

Round 2

1. BIOLOGY

Writer: Janine Goh

Toss Up: Short Answer

In DNA replication, the lagging strand is replicated in what fragments?

Bonus Answer: Okazaki

Bonus: Short Answer

Sickle-cell anemia is caused by what type of mutation?

Bonus Answer: Point mutation/deletion

2. 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

3. BIOLOGY

Writer: Calvin Vuong

Toss Up: Multiple Choice

Introns are hydrolyzed and removed from pre-mRNA by

W) exons

X) spliceosomes

Y) small nuclear ribonucleoproteins

Z) nucleotide-pair substitution

Toss Up Answer: X (NOTE: although choice Y forms part of the spliceosome structure, choice Y is not responsible for the catalytic properties and is therefore incorrect)

Bonus: Short Answer

Okazaki fragments on the lagging strand of DNA are joined by which protein?

Bonus Answer: DNA ligase (ACCEPT: ligase)

4. CHEMISTRY

Writer: Andrew Chen (Senior)

Toss Up: Multiple Choice

When 50 mL of stock solution of 6M NaCl (aq) is diluted into a 150 mL solution what will be the molarity of the diluted solution?

- W) 3M
- X) 2M
- Y) 1M
- Z) 6M

Toss Up Answer: X

Bonus: Short Answer

What is the given equation for calculating molarity?

Bonus Answer: Moles of solute divided by liters of solution

5. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following conditions causes an autoimmune response to eating gluten?

- W) Anaplasmosis
- X) Anisakiasis
- Y) celiac disease
- Z) Candidiasis

Toss Up Answer: Y

Bonus: Multiple Choice

What is colony collapse disorder characterized by?

- W) The disappearance of many male worker bees
- X) The death of the queen bee
- Y) The destruction of the honey produced by bees
- Z) The destruction of the structure of a bee hive

Bonus Answer: W

6. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Multiple Choice

What kind of process is the loss of electrons?

- W) electrolysis
- X) thermodynamically favored
- Y) reduction
- Z) oxidation

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following metals does not react with water to produce hydrogen?

- W) Zn
- X) Li
- Y) Ca

Z) Na

Bonus Answer: W

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7. BIOLOGY

Writer: Benjamin Avrahami

Toss Up: Multiple Choice

Which one of these is an enzyme?

W) Inositol

X) Lyase

Y) Alanine

Z) Butyric Acid

Toss Up Answer: X

Bonus: Multiple Choice

Which molecule is not involved in the C3 Calvin cycle?

W) OAA

X) RuBP

Y) G3P

Z) PGA

Bonus Answer: W

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8. 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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9. BIOLOGY

Writer: Mohammed Jamil

Toss Up: Multiple Choice

Where does the electrical signal in the heart start

W) sinoatrial node

X) atrioventricular node

Y) atrioventricular bundle

Z) purkinje fibers

Toss Up Answer: W

Bonus: Multiple Choice

Which valve separates the right atrium from the right ventricle

W) Mitral Valve

X) Tricuspid valve

Y) Bicuspid Valve

Z) Semi-lunar valves

Bonus Answer: X

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10. 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

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Bonus: Short Answer

U shaped valleys are made by what type of agent of erosion?

Bonus Answer: Glaciers.

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11. PHYSICS

Writer: Nicholas Adit

Toss Up: Multiple Choice

A force F of strength 20 N acts on an object of mass 3 kg as it moves a distance of 4 m. If F is perpendicular to the 4 m displacement, the work it does is equal to

W) 0 J

X) 60 J

Y) 80 J

Z) 600 J

Toss Up Answer: W

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Bonus: Short Answer

Under the influence of a force, an object of mass 4 kg accelerates from 3 m/s to 6 m/s in 8 s. How much work was done on the object during this time?

Bonus Answer: 54 J

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12. CHEMISTRY

Writer: Hanna Yang

Toss Up: Multiple Choice

Which of the following is a polar molecule?

W) SO₂

X) CH₄

Y) SF₆

Z) BF₄

Toss Up Answer: W

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Bonus: Short Answer

Fill in the blanks in the following statement to make it true. Ionic compounds are ____ conductors in their solid state, but ____ conductors when dissolved in water.

