

ROUND 9

TOSS-UP

1) CHEMISTRY *Multiple Choice* The so-called d-block elements of the periodic table constitute the:

- W) lanthanide and actinide series
- X) transition metals
- Y) group 3A to 8A elements
- Z) group 1A and 2A elements

ANSWER: X) TRANSITION METALS

BONUS

1) CHEMISTRY *Short Answer* In any order, give the full names of any 4 metalloids:

ANSWER: BORON; SILICON; GERMANIUM; ARSENIC; ANTIMONY; TELLURIUM; ASTATINE

TOSS-UP

2) PHYSICS *Short Answer* What is the most common term used to describe the velocity equal to the average velocity in the limit that the measurement time period approaches zero?

ANSWER: INSTANTANEOUS VELOCITY

BONUS

2) PHYSICS *Short Answer* How long will it take a squirrel to run straight down a tree trunk 18 meters long if it accelerates from a stop at 4 meters/sec²?

ANSWER: 3 SECONDS

(Solution: $t = \sqrt{2\Delta x/a} = \sqrt{9} = 3$)

TOSS-UP

3) BIOLOGY *Short Answer* What gland in humans is the primary producer of melatonin?

ANSWER: PINEAL GLAND

BONUS

3) BIOLOGY *Multiple Choice* An example of negative feedback control is when:

- W) thyroid hormone interrupts the stimulation of the thyroid by TSH
- X) the initial enzyme of a metabolic pathway inhibits a later reaction
- Y) FSH inhibits progesterone production by the corpus luteum
- Z) the initial product of a metabolic pathway inhibits the next reaction

ANSWER: W) THYROID HORMONE INTERRUPTS THE STIMULATION OF THE THYROID BY TSH

TOSS-UP

4) ASTRONOMY *Short Answer* According to Kepler's second Law of planetary motion, in which season in North America does the Earth currently move the fastest in its orbit about the Sun?

ANSWER: WINTER

BONUS

4) ASTRONOMY *Short Answer* What is the brightest star in the Northern sky?

ANSWER: ARCTURUS (ACCEPT: ALPHA BOÖTES)

TOSS-UP

5) MATH *Short Answer* What is the most common name for the theorem proved by Gauss which states that “every polynomial of degree $n \geq 1$ with real or complex coefficients has n real or complex roots”?

ANSWER: THE FUNDAMENTAL THEOREM OF ALGEBRA

BONUS

5) MATH *Short Answer* Simplify the following fractional radicand to an expression that has the lowest whole number radicand: $\sqrt{\frac{2}{3}}$

ANSWER: $\frac{1}{3}\sqrt{6}$

TOSS-UP

6) EARTH SCIENCE *Short Answer* Which body wave can travel at the greatest velocity of all the seismic waves?

ANSWER: P-WAVES (ACCEPT: PRIMARY WAVE OR COMPRESSION/EXPANSION WAVES)

BONUS

6) EARTH SCIENCE *Multiple Choice* The earth's outer core is interpreted to be liquid because:

- W) S-waves don't travel through liquid
- X) S-waves are faster than P-waves
- Y) S-waves don't travel through gases
- Z) P-waves don't travel through liquids

ANSWER: W) S-WAVES DON'T TRAVEL THROUGH LIQUID

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* If you need to measure 100 milliliters in an Erlenmeyer flask that has a stated volume of 100 ml but has no calibration lines, typically the stated volume will approximately fill to:

- W) the top rim of the flask
- X) where the neck attaches to the flask
- Y) 1 centimeter below the where the neck attaches to the flask
- Z) there is no safe way to approximate 100 ml in such a flask

ANSWER: X) WHERE THE NECK ATTACHES TO THE FLASK

BONUS

7) GENERAL SCIENCE *Short Answer* The ratio of total leaf surface area to the total ground surface area covered by the leaves is known as what?

ANSWER: LEAF AREA INDEX (ACCEPT: LAI)

TOSS-UP

8) COMPUTER SCIENCE *Multiple Choice* Which of the following best describes a router:

- W) segments an existing network
- X) provides the network address for the PC
- Y) manages traffic on the network by filtering data
- Z) controls the flow of data between 2 or more separate networks

ANSWER: Z) CONTROLS THE FLOW OF DATA BETWEEN 2 OR MORE SEPARATE NETWORKS

(Solution: W & Y = bridge; X = NIC)

BONUS

8) COMPUTER SCIENCE *Short Answer* A network technology based on transferring data in cells or packets, what does the acronym ATM stand for?

