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1. Biology

Toss Up: Multiple Choice

Global warming has been linked to a decrease in

- W) the size of polar icecaps
- X) temperature of Earth
- Y) rate of species extinction
- Z) rate of carbon dioxide production

Toss Up Answer: W

Bonus: Multiple Choice

Why is a mushroom a heterotroph?

- W) it manufactures its own food
- X) It divides by mitosis
- Y) It transforms light energy into chemical energy
- Z) It obtains nutrients from the environment

Bonus Answer: Z

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2. Earth and Space Science

Toss Up: Multiple Choice

Which of the following is a sedimentary rock?

- W) slate
- X) marble
- Y) basalt
- Z) sandstone

Toss Up Answer: Z

Bonus: Short Answer

What is the name for the outer shadow cast during eclipses, which gives rise to a partial eclipse?

Bonus Answer: Penumbra

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3. Chemistry

Toss Up: Multiple Choice

Choose the strongest acid from the choices below.

- W) Hydrochloric acid
- X) Hydrobromic acid
- Y) Hydroiodic acid
- Z) Hydrofluoric acid

Toss Up Answer: Y

Bonus: Short Answer

What are the conjugate bases of HCl, HBr, and HI?

Bonus Answer: Cl⁻, Br⁻, I⁻

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4. Physics

Toss Up: Short Answer

A 1-kilogram ball is thrown into the air with an initial velocity of 30 m/sec. How high in the air did it travel, assuming gravitational acceleration is 10m/s^2 ?

Toss Up Answer: 45 meters

Bonus: Short Answer

What is the velocity of an 500-kilogram elevator that has 4,000 joules of energy?

Bonus Answer: 4 m/sec

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5. Energy

Toss Up: Multiple Choice

In a typical power plant used to generate electricity in the U.S., the percentage of energy in the fuel that is converted to electricity is about:

W) 60%

X) 90%

Y) 20%

Z) 35%

Toss Up Answer: Z

Bonus: Short Answer

The Nuclear Waste Policy Act of 1982 and amendments require what

Federal agency to site, construct and operate a geologic repository for disposal of high-level nuclear waste?

Bonus Answer: U.S. Department of Energy

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6. Mathematics

Toss Up: Multiple Choice

Which of the following is true?

W) -1 is congruent to 1 modulo 5

X) -1 is congruent to 2 modulo 5

Y) -1 is congruent to 3 modulo 5

Z) -1 is congruent to 4 modulo 5

Toss Up Answer: Z

Bonus: Short Answer

Which is larger, 8^{10} or 3^{30}

Bonus Answer: 3^{30}

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7. Chemistry

Toss Up: Multiple Choice

A molecule is considered a lewis acid if

W) accepts a pair of electrons to form a bond

X) accepts a proton from water

Y) donates a pair of electrons to form a bond

Z) donates a proton to water

Toss Up Answer: W

Bonus: Multiple Choice

Which of the following is a binary compound?

- W) Hydrogen Sulfate
- X) Hydrogen Sulfide
- Y) Ammonium Sulfide
- Z) Ammonium Sulfate

Bonus Answer: X

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8. Physics

Toss Up: Short Answer

A rock is thrown downward from the top of a tower with an initial speed of 12 m/s. If the rock hits the ground after 2 s, what is the speed of the rock as it hits the ground if air resistance is negligible to the nearest whole number?

Toss Up Answer: 32 m/s

Bonus: Short Answer

Human reaction time is usually greater 0.10 s. If someone holds a ruler between your finger and thumb and releases it without warning, how far can you expect the ruler to fall before you catch in cm to the 10th place?

Bonus Answer: 4.9 cm (accept 5 cm)

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9. Mathematics

Toss Up: Short Answer

What is the derivative of x^2 ?

Toss Up Answer: 2x

Bonus: Short Answer

What is the derivative of $42x^2$

Bonus Answer: 84x

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10. Physics

Toss Up: Multiple Choice

Who did not have a unit of electrical measurement named after him?

- W) Voltaire
- X) Georg Ohm
- Y) Andre Ampere
- Z) Charles Coulomb

Toss Up Answer: W

Bonus: Short Answer

It converts electrical energy into electromagnetic radiation and vice versa. Name this device designed to transmit and receive radio waves.

Bonus Answer: Antenna

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11. Earth and Space Science

Toss Up: Short Answer

In what location is the majority of Earth's freshwater "locked up"?

Toss Up Answer: Antarctica

Bonus: Short Answer

What are the four terrestrial planets?

Bonus Answer: Earth, Mars, Mercury, Venus

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12. Physics

Toss Up: Multiple Choice

A standard 1-kg mass is attached to a compressed spring and the spring is released. If the mass initially has an acceleration of 5.6m/s^2 , the force of the spring has a magnitude of:

W) 0N

X) 2.8N

Y) 5.6N

Z) 11.2N

Toss Up Answer: Y

Bonus: Multiple Choice

A 42-kg man stands in an elevator that has a downward acceleration of 3.4m/s^2 . The force exerted by him on the floor is about:

W) 12N

X) 270N

Y) 340N

Z) 412N

Bonus Answer: X

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13. Chemistry

Toss Up: Short Answer

At room temperature, what is the only metal that is in liquid form?

