

TOSS-UP

1. ASTRONOMY: Short Answer: "Hypercrionius" and "Georgian Star" were just two of the names proposed in 1781 to describe what object, along with the name "Herschel" in honor of its discoverer, astronomer Sir William Herschel?

ANSWER: the planet Uranus

BONUS

1. ASTRONOMY: Short Answer: Give the 2-word term for the area just outside a black hole that you cannot escape from, no matter how hard you try.

ANSWER: event horizon

TOSS-UP

2. BIOLOGY: Short Answer: One of its types is found in ribosomes, while another carries amino acids to the ribosomes. Single-stranded viruses with its label include the polio virus and various retroviruses. Name this material that uses uracil [YUR-a-sill] instead of thymine.

ANSWER: ribonucleic acid or RNA

BONUS

2. BIOLOGY: Short Answer: It takes place in the cell body and forms the backbone of cellular respiration. Name this process that turns glucose into pyruvate.

ANSWER: glycolysis [gly-CALL-a-sis]

TOSS-UP

3. MATH: Multiple Choice: The mathematical curve known as a “cardioid” [KAR-dee-oyd] is called that because it looks like what part of the human body?

- W) brain
- X) heart
- Y) ribcage
- Z) foot

ANSWER: X) heart

BONUS

3. MATH: Short Answer: Calculate the dot product of Vector A and Vector B if Vector A is $(2i + 3j + 4k)$ and Vector B is $(3i - 2j + 2k)$.

ANSWER: 8 ($6 - 6 + 8$)

TOSS-UP

4. PHYSICS: Multiple Choice: Counting the zeroth law, how many laws of thermodynamics are there?

- W) 3
- X) 4
- Y) 5
- Z) 6

ANSWER: X) 4

BONUS

4. PHYSICS: Short Answer: Many types of sunglasses reduce glare by filtering out all light that does not vibrate at a certain angle. Give the term for the type of material used to do this filtering.

ANSWER: polarizer (accept forms of the word)

TOSS-UP

5. GENERAL SCIENCE: Multiple Choice: What condition that usually accompanies an injury can be treated with first aid by remembering the phrase, "If the face is red, you raise the head; if the face is pale, you raise the tail" ?

- W) heatstroke
- X) shock
- Y) sunburn
- Z) rigor mortis

ANSWER: **X) shock**

BONUS

5. GENERAL SCIENCE: Short Answer: During 2003, the FDA announced manufacturers must now acknowledge how much of it their products contain. Name this substance, found in most snack foods, that may contribute to heart disease.

ANSWER: **trans fatty acids**

TOSS-UP

6. CHEMISTRY: Short Answer: It has been used to enhance the red color of wine and is still used as an active ingredient in many laxatives. Name this substance used in chemistry lab because it remains colorless in an acid solution but turns dark red in a base.

ANSWER: **phenolphthalein** (fa-NOLF-tha-leen or fee-nul-THAY-leen)

BONUS

6. CHEMISTRY: Multiple Choice: What chemical term describes a hydrocarbon compound that has an attached OH group?

- W) ketone
- X) alkane
- Y) ester
- Z) alcohol

ANSWER: **alcohol**

TOSS-UP

7. EARTH SCIENCE: Short Answer: The Gutenberg discontinuity separates it from the core, while the Moho discontinuity separates it from the crust. Identify this intermediate layer of the earth.

ANSWER: mantle

BONUS

7. EARTH SCIENCE: Short Answer: Its discovery allowed Japan to send gas-filled balloon bombs to the northwestern United States during World War II. Name this narrow band of very fast wind in the upper troposphere, used by high-flying aircraft to speed their journey.

ANSWER: jet stream

TOSS-UP

8. MATH: Short Answer: Draw two horizontal parallel lines AC and DF (with A and D on the left), and a transversal line GH crossing them both (with G at the top). AC and GH intersect at point B, while DF and GH intersect at point E. In this diagram, what is the relationship between the congruent angles ABG and CBE?

ANSWER: vertical angles

BONUS

8. MATH: Multiple Choice: In the same diagram, the angles GBC and DEH are

- W) alternate exterior angles
- X) alternate interior angles
- Y) corresponding angles
- Z) supplementary angles

ANSWER: W) alternate exterior angles

TOSS-UP

9. BIOLOGY: Short Answer: Found mainly in California, one of its specimens is more than 3,500 years old. Name this type of tree with one species called the “redwood” that shares its name with a 19th-century Cherokee Indian.

