

ROUND 4

TOSS-UP

- 1) PHYSICS *Short Answer* In a standing wave of a vibrating string, what are the points of destructive interference most commonly called?

ANSWER: NODES

BONUS

- 1) PHYSICS *Multiple Choice* An inelastic collision is most accurately defined as one in which:
- W) momentum and kinetic energy are conserved
 - X) momentum is conserved and kinetic energy is not
 - Y) momentum is not conserved and kinetic energy is conserved
 - Z) neither momentum nor kinetic energy are conserved

ANSWER: X) MOMENTUM IS CONSERVED AND KINETIC ENERGY IS NOT

TOSS-UP

- 2) CHEMISTRY *Multiple Choice* Which of the following is considered a polar molecule:
- W) CH₄
 - X) BH₃
 - Y) CO₂
 - Z) H₂S

ANSWER: Z) H₂S

BONUS

- 2) CHEMISTRY *Short Answer* Finish balancing the following equation: Fe₂O₃ + 3H₂ yields what, assuming the iron is totally reduced:

ANSWER: 2Fe + 3H₂O

TOSS-UP

- 3) **BIOLOGY** *Short Answer* Thomas Morgan helped in the early rapid advancement of genetics primarily by using what organism?

ANSWER: FRUIT FLY (ACCEPT: DROSOPHILA MALANOGASTER OR DROSOPHILA)

BONUS

- 3) **BIOLOGY** *Multiple Choice* In what part of the human body is the anterior fontanelle located:

- W) head
- X) knee
- Y) elbow
- Z) ankle

ANSWER: W) HEAD

TOSS-UP

- 4) **ASTRONOMY** *Short Answer* What is Saturn's biggest moon?

ANSWER: TITAN

BONUS

- 4) **ASTRONOMY** *Short Answer* What planet is 17.2 times the mass of the Earth, has a year 164 times as long as the Earth, and has a diameter of 49,528 kilometer?

ANSWER: NEPTUNE

TOSS-UP

- 5) MATH *Short Answer* What is the tangent of the angle θ (read as: theta) whose terminal side passes through the point (4, -3)?

ANSWER: $-3/4$ (ACCEPT: $-.75$)

(Solution: $\tan = y/x$)

BONUS

- 5) MATH *Multiple Choice* The perimeter of triangle ABC is 16, side AB = 6 and side BC = 4. What is the area of the triangle?

- W) $4\sqrt{2}$
- X) $8\sqrt{2}$
- Y) $9\sqrt{3}$
- Z) $4\sqrt{3}$

ANSWER: X) $8\sqrt{2}$

(Solution: $BC=6$, thus an isosceles; $h^2 + 2^2 = 6^2$; $h = 4\sqrt{2}$; $A = 1/2 (4)(4\sqrt{2})$; $= 8\sqrt{2}$)

TOSS-UP

- 6) EARTH SCIENCE *Multiple Choice* The circulation of water in the Hydrologic System is driven by:

- W) potential energy
- X) solar energy
- Y) kinetic energy
- Z) wind energy

ANSWER: X) SOLAR ENERGY

BONUS

- 6) EARTH SCIENCE *Short Answer* Most of the natural greenhouse warming, nearly 97%, is caused by the presence of what gas in the atmosphere?

ANSWER: WATER VAPOR (ACCEPT: WATER)

TOSS-UP

- 7) GENERAL SCIENCE *Multiple Choice* The leaf of the Quaking Aspen tree is considered to be:
- W) simple lobed
 - X) pinnately (Pron: pin-ate-lee) lobed
 - Y) palmately (Pron: palm-ate-lee) lobed
 - Z) simple toothed

ANSWER: Z) SIMPLE TOOTHED

BONUS

- 7) GENERAL SCIENCE *Multiple choice* Which of the following is an example of a suspended load being carried downstream:
- W) silt
 - X) boulders
 - Y) sand
 - Z) cobbles

ANSWER: W) SILT

TOSS-UP

- 8) COMPUTER SCIENCE *Short Answer* If a computer has an 8-bit bus, how many bytes of information can travel at a time?

ANSWER: 1

BONUS

- 8) COMPUTER SCIENCE *Multiple Choice* A gigabyte is how many bytes:
- W) 2^{10}
 - X) 2^{20}
 - Y) 2^{30}
 - Z) 2^{40}

ANSWER: Y) 2^{30}

TOSS-UP

- 9) PHYSICS *Short Answer* When Archimedes said, "Give me a place to stand and I will move the world!", what simple machine was he going to use?

ANSWER: A LEVER

BONUS

- 9) PHYSICS *Short Answer* How long will it take a chipmunk to cross a street 10 meters wide if it accelerates from rest at a constant 5 meters per second squared?