Toss Up Answer: Mercury (Hg)

Bonus: Multiple Choice

What is the third most common gas found in the air in the atmosphere?

W) Argon

X) Hydrogen

Y) Oxygen

Z) Helium

Bonus Answer: W

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14. Biology

Toss Up: Multiple Choice

Protein digestion in humans begins in the

W) mouth

X) stomach

Y) small intestine

Z) large intestine

Toss Up Answer: X

Bonus: Short Answer

Which protein is responsible for protein digestion in the stomach?

Bonus Answer: pepsin (DO NOT accept: pepsinogen)

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15. Physics

Toss Up: Multiple Choice

In the absence of air resistance, the magnitude of the vertical component of a projectile's acceleration

W) is constant until the projectile hits the ground.

X) always decreases with time until the projectile hits the ground.

Y) is equal to the magnitude of the horizontal component of the projectile's acceleration.

Z) increases and/or decreases with time, depending on the projectile's velocity.

Toss Up Answer: W

Bonus: Multiple Choice

In the laboratory, the speed of sound is measured to be 344 meters per second, different from the actual value of 343 meters per second. What is the percent error in the measurement?

W) 1%

X) 1%

Y) 10%

Z) 0.30%

Bonus Answer: Z

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16. Mathematics

Toss Up: Short Answer

Using an x-y coordinate axis, a parabola is represented by the equation $x^2 = 6y$. The vertex of this parabola is at what coordinate point?

Toss Up Answer: (0,0)

Bonus: Short Answer

For a right triangle, the $\sin(A)$ is $\frac{3}{5}$. To what value is the $\tan(A)$ equal?

Bonus Answer: $\frac{3}{4}$

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17. Earth and Space Science

Toss Up: Short Answer

Which scientist came up with the laws of planetary motion?

Toss Up Answer: Kepler

Bonus: Short Answer

Which constellation is the star that remains stationary in northern hemisphere part of?

Bonus Answer: Ursa Minor
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18. Chemistry

Toss Up: Short Answer

What term describes the process when a solid phase changes directly to the gas phase?

Toss Up Answer: Sublimation

Bonus: Short Answer

The angle between any two boron-hydrogen bonds in a boron trihydride molecule is how many degrees?

Bonus Answer: 120 degrees
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19. Biology

Toss Up: Short Answer

Who discovered that DNA has equal amounts of adenine and thymine as well as equal amounts of guanine and cytosine?

Toss Up Answer: Accept Erwin Chargaff OR Chargaff

Bonus: Short Answer

What method was used to obtain Photograph 51, which was used to determine the structure of DNA?

Bonus Answer: X-ray diffraction
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20. Chemistry

Toss Up: Multiple Choice

What kind of process is the loss of electrons?

W) electrolysis

X) thermodynamically favored

Y) reduction

Z) oxidation

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following metals does not react with water to produce hydrogen?

W) Zn

X) Li

Y) Ca

Z) Na

Bonus Answer: W
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21. Earth and Space Science

Toss Up: Multiple Choice

The seasons we experience on the Earth are caused by

W) the change in the Earth's distance from the sun during the year

- X) the precession of the Earth's pole
- Y) the tilt of the Earth's axis with respect to the ecliptic pole
- Z) the change in the Moon's distance from the Earth during the year

Toss Up Answer: Y

Bonus: Multiple Choice

If we compare two stars of different temperature, the hotter star

- W) will appear redder
- X) emits more energy from each unit area of surface
- Y) will have a brighter apparent magnitude
- Z) will have a brighter absolute magnitude

Bonus Answer: X

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22. Mathematics

Toss Up: Multiple Choice

What conic section is described by the following: the intersection of a cone and some plane parallel to that cone's side such that that intersection is non-empty?

- W) Circle
- X) Parabola
- Y) A point
- Z) Ellipse

Toss Up Answer: X

Bonus: Short Answer

Respectively, give the vertex and the focus of the following parabola: $(y - 3)^2 = 8(x - 5)$?

Bonus Answer: vertex: (5,3); focus: (7,3)

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23. Earth and Space Science

Toss Up: Short Answer

What are lines on a topographic map that connect points at the same elevation called?

Toss Up Answer: Contour lines

Bonus: Multiple Choice

In which state is the most bituminous coal produced?

- W) Kentucky
- X) Pennsylvania
- Y) Wyoming
- Z) West Virginia

Bonus Answer: Z

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24. Mathematics

Toss Up: Short Answer

The surface area of a sphere is how many times the area of a circle?

Toss Up Answer: 4

Bonus: Short Answer

What is the total surface area of a cone, given l as the slant height?

Bonus Answer: $(\pi)r^2 + \pi rl$

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25. Biology

Toss Up: Multiple Choice

Which of these is not an accepted domain of life?

W) Archea

X) Bacteria

Y) Eukarya

Z) Protista

Toss Up Answer: Z

Bonus: Short Answer

What is the causative agent of Scrapie?

Bonus Answer: prion

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