ANSWER: sequoia

BONUS

9. BIOLOGY: Short Answer: All adult members of this group have a pentaradial body organization. What phylum of animals has five main classes that include sea lilies, sand dollars, sea cucumbers, and two types of starfish?

ANSWER: echinoderms or Echinodermata

TOSS-UP

10. CURRENT EVENTS: Multiple Choice: The Chinese city of Guangzhou [gwong-ZHO] tried to do their part to prevent SARS in 2004 by killing thousands of local civets [SIV-utz] thought to spread the disease. What kind of animal is a civet?

- W) a snake
- X) a lizard
- Y) a cat
- Z) a rat

ANSWER: Y) a cat

BONUS

10. CURRENT EVENTS: Short Answer: In March 2004, scientists announced the discovery of the most remote object known to orbit the sun. Identify this planetoid, named for the Inuit [IN-oo-ut] goddess who created the sea.

ANSWER: Sedna

TOSS-UP

11. ASTRONOMY: Multiple Choice: You would find the Sea of Nectar, Sea of Muscoy, Sea of Cold and Sea of Showers on:

- W) Venus
- X) the moon
- Y) Jupiter
- Z) Mercury

ANSWER: **X) the moon**

BONUS

11. ASTRONOMY: Short Answer: It is partly named for Johann Titius [TISH-us], who first noticed that the semi-major axes of the orbits of the known planets fit the equation $0.4 + (0.3)2^n$, where $n = 1$ describes the Earth. What scientist is this concept more popularly named for?

ANSWER: **Bode's Law**

TOSS-UP

12. GENERAL SCIENCE: Multiple Choice: The 100th anniversary of his birth was marked in 2003. Name this doctor famous for his 1946 book *Common Sense Book of Baby and Child Care*.

- W) Robert Atkins
- X) Phil McGraw
- Y) Benjamin Spock
- Z) William Sears

ANSWER: **Y) Benjamin Spock**

BONUS

18. GENERAL SCIENCE: Short Answer: It is made commercially from the whey used in creating cheese. Name this type of sugar contained in cow's milk that causes stomach trouble for humans who can't "tolerate" it.

ANSWER: **lactose**

TOSS-UP

13. CHEMISTRY: Multiple Choice: If a mole of water, H_2O , weighs 18 grams, what fraction of that weight is made up of the oxygen atoms?

- W) 8/9
- X) 7/8
- Y) 1/3
- Z) 1/9

ANSWER: **W) 8/9** (16/18)

BONUS

13. CHEMISTRY: Short Answer: Lactic acid fits this description because its two possible structures cannot be superimposed over each other. Name this concept that allows some organic compounds to be termed "left-handed" or "right-handed."

ANSWER: **chirality** [ky-RAL-a-tee]

TOSS-UP

14. PHYSICS: Multiple Choice: Calculate the equivalent resistance when a resistor of 10 ohms and another of 15 ohms are placed in parallel with each other.

- W) 6 ohms
- X) 25 ohms
- Y) 50 ohms
- Z) 150 ohms

ANSWER: **W) 6 ohms** ($[10 \times 15] / [10 + 15]$)

BONUS

14. PHYSICS: Short Answer: It calculates the value of an unknown resistor by changing one of its three known resistors. What instrument named for a British physicist features four resistors connected in the shape of a diamond?

ANSWER: **Wheatstone bridge**

TOSS-UP

15. MATH: Short Answer: What is the radius of the circle represented by the equation $x^2 + y^2 = 121$?

ANSWER: 11 units

BONUS

15. MATH: Short Answer: If $y = \cos 2x$, calculate the derivative of y with respect to x .

ANSWER: $-2 \sin 2x$

TOSS-UP

16. BIOLOGY: Short Answer: Recent studies show that one dose of doxycycline [dox-a-SIGH-klin] will kill this illness caused by *Borrelia burgdorferi* [bo-REE-lee-a burg-DORF-a-ree]. What disease, discovered in the northeastern United States, is carried by infected deer ticks?

ANSWER: Lyme disease

BONUS

16. BIOLOGY: Short Answer: Once marketed as a sedative even for children, it is now used to treat AIDS, cancer and leprosy. Name this drug that became infamous in the 1960's after it was linked to birth defects in some 10,000 babies.

ANSWER: thalidomide [tha-LID-a-mide]

TOSS-UP

17. EARTH SCIENCE: Multiple Choice: What mineral that turns yellow with age is a form of calcium phosphate that can be obtained from the whale, the walrus and the elephant?