ANSWER: 2 SECONDS

TOSS-UP

- 10) CHEMISTRY *Multiple Choice* Which of the following elements does not participate in strong hydrogen bonding:

- W) oxygen
- X) nitrogen
- Y) fluorine
- Z) carbon

ANSWER: Z) CARBON

BONUS

- 10) CHEMISTRY *Short Answer* If 1.0 gram of NaOH, with a molar mass of 40, is dissolved in enough water to give 250 milliliters of solution, what is the molarity of the solution?

ANSWER: 0.1 MOLAR (ACCEPT: 0.1 MOLES/LITER)

(Solution: $1 \text{ g} (1 \text{ mole} / 40 \text{ g}) = 0.025$; $0.025 \text{ moles} / .250 \text{ L} = 0.1 \text{ M}$)

TOSS-UP

- 11) **BIOLOGY** *Short Answer* What is the most common biochemical term for the biosynthetic phases of metabolism?

ANSWER: ANABOLISM

BONUS

- 11) **BIOLOGY** *Multiple Choice* At which of the following wavelengths does chlorophyll absorb the most:

- W) 450 and 600 nanometers
- X) 500 and 650 nanometers
- Y) 450 and 675 nanometers
- Z) 550 nanometers only

ANSWER: Y) 450 AND 675 NANOMETERS

TOSS-UP

- 12) **ASTRONOMY** *Short Answer* The statement that, “The path of each planet about the sun is an ellipse with the sun at one focus” is best known as what law?

ANSWER: KEPLER’S 1ST LAW

BONUS

- 12) **ASTRONOMY** *Short Answer* The star Sirius was referred to by what common name by mariners of the 19th century?

ANSWER: DOG STAR

TOSS-UP

13) MATH *Short Answer* In an equilateral triangle, each angle measures how many degrees?

ANSWER: 60°

BONUS

13) MATH *Short Answer* Subtract the following 2 polynomials:
 $(5x^2y + x^3y^2 + 2x^2y^3 + 3y) - (5x^2y - 4x^3y^2 + x^2y^2 - 2y)$

ANSWER: $5x^3y^2 + 2x^2y^3 - x^2y^2 + 5y$

TOSS-UP

14) EARTH SCIENCE *Short Answer* What is the general term used to describe an earthquake that follows an initial earthquake and has its epicenter near a larger earthquake?

ANSWER: AFTERSHOCK

BONUS

14) EARTH SCIENCE *Multiple Choice* A subduction zone occurs along which type of plate margin:

- W) divergent
- X) convergent
- Y) transform
- Z) spreading center

ANSWER: X) CONVERGENT

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* The Earth's climate has been warming since the last glacial period which ended about how many years ago:

- W) 10,000 – 20,000
- X) 30,000 – 40,000
- Y) 50,000 – 60,000
- Z) 75,000 – 100,000

ANSWER: W) 10,000 – 20,000

BONUS

15) GENERAL SCIENCE *Short Answer* What pioneer bacteriologist in 1905 won the Nobel Prize for Physiology and Medicine for his work on tuberculosis and whose principles for investigating the causes of infectious diseases established clinical bacteriology as a medical science:

ANSWER: ROBERT KOCH (ACCEPT: KOCH)

TOSS-UP

16) COMPUTER SCIENCE *Multiple Choice* What keeps track of the time even when a computer is turned off:

- W) CPU clock
- X) time transport protocol
- Y) time division multiplexing
- Z) real-time clock

ANSWER: Z) REAL-TIME CLOCK

(Solution: CPU clock regulates the execution of instructions)

BONUS

16) COMPUTER SCIENCE *Short Answer* A condition of a computer's disk in which files are divided into pieces scattered around the disk is called:

ANSWER: FRAGMENTATION (ACCEPT: FRAGMENTED) (DO NOT ACCEPT: DEFRAGMENTED)

TOSS-UP

- 17) PHYSICS *Multiple Choice* According to Archimedes' Principle, a rock sinks in water because the displaced water:
- W) takes up less volume than the rock
 - X) takes up more volume than the rock
 - Y) weighs less than the rock
 - Z) weighs more than the rock

ANSWER: Y) WEIGHS LESS THAN THE ROCK

BONUS

- 17) PHYSICS *Short Answer* By 1733, what scientist, in his treatise on hydrodynamics, applied conservation of mechanical energy and found that as temperature changes, pressure changes with the square of the particle velocities?

