

ROUND 7

TOSS-UP

1) PHYSICAL SCIENCE *Multiple Choice* Which of the following laws most directly limits the ability of a simple machine to an efficiency of 100% or lower:

- W) Hooke's law
- X) law of equal proportions
- Y) the first law of motion
- Z) the law of conservation of energy

ANSWER: Z) THE LAW OF CONSERVATION OF ENERGY

BONUS

1) PHYSICAL SCIENCE *Short Answer* To the first decimal place, what is the ideal mechanical advantage of a lever with a resistance arm of 200 centimeters and an effort arm of 3.4 meters?

ANSWER: 1.7

(Solution: $MA = EA/RA = 340/200 = 1.7$)

TOSS-UP

2) EARTH SCIENCE *Multiple Choice* Which of the following characteristics is most commonly associated with a tsunami wave as opposed to a normal ocean wave in the open ocean:

- W) period of 5 seconds
- X) wavelength of 300 miles
- Y) speed of 50 miles per hour
- Z) motion of only the uppermost layer of water

ANSWER: X) WAVELENGTH OF 300 MILES

BONUS

2) EARTH SCIENCE *Multiple Choice* Which of the following is a true tidal wave:

- W) tsunami
- X) tidal bore
- Y) rip current
- Z) tidal range

ANSWER: X) TIDAL BORE

TOSS-UP

3) MATH *Short Answer* Divide x^5 by x^3 and simplify:

ANSWER: x^2

BONUS

3) MATH *Short Answer* Evaluate the following and give your answer as a mixed fraction in lowest terms: $9\frac{1}{2} - 5\frac{2}{5}$

ANSWER: $4\frac{1}{10}$

TOSS-UP

4) GENERAL SCIENCE *Multiple Choice* Which of the following does the prefix endo (spell out the letters e, n, d, o) mean, as in the word endoscope:

- W) under
- X) dark
- Y) inside
- Z) invisible

ANSWER: Y) INSIDE

BONUS

4) GENERAL SCIENCE *Short Answer* Arrange the following 3 choices in order of INCREASING speed: 3 feet per minute; 5 yards per minute; 30 yards per hour

ANSWER: 30 YARDS PER HOUR; 3 FEET PER MINUTE; 5 YARDS PER MINUTE

TOSS-UP

5) LIFE SCIENCE *Multiple Choice* Which of the following anatomical structures do sharks NOT possess:

- W) gill covers or opercula
- X) lateral lines
- Y) cartilaginous skeletons
- Z) livers

ANSWER: W) GILL COVERS OR OPERCULA

BONUS

5) LIFE SCIENCE *Short Answer* What scientist is sometimes considered the father of genetics because of his extensive studies on the patterns of inheritance?

ANSWER: GREGOR MENDEL (ACCEPT: MENDEL)

TOSS-UP

6) PHYSICAL SCIENCE *Multiple Choice* What is the mass of an electron:

- W) about the same as a proton
- X) about $\frac{1}{2}$ as much as a proton
- Y) about $1/1,800^{\text{th}}$ of a proton
- Z) electrons have no mass

ANSWER: Y) ABOUT $1/1,800^{\text{TH}}$ OF A PROTON

BONUS

6) PHYSICAL SCIENCE *Short Answer* A 10,000-newton car is on the top floor of a parking garage 25 meters above the ground. Relative to the ground, what is the gravitational potential energy, in joules, of the car?

ANSWER: 250,000 (ACCEPT: 2.5×10^5)

(Solution: $PS = 10,000 \text{ N} \times 25 \text{ m} = 250,000 \text{ J}$)

TOSS-UP

7) EARTH SCIENCE *Multiple Choice* Streams running off the terminus of glaciers have a high bed load and easily erodible banks, typically forming which of the following types of stream patterns:

- W) meandering
- X) oxbow
- Y) braided
- Z) back swamp

ANSWER: X) BRAIDED

BONUS

7) EARTH SCIENCE *Multiple Choice* Which of the following is similar to a delta but forms when a steep mountain stream spreads out from a mountain canyon onto a flat, broad valley:

- W) alluvial fan
- X) levee
- Y) playa
- Z) flood plain

ANSWER: W) ALLUVIAL FAN

TOSS-UP

8) MATH *Short Answer* Solve the following equation for x: $15x + 8x - 3x = 120$

ANSWER: 6

BONUS

8) MATH *Short Answer* Divide $\frac{5}{9}$ by $\frac{3}{5}$ and give your answer as a proper fraction in lowest terms:

ANSWER: $\frac{25}{27}$

TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Which of the following BEST describes the SI unit called the Newton:

- W) a unit of power
- X) a unit of force
- Y) a unit of work
- Z) a unit of energy

ANSWER: X) A UNIT OF FORCE

BONUS

9) GENERAL SCIENCE *Short Answer* Rounded to the nearest whole number, how many meters per second is equal to 40 kilometers per hour?