Bonus Answer: poor; good (accept equivalent answers)

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13. PHYSICS

Writer: William Xiang

Toss Up: Short Answer

A ball with a weight of 3.5 Newtons is thrown at an angle of 30 degrees above the horizontal with an initial speed of 16 meters per second. Give the magnitude and direction of the net force on the ball at its highest point.

Bonus Answer: 3.5 Newtons, downward

Bonus: Short Answer

A car is traveling at 15 meters per second on a horizontal road. The brakes are applied and the car skids to a stop in 4 seconds. Assuming gravitational acceleration is 10 meters per second squared, find the coefficient of kinetic friction between the tires and road. Round your answer to the nearest tenth.

Bonus Answer: 0.38

14. 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

15. PHYSICS

Writer: Nicholas Adit

Toss Up: Short Answer

The mean distance from Saturn to the sun is 9 times greater than the mean distance from Earth to the sun. How long is a Saturn year?

Bonus Answer: 27 Earth years

Bonus: Short Answer

An object moves at constant speed in a circular path. True statements about the motion include which of the following?

I. The velocity is constant.

II. The acceleration is constant.

III. The net force on the object is zero since its speed is constant.

Bonus Answer: None of them (The vectors are changing)

16. CHEMISTRY

Writer: Shihab Karim

Toss Up: Short Answer

What is the hybridization of CH₄?

Bonus Answer: sp³

Bonus: Short Answer

What is the strongest intermolecular force in HF?

Bonus Answer: Hydrogen Bonding

17. PHYSICS

Writer: Nicholas Adit

Toss Up: Multiple Choice

For an ohmic conductor, doubling the voltage without changing the resistance will cause the current to

W) decrease by a factor of 2

X) decrease by a factor of 4

Y) increase by a factor of 4

Z) increase by a factor of 2

Toss Up Answer: Z

Bonus: Short Answer

If a 60-watt lightbulb operates at a voltage of 120 V, what is the resistance of the bulb?

Bonus Answer: 240 ohms

18. 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

19. 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

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20. EARTH and SPACE

Writer: Olivia Gallager

Toss Up: Short Answer

How many planets in our solar system have moons?

Bonus Answer: 6

Bonus: Short Answer

What layer of the atmosphere lies between the troposphere and mesosphere?

Bonus Answer: Stratosphere

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21. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A bulldozer does 30,000 joules of work to push another boulder a distance of 20 meters. How much force is applied to push the boulder?

Bonus Answer: 1,500 N

Bonus: Short Answer

A 450-newton gymnast jumps upward a distance of 0.50 meters to reach the uneven parallel bars. How much work, in joules, did she do before she even began her routine ?

Bonus Answer: 225

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22. EARTH and SPACE

Writer: Jessica Titensky

Toss Up: Multiple Choice

What is the closest star to earth

W) Sirius

X) Betelgeuse

Y) Alpha proxima

Z) The sun

Toss Up Answer: Z

Bonus: Short Answer

What is the closest star to the sun

Bonus Answer: Proxima centauri

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23. EARTH and SPACE

Writer: Prangon Ghose

Toss Up: Short Answer

What is the name of the largest volcanic mountain on Mars?

Bonus Answer: Olympus Mons

Bonus: Short Answer

Which spacial event marks the beginning of spring in the Northern Hemisphere

Bonus Answer: Vernal Equinox (Accept: Spring Equinox)

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24. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Multiple Choice

What happens as air rises?

W) It gets warmer

X) It gets colder

Y) The temperature fluctuates

Z) Nothing

Toss Up Answer: X

Bonus: Short Answer

How are winds named?

Bonus Answer: By the direction they are coming in

25. EARTH and SPACE

Writer: Nicholas Adit

Toss Up: Multiple Choice

What is the main source of energy for the Sun?

W) Hydrogen fusion

X) Internal combustion

Y) Nuclear fission of metals

Z) Burning of solar gases

Toss Up Answer: W

Bonus: Multiple Choice

The Long Valley Caldera in east-central California was formed by a massive volcanic eruption about 760,000 years ago. Since then, it has erupted several times. Of the following, which would be least likely to indicate that another eruption will soon occur?

W) Recurring earthquakes in the vicinity

X) decreases of precipitation in the area

Y) changes of emissions from the caldera

Z) uplifting of the floor of the caldera

Bonus Answer: X
