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1. Biology

Toss Up: Short Answer

Which plant tissue conducts water from the roots to the leaves?

Toss Up Answer: Xylem

Bonus: Multiple Choice

Which system rids of nitrogenous waste?

- W) Digestive system
- X) Integumentary system
- Y) Respiratory system
- Z) Urinary system

Bonus Answer: Z

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2. Earth and Space Science

Toss Up: Multiple Choice

Which of the following renewable energy sources do not involve water

- W) Geothermal energy
- X) Hydroelectric power
- Y) Tidal power
- Z) Biomass

Toss Up Answer: Z

Bonus: Multiple Choice

Which gas is attributed to be the cause of ozone depletion

- W) Carbon dioxide
- X) Chlorofluorocarbons
- Y) Nitrogen
- Z) Methane

Bonus Answer: X

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3. Chemistry

Toss Up: Multiple Choice

Which of the following species is amphoteric?

- W) Na_3PO_4
- X) HSO_4^-
- Y) KOH
- Z) HNO_3

Toss Up Answer: X

Bonus: Short Answer

A 600-milliliter container holds 2 moles of $\text{O}_2(\text{g})$, 3 moles of $\text{H}_2(\text{g})$, and 1 mole of $\text{He}(\text{g})$. Total pressure within the container is 760 torr. What is the partial pressure of O_2 ?

Bonus Answer: 253 torr

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4. Physics

Toss Up: Multiple Choice

Which of the following bodies has the largest kinetic energy?

- W) Mass 3M and speed V
- X) Mass 3M and speed 2V
- Y) Mass 2M and speed 3V
- Z) Mass M and speed 4V

Toss Up Answer: Y

Bonus: Multiple Choice

AN object is constrained by a cord to move in a circular path of radius 0.5m on a horizontal frictionless surface. The cord will break if its tension exceeds 16N. The maximum kinetic energy the object can have is:

- W) 4J
- X) 8J
- Y) 17J
- Z) 32J

Bonus Answer: W

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5. Chemistry

Toss Up: Short Answer

What is the hybridization of CH₄?

Toss Up Answer: sp³

Bonus: Short Answer

What is the strongest intermolecular force in HF?

Bonus Answer: Hydrogen Bonding

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6. Mathematics

Toss Up: Multiple Choice

Solve the following equation for x:

$$x^2 - 20x + 19 = 0$$

- W) 9, 10
- X) 10 and 9
- Y) 21 and 19
- Z) 19 and 1

Toss Up Answer: Z

Bonus: Short Answer

Convert log base 4 of 53 into a base 10 expression:

Bonus Answer: $\log 53 / \log 4$

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7. Physics

Toss Up: Short Answer

What fuel is mostly used in a nuclear power-generation station?

Toss Up Answer: Uranium-235 (Do not accept: Uranium or Uranium-238)

Bonus: Multiple Choice

Dark energy and dark matter comprise approximately how much of the known universe?

- W) 50%
- X) 75%
- Y) 95%
- Z) 99%

Bonus Answer: Y

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8. Earth and Space Science

Toss Up: Multiple Choice

What is the main source of energy for the Sun?

- W) Hydrogen fusion
- X) Internal combustion
- Y) Nuclear fission of metals
- Z) Burning of solar gases

Toss Up Answer: W

Bonus: Multiple Choice

The Long Valley Caldera in east-central California was formed by a massive volcanic eruption about 760,000 years ago. Since then, it has erupted several times. Of the following, which would be least likely to indicate that another eruption will soon occur?

- W) Recurring earthquakes in the vicinity
- X) decreases of precipitation in the area
- Y) changes of emissions from the caldera
- Z) uplifting of the floor of the caldera

Bonus Answer: X

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9. Chemistry

Toss Up: Short Answer

In 12.4 hours, a 100 gram sample of an element decays so that its mass is 25 grams. What is the approximate half-life of this radioactive substance?

Toss Up Answer: 6.2 hours

Bonus: Multiple Choice

Which of the following will raise the boiling point of a sample of water?

- W) Heat the water
- X) Mix gasoline into the water
- Y) Bring the water to a higher altitude
- Z) Dissolve table sugar in the water

Bonus Answer: Z

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10. 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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11. Mathematics

Toss Up: Short Answer

Subtract the following complex numbers, giving your answer in standard form: $(11 - 4i) - (-3 + 3i)$

Toss Up Answer: 12 - 7i

Bonus: Short Answer

Solve the following inequality for x, giving your answer in fractional form, $\frac{1}{3}x + \frac{2}{3}$ is less than $\frac{5}{6}x - 2$.

