

Round 3

1. CHEMISTRY

Writer: Ahmad Alnasser

Toss Up: Short Answer

At room temperature, what is the only metal that is in liquid form?

Bonus Answer: Mercury (Hg)

Bonus: Multiple Choice

What is the third most common gas found in the air in the atmosphere?

- W) Argon
- X) Hydrogen
- Y) Oxygen
- Z) Helium

Bonus Answer: W

2. EARTH and SPACE

Writer: Shantanu Jha

Toss Up: Multiple Choice

Which of these units is defined as "3.26 light-years"?

- W) Astronomical Unit
- X) Parsec
- Y) Gigasphere
- Z) Kilometer

Toss Up Answer: X

Bonus: Multiple Choice

What are the two neighboring galaxies of the Milky Way known as?

- W) The Keplers
- X) Magellanic Clouds
- Y) Twin Cities
- Z) Petronas Galaxies

Bonus Answer: X

3. PHYSICS

Writer: Aaron Gee

Toss Up: Multiple Choice

The work done by a friction force is

- W) always -
- X) always 0
- Y) either positive or negative depending upon the situation.
- Z) always +

Toss Up Answer: W

Bonus: Multiple Choice

: As defined in physics, work is:

- W) scalar quantity

- X) always a positive quantity
- Y) a vector quantity
- Z) always 0

Bonus Answer: W

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4. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Which two scientists proved that DNA replication was semi-conservative?

Bonus Answer: Meselson and Stahl

Bonus: Short Answer

Meselson and Stahl replaced an element in DNA with an isotope in order to tag the original DNA molecule. Which element did they replace?

Bonus Answer: Nitrogen

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5. 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 " $(\text{Mass} \cdot \text{Time}) / \text{Length}^2$ ". If A has units "Length / Time", what are the units of B?

Bonus Answer: $\text{Length}^5 / (\text{Mass}^2 \cdot \text{Time}^3)$

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6. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Where in the DNA are short tandem repeats usually located?

Bonus Answer: Accept introns OR noncoding DNA

Bonus: Short Answer

Why do DNA molecules travel through the gel in gel electrophoresis?

Bonus Answer: DNA has a negative charge

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7. CHEMISTRY

Writer: Shihab Karim

Toss Up: Multiple Choice

What is the name given to the equation $P_1V_1=P_2V_2$?

- W) Ideal Gas Law
- X) Charles's Law
- Y) Boyle's Law

Z) Gay-Lusacc's Law

Toss Up Answer: Y

Bonus: Short Answer

What are bond angles to the nearest tenth of a molecule with a tetrahedral molecular geometry?

Bonus Answer: 109.5 degrees

8. BIOLOGY

Writer: Hanna Yang

Toss Up: Multiple Choice

What transmissible agent causes Bovine Spongiform Encephalopathy?

W) Viron

X) Virus

Y) Bacteria

Z) Prion

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following are prions made up of?

W) Proteins, only

X) Nucleic Acids, only

Y) Proteins and Nucleic Acids, only

Z) Proteins and Carbohydrates, only

Bonus Answer: W

9. MATHEMATICS

Writer: Aaron Gee

Toss Up: Multiple Choice

Which of the following has the largest amplitude?

W) $9\sin(x) - 2$

X) $2\cos(6x) + 5$

Y) $\cos(2x)$

Z) $4\sin(10x)$

Toss Up Answer: W

Bonus: Short Answer

What power of 2 is closest to 255?

Bonus Answer: 8

10. BIOLOGY

Writer: Calvin Vuong

Toss Up: Short Answer

At which stage of mitosis are chromosomes usually photographed in order to produce a karyotype?

Bonus Answer: metaphase

Bonus: Short Answer

Name all of the following that a homologous pairs of chromosomes share in common.

I. length

- II. loci of genes
- III. characteristics encoded by their genes
- IV. DNA sequence

Bonus Answer: I, II, III only

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11. CHEMISTRY

Writer: Ahmad Alnasser

Toss Up: Short Answer

What is the word that describes a substance that reacts with both strong acids and strong bases?

Bonus Answer: Amphoteric

Bonus: Multiple Choice

The triple bond between the carbon atoms causes acetylene, C₂H₂, to have which of the following shapes?

