Round 32

1. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Multiple Choice

The purpose of Glial cells is to

W) insulate and protect neurons

X) insulate and protect endothelial cells

Y) protect the body from viral diseases

Z) reinforce smooth muscle

Toss Up Answer: W

Bonus: Short Answer

Blood is to the circulatory system as hemolymph is to the

Bonus Answer: hemocoel

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2. PHYSICS

Writer: William Xiang

Toss Up: Multiple Choice

Vectors A and B each have magnitude L. What is the cross product of these vectors if the angle between them when drawn with their tails at the same point is 60 degrees.

W) Zero

X) L/2

Y) L^2

Z) (L^2)/2

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following is true when a system is at equilibrium?

W) The object is at rest.

X) The object is not accelerating.

Y) The object is at constant velocity.

Z) Internal forces sum to zero.

Bonus Answer: X

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3. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

What are the purine bases in DNA?

Bonus Answer: Adenine and guanine

Bonus: Short Answer

What are the pyrimidine bases in RNA?

Bonus Answer: Cytosine and uracil

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4. PHYSICS

Writer: Shihab Karim

Toss Up: Multiple Choice

As defined in physics, speed is:

W) a vector quantity
X) always negative
Y) always zero
Z) always positive

Toss Up Answer: Z

Bonus: Multiple Choice
Electric current may be expressed in which one of the following
units?
W) joules/coulomb
X) coulombs/second
Y) coulombs/volt
Z) ohms/second

Bonus Answer: X

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5. CHEMISTRY
Writer: Siam Muquit
Toss Up: Short Answer
What is the molecular geometry of ammonia (NH3)?
Bonus Answer: Trigonal Pyramidal

Bonus: Multiple Choice
How many lone pairs are in Xenon tetrafluoride (XeF4)?
W) 0
X) 1
Y) 2
Z) 3

Bonus Answer: Y

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6. BIOLOGY
Writer: Shanjeed Ali
Toss Up: Short Answer
Which two monosaccharides make up lactose?
Bonus Answer: Glucose and galactose

Bonus: Short Answer
Which two monosaccharides make up sucrose?
Bonus Answer: Glucose and fructose

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7. MATHEMATICS
Writer: Siam Muquit
Toss Up: Short Answer
Given $y = |x - 6|$, what is the derivative at $x = 6$?
Bonus Answer: The derivative does not exist

Bonus: Short Answer
Find the derivative of x^3 / x^2

Bonus Answer: 1
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8. BIOLOGY
Writer: Shanjeed Ali
Toss Up: Short Answer
What term describes the number of times a normal human cell population can divide?
Bonus Answer: Hayflick limit

Bonus: Multiple Choice
What controls the Hayflick limit?
W) apoptosis
X) length of telomeres
Y) genomic instability
Z) genetic drift

Bonus Answer: X
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9. MATHEMATICS
Writer: Shamaul Dilmohamed
Toss Up: Short Answer
What type of number is defined as a number that is not a root of a polynomial with rational coefficients?
Bonus Answer: Transcendental numbers

Bonus: Short Answer
Of the following, which of these numbers of transcendental? pi, e, i, phi, e times i, 2 ^ root(2)
Bonus Answer: pi, e, e times i, 2 ^ root(2)
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10. EARTH and SPACE
Writer: Seiji Yawata
Toss Up: Multiple Choice
New York City is primarily composed of sediments that were metamorphosed during the Taconic and Acadian orogenies roughly:
W) 450 million years ago
X) 550 million years ago
Y) 650 million years ago
Z) 750 million years ago
Toss Up Answer: W

Bonus: Short Answer
When the earth is closest to the sun, what season is it in the Southern Hemisphere?
Bonus Answer: Summer
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11. MATHEMATICS
Writer: Raafiul Hossain
Toss Up: Short Answer
The surface area of a sphere is how many times the area of a circle?
Bonus Answer: 4

Bonus: Short Answer
What is the area of a cone?

Bonus Answer: (pi)r^2*h
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12. CHEMISTRY
Writer: Nicholas Adit
Toss Up: Multiple Choice
A solution of H2SO3 is found to have a hydrogen ion concentration of 1 × 10–3 molar at 25°C. What is the hydroxide ion concentration in the solution?
W) 1 x 10^-1
X) 1 x 10^-3
Y) 1 x 10^-11
Z) 1 x 10^-13
Toss Up Answer: Y

Bonus: Short Answer
If the pH of a solution is changed from 1 to 3 with the addition of an antacid, what percentage of [H+] was neutralized?
Bonus Answer: 99%
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13. MATHEMATICS
Writer: Raafiul Hossain
Toss Up: Multiple Choice
A statement about a relationship between natural quantities. The statement 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
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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14. BIOLOGY
Writer: Shanjeed Ali
Toss Up: Multiple Choice
The phenomenon by which diploid cells cease to divide is known as
W) parthenogenesis
X) alternation of generations
Y) cellular senescence
Z) lysis
Toss Up Answer: Y

Bonus: Short Answer

What country has the highest human life expectancy?

