Round 27

1. PHYSICS

Writer: Charles Zhang

Toss Up: Multiple Choice

An object oscillates with equation x = 2cos(5πt) (READ AS: x equals 2 times cosine of open parentheses 5 PI times t close parentheses). What is the frequency of the oscillation?

W) 0.5

X) 1

Y) 2.5

Z) 4

Toss Up Answer: Y

Bonus: Multiple Choice

An LC circuit consists of a 5 henry inductor and a 20 farad capacitor connected to a battery in a series circuit. What is the frequency of the oscillation of the current in the circuit?

W) 0.05/π (0.05/PI)

X) 0.1/π (0.1/PI)

Y) 2/π (2/PI)

Z) 3/π (3/PI)

Bonus Answer: W

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2. PHYSICS

Writer: Charles Zhang

Toss Up: Short Answer

An electron travels 45 degrees north of east in a magnetic field which points 45 degrees west of north. In what direction does the magnetic force acting on the electron points?

Bonus Answer: Down

Bonus: Short Answer

A 2C charge travels through a magnetic field B = 6i + 15j + 9k with velocity v = 2i + 5j + 3k. What is the magnetic force acting on the charge?

Bonus Answer: 0

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3. PHYSICS

Writer: Charles Zhang

Toss Up: Multiple Choice

A 5 kg ball is ejected from a spring and it rolls 8m up a frictionless incline at 30 degrees before coming to a stop. Assuming that g = 10 m/s^2 (READ AS 10 meters per second squared) and that the spring constant is 100N/m, how far does the spring has to be compressed initially?

W) 1m

X) 2m

Y) 4m

Z) 6m

Toss Up Answer: X

Bonus: Short Answer

The potential energy of a 1kg particle is represented by U(x,y,z) = 2xy + 3z^2 (READ AS: U of x, y, z equals 2xy plus 3 z squared). What is the magnitude of the force acting on the particle at position (0,4,1)?

Bonus Answer: 10 N

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4. PHYSICS

Writer: Kerwin Chen

Toss Up: Short Answer

An octave is a music interval of what ratio of frequency?

Bonus Answer: 2:1

Bonus: Short Answer

From 440 Hertz to what Hertz would be one octave?

Bonus Answer: 880 Hertz

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5. PHYSICS

Writer: Kerwin Chen

Toss Up: Short Answer

Which greek letter is used to denote shear stress?

Bonus Answer: tao

Bonus: Short Answer

Which greek letter is sued to denote coefficient of viscosity?

Bonus Answer: mu

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6. MATHEMATICS

Writer: Henry Zheng

Toss Up: Short Answer

Given a rectangular box with side lengths of 5, 5, and 5, what is the surface area of the box?

Bonus Answer: 150 units squared (ACCEPT: 150)

Bonus: Multiple Choice

The length, in inches, of a box is 3 inches less than twice its width, in inches. Which of the following gives the length, L inches, in terms of the width, W inches, of the box?

W) L = .5W + 3

X) L = W – 3

Y) L = 2W + 3

Z) L = 2W - 3

Bonus Answer: Z

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7. MATHEMATICS

Writer: Henry Zheng

Toss Up: Short Answer

What is the probability of rolling a even number on an 8 sided die labeled 1 through 8?

Bonus Answer: 1/2

Bonus: Short Answer

What is the probability of rolling an even number on an 8 sided die labeled 1 through 8 and rolling an odd number on a 7 sided die labeled 1 through 7 in simplest fractional form?

Bonus Answer: 2/7

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8. MATHEMATICS

Writer: Henry Zheng

Toss Up: Multiple Choice

What trigonometric ratio is equal to 1/2?

W) sin 60

X) sin 30

Y) cos 30

Z) sin 30 degrees

Toss Up Answer: Z

Bonus: Short Answer

What is the probability of rolling a 1 on 3 die rolls?

Bonus Answer: 1/216

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9. MATHEMATICS

Writer: Henry Zheng

Toss Up: Short Answer

By words or number, name all of the following 3 statements that are TRUE for the function, $f(x) = –3x^2 – 2x – 2 = 0$:

1) there are no real zeros

2) the graph is a parabola opening downward

3) the graph has no x-intercepts

Bonus Answer: All or 1,2,3

Bonus: Short Answer

Factor the following expression completely over integers: $x^4 – 16$

Bonus Answer: $(x – 2)(x + 2)(x^2 + 4)$

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10. BIOLOGY

Writer: Jason Weng

Toss Up: Short Answer

The flow of what ion allows ATP synthase to synthesize ATP?

Bonus Answer: H+, hydrogen ion, proton

Bonus: Short Answer

Which cellular structures oxygen to oxidize complex molecules to produce a by-product of hydrogen peroxide?

Bonus Answer: Peroxisome

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11. BIOLOGY

Writer: Jason Weng

Toss Up: Short Answer

What type of tissue are the urinary bladder comprised of?

Bonus Answer: Transitional epithelium

Bonus: Short Answer

The walls of the heart consist of three layers. What is the middle layer called, which is also the main layer that allows the heart's muscular contractions?