ANSWER: ASYNCHRONOUS TRANSFER MODE (DO NOT ACCEPT: AUTOMATED TELLER MACHINE)

TOSS-UP

9) CHEMISTRY *Multiple Choice* One standard atmosphere of pressure is equal to how many Pascals:

- W) 760
- X) 1,325
- Y) 10,325
- Z) 101,325

ANSWER: Z) 101,325

BONUS

9) CHEMISTRY *Short Answer* In order of increasing energy, number and designate all the subshells in the 4th electron shell:

ANSWER: 4s, 4p, 4d, 4f (ACCEPT: s, p, d, f)

TOSS-UP

10) PHYSICS *Multiple Choice* Rutherford discovered that x-rays were produced by:

- W) uranium when bombarded with slow neutrons
- X) certain binary stars
- Y) particles emitted by a cathode, which then struck an anode
- Z) the sun

ANSWER: Y) PARTICLES EMITTED BY A CATHODE, WHICH THEN STRUCK AN ANODE

BONUS

10) PHYSICS *Short Answer* Which 3 of the following 4 are vector quantities: velocity, acceleration, speed, magnetic field

ANSWER: VELOCITY, ACCELERATION, MAGNETIC FIELD

(Solution: speed has no directional component)

TOSS-UP

11) BIOLOGY *Multiple Choice* Which of the following is NOT a Rickettsial disease:

- W) Q fever
- X) Scrub Typhus
- Y) Rocky Mountain Spotted Fever
- Z) Relapsing fever

ANSWER: Z) RELAPSING FEVER

BONUS

11) BIOLOGY *Multiple Choice* Which of the following vegetations is NOT properly matched with its location:

- W) boreal coniferous forest and Midwestern Canada
- X) rain forest and the Olympic National Forest
- Y) Saguaro desert and the Southwestern US
- Z) Taiga and the Northeastern US

ANSWER: Z) TAIGA AND THE NORTHEASTERN US

TOSS-UP

12) ASTRONOMY *Short Answer* Which planet is 14.5 times the Earth's mass, has a rotational rate of 17.2 hours, and a year length of 84 Earth years?

ANSWER: URANUS

BONUS

12) ASTRONOMY *Short Answer* What are generally considered the most common and most primitive type of meteorites?

ANSWER: CHONDRITES

TOSS-UP

13) MATH *Short Answer* Simplify the ratio of the following factorial: $\frac{4!}{6!}$ (read as: 4 factorial divided by 6 factorial)

ANSWER: 1/30 (ACCEPT: 0.033)

BONUS

13) MATH *Short Answer* A recipe calls for flour, sugar and butter to be mixed in a ratio of 7 to 5 to 2, respectively. Assuming there is enough sugar and butter to use all the flour and 20 pounds of flour is available, how many pounds of the mixture can be made?

ANSWER: 40

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* Which one of the following was NOT formed by the deposition of sediment by a glacial stream:

- W) outwash plain
- X) kame
- Y) moraine
- Z) esker

ANSWER: Y) MORAINE

BONUS

14) EARTH SCIENCE *Multiple Choice* Closely spaced isobars on a weather map most directly indicate which of the following weather-related events:

- W) calm conditions
- X) windy conditions
- Y) a gentle pressure gradient
- Z) torrential rainfall

ANSWER: X) WINDY CONDITIONS

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Most plants absorb nitrogen from the soil through their roots in which of the following forms:

- W) dinitrogen
- X) ammonia
- Y) ammonium
- Z) nitrate

ANSWER: Z) NITRATE

BONUS

15) GENERAL SCIENCE *Multiple Choice* Which of the following is NOT a fat-soluble vitamin:

- W) vitamin K
- X) vitamin A
- Y) vitamin D
- Z) biotin

ANSWER: Z) BIOTIN

TOSS-UP

16) COMPUTER SCIENCE *Short Answer* If a computer has a 64-bit bus, how many bytes of information can travel across it at the same time?

ANSWER: 8

BONUS

16) COMPUTER SCIENCE *Multiple Choice* What type of chip is commonly used to store the BIOS in a PC:

- W) ROM
- X) DAT
- Y) DOS
- Z) FAT

ANSWER: W) ROM

TOSS-UP

17) CHEMISTRY *Multiple Choice* An amine is a class of compounds that contains a:

- W) sulfur and hydrogen group
- X) nitrogen and oxygen group
- Y) nitrogen and hydrogen group
- Z) carbon and sulfur group

ANSWER: Y) NITROGEN AND HYDROGEN GROUP

BONUS

17) CHEMISTRY *Short Answer* An element with an electron configuration of 2-8-8-2 is found in what Period and main Group number on the Periodic Chart?

ANSWER: PERIOD 4 AND GROUP 2 (ACCEPT: PERIOD 4 AND GROUP 2A)

TOSS-UP

18) PHYSICS *Short Answer* In 1885, Johann Balmer derived the formula for the 4 spectral line of what element?