Bonus Answer: Japan

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15. CHEMISTRY

Writer: Nicholas Adit

Toss Up: Multiple Choice

What happens in a hydrogen atom when an electron jumps from an excited energy state to a more stable energy state?

W) electromagnetic radiation is emitted by the atom

X) electromagnetic radiation is absorbed by the atom

Y) the atom becomes a positively charged ion

Z) the atom becomes a negatively charged ion

Toss Up Answer: W

Bonus: Short Answer

A closed 5-liter vessel contains a sample of neon gas. The temperature inside the container is 25°C, and the pressure is 1.5 atmospheres. (The gas constant, R, is equal to 0.08 L?atm/mol?K.) If the neon gas in the vessel is replaced with an equal molar quantity of helium gas, which of the following properties of the gas in the container will be changed?

I. Pressure

II. Temperature

III. Density

Bonus Answer: III only

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16. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

How many ATP molecules are produced by the Calvin cycle?

Bonus Answer: 0

Bonus: Short Answer

How many ATP are used in the Calvin cycle to make one glucose molecule?

Bonus Answer: 18

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17. EARTH and SPACE

Writer: Seiji Yawata

Toss Up: Multiple Choice

The Cascadia Subduction Zone separates the North American Plate and the

W) Caribbean Plate

X) Juan de Fuca Plate

Y) Okhotsk Plate

Z) Cocos Plate

Toss Up Answer: X

Bonus: Short Answer

During which geologic period did Pangaea start breaking up?

Bonus Answer: Jurassic

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18. PHYSICS

Writer: William Xiang

Toss Up: Short Answer

A ball is thrown with an initial velocity of 10 meters per second off the top of a 30 foot building, at an angle 30 degrees above the horizontal. Assuming there is no air friction and the scenario occurs on Jupiter where objects have a gravitational acceleration of 25 meters per second squared, find the time it takes, in seconds, for the ball to reach ground level. Round to the nearest tenth.

Bonus Answer: 0.4

Bonus: Multiple Choice

A boy in freefall swings a ball tied to a string around in horizontal circles. Assuming no air friction, which of the following forces are NOT acting ball?

W) Centripetal Force
X) Centrifugal Force
Y) Gravitational Force
Z) Normal Force

Bonus Answer: Z

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19. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

What is the chemical formula of tetraphosphorus decaoxide?

Bonus Answer: P_4O_{10}

Bonus: Short Answer

What is the bond order of the central atom in CO_3^{-2}?

Bonus Answer: 4/3 (accept: 1 1/3)

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20. PHYSICS

Writer: William Xiang

Toss Up: Multiple Choice

Which of the following quantities are vector?

W) Work
X) Speed
Y) Torque
Z) Power

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following terms is NOT commonly used to represent a higher-order derivative of displacement?

W) Acceleration
X) Jounce
Y) Lock
Z) Spin

Bonus Answer: Z

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21. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which pair of organisms is correctly matched with the interspecific interaction?

W) Commensalism: Clownfish and sea anemone

X) Parasitism: Whales and barnacles

Y) Mutualism: Oxpecker and rhino

Z) Predation: Apes and bees

Toss Up Answer: Y

Bonus: Short Answer

List the 5 types of interspecific interaction.

Bonus Answer: Predation, Commensalism, Parasitism, Mutualism, Neutral

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22. PHYSICS

Writer: William Xiang

Toss Up: Multiple Choice

What is the magnitude of a vector 4 meters in the x direction, 1 meter in the y direction, and 8 meters in the z direction?

W) 7 meters

X) 9 meters

Y) 11 meters

Z) 13 meters

Toss Up Answer: X

Bonus: Short Answer

Unit X equals "sqrt(A / B)" and is in units "(Mass*Time) / Length^2". If A has units "Length / Time", what are the units of B?

Bonus Answer: Length^5 / (Mass^2 * Time^3)

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23. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which disease was famously eradicated in 1977?

W) Polio

X) Smallpox

Y) Mumbs

Z) AIDS

Toss Up Answer: X

Bonus: Short Answer

Which human body system is attacked by AIDS?

Bonus Answer: Immune system

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24. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

In a rate law, what are the units of k when the order is 1?

Bonus Answer: s^-1

Bonus: Short Answer

In a rate law, what are the units of k when the order is 5?

Bonus Answer: L^4 mol^-4 s^-1

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25. EARTH and SPACE

Writer: Elias Milborn

Toss Up: Short Answer

Pandora is a moon of which planet?

Bonus Answer: Saturn

Bonus: Multiple Choice

Sea water is approximately what percent salt by mass?

W) 1%

X) 2%

Y) 4%

Z) 8%

Bonus Answer: Y

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