Y) SODIUM BICARBONATE

TOSS-UP

4) EARTH AND SPACE *Multiple Choice* Which of the following statements is NOT true about rock folding in the Earth's crust?

- W) Brittle conditions tend to occur near the surface
- X) Folding of rock is more likely to occur in brittle rocks
- Y) If rocks become extremely hot during compression, they are more likely to fold than fault
- Z) If rocks are exposed to extremely high pressures, they are more likely to fold than fault

ANSWER: X) FOLDING OF ROCK IS MORE LIKELY TO OCCUR IN BRITTLE ROCKS

BONUS

4) EARTH AND SPACE *Short Answer* What kind of weather satellite is in relatively low altitude orbit and images the same location on Earth every twelve hours?

ANSWER: POLAR-ORBITING (ACCEPT: POLAR, NEAR-POLAR, SUN-SYNCHRONOUS)

TOSS-UP

5) MATH *Multiple Choice* Which of the following numbers is NOT a perfect cube?

- W) 216
- X) 343
- Y) 521
- Z) 729

ANSWER: Y) 521

BONUS

5) MATH *Short Answer* Matt is 12 years older than Clay. Clay is 1 year younger than Anna. If Anna is 8 years old, how old is Matt?

ANSWER: 19

TOSS-UP

6) ENERGY *Multiple Choice* The energy saved from recycling one aluminum can is enough to run a TV set for about how long?

- W) 30 minutes
- X) 1 hour
- Y) 2 hours
- Z) 3 hours

ANSWER: Z) 3 HOURS

BONUS

6) ENERGY *Multiple Choice* To maximize the concentration of energy from the Sun, heliostats must do which of the following?

- W) Track the zenith angle of the Sun
- X) Track the solar declination of the Sun
- Y) Track the azimuth angle and the altitude of the Sun
- Z) Keep the panel facing up at all times

ANSWER: Y) TRACK THE AZIMUTH ANGLE AND THE ALTITUDE OF THE SUN

TOSS-UP

7) LIFE SCIENCE *Multiple Choice* Which of the following statements is NOT true about paper wasps?

- W) They are semi-social insects
- X) They can only sting once
- Y) Stinging workers do not survive the winter
- Z) A mature nest may have 20 to 30 adults

ANSWER: X) THEY CAN ONLY STING ONCE

BONUS

7) LIFE SCIENCE *Short Answer* Identify all of the following five choices that may serve as food for a hornet: 1) house fly, 2) blow fly, 3) pollen, 4) caterpillar, 5) tree sap.

ANSWER: 1, 2, 4, 5 (HOUSE FLY, BLOW FLY, CATERPILLAR, TREE SAP)

TOSS-UP

8) PHYSICAL SCIENCE *Short Answer* What is the name given to the kinetic energy of atoms and molecules?

ANSWER: THERMAL ENERGY (ACCEPT: HEAT ENERGY)

BONUS

8) PHYSICAL SCIENCE *Short Answer* What is the number of valence electrons in Group 17 elements?

ANSWER: 7

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* A cell that is not undergoing active division is said to be in which of the following stages?

- W) Mitosis [*my-TOH-sis*]
- X) Interphase
- Y) Metaphase
- Z) Telophase

ANSWER: X) INTERPHASE

BONUS

9) GENERAL SCIENCE *Short Answer* Place the following three models of atomic structure in the order in which they were developed: 1) planetary, 2) quantum mechanical, 3) solid sphere.

ANSWER: 3, 1, 2 (ACCEPT: SOLID SPHERE, PLANETARY, QUANTUM MECHANICAL)

TOSS-UP

10) EARTH AND SPACE *Multiple Choice* Which of the following is an area of high land, usually consisting of relatively flat terrain, sometimes formed by upwelling of volcanic magma, extrusion of lava, or erosion by water and glaciers?

- W) Coastal plain
- X) Interior plain
- Y) Plateau
- Z) Mountain

ANSWER: Y) PLATEAU

BONUS

10) EARTH AND SPACE *Short Answer* What is the term for a rotating column of wind extending from the base of a cloud but not reaching the ground or water surface, often associated with thunderstorms?