ANSWER: HYDROGEN

BONUS

18) PHYSICS *Short Answer* Which lower case letter is most typically used to denote Planck's constant?

ANSWER: h

TOSS-UP

19) BIOLOGY *Multiple Choice* Which of the following is a member of the Hirudinea:
(pronounced: high-rue-DIN-E-A)

- W) earthworm
- X) centipede
- Y) leech
- Z) chelicerae (read as: chell-IS-err-aye)

ANSWER: Y) LEECH

BONUS

19) BIOLOGY *Short Answer* When successive beats of the heart result in an increased end-diastolic volume leading to optimal sarcomere length for strength of contraction, it is most commonly referred to by the name of what law:

ANSWER: THE FRANK-STARLING LAW

TOSS-UP

20) ASTRONOMY *Multiple Choice* Which of the following was NOT known to be a planet until 1781 AD:

- W) Saturn
- X) Venus
- Y) Mercury
- Z) Uranus

ANSWER: Z) URANUS

BONUS

20) ASTRONOMY *Short Answer* What law states that the total amount of energy radiated per unit time from the surface of a body is related to the fourth power of its temperature?

ANSWER: STEFAN-BOLTZMANN LAW (ACCEPT: STEFAN'S LAW)

TOSS-UP

21) MATH *Short Answer* A statistician who computes the standard deviation of a set of sample means is computing what statistical quantity?

ANSWER: STANDARD ERROR OF THE MEAN (ACCEPT: STANDARD ERROR)

BONUS

21) MATH *Short Answer* Name 2 consecutive ODD integers where 5 times the second number minus 6 times the first number equals -55:

ANSWER: -65 AND -67 (must be in order)

(Solution: $5(n+2) - 6n = -55$; $5n + 10 - 6n = -55$; $-n = -65$; $n = 65$; but the ans. must be negative)

TOSS-UP

22) GENERAL SCIENCE *Multiple Choice* Recent evidence shows which to be the best advice for a person suffering from recurrent kidney stones:

- W) decrease their intake of calcium-rich foods
- X) increase their intake of calcium-rich foods
- Y) increase their intake of oxalate-rich foods
- Z) decrease their intake of magnesium-rich foods

ANSWER: X) INCREASE THEIR INTAKE OF CALCIUM-RICH FOODS

(Solution: the Ca is thought to bind with oxalates in the intestine, keeping it from entering the bloodstream)

BONUS

22) GENERAL SCIENCE *Multiple Choice* A lens defect resulting from its inability to bring all wavelengths of light into the same plane of focus is called:

- W) barrel distortion
- X) astigmatism
- Y) chromatic aberration
- Z) spherical aberration

ANSWER: Y) CHROMATIC ABERRATION

TOSS-UP

23) CHEMISTRY *Multiple Choice* Which metal acts at the anode in mercury batteries that are commonly found in cameras and watches:

- W) mercury
- X) mercury (II) oxide
- Y) zinc
- Z) lithium

ANSWER: Y) ZINC

BONUS

23) CHEMISTRY *Short Answer* In the periodic table, what are elements 58 through 71 classified as?

ANSWER: LANTHANIDES (ACCEPT: LANTHANIDE SERIES OR INNER TRANSITION METALS OR RARE EARTH ELEMENTS)

TOSS-UP

24) PHYSICS *Short Answer* How far, in kilometers, will the runner travel in five hours on a straight path if her average speed is 9 kilometers per hour?

ANSWER: 45 KM

(Solution: $(9 \text{ km/h}) (5 \text{ h}) = 45 \text{ km}$)

BONUS

24) PHYSICS *Multiple Choice* Which of the following forms of radioactive decay does NOT alter the atomic number of an element:

- W) alpha
- X) beta minus
- Y) beta plus
- Z) gamma

ANSWER: Z) GAMMA

TOSS-UP

25) BIOLOGY *Multiple Choice* Which of the following genera of plants contains a species that traps and digests insects:

- W) *Ulmus*
- X) *Nepenthes* (pronounced: neh-PEN-thes)
- Y) *Lupinus* (pronounced : lew-PIE-nus)
- Z) *Psilotum* (pronounced : sill-O-tum)

ANSWER: X) *NEPENTHES*

BONUS

25) BIOLOGY *Multiple Choice* Thalassemia (pronounced: thal-ah-SEE-me-ah) and Marfan Syndrome are both which of the following types of diseases:

- W) virus-related diseases
- X) bacteria-related diseases
- Y) toxic-exposure diseases
- Z) inherited disorders

ANSWER: Z) INHERITED DISORDERS