- W) Trigonal planar (pron: try-gon-al)
- X) Linear
- Y) Tetrahedral
- Z) Trigonal bipyramidal

Bonus Answer: X

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12. BIOLOGY

Writer: Shamaul Dilmohamed

Toss Up: Short Answer

What is the name given to the jellylike substance filling the chamber behind the lens of the human eye?

Bonus Answer: vitreous humor

Bonus: Short Answer

Name the clear watery liquid that surrounds the brain and spinal cord and fills the four cavities or ventricles of the brain.

Bonus Answer: Cerebrospinal Fluid

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13. PHYSICS

Writer: Prangon Ghose

Toss Up: Short Answer

If a 5000 kg truck is traveling at 30 m/s, how high must a ramp be to bring the truck to a complete stop?

Bonus Answer: 45 m

Bonus: Short Answer

A 1 kg radio controlled car is traveling at 10 m/s. When the car is 5 m from a cliff, the operator hits the brakes. How much force is required to stop the car?

Bonus Answer: 10 N

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14. MATHEMATICS

Writer: Aaron Gee

Toss Up: Short Answer

Using an x-y coordinate axis, a parabola is represented by the equation $x^2 = 6y$. The vertex of this parabola is at what coordinate point?

Bonus Answer: (0,0)

Bonus: Short Answer

For a right triangle, the $\sin(A)$ is $\frac{3}{5}$. To what value is the $\tan(A)$ equal?

Bonus Answer: $\frac{3}{4}$

15. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Short Answer

What are lines on a topographic map that connect points at the same elevation called?

Bonus 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

16. MATHEMATICS

Writer: George Zhou

Toss Up: Short Answer

What is the solution for square root of the quantity $x+5$ equals $x+3$

Bonus Answer: -1 *(do not except: [-1 and -4] or [-3])

Bonus: Short Answer

In a certain language of a certain people of a certain world, to frack a number is to find the average of the number and its square. For example, the frack of 2 is 3 since it is the average of 2 and 2 squared. what is the frack of 100?

Bonus Answer: 5050

17. 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

18. EARTH and SPACE

Writer: Mohammed Jamil

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

19. PHYSICS

Writer: Elias Milborn

Toss Up: Multiple Choice

When a resistor, inductor, and capacitor are connected in series to an AC generator, the current through the capacitor must be in phase with the voltage across which of the following?

- W) The capacitor
- X) The resistor
- Y) The entire circuit
- Z) The inductor

Toss Up Answer: Z

Bonus: Short Answer

Which lower case letter is commonly used to denote planck's constant?

Bonus Answer: h

20. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Short Answer

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

Bonus Answer: Equator

Bonus: Short Answer

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

Bonus Answer: Equator

21. PHYSICS

Writer: Raafiul Hossain

Toss Up: Short Answer

What is energy measured in?

Bonus Answer: Joules

Bonus: Short Answer

What is the unit of charge?

Bonus Answer: Coulomb

22. EARTH and SPACE

Writer: Ivan Zhang

Toss Up: Multiple Choice

What is the name given to planets that lie within a habitable zone of a star?

W) Extraneous Planets

X) Exoplanets

Y) Goldilocks Planet

Z) Temperate Planets

Toss Up Answer: Y

Bonus: Short Answer

What is the name given to a cloud of dust and gas in outer space?

Bonus Answer: nebula

23. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

What is the chemical formula of tetraphosphorus decaoxide?

Bonus Answer: P₄O₁₀

Bonus: Short Answer

What is the bond order of the central atom in CO₃⁽⁻²⁾?

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

24. EARTH and SPACE

Writer: Matthew Lee

Toss Up: Multiple Choice

Which change in the stream system would most likely cause deposition of larger particles to be farther offshore?

W) a decrease in the stream's gradient

X) a decrease in the quantity of large particles

Y) an increase in the stream's velocity

Z) an increase in the density of large particles

Toss Up Answer: Y

Bonus: Multiple Choice

Which set of characteristics best describes a ventifact (wind-eroded rock)?

W) round and smooth

X) rounded with striations

Y) smooth and angular with pitted surfaces

Z) rough and angular with a mix of fresh and weathered surfaces

Bonus Answer: Y

25. CHEMISTRY

Writer: Shihab Karim

Toss Up: Multiple Choice

How many moles of nitrogen are in 35 grams of nitrogen?

W) 3

X) 3.5

Y) 4

Z) 2.5

Toss Up Answer: Z

Bonus: Short Answer

What periodic group is Magnesium a part of?

Bonus Answer: Alkaline Earth Metals