ANSWER: FUNNEL CLOUD (DO NOT ACCEPT: TORNADO)

TOSS-UP

11) MATH *Short Answer* If the product of three consecutive negative integers is -24, what is the smallest of the three integers?

ANSWER: -4

BONUS

11) MATH *Short Answer* For what value of c does the line $-4x + cy = 2$ pass through the point with coordinates $(2, -3)$?

ANSWER: $-10/3$ (ACCEPT: $-3 \frac{1}{3}$)

TOSS-UP

12) ENERGY *Multiple Choice* Which of the following types of wind turbine will produce the most power?

- W) Perpendicular axis
- X) Tilted axis
- Y) Vertical axis
- Z) Horizontal axis

ANSWER: Z) HORIZONTAL AXIS

BONUS

12) ENERGY *Short Answer* Given that, at standard conditions, the combustion of 1.0 moles of hydrogen with oxygen released 285.8 kilojoules of energy, providing your answer to the nearest tenth, how much energy in kilojoules is released when a balloon containing 0.15 moles of hydrogen is ignited in the air?

ANSWER: 42.9

TOSS-UP

13) LIFE SCIENCE *Multiple Choice* If you eat a tuna fish sandwich, which of the following types of fish would you be eating?

- W) Cartilaginous [*kahr-tl-AJ-uh-nuhs*]
- X) Lobe-finned
- Y) Ray-finned
- Z) Jawless

ANSWER: Y) RAY-FINNED

BONUS

13) LIFE SCIENCE *Multiple Choice* Huge groups of which of the following migrating animals stop traffic on Australia's Christmas Island every year?

- W) Red crabs
- X) Kangaroos
- Y) Emus
- Z) Yellow jacket wasps

ANSWER: W) RED CRABS

TOSS-UP

14) EARTH AND SPACE *Multiple Choice* Which of the following types of weather front is indicated by an alternating red and blue line on a weather map?

- W) Warm
- X) Cold
- Y) Stationary
- Z) Low pressure

ANSWER: Y) STATIONARY

BONUS

14) EARTH AND SPACE *Short Answer* What is the phrase that refers to the tendency for a city or town to remain warmer than its surroundings, mostly caused by lack of vegetation and soil moisture?

ANSWER: URBAN HEAT ISLAND (ACCEPT: HEAT ISLAND)

TOSS-UP

15) LIFE SCIENCE *Multiple Choice* Which of the following is NOT a gymnosperm?

- W) Ginkgo
- X) Hornwort
- Y) Conifer
- Z) Cycad

ANSWER: X) HORNWORT

BONUS

15) LIFE SCIENCE *Multiple Choice* Which of the following best describes why humans are unable to digest cellulose?

- W) Weak stomach acid
- X) Lack of appropriate enzymes
- Y) Glutamate dehydrogenase [*GLOO-tuh-mayt dee-HY-druh-juh-nays*]
- Z) Topoisomerase [*toh-poh-ee-SAH-muh-rays*]

ANSWER: X) LACK OF APPROPRIATE ENZYMES

TOSS-UP

16) PHYSICAL SCIENCE *Short Answer* What is the equivalent resistance in ohms of a 2 ohm and 6 ohm resistor connected in series, in which the combination is connected in parallel with an 8 ohm resistor?

ANSWER: 4

BONUS

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following describes a region within a magnetic material that has uniform magnetization?

- W) Magnetic domain
- X) Magnetosphere
- Y) Magnetic pole
- Z) Magnetic line

ANSWER: W) MAGNETIC DOMAIN

TOSS-UP

17) GENERAL SCIENCE *Short Answer* Name all of the following four choices that are examples of smooth muscle: 1) stomach wall lining, 2) blood vessels, 3) walls of the heart, 4) bicep.

ANSWER: 1, 2 (ACCEPT: STOMACH WALL LINING, BLOOD VESSELS)

BONUS

17) GENERAL SCIENCE *Short Answer* Place the following four layers of Earth in order from thickest to thinnest: 1) inner core, 2) crust, 3) outer core, 4) mantle.