- W) gneiss
- X) marble
- Y) chalcedony
- Z) ivory

ANSWER: Z) ivory

BONUS

17. EARTH SCIENCE: Multiple Choice: Name the blood-red mineral whose combination of mercury and sulfide makes it the only known ore of mercury.

- W) cinnabar
- X) sapphire
- Y) lapis lazuli
- Z) corundum

ANSWER: W) cinnabar

TOSS-UP

18. GENERAL SCIENCE: Short Answer: What scientific term describes any process carried out at a temperature below -183 degrees Celsius?

ANSWER: cryogenics

BONUS

12. GENERAL SCIENCE: Multiple Choice: Its Turkish species became so popular that it created a 17th-century bull market in Holland. What flower, at one point, cost as much as a ship?

- W) rose
- X) poinsettia
- Y) magnolia
- Z) tulip

ANSWER: Z) tulip

TOSS-UP

19. CHEMISTRY: Short Answer: When filling atomic orbitals, which orbitals are filled after 4s but before 4p?

ANSWER: 3d (or 3d₁₀)

BONUS

19. CHEMISTRY: Multiple Choice: In 2003, chemical element number 110 was officially named for what German city where it was created from fusing together a lead-atom nucleus and a nickel-atom nucleus?

- W) Hamburg
- X) Munich
- Y) Darmstadt
- Z) Berlin

ANSWER: Y) Darmstadt [DARM-shtot]

TOSS-UP

20. MATH: Short Answer: Give the TWO values of x that satisfy the equation $x^2 + 2x - 8 = 0$.

ANSWER: 2 and -4

BONUS

20. MATH: Multiple Choice: You want to find an old girlfriend by searching her phone number on the Internet, but all you know is the last 2 digits of her 7-digit number. Even though the first digit of the seven can't be 0 or 1, you'll still have to search how many different combinations of the 5 missing digits?

- W) 8,000
- X) 10,000
- Y) 32,768
- Z) 80,000

ANSWER: Z) 80,000 ($8 \times 10 \times 10 \times 10 \times 10$)

TOSS-UP

21. CURRENT EVENTS: Short Answer: Produced when sunlight hits water, it was discovered in February 2004 to exist in the atmosphere of Mars. Name this chemical compound with formula H_2O_2 .

ANSWER: hydrogen peroxide

BONUS

21. CURRENT EVENTS: Multiple Choice: One recent researcher claims Alexander the Great did not die of typhoid, but rather of what recently-notorious virus, marked in Alexander's day by a group of crows that suddenly fell dead in front of him?

- W) West Nile virus
- X) SARS
- Y) AIDS
- Z) the Ebola virus

ANSWER: W) West Nile virus

TOSS-UP

22. MATH: Short Answer: Weapons should be shot at this angle to fly the maximum horizontal distance from their origin. Identify this angle whose sine in the first quadrant is equal to its cosine.

ANSWER: 45°

BONUS

22. MATH: Short Answer: A kilobyte of computer memory is not exactly 1,000 bytes, but 2^{10} bytes. 32 kilobytes is actually 2^{15} bytes, which is how many?

ANSWER: 32,768

TOSS-UP

23. BIOLOGY: Multiple Choice: What biome contains a deep layer of soil that never thaws in the summer called "permafrost"?

- W) chaparral
- X) tundra
- Y) taiga
- Z) rain forest

ANSWER: X) tundra

BONUS

23. BIOLOGY: Multiple Choice: The protist kingdom is divided into two phyla: those organisms similar to animals (called "protozoa"), and those similar to plants, which are called:

- W) protists
- X) fungi
- Y) algae
- Z) mold

ANSWER: Y) algae

TOSS-UP

24. PHYSICS: Short Answer: What term represents the change of velocity with respect to time?

ANSWER: acceleration

BONUS

24. PHYSICS: Multiple Choice: What letter of the Greek alphabet generally denotes angular velocity?

- W) lambda
- X) mu
- Y) omega
- Z) beta

ANSWER: Y) omega (ω)

TOSS-UP

25. CHEMISTRY: Short Answer: Doctors use it to adjust dosages of medicine for their patients. In chemistry, it is often done by pouring one solution into another until either the solution or the litmus paper changes color. Name this technique, used to measure the amount of a substance that will completely react with a known reagent.

ANSWER: titration

BONUS

25. CHEMISTRY: Multiple Choice: The National Institute of Standards and Technology supervises America's national clock, now accurate to one second in twenty million years. What chemical element's atoms have helped define the length of one second since 1972?

- W) gallium
- X) strontium
- Y) neodymium
- Z) cesium [SEE-zee-um]

ANSWER: Z) cesium

END OF ROUND 2