

## Round 1

### 1. 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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### 2. 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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### 3. 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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### 4. MATHEMATICS

Writer: Hanna Yang

Toss Up: Multiple Choice

Which of the following types of symmetry does  $x^2 + (y-1)^2 = 36$  have?

W) Y-axis symmetry, only

X) X-axis symmetry, only

Y) Both x and y axis symmetry

Z) Neither x nor y axis symmetry

Toss Up Answer: W

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**Bonus: Multiple Choice**

Which of the following types of symmetry does  $x^2 - y^2 = 36$  have?

- W) Y-axis symmetry, only
- X) X-axis symmetry, only
- Y) Both x and y axis symmetry
- Z) Neither x nor y axis symmetry

**Bonus Answer: Y**

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**5. 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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**6. 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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**7. EARTH and SPACE**

**Writer: Mohammed Jamil**

**Toss Up: Multiple Choice**

The seasons we experience on the Earth are caused by

- W) the change in the Earth's distance from the sun during the year
- X) the precession of the Earth's pole
- Y) the tilt of the Earth's axis with respect to the ecliptic pole
- Z) the change in the Moon's distance from the Earth during the year

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

If we compare two stars of different temperature, the hotter star  
W) will appear redder  
X) emits more energy from each unit area of surface  
Y) will have a brighter apparent magnitude  
Z) will have a brighter absolute magnitude

**Bonus Answer: X**

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## 8. CHEMISTRY

**Writer: Shihab Karim**

**Toss Up: Short Answer**

By name or number, list the following atoms in order of increasing electronegativity:

1. Flourine
2. Chlorine
3. Bromine

**Bonus Answer: Bromine, Chlorine, Flourine (accept 3,2,1)**

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**Bonus: Short Answer**

Which element has the highest electronegativity?

**Bonus Answer: Flourine**

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## 9. EARTH and SPACE

**Writer: Sean Vaysburd**

**Toss Up: Multiple Choice**

Which is not a type of rock?

- W) sedimentary  
X) metamorphic  
Y) igneous  
Z) elementary

**Toss Up Answer: Z**

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**Bonus: Short Answer**

Which type of rock is formed from magma?

**Bonus Answer: igneous rock**

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## 10. BIOLOGY

**Writer: Zoe Orlin**

**Toss Up: Short Answer**

The broad climatic zones that Earth's environments are organized into are called

**Bonus Answer: BIOMES**

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**Bonus: Short Answer**

What biome makes up the majority of NY State?

**Bonus Answer: temperate forest biome**

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## 11. EARTH and SPACE

**Writer: Seiji Yawata**

**Toss Up: Multiple Choice**

Which of the following is a sedimentary rock?

- W) slate

- X) marble
- Y) basalt
- Z) sandstone

**Toss Up Answer: Z**

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**Bonus: Short Answer**

What is the name for the outer shadow cast during eclipses, which gives rise to a partial eclipse?

**Bonus Answer: Penumbra**

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## 12. MATHEMATICS

**Writer: Aaron Gee**

**Toss Up: Short Answer**

What function is the inverse of  $y = 3x + 4$ ?

**Bonus Answer:  $y = x - 4/3$**

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**Bonus: Short Answer**

Giving your answer as an ordered pair, find the solution of the system of the following 2 equations:  $2x + 3y = 8$ , and  $3x - 2y = -1$

**Bonus Answer: (1,2)**

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## 13. 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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## 14. EARTH and SPACE

**Writer: Zoe Orlin**

**Toss Up: Short Answer**

What is the US state with the most glaciers?

**Bonus Answer: Alaska**

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**Bonus: Short Answer**

How many glaciers are there in Hawaii rounded to the nearest 1000?

**Bonus Answer: 0**

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## 15. CHEMISTRY

**Writer: Nicholas Adit**

**Toss Up: Multiple Choice**

Which of the following is a nonpolar molecule?

- W) Carbon dioxide

- X) Water
- Y) Ammonia
- Z) Hydrochloric acid

**Toss Up Answer: W**

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**Bonus: Short Answer**

Which of the following forms of radioactive decay has (or have) no electrical charges? 1) Alpha Decay 2) Beta Decay 3) Gamma Decay

**Bonus Answer: 3 only**

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## 16. 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**

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**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.**

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## 17. 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**

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**Bonus: Short Answer**

The angle between any two boron-hydrogen bonds in a boron trihydride molecule is how many degrees?

**Bonus Answer: 120 degrees**

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## 18. 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  $10\text{m/s}^2$ ?

**Bonus Answer: 45 meters**

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**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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## 19. 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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## 20. PHYSICS

**Writer: Aaron Gee**

**Toss Up: Short Answer**

The speed at which a wave propagates down a string is 300 meters per second. If the frequency of this wave is 150 Hertz, what is the wavelength of this wave?

**Bonus Answer: 2 meters**

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**Bonus: Multiple Choice**

When a physical property such as charge exists in discrete "packets" rather than in continuous amounts, the property is said to be:

W) quantized

X) random

Y) discontinuous

Z) nonexistent

**Bonus Answer: W**

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## 21. BIOLOGY

**Writer: Siam Muquit**

**Toss Up: Multiple Choice**

Kuru is a disease caused by what type of microbe?

W) Bacteria

X) Virus

Y) Prion

Z) Viroid

**Toss Up Answer: Y**

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**Bonus: Short Answer**

Give the genus and species name of the microbe that causes peptic ulcer disease.

**Bonus Answer: Helicobacter pylori**

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## 22. EARTH and SPACE

**Writer: Janine Goh**

**Toss Up: Short Answer**

Which scientist came up with the laws of planetary motion?

**Bonus Answer: Kepler**

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**Bonus: Short Answer**

Which constellation is the star that remains stationary in northern hemisphere part of?

**Bonus Answer: Ursa Minor**

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## 23. PHYSICS

**Writer: Prangon Ghose**

**Toss Up: Short Answer**

A rock is thrown downward from the top of a tower with an initial speed of 12 m/s. If the rock hits the ground after 2 s, what is the speed of the rock as it hits the ground if air resistance is negligible to the nearest whole number?

**Bonus Answer: 32 m/s**

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**Bonus: Short Answer**

Human reaction time is usually greater 0.10 s. If someone holds a ruler between your finger and thumb and releases it without warning, how far can you expect the ruler to fall before you catch in cm to the 10th place?

**Bonus Answer: 4.9 cm (accept 5 cm)**

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## 24. MATHEMATICS

**Writer: Aaron Gee**

**Toss Up: Short Answer**

Subtract the following complex numbers, giving your answer in standard form:  $(11 - 4i) - (-3 + 3i)$

**Bonus Answer: 12 - 7i**

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**Bonus: Short Answer**

Solve the following inequality for x, giving your answer in fractional form,  $\frac{1}{3}x + \frac{2}{3}$  is less than  $\frac{5}{6}x - 2$ .

**Bonus Answer: x is greater than  $\frac{16}{3}$**

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## 25. PHYSICS

**Writer: Aaron Gee**

**Toss Up: Short Answer**

What is the resulting electrical potential, in volts, when a charge of 12 coulombs is applied to a 1 farad capacitor?

**Bonus Answer: 12 volts**

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**Bonus: Short Answer**

If 1000 pounds is applied to a spring with spring constant of 100 pounds per inch on top of a hydraulic piston, how many pounds of force is transferred to the piston?

**Bonus Answer: 1,000**

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