ANSWER: 4, 3, 1, 2 (ACCEPT: MANTLE, OUTER CORE, INNER CORE, CRUST)

TOSS-UP

18) EARTH AND SPACE *Short Answer* What category of hurricane would have winds of 111 to 130 miles per hour, and would cause extensive damage, such as damage to small buildings, knocking down large trees, and destroying mobile homes?

ANSWER: THREE

BONUS

18) EARTH AND SPACE *Multiple Choice* Which of the following statements is NOT true about hurricanes?

- W) They are intense low pressure areas
- X) They gradually die as they move over warmer waters
- Y) They have warm air in their eyes
- Z) They generally form in the summer and early fall

ANSWER: X) THEY GRADUALLY DIE AS THEY MOVE OVER WARMER WATERS

TOSS-UP

19) MATH *Short Answer* On a history test, 10 students scored 80 and 10 students scored 72. What was the mean test score?

ANSWER: 76

BONUS

19) MATH *Short Answer* What are the coordinates of the vertex of $y = x^2 + 16x + 70$?

ANSWER: (-8, 6)

TOSS-UP

20) ENERGY *Short Answer* At least how many seismograph stations are needed to locate the epicenter of an earthquake?

ANSWER: THREE

BONUS

20) ENERGY *Multiple Choice* A falling leaf eventually stops accelerating towards Earth because of wind resistance. Potential energy of the leaf, however, is still decreasing as the leaf falls. Into which of the following forms of energy is the remaining potential energy converted?

- W) Mechanical only
- X) Kinetic only
- Y) Thermal only
- Z) Kinetic and thermal

ANSWER: Y) THERMAL ONLY

TOSS-UP

21) LIFE SCIENCE *Multiple Choice* A plant produces small flowers that do not have a strong odor and are not brightly colored. The plant is probably fertilized by which of the following?

- W) Wind
- X) Bats
- Y) Flies
- Z) Bees

ANSWER: W) WIND

BONUS

21) LIFE SCIENCE *Short Answer* From what protein are hair and fur synthesized?

ANSWER: KERATIN

TOSS-UP

22) PHYSICAL SCIENCE *Multiple Choice* In order to measure the current passing through an element in the circuit, we want to connect which of the following?

- W) An ammeter in parallel with the element
- X) A voltmeter in parallel with the element
- Y) An ammeter in series with the element
- Z) A voltmeter in series with the element

ANSWER: Y) AN AMMETER IN SERIES WITH THE ELEMENT

BONUS

22) PHYSICAL SCIENCE *Short Answer* Boyle's Law describes an inverse relationship between which two physical properties?

ANSWER: PRESSURE AND VOLUME

TOSS-UP

23) GENERAL SCIENCE *Multiple Choice* Which of the following is an example of a homozygous [*hoh-muh-ZY-guhs*] dominant genotype?

- W) BB [**Big b big b**]
- X) bB [*Little b big b*]
- Y) Bb [**Big b little b**]
- Z) bb [*Little b little b*]

ANSWER: W) BB

BONUS

23) GENERAL SCIENCE *Multiple Choice* Which of the following types of energy is represented by the high concentration of protons in the intermembrane space relative to the mitochondrial [*my-tuh-KON-dree-uhl*] matrix?

- W) Chemical
- X) Thermal
- Y) Mechanical
- Z) Kinetic

ANSWER: W) CHEMICAL

TOSS-UP

24) LIFE SCIENCE *Multiple Choice* Which of the following statements is NOT true about botulism?

- W) It is caused by a virus
- X) Food-borne botulism can thrive in raw honey
- Y) Its toxin can be used to reduce severe underarm sweating
- Z) It can cause paralysis

ANSWER: W) IT IS CAUSED BY A VIRUS

BONUS

24) LIFE SCIENCE *Short Answer* What disaccharide sugar is formed from galactose and glucose?

ANSWER: LACTOSE

TOSS-UP

25) MATH *Short Answer* Given a quadrilateral with interior angles of 95° , 85° , and 120° , what is the measure in degrees of its fourth interior angle?

ANSWER: 60°

BONUS

25) MATH *Short Answer* Solve for v : $v^2 - 2v - 35 = 0$.

ANSWER: 7, -5