

# Round 1

## 1. BIOLOGY

Writer: Yae June Lee

Toss Up: Short Answer

Which plant tissue conducts water from the roots to the leaves?

Bonus Answer: Xylem

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Bonus: Multiple Choice

Which system rids of nitrogenous waste?

W) Digestive system

X) Integumentary system

Y) Respiratory system

Z) Urinary system

Bonus Answer: Z

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## 2. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Short Answer

In what location is the majority of Earth's freshwater "locked up"?

Bonus Answer: Antarctica

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Bonus: Short Answer

What are the four terrestrial planets?

Bonus Answer: Earth, Mars, Mercury, Venus

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## 3. BIOLOGY

Writer: Sean Vaysburd

Toss Up: Multiple Choice

Which is not a part of the nucleus?

W) nuclear envelope

X) nucleolus

Y) chromatin

Z) plasmodesmata

Toss Up Answer: Z

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Bonus: Multiple Choice

Which is not a part of the cytoskeleton?

W) microfilaments

X) intermediate filaments

Y) microtubules

Z) gap junctions

Bonus Answer: Z

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## 4. 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)

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**Bonus: Short Answer**

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

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

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## 5. PHYSICS

**Writer:** Nicholas Adit

**Toss Up: Multiple Choice**

Negative charges are accelerated by electric fields toward points

W) at lower electric potentials

X) at higher electric potentials

Y) where the electric field is weaker

Z) where the electric field is stronger

**Toss Up Answer:** X

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**Bonus: Multiple Choice**

The potential at point A in an electric field is 10V higher than at point B. If a negative charge,  $q = -2 \text{ C}$ , is moved from point A to point B, then the potential energy of this charge will

W) decrease by 20 J

X) decrease by 5 J

Y) increase by 5 J

Z) increase by 20 J

**Bonus Answer:** Z

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## 6. MATHEMATICS

**Writer:** Hanna Yang

**Toss Up: Multiple Choice**

Which of the following is true?

W) -1 is congruent to 1 modulo 5

X) -1 is congruent to 2 modulo 5

Y) -1 is congruent to 3 modulo 5

Z) -1 is congruent to 4 modulo 5

**Toss Up Answer:** Z

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**Bonus: Short Answer**

Which is larger,  $8^{10}$  or  $3^{30}$

**Bonus Answer:**  $3^{30}$

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## 7. PHYSICS

**Writer:** William Xiang

**Toss Up: Short Answer**

Name all of the following that are NOT correct units for work: Joule, Newton\*meter, Watt, ft\*lb, Volt

**Bonus Answer:** Watt, Volt

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**Bonus: Multiple Choice**

An 80-N crate slides with constant speed a distance of 5.0 m downward along a rough slope that makes an angle of 30 degrees with the horizontal. The work done by the force of gravity is:

- W) -400 J
- X) -200 J
- Y) 200 J
- Z) 400 J

**Bonus Answer: Y**

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## 8. BIOLOGY

**Writer: Calvin Vuong**

**Toss Up: Multiple Choice**

Protein digestion in humans begins in the

- W) mouth
- X) stomach
- Y) small intestine
- Z) large intestine

**Toss Up Answer: X**

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**Bonus: Short Answer**

Which protein is responsible for protein digestion in the stomach?

**Bonus Answer: pepsin (DO NOT accept: pepsinogen)**

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## 9. 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**

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**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**

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## 10. BIOLOGY

**Writer: Ahmad Alnasser**

**Toss Up: Short Answer**

An ecologist recorded 12 white-tailed deer, *Odocoileus virginianus*, per square mile in one woodlot and 20 per square mile in another woodlot. What was the ecologist comparing?

**Bonus Answer: density**

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**Bonus: Short Answer**

Why do populations grow more slowly as they approach their carrying capacity?

**Bonus Answer: Density-dependent factors lead to fewer births and increased mortality. (Accept Density-Dependent factors)**

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## 11. 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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## 12. MATHEMATICS

**Writer: Hussain Waris**

**Toss Up: Multiple Choice**

What conic section is described by the following: the intersection of a cone and some plane parallel to that cone's side such that that intersection is non-empty?

W) Circle

X) Parabola

Y) A point

Z) Ellipse

**Toss Up Answer: X**

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**Bonus: Short Answer**

Respectively, give the vertex and the focus of the following parabola:  $(y - 3)^2 = 8(x - 5)$ ?