Bonus Answer: x is greater than $\frac{16}{3}$

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12. Biology

Toss Up: Multiple Choice

Which of the following is not one of the basic tastes

- W) sweetness
- X) saltiness
- Y) umami
- Z) spiciness

Toss Up Answer: Z

Bonus: Multiple Choice

In classical conditioning, an unlearned, inborn reaction to an unconditioned stimulus is a(n)

- W) unconditioned stimulus
- X) conditioned stimulus
- Y) conditioned response
- Z) unconditioned response

Bonus Answer: Z

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13. Earth and Space Science

Toss Up: Short Answer

What are two general types of soils that have developed in the United States?

Toss Up Answer: pedocals and pedalfers

Bonus: Short Answer

What are the two most prominent elements dissolved in seawater?

Bonus Answer: Chlorine and Sodium

14. 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

15. 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)

16. Biology

Toss Up: Short Answer

An ecologist recorded 12 white-tailed deer, *Odocoileus virginianus*, per square mile in one woodlot and 20 per square mile in another woodlot. What was the ecologist comparing?

Toss Up Answer: density

Bonus: Short Answer

Why do populations grow more slowly as they approach their carrying capacity?

Bonus Answer: Density-dependent factors lead to fewer births and increased mortality. (Accept Density-Dependent factors)

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17. Mathematics

Toss Up: Short Answer

Compute: $\sqrt{(3^4 \cdot 5 - 60)^2}$

Toss Up Answer: 0

Bonus: Short Answer

Compute $(\frac{34}{17} - 2 + 5) * (96 + -144) * (\frac{1}{46 - \frac{130}{5}})$

Bonus Answer: -12

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18. Physics

Toss Up: Multiple Choice

e Often some of the strongest spectral lines in cold interstellar gas are produced by

W) neutral lithium

X) ionized iron

Y) carbon and iron

Z) calcium and sodium

Toss Up Answer: Z

Bonus: Short Answer

The cosmic background radiation discovered by Penzias and Wilson closely matches the radiation from a black body with what temperature Kelvin, to the nearest whole number?

Bonus Answer: 3

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19. Biology

Toss Up: Multiple Choice

Which of these does not result in recombinant bacteria?

W) Transformation

X) Insertion

Y) Transduction

Z) Conjugation

Toss Up Answer: X

Bonus: Short Answer

What serves as the vector for bacterial transduction?

Bonus Answer: Virus (accept viruses, phages, bacteriophages)

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20. Earth and Space Science

Toss Up: Multiple Choice

What element accounts for the second-most percentage of volume of the Earth's crust?

W) Oxygen

X) Calcium

Y) Potassium

Z) Silicon

Toss Up Answer: Z

Bonus: Short Answer

Give four pieces of information that would be present on a typical weather map.

Bonus Answer: Any four of the following: Temperature, visibility, weather or weather conditions, dew point, wind speed, wind direction, pressure or barometric pressure, precipitation, and cloud cover
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21. Mathematics

Toss Up: Multiple Choice

Which of the following is a triangular number?

W) 2

X) 6

Y) 9

Z) 11

Toss Up Answer: X

Bonus: Short Answer

What is the greatest common factor of 456 and 460?

Bonus Answer: 4
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22. Chemistry

Toss Up: Multiple Choice

The term(s) most useful in determining the solubility of a substance is (are)

W) K_a and Q

X) K_{sp}

Y) Q and Le Chatelier's Principle

Z) K_c

Toss Up Answer: X

Bonus: Multiple Choice

The effect of temperature on a chemical system is best described using

W) K_a and Q

X) K_{sp}

Y) Le Chatelier's Principle

Z) K_c

Bonus Answer: Y
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23. Biology

Toss Up: Multiple Choice

Which of the following is the most common organic compound on Earth?

W) chitin

X) glucose

Y) phospholipids

Z) cellulose

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following syndrome occurs in women born with only 1 X chromosome?

- W) Marfan Syndrome
- X) Turner Syndrome
- Y) Prader-Willi syndrome
- Z) Porphyria

Bonus Answer: X

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24. Chemistry

Toss Up: Multiple Choice

The relation between pressure and temperature of two ideal gases is stated in

- W) Gay-Lussac's Law
- X) Boyle's Law
- Y) Charles's Law
- Z) Avogadro's Law

Toss Up Answer: W

Bonus: Short Answer

What are the dimensions of the gas constant R in SI base units?

Bonus Answer: $\text{kg m}^2 \text{mol}^{-1} \text{K}^{-1} \text{s}^{-2}$ (accept as a fraction)

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