

Round 4

1. CHEMISTRY

Writer: Nicholas Adit

Toss Up: Multiple Choice

Which of the following species is amphoteric?

W) Na_3PO_4

X) HSO_4^-

Y) KOH

Z) HNO_3

Toss Up Answer: X

Bonus: Short Answer

A 600-milliliter container holds 2 moles of $\text{O}_2(\text{g})$, 3 moles of $\text{H}_2(\text{g})$, and 1 mole of $\text{He}(\text{g})$. Total pressure within the container is 760 torr. What is the partial pressure of O_2 ?

Bonus Answer: 253 torr

2. BIOLOGY

Writer: Josh Tish

Toss Up: Multiple Choice

What is the cause of trisomy 21?

W) error during meiosis

X) error during mitosis

Y) over duplication of chromosome 21

Z) chromosomal insertion

Toss Up Answer: W

Bonus: Multiple Choice

Why is pepsinogen secreted as a zymogen into the stomach?

W) to change the pH of the stomach fluids to aid digestion.

X) to prevent digestion of the gastric glands

Y) to inactivate pepsinogen

Z) to digest complex carbohydrates

Bonus Answer: X

3. 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-Lussac'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

4. BIOLOGY

Writer: Olivia Gallager

Toss Up: Short Answer

What type of immune cell is involved in humoral immunity?

Bonus Answer: B cells

Bonus: Short Answer

What is the most common type of immunoglobulin?

Bonus Answer: Immunoglobulin G (ACCEPT: IgG)

5. CHEMISTRY

Writer: Ahmad Alnasser

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

6. 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

7. MATHEMATICS

Writer: George Zhou

Toss Up: Multiple Choice

Donald Trump has $10x+5$ apples where $x=3$. How many apples does he have if he eats two of them?

W) 35

X) 39

Y) 30

Z) 33

Toss Up Answer: Z

Bonus: Short Answer

Donald Trump has a tower consisting of 0.00405×10^{45} grams of gold. How many kilograms of gold is in his tower?
Express in scientific notation.

Bonus Answer: 4.05×10^{39} (kilograms of gold)

8. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

The double membranes found in mitochondria and chloroplasts suggest which of the following?

W) mitochondria and chloroplasts are part of the endomembrane system

X) the endosymbiont theory

Y) chloroplasts evolved before mitochondria

Z) chloroplasts and mitochondria are capable of synthesizing their own proteins

Toss Up Answer: X

Bonus: Short Answer

The light reactions occur in which part of the chloroplast?

Bonus Answer: the thylakoid (or thylakoid membrane)

9. 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

10. 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

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11. MATHEMATICS

Writer: Zoe Orlin

Toss Up: Short Answer

What is the derivative of x^2 ?

Bonus Answer: $2x$

Bonus: Short Answer

What is the derivative of $42x^2$

Bonus Answer: $84x$

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12. 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

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13. MATHEMATICS

Writer: Raafiul Hossain

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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14. EARTH and SPACE

Writer: Shamaul Dilmohamed

Toss Up: Multiple Choice

What is the driving force present in a supernova explosion?

W) electromagnetic force

X) strong nuclear force

Y) gravitational force

Z) weak nuclear force

Toss Up Answer: Y

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Bonus: Short Answer

What gas is the Mars atmosphere primarily made up of?

Bonus Answer: Carbon dioxide

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15. PHYSICS

Writer: Raafiul Hossain

Toss Up: Multiple Choice

In the absence of air resistance, the magnitude of the vertical component of a projectile's acceleration

W) is constant until the projectile hits the ground.

X) always decreases with time until the projectile hits the ground.

Y) is equal to the magnitude of the horizontal component of the projectile's acceleration.

Z) increases and/or decreases with time, depending on the projectile's velocity.

Toss Up Answer: W

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Bonus: Multiple Choice

In the laboratory, the speed of sound is measured to be 344 meters per second, different from the actual value of 343 meters per second. What is the percent error in the measurement?

W) 1%

X) 1%

Y) 10%

Z) 0.30%

Bonus Answer: Z

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16. BIOLOGY

Writer: Sean Vaysburd

Toss Up: Short Answer

What term is used to describe the most current model of the cell membrane?

Bonus Answer: Fluid Mosaic Model

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Bonus: Short Answer

Who came up with the fluid mosaic model?

Bonus Answer: SJ Singer and GL Nicolson

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17. PHYSICS

Writer: Aaron Gee

Toss Up: Multiple Choice

The force acting between two point charges can be computed using which of the following laws?

- W) Ohm's Law
- X) Ampere's Law
- Y) Coulomb's Law
- Z) Newton's Second Law

Toss Up Answer: Y

Bonus: Short Answer

Five volts are applied across the plates of a parallel plate capacitor. The distance of separation of the plates is .02 meters. What is the magnitude of the electric field inside the capacitor?

Bonus Answer: 250 volts per meter

18. BIOLOGY

Writer: Benjamin Avrahami

Toss Up: Multiple Choice

Which of the following is not an amino acid?

- W) Threonine
- X) Serine
- Y) Diamine
- Z) Lysine

Toss Up Answer: Y

Bonus: Short Answer

Giving your answer in millions of years ago, name one year that was in Romer's gap.

Bonus Answer: Between 345 and 360 (inclusive)

19. MATHEMATICS

Writer: Mohammed Jamil

Toss Up: Short Answer

Find how many different 4-digit numbers can be formed from the digits

1, 3, 5, 6, 8 and 9 if each digit may be used only once.

Bonus Answer: 360

Bonus: Short Answer

A true or false test has six questions. If a person guesses the answers, how many different ways are there to answer the test?

Bonus Answer: 64

20. BIOLOGY

Writer: Shamaul Dilmohamed

Toss Up: Short Answer

The chromosomes responsible for characteristics other than sex are known by what name?

Bonus Answer: Autosomes

Bonus: Short Answer

What is the term given to enzymes whose action is modulated by binding of a molecule to a site other than the active site?

Bonus Answer: allosteric enzymes

21. 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

22. PHYSICS

Writer: Mohammed Jamil

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?

Bonus 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.

23. PHYSICS

Writer: Aaron Gee

Toss Up: Multiple Choice

For an object moving in uniform circular motion, the direction of the instantaneous acceleration vector is:

W) tangent to the path of motion

X) equal to zero

Y) directed radially outward

Z) directed radially inward

Toss Up Answer: Z

Bonus: Multiple Choice

A Newton is equal to which of the following?

W) kilogram-meter per second

X) meter per second squared

Y) kilogram-meter per second

Z)) kilogram per meter-second

Bonus Answer: Y

24. PHYSICS

Writer: Mohammed Jamil

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 ?

Bonus 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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25. PHYSICS

Writer: Nicholas Adit

Toss Up: Short Answer

A baseball is thrown straight upward. What is the velocity at the highest point?

Bonus Answer: 0

Bonus: Multiple Choice

A rock is dropped off a cliff and strikes the ground with an impact velocity of 30 m/s. How high was the cliff?

W) 15 m

X) 30 m

Y) 45 m

Z) 60 m

Bonus Answer: Y

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