**Bonus Answer: vertex: (5,3); focus: (7,3)**

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## 13. BIOLOGY

**Writer: Hanna Yang**

**Toss Up: Multiple Choice**

Which of the following is present in plant cells but not animal cells?

W) Nuclei

X) Plasmodesmata

Y) Mitochondria

Z) Vacuoles

**Toss Up Answer: X**

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**Bonus: Short Answer**

What is the name of the theory that explains the existence of mitochondria (and why they have their own DNA)?

**Bonus Answer: Endosymbiont Theory**

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## 14. 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])

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**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

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**15. PHYSICS**

**Writer:** Raafiul Hossain

**Toss Up: Multiple Choice**

How long is a meter stick?

- W) 36 inches
- X) 100 mm
- Y) 10 cm
- Z) 1 m

**Toss Up Answer:** Z

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**Bonus: Multiple Choice**

Which combination of the following statements is wrong?

- W) A body can have a constant speed but a varying velocity
- X) A body can have a constant velocity but a varying speed
- Y) A body can have a zero velocity and finite acceleration.
- Z) A body can have zero acceleration and constant speed

**Bonus Answer:** X

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**16. 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

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**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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**17. BIOLOGY**

**Writer: Siam Muquit**

**Toss Up: Multiple Choice**

Which of these is not an accepted domain of life?

W) Archea

X) Bacteria

Y) Eukarya

Z) Protista

**Toss Up Answer: Z**

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**Bonus: Short Answer**

What is the causative agent of Scrapie?

**Bonus Answer: prion**

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## 18. 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**

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**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)**

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## 19. CHEMISTRY

**Writer: Shihab Karim**

**Toss Up: Short Answer**

What is the hybridization of CH<sub>4</sub>?

**Bonus Answer: sp<sup>3</sup>**

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**Bonus: Short Answer**

What is the strongest intermolecular force in HF?

**Bonus Answer: Hydrogen Bonding**

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## 20. PHYSICS

**Writer: Elias Milborn**

**Toss Up: Multiple Choice**

As an object falls to the earth with air resistance present, what happens to the acceleration of the object?

W) It remains a constant 9.8 m/s<sup>2</sup>

X) It increases from 0 to 9.8 m/s<sup>2</sup>

Y) It remains at a constant 0 m/s<sup>2</sup>

Z) It decreases from 9.8 to 0 m/s<sup>2</sup>

**Toss Up Answer: Z**

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**Bonus: Multiple Choice**

Mary and Joe are on a merry-go-round. Mary is seated near the center of rotation and Joe is on the outer edge. Which of the following BEST describes their motion?

- W) Mary has a greater acceleration than Joe
- X) Joe has a greater acceleration than Mary
- Y) neither Joe nor Mary are accelerating
- Z) both Mary and Joe have the same acceleration

**Bonus Answer: X**

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## 21. CHEMISTRY

**Writer: Andrew Chen (Senior)**

**Toss Up: Multiple Choice**

Choose the strongest acid from the choices below.

- W) Hydrochloric acid
- X) Hydrobromic acid
- Y) Hydroiodic acid
- Z) Hydrofluoric acid

**Toss Up Answer: Y**

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**Bonus: Short Answer**

What are the conjugate bases of HCl, HBr, and HI?

**Bonus Answer: Cl-, Br-, I-**

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## 22. 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**

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**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 " $\text{Length} / \text{Time}$ ", what are the units of B?

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

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## 23. 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**

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**Bonus: Multiple Choice**

The triple bond between the carbon atoms causes acetylene, C<sub>2</sub>H<sub>2</sub>, 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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## 24. EARTH and SPACE

**Writer: Justin Lam**

**Toss Up: Multiple Choice**

Which of the following gases make up the majority of Earth's atmosphere?

W) Oxygen

X) Argon

Y) Carbon dioxide

Z) Nitrogen

**Toss Up Answer: Z**

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**Bonus: Short Answer**

What is the name for the scientific theory that describes the movement of plates across the Earth's lithosphere?

**Bonus Answer: Plate tectonics**

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## 25. CHEMISTRY

**Writer: Zoe Orlin**

**Toss Up: Short Answer**

What element has the largest atomic radius?

**Bonus Answer: Francium**

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**Bonus: Multiple Choice**

What is the most electronegative element?

W) Francium

X) Beryllium

Y) Fluorine

Z) Lithium

**Bonus Answer: Y**

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