

Round 8

1. BIOLOGY

Toss Up: Multiple Choice

A product of noncyclic photophosphorylation is

- W) NADPH
- X) water
- Y) carbon dioxide
- Z) ADP

Toss Up Answer: W

Bonus: Multiple Choice

All of the following occur in cyclic photophosphorylation EXCEPT:

- W) Electrons move along an electron transport chain.
- X) Electrons in chlorophyll become excited.
- Y) ATP is produced.
- Z) NADPH is produced.

Bonus Answer: Z

2. CHEMISTRY

Toss Up: Multiple Choice

A tetrahedral molecule, XY_4 would be formed if X were using the orbital hybridization:

- W) p^2
- X) s^2
- Y) sp^2
- Z) sp^3

Toss Up Answer: Z

Bonus: Multiple Choice

How does a Bronsted-Lowry differ from its conjugate base?

- W) The acid has one more proton.
- X) The acid has one less proton.
- Y) The acid has one more electron.
- Z) The acid has one less electron.

Bonus Answer: W

3. EARTH and SPACE

Toss Up: Short Answer

What star has the greatest apparent magnitude

Bonus Answer: Sun

Bonus: Multiple Choice

What month can the constellation Orion be most prominent in the southern sky at about 10 pm from mid-northern latitudes

- W) February
- X) March
- Y) December

Z) July

Bonus Answer: Y

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4. CHEMISTRY

Toss Up: Short Answer

What is the halide with no known stable isotopes?

Bonus Answer: Astatine

Bonus: Multiple Choice

Which of the following molecules is a saturated hydrocarbon?

W) C₂H₄

X) C₃H₈

Y) CH₃OH

Z) C₄H₆

Bonus Answer: X

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5. BIOLOGY

Toss Up: Short Answer

How many turns of the Calvin Cycle are needed to make 1 glucose molecule?

Bonus Answer: 6

Bonus: Short Answer

How many molecules of ATP are required to make a glucose molecule in the Calvin Cycle?

Bonus Answer: 18 molecules of ATP (also accept "18", or "18 molecules")

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6. MATHEMATICS

Toss Up: Multiple Choice

Compute $3C_1 + 4C_2 + 5C_3 + 6C_4 + 7C_5$. [3 choose 1 + 4 choose 2 + 5 choose 3 + 6 choose 4 + 7 choose 5]

W) 55

X) 336

Y) 240

Z) 56

Toss Up Answer: W

Bonus: Short Answer

Compute the square root of 5476

Bonus Answer: 74

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7. ENERGY

Toss Up: Multiple Choice

Using current technologies, which of the following sources of energy is nonrenewable?

W) Geothermal

X) Wind

Y) Nuclear

Z) Solar

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following is NOT a fossil fuel?

- W) Coal
- X) Petroleum
- Y) Natural gas
- Z) Uranium

Bonus Answer: Z

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8. EARTH and SPACE

Toss Up: Short Answer

What planet has the most amount of solidified water in our solar system?

Bonus Answer: Earth

Bonus: Short Answer

How about our solar system?

Bonus Answer: Jupiter

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9. MATHEMATICS

Toss Up: Multiple Choice

Simplify $(\sin 15 \cos 75 - \cos 15 \sin 75) / (\cos 15 \cos 75 + \sin 15 \sin 75)$

- W) negative square root of 3
- X) $1/2$
- Y) $-1/2$
- Z) square root 6 minus square root 2 all over 2

Toss Up Answer: W

Bonus: Short Answer

Compute $(2 + 2\sqrt{3}i)^6$. [2+2 times the square root of 3, i to the 6th power]

Bonus Answer: 4096

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10. BIOLOGY

Toss Up: Multiple Choice

All of the following processes release carbon dioxide EXCEPT:

- W) the Krebs's cycle
- X) alcohol fermentation
- Y) oxidative phosphorylation
- Z) the conversion of pyruvate to acetyl CoA

Toss Up Answer: Y

Bonus: Multiple Choice

All of the following processes produce ATP EXCEPT:

- W) glycolysis
- X) the Krebs's cycle
- Y) lactic acid fermentation
- Z) oxidative phosphorylation of NADH

Bonus Answer: Y

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11. EARTH and SPACE

Toss Up: Short Answer

The 29 ½ days it takes the Moon to complete an orbit around the Earth is called a

Bonus Answer: Synodic Month

Bonus: Short Answer

The time between two successive meridian transits of the Sun as observed from a stationary spot on the Earth's surface is called

Bonus Answer: A day (a solar day)

12. BIOLOGY

Toss Up: Multiple Choice

Each of the following molecules is a polymer EXCEPT:

- W) protein
- X) glucose
- Y) cellulose
- Z) starch

Toss Up Answer: X

Bonus: Multiple Choice

Hydrophilic properties are characteristic of all of the following EXCEPT:

- W) polar molecules
- X) molecules soluble in water
- Y) molecules that readily ionize in water
- Z) the long hydrocarbon chain components of some molecules

Bonus Answer: Z

13. BIOLOGY

Toss Up: Short Answer

Which structural component of the cell cytoskeleton has alpha and beta subunits and is involved with intracellular transport?

Bonus Answer: Microtubules

Bonus: Short Answer

What are the units of inheritance?

Bonus Answer: Genes (accept DNA)

14. EARTH and SPACE

Toss Up: Short Answer

What type of rock comes in layers?