Bonus Answer: Myocardium

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12. BIOLOGY

Writer: Jason Weng

Toss Up: Short Answer

What types of macromolecules to lipase break down?

Bonus Answer: Lipids

Bonus: Short Answer

What lobe of the brain is associated with vision?

Bonus Answer: Occipital Lobe

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13. BIOLOGY

Writer: Jason Weng

Toss Up: Short Answer

What muscle of the respiratory system regulates primarily regulates breathing?

Bonus Answer: Diaphragm

Bonus: Short Answer

What protein catalyzes the reaction of carbon dioxide with water to form bicarbonate ion and hydrogen ion?

Bonus Answer: Carbonic anhydrase

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14. BIOLOGY

Writer: Jason Weng

Toss Up: Short Answer

What individual cell structure comprises polysomes?

Bonus Answer: Ribosome

Bonus: Short Answer

What is the complementary RNA for [read slowly] CAGGGTAC?

Bonus Answer: GUCCCAUG

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15. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which of these is not an abiotic factor that influences climate?

W) Sunlight

X) Precipitation

Y) Wind

Z) Bodies of water

Toss Up Answer: Z

Bonus: Short Answer

What type of population distribution characterizes human populations?

Bonus Answer: Clumped distribution (Accept clumped)

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16. BIOLOGY

Writer: Matthew Lee

Toss Up: Short Answer

What is the process of electrons being shuttled between Photosystem I and the cytochrome complex called?

Bonus Answer: cyclic electron flow

Bonus: Multiple Choice

In linear electron flow during the light reactions, electrons shuttled by Plastocyanin reduce what molecule?

W) P700
X) P680
Y) Plastoquinone
Z) Ferredoxin

Bonus Answer: W

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17. BIOLOGY

Writer: Matthew Lee

Toss Up: Multiple Choice

Theodore Engelmann performed a famous experiment with filamentous algae and aerobic bacteria. What was he trying to find out about photosynthesis?
W) action spectrum
X) absorption spectrum
Y) electromagnetic spectrum
Z) spectrophotomic range

Toss Up Answer: W

Bonus: Short Answer

What metallic atom is at the center of the light-absorbing head of a chlorophyll molecule?

Bonus Answer: Magnesium

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18. CHEMISTRY

Writer: George Papastefanou

Toss Up: Short Answer

What is the last element of the periodic table to occur naturally on Earth?

Bonus Answer: Plutonium, element 94

Bonus: Short Answer

Which element is most abundant in the entire Earth?

Bonus Answer: Iron (do not accept Oxygen, that's just the crust)

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19. CHEMISTRY

Writer: George Papastefanou

Toss Up: Short Answer

Using noble gas abbreviation, what is the electron configuration of a silver atom?

Bonus Answer: [Kr] 4d^10 5s^1

Bonus: Short Answer

What is the most electropositive element in group 1A?

Bonus Answer: Francium

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20. CHEMISTRY

Writer: Henry Zheng

Toss Up: Short Answer

A stable suspension of fine particles in a liquid is called a:

Bonus Answer: colloid

Bonus: Multiple Choice

Which of the following compounds is used as a fuel additive in what is commonly known as "dry gas" by solubilizing

water to reduce its contamination in gasoline?
W) isooctane
X) glycerol
Y) MTBE
Z) isopropyl alcohol

Bonus Answer: Z

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21. CHEMISTRY

Writer: Shihab Karim

Toss Up: Short Answer

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

Bonus 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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22. CHEMISTRY

Writer: Shihab Karim

Toss Up: Short Answer

List the following atoms in order of increasing electronegativity: flourine, chlorine, and bromine

Bonus Answer: Flourine

Bonus: Short Answer

Which element has the highest electronegativity?

Bonus Answer: Flourine

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23. EARTH and SPACE

Writer: Yae June Lee

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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24. EARTH and SPACE

Writer: Andrew Chen (Senior)

Toss Up: Multiple Choice

Given the following choices chose the one that best presents the layers of the earth's atmosphere from lowest to highest altitude.
W) Thermosphere, Mesosphere, Stratosphere, Troposphere
X) Mesosphere, Thermosphere, Stratosphere, Troposphere
Y) Troposphere, Stratosphere, Mesosphere, Thermosphere

Z) Stratosphere, Troposphere, Thermosphere, Mesosphere

Toss Up Answer: Y

Bonus: Multiple Choice

There are various different particle sizes when dealing with sediments. What is the approximate particle size range of sand?

W) 2 - 4 mm

X) 1/16 - 2 mm

Y) 1/256 - 1/16 mm

Z) 4 - 64 mm

Bonus Answer: X

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25. EARTH and SPACE

Writer: Nten Nylam

Toss Up: Multiple Choice

Which of the following is the mantle thought to be made up of?

W) coal

X) peridotite

Y) granite

Z) conglomerate

Toss Up Answer: X

Bonus: Short Answer

In hours and minutes, how long will it take for the tidal pattern to change from high tide to low tide and back to high tide?

Bonus Answer: 24 hours 50 minutes

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