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1. Chemistry

Toss Up: Short Answer

Which element is the more electronegative?

Toss Up Answer: Flourine

Bonus: Short Answer

Name all the atoms that are diatomic.

Bonus Answer: Hydrogen (H₂)

Nitrogen (N₂)

Oxygen (O₂)

Fluorine (F₂)

Chlorine (Cl₂)

Iodine (I₂)

Bromine (Br₂)

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2. Biology

Toss Up: Multiple Choice

Which of the following is present in plant cells but not animal cells?

W) Nuclei

X) Plasmodesmata

Y) Mitochondria

Z) Vacuoles

Toss Up Answer: X

Bonus: Short Answer

What is the name of the theory that explains the existence of mitochondria (and why they have their own DNA)?

Bonus Answer: Endosymbiont Theory

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3. 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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4. Biology

Toss Up: Multiple Choice

Which is not a part of the nucleus?

W) nuclear envelope

X) nucleolus

Y) chromatin

Z) plasmodesmata

Toss Up Answer: Z

Bonus: Multiple Choice

Which is not a part of the cytoskeleton?

- W) microfilaments
- X) intermediate filaments
- Y) microtubules
- Z) gap junctions

Bonus Answer: Z

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5. 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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6. Physics

Toss Up: Multiple Choice

What Irish physicist, living from 1805-1865, made important contributions to his namesake branch of classical mechanics, optics, and algebra?

- W) William Parsons
- X) William Hamilton
- Y) Francis Beaufort
- Z) George Boole

Toss Up Answer: X

Bonus: Multiple Choice

What is generated by a Van de Graff generator?

- W) Static Charge
- X) Current
- Y) Nuclear Decay
- Z) Radiation

Bonus Answer: W

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7. Biology

Toss Up: Multiple Choice

What is the main function of a vacuole in a cell?

- W) storage
- X) coordination
- Y) synthesis of molecules
- Z) release of energy

Toss Up Answer: W

Bonus: Multiple Choice

If 15% of a DNA sample is made up of thymine, T, what percentage is made up of cytosine, C?

- W) 15%
- X) 35%
- Y) 70%
- Z) 85%

Bonus Answer: X

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8. Chemistry

Toss Up: Multiple Choice

When 50 mL of stock solution of 6M NaCl (aq) is diluted into a 150 mL solution what will be the molarity of the diluted solution?

- W) 3M
- X) 2M
- Y) 1M
- Z) 6M

Toss Up Answer: X

Bonus: Short Answer

What is the given equation for calculating molarity?

Bonus Answer: Moles of solute divided by liters of solution

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9. Earth and Space Science

Toss Up: Short Answer

Given the three types of volcanoes, composite, cindercone and shield volcanoes which type of volcano is Mount Vesuvius?

Toss Up Answer: Composite volcano (Also accept stratovolcano)

Bonus: Multiple Choice

Viscosity of magma depends on silica content and temperature, from the choices which type of magma has the highest viscosity?

- W) rhyolitic magma
- X) basaltic magma
- Y) andesitic magma
- Z) mafic magma

Bonus Answer: W

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10. 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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11. Earth and Space Science

Toss Up: Short Answer

Does a person weigh less at the equator or the poles?

Toss Up Answer: Equator

Bonus: Short Answer

Does one move faster on the equator or on the poles?

Bonus Answer: Equator

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12. Physics

Toss Up: Short Answer

A bullet travels through the air, it slows down due to air resistance. How does the bullet's momentum change as a result?

Toss Up Answer: Decreases

Bonus: Short Answer

How can a small force produce a large change in momentum ?

Bonus Answer: A small force can produce a large change in momentum if the force acts on an object for a long period of time.

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13. Chemistry

Toss Up: Short Answer

What is the most common oxidation state of Oxygen?

Toss Up Answer: -2

Bonus: Multiple Choice

Which of the following elements is a halogen?

- W) Lithium
- X) Potassium
- Y) Neon
- Z) Chlorine

Bonus Answer: Z

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14. Earth and Space Science

Toss Up: Multiple Choice

How are rocks sorted in water erosion?

- W) Sorted, rounded, smooth
- X) Not sorted, rounded, smooth
- Y) Not sorted, not rounded, smooth
- Z) Not sorted, not rounded, not smooth

Toss Up Answer: W

Bonus: Short Answer

U shaped valleys are made by what type of agent of erosion?

Bonus Answer: Glaciers.

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15. Mathematics

Toss Up: Short Answer

Given $y = |x - 6|$, what is the derivative at $x = 6$?

Toss Up Answer: The derivative does not exist

Bonus: Short Answer

Find the derivative of x^3 / x^2

Bonus Answer: 1

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16. Physics

Toss Up: Multiple Choice

For an ohmic conductor, doubling the voltage without changing the resistance will cause the current to

- W) decrease by a factor of 2
- X) decrease by a factor of 4
- Y) increase by a factor of 4
- Z) increase by a factor of 2

Toss Up Answer: Z

Bonus: Short Answer

If a 60-watt lightbulb operates at a voltage of 120 V, what is the resistance of the bulb?

Bonus Answer: 240 ohms

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17. Mathematics

Toss Up: Multiple Choice

If a statement about a relationship between natural quantities has been tested many times, and has not been contradicted, what is it?

- W) Fact

- X) Hypothesis
- Y) Law
- Z) Theory

Toss Up Answer: Y

Bonus: Multiple Choice

What is a framework that includes many well-tested and verified hypotheses about one or more aspects of the natural world?

- W) Fact
- X) Hypothesis
- Y) Law
- Z) Theory

Bonus Answer: Z

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18. 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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19. Biology

Toss Up: Short Answer

What hormone regulates sleep cycles?

Toss Up Answer: Melatonin

Bonus: Short Answer

What blood type is considered the universal donor?

Bonus Answer: O-, O-neg, O-negative

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20. 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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21. Mathematics

Toss Up: Short Answer

What function is the inverse of $y = 3x + 4$?

Toss Up Answer: $y = x - 4/3$

Bonus: Short Answer

Giving your answer as an ordered pair, find the solution of the system of the following 2 equations: $2x + 3y = 8$, and $3x - 2y = -1$

Bonus Answer: (1,2)

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22. Earth and Space Science

Toss Up: Short Answer

What is the name of the largest volcanic mountain on Mars?

Toss Up Answer: Olympus Mons

Bonus: Short Answer

Which spacial event marks the beginning of spring in the Northern Hemisphere

Bonus Answer: Vernal Equinox (Accept: Spring Equinox)

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23. 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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24. 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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25. 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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