Bonus Answer: Sedimentary

Bonus: Short Answer

What color is a flame of lithium?

Bonus Answer: Green

15. MATHEMATICS

Toss Up: Short Answer

Which of the following statements concerning prime numbers are true?

1. If a and n are relatively prime then there are infinitely many primes that leave a remainder of a when divided by n .
2. All integers less than p are quadratic residues modulo p
3. There are infinitely many prime numbers

Bonus Answer: 1 and 3

Bonus: Short Answer

If $a_1 + a_2 + a_3 + a_4 + a_5 = 17$ for positive integers a_1, a_2, a_3, a_4, a_5 , then maximize the product $a_1 a_2 a_3 a_4 a_5$?

Bonus Answer: 432

16. CHEMISTRY

Toss Up: Short Answer

fuel additive in what is commonly known as "dry-gas" by solubilizing water to reduce contamination in gasoline:

Bonus Answer: Isopropyl Alcohol

Bonus: Multiple Choice

The latent heat of vaporization for water at its boiling point and in kJ per mole is:

- W) 6.01
- X) 42.7
- Y) 40.7
- Z) 40,000,000

Bonus Answer: Y

17. CHEMISTRY

Toss Up: Short Answer

gypsum is what percent water by weight? (atomic masses of calcium = 40; sulfur = 32 and oxygen = 16.)

Bonus Answer: 21!!!!!!

Bonus: Short Answer

What is the general name for a hypothetical gas that does not obey Boyle's law at all temperatures and pressures?

Bonus Answer: not ideal

18. MATHEMATICS

Toss Up: Multiple Choice

Which of the following expressions in x grows fastest?

- W) 3^x [3 to the x]
- X) $10(3/2)^x$ [10 times three halves to the x]
- Y) x^2 [x squared]
- Z) $2^{(2x)}$ [2 to the $2x$]

Toss Up Answer: Z

Bonus: Short Answer

Given $504 = 2^3 \times 3^2 \times 7$ [504 equals 2 cubed times 3 squared times 7], compute the sum of the positive divisors of 504

Bonus Answer: 1560

19. CHEMISTRY

Toss Up: Short Answer

If the electronegativity difference in the bonding atoms is intermediate , what type of bond is formed?

Bonus Answer: polar covalent

Bonus: Short Answer

what is the formula for potassium perchlorate?

Bonus Answer: KClO_4

20. EARTH and SPACE

Toss Up: Short Answer

What are the three types of asteroids, classified based on composition?

Bonus Answer: C-type (accept carbonaceous), M-type (accept metal-rich), S-type (accept silicate)

(Accept in any order)

Bonus: Short Answer

Order these three types of asteroid from most common to least common in the asteroid belt.

Bonus Answer: C-type (accept carbonaceous), S-type (accept silicate), M-type (accept metal-rich)

About 75% of visible asteroids in the asteroid belt are carbonaceous, about 17% are silicate asteroids, and about 10% are metal-rich asteroids

21. CHEMISTRY

Toss Up: Short Answer

If pure water boils at 100C, how many additional calories of heat are needed to convert 1 gram of water from the liquid to the vapor?!

Bonus Answer: 540

Bonus: Short Answer

What is the name for the straight-chain alkane containing 5 carbons?

Bonus Answer: pentane

22. PHYSICS

Toss Up: Multiple Choice

What is true about the capacitance of two parallel plates?

- W) it is proportional to the square of the Area of the plates
- X) it is proportional to the inverse of the Area of the plates
- Y) it is proportional to the inverse of the plate separation
- Z) it is proportional to the plate separation

Toss Up Answer: Y

Bonus: Multiple Choice

A 200 farad capacitor is used in a circuit. The voltage difference between the plates of the capacitor is 10 volts. What is the magnitude of the charge on each of the capacitor's plates?

- W) 100 Coulombs
- X) 2000 Coulombs
- Y) 10 Coulombs
- Z) 200 Coulombs

Bonus Answer: X

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23. PHYSICS

Toss Up: Short Answer

Given two frequencies of 410 Hertz and 412 Hertz, what is the period of the beats produced?

Bonus Answer: .5 seconds

Bonus: Short Answer

A car is driving away at 50 meters/seconds from an observer at rest. The car is emitting a frequency at 80 Hz. What is the apparent frequency for the observer, given that the speed of sound is 350 meters/seconds? Give your answer to the nearest integer.

Bonus Answer: 70 Hertz

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24. PHYSICS

Toss Up: Short Answer

What is the first derivative of velocity?

Bonus Answer: Acceleration

Bonus: Short Answer

If you are on an asteroid 100 km in diameter and it is rotating at 200 meters per second, what is your angular acceleration?

Bonus Answer: 0.4 meters per second

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25. PHYSICS

Toss Up: Multiple Choice

Which law of thermodynamics states that if two thermodynamic systems are each in thermal equilibrium with a third, then they are in thermal equilibrium with each other?

W) Fourth

X) Third

Y) Second

Z) Zeroth

Toss Up Answer: Z

Bonus: Multiple Choice

What factor is the energy density in radiation of a region of space changed by if the absolute temperature is increased by a factor of 2?

W) Times 4

X) Times 1/4

Y) Times 2

Z) Times 16

Bonus Answer: Z

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