ANSWER: DANIEL BERNOULLI (ACCEPT: BERNOULLI)

TOSS-UP

- 18) CHEMISTRY *Short Answer* What is the name for one of the most central concepts of chemical equilibria, which states that a change in one of the variables that describes a system at equilibrium produces a shift in the position of the equilibrium that counteracts the effect of the change:

ANSWER: LECHATELIER'S PRINCIPLE

BONUS

- 18) CHEMISTRY *Short Answer* A compound with a molecular weight of 100 has a density of 0.60 grams per milliliter at 25°C. To the nearest whole number, how many milliliters would you use if you needed 42 grams?

ANSWER: 70

(Solution: $(0.60 \text{ g/ml})(x) = 42\text{g}$; $x = 42\text{g}/0.6 \text{ g/ml} = 70\text{ml}$)

TOSS-UP

19) **BIOLOGY** *Multiple Choice* Which of the following organisms belongs to the Class Diplopoda: (Pron: dip-low-po-dah)

- W) millipedes
- X) centipedes
- Y) grasshoppers
- Z) ticks

ANSWER: W) MILLIPEDES

BONUS

19) **BIOLOGY** *Short Answer* What is the most common collective name for the leaf tissue which is immediately interior to the epidermis:

ANSWER: MESOPHYLL (ACCEPT: SPONGY MESOPHYLL OR PALISADE MESOPHYLL)

TOSS-UP

20) **MATH** *Multiple Choice* Of the following sets of numbers, which cannot represent the sides of a triangle:

- W) 7, 7, 7
- X) 6, 15, 21
- Y) 5, 10, 11
- Z) 3, 10, 11

ANSWER: X) 6, 15, 21

(Solution: The sum of the lengths of any two sides of a triangle must exceed the length of the third side)

BONUS

20) **MATH** *Short Answer* Solve the following inequality: $\frac{4}{5} - 3x > -\frac{1}{3} - 2x$

ANSWER: $x < \frac{17}{15}$ (ACCEPT: $\frac{17}{15} > x$ OR $1.13 > x$)

TOSS-UP

21) EARTH SCIENCE *Multiple Choice* A major break through in the development of plate tectonic theory occurred in the late 1960s with sea floor mapping by:

- W) satellite imagery
- X) magnetic characteristics
- Y) aerial photography
- Z) water depth by soundings

ANSWER: X) MAGNETIC CHARACTERISTICS

BONUS

21) EARTH SCIENCE *Short Answer* A large area of extremely flat deep seafloor lying near a continent and generally ranging in depth below sea level from 3 to 6 kilometers is called what?

ANSWER: ABYSSAL PLAIN

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Rickets is commonly due to a severe and chronic deficiency in what vitamin:

- W) vitamin C
- X) thiamine
- Y) vitamin D
- Z) niacin

ANSWER: Y) VITAMIN D

BONUS

22) GENERAL SCIENCE *Short Answer* What French chemist in 1888 stated that every change in one of the factors of an equilibrium brings about a rearrangement of the system in such a direction as to counteract the original change:

ANSWER: HENRI-LOUIS LeCHATELIER (ACCEPT: LeCHATELIER)

TOSS-UP

- 23) PHYSICS *Short Answer* What principal, enunciated in 1927, was to that date the most direct challenge to the deterministic nature of the universe?

ANSWER: HEISENBERG'S UNCERTAINTY PRINCIPAL (ACCEPT: INDETERMINANCY PRINCIPAL)

BONUS

- 23) PHYSICS *Short Answer* According to the standard model, all forces are due to the underlying interaction of particles. What are the four interactions most often called?

ANSWER: GRAVITATIONAL, ELECTROMAGNETIC, STRONG AND WEAK (ACCEPT: GRAVITY, ELECTROMAGNETISM, STRONG AND WEAK)

TOSS-UP

- 24) CHEMISTRY *Multiple Choice* Of the following four elements, which has the lowest abundance in the earth's crust:

- W) iron
- X) magnesium
- Y) phosphorus
- Z) calcium

ANSWER: Y) PHOSPHORUS

BONUS

- 24) CHEMISTRY *Short Answer* What is the pH of a solution at 25°C with a hydronium ion concentration of 1×10^{-4} moles per liter?

ANSWER: 4

TOSS-UP

25) **BIOLOGY** *Short Answer* What is the common term used to describe a fatty acid that has no double bonds between carbons?

ANSWER: SATURATED (DO NOT ACCEPT: UNSATURATED)

BONUS

25) **BIOLOGY** *Short Answer* *Malus floribundus* (Pron: mal-us floor-a-bund-us) and *Malus sylvestris* (Pron: mal-us sil-vest-rus) are the genera and species of what common tree?

ANSWER: APPLE