ANSWER: 11

TOSS-UP

10) LIFE SCIENCE *Short Answer* How many phalanges are in a human thumb?

ANSWER: 2

BONUS

10) LIFE SCIENCE *Multiple Choice* Which of the following terms is most often used to describe a biochemical reaction where the forward reaction is at the same rate as the reverse reaction:

- W) isothermic
- X) isotropic
- Y) equilibrium
- Z) homeotropic

ANSWER: Y) EQUILIBRIUM

TOSS-UP

11) PHYSICAL SCIENCE *Multiple Choice* Alkali metals all have the same:

- W) number of electrons in their outer shells
- X) atomic radii
- Y) electronegativities
- Z) melting points

ANSWER: W) NUMBER OF ELECTRONS IN THEIR OUTER SHELLS

BONUS

11) PHYSICAL SCIENCE *Multiple Choice* Which of the following liquids at room temperature and 1 atmosphere would have the GREATEST surface tension:

- W) distilled water
- X) ethanol
- Y) methanol
- Z) acetone

ANSWER: W) DISTILLED WATER

TOSS-UP

12) EARTH SCIENCE *Multiple Choice* Which of the following most likely formed a U-shaped valley:

- W) glacial erosion
- X) mountain stream erosion
- Y) wind erosion
- Z) deforestation

ANSWER: W) GLACIAL EROSION

BONUS

12) EARTH SCIENCE *Multiple Choice* Which of the following gives glacial meltwater a quality which is commonly described as glacial milk:

- W) ice crystals in the water
- X) the abundance of trapped air
- Y) large amounts of suspended material
- Z) the abundance of cyanobacteria

ANSWER: Y) LARGE AMOUNTS OF SUSPENDED MATERIAL

TOSS-UP

13) MATH *Short Answer* Name all of the following 3 statements which are always TRUE:

- 1) a square is a regular polygon
- 2) an equilateral triangle is equiangular
- 3) a scalene triangle has 2 sides of equal length

ANSWER: 1 AND 2

BONUS

13) MATH *Multiple Choice* Which of the following is evenly divisible by each of the counting numbers 1 through 8:

- W) 360
- X) 1,250
- Y) 1,800
- Z) 2,520

ANSWER: Z) 2,520

TOSS-UP

14) GENERAL SCIENCE *Multiple Choice* Which of the following instruments consists of a weighted glass tube or bulb, which is floated in a liquid to measure the liquid's relative density:

- W) hydrometer
- X) hypsometer
- Y) densitometer
- Z) sensometer

ANSWER: W) HYDROMETER

BONUS

14) GENERAL SCIENCE *Short Answer* Identify each of the following 3 materials as derived from a plant or animal source, respectively: lanolin; silk; jute

ANSWER: LANOLIN = ANIMAL; SILK = ANIMAL; JUTE = PLANT

TOSS-UP

15) LIFE SCIENCE *Multiple Choice* In which of the following areas of the human body is the frontal bone found:

- W) pelvis
- X) spine
- Y) shoulder
- Z) head

ANSWER: Z) HEAD

BONUS

15) LIFE SCIENCE *Multiple Choice* In which of the following areas of the human body is the ileum bone found:

- W) pelvis
- X) wrist
- Y) shoulder
- Z) head

ANSWER: W) PELVIS

TOSS-UP

16) PHYSICAL SCIENCE *Multiple Choice* Which of the following chemical formulas gives an indication of the arrangement of atoms and bonds in a chemical compound:

- W) empirical
- X) molecular
- Y) structural
- Z) polyatomic

ANSWER: Y) STRUCTURAL

BONUS

16) PHYSICAL SCIENCE *Short Answer* How many total atoms are in any one molecule of Epsom salts, or $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (read as: Mg, S, O, 4, dot, 7, H, 2, O)

ANSWER: 27

TOSS-UP

17) EARTH SCIENCE *Multiple Choice* Which of the following is made of microcrystalline quartz and is very hard and compact:

- W) gypsum
- X) chalk
- Y) limestone
- Z) chert

ANSWER: Z) CHERT

BONUS

17) EARTH SCIENCE *Multiple Choice* Which of the following is NOT true of geodes:

- W) they occur in sedimentary and certain volcanic rocks
- X) they look like ordinary rocks from the outside
- Y) their exterior is typically made up of limestone
- Z) they are not found in the U.S.

ANSWER: Z) THEY ARE NOT FOUND IN THE U.S.

TOSS-UP

18) MATH *Short Answer* Give the numerical value of 8 factorial divided by 8 factorial:

ANSWER: 1

BONUS

18) MATH *Short Answer* Evaluate the following expression: $10 + [8 + (2 - 10)]$ (read as: 10 plus, open bracket, 8 plus, open parenthesis, 2 minus 10, close parenthesis, close bracket)

ANSWER: 10

TOSS-UP

19) GENERAL SCIENCE *Multiple Choice* Which of the following is the study of bees:

- W) herpetology
- X) apiology
- Y) ichthyology
- Z) ornithology

ANSWER: X) APIOLOGY

BONUS

19) GENERAL SCIENCE *Multiple Choice* Which of the following is CLOSEST to the height, in meters, of a person who is 4 feet and 11 inches tall:

- W) 1.2
- X) 1.5
- Y) 1.8
- Z) 2.2

ANSWER: X) 1.5

(Solution: $(59 \text{ in})(2.54 \text{ cm/in})(1 \text{ m}/100 \text{ cm}) = 1.49 \text{ m}$)

TOSS-UP

20) LIFE SCIENCE *Short Answer* In what organelle do parenchymal (read as: PAR-en-KYM-al) cells store most of a plant's cellular fluid?

ANSWER: VACUOLE

BONUS

20) LIFE SCIENCE *Short Answer* Name all of the following 3 groups of plants that have no xylem: mosses; ferns; conifers

ANSWER: MOSSES

TOSS-UP

21) PHYSICAL SCIENCE *Multiple Choice* Which of the following is generally NOT true:

- W) the boiling point of water decreases with increased altitude on Earth
- X) the melting point of table salt is much higher than that of glucose
- Y) radon is radioactive
- Z) metals react with nonmetals to form new metals

ANSWER: Z) METALS REACT WITH NONMETALS TO FORM NEW METALS

BONUS

21) PHYSICAL SCIENCE *Short Answer* What is the percent efficiency, rounded to the nearest whole number, of a simple machine that requires 600 joules of energy input to achieve 400 joules of energy output?

ANSWER: 67

(Solution: $400/600 = 0.67 \times 100 = 67\%$)

TOSS-UP

22) EARTH SCIENCE *Multiple Choice* Which of the following most likely made the trip from Europe to the New World possible for early sailors:

- W) the westerlies
- X) the trade winds
- Y) the doldrums
- Z) the jet stream

ANSWER: X) THE TRADE WINDS

BONUS

22) EARTH SCIENCE *Multiple Choice* Which of the following is a dark gray, low cloud associated with continuous falling rain:

- W) altocumulus
- X) stratocumulus
- Y) cumulus humilis
- Z) nimbostratus

ANSWER: Z) NIMBOSTRATUS

TOSS-UP

23) MATH *Short Answer* Evaluate $\frac{x}{y}$ when $x = 0$ and $y = -8$:

ANSWER: 0

BONUS

23) MATH *Short Answer* Jill has \$2.25 consisting of U.S. dimes and quarters. If she has 5 more dimes than quarters, how many dimes and quarters, respectively, does she have?

ANSWER: DIMES = 10; QUARTERS = 5

TOSS-UP

24) GENERAL SCIENCE *Short Answer* What is the common term for the most accepted theory on how the universe came into being?

ANSWER: BIG BANG

BONUS

24) GENERAL SCIENCE *Short Answer* What letter is most often used by scientists as a symbol for light or the speed of light?

ANSWER: C

TOSS-UP

25) LIFE SCIENCE *Short Answer* What glands of the human body are most responsible for producing what is sometimes called the stress hormone cortisol?

ANSWER: ADRENALS (ACCEPT: ADRENAL CORTEX)

BONUS

25) LIFE SCIENCE *Short Answer* Name all of the following 3 choices that are common functions of feathers on birds: thermal insulation; sexual selection; flight

ANSWER: ALL