# Round 15

## 1. PHYSICS

**Writer: Aaron Gee**

**Toss Up: 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: 1000**

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**Bonus: Short Answer**

If g = 9.8 meters per second squared, to the first decimal place and in
newtons, how many newtons of force are required to keep a 500 kilogram table of granite moving across a horizontal surface at constant speed if there is a kinetic frictional coefficient of 0.10 between the surface and the table?

**Bonus Answer: 490 N**

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## 2. PHYSICS

**Writer: Aaron Gee**

**Toss Up: Multiple Choice**

Which of the following is NOT true?

W) the magnetic field associated with the current on a straight long wire is inversely proportional to the distance from the wire

X) Kirchhoff's first rule has to do with the accounting of total charges entering and leaving a junction per unit time

Y) Y) superconducting quantum interference devices, or SQUID's, are based on the Josephson Effect

Z) resistance and voltage are the two most common parameters used to characterize a resistor

**Toss Up Answer: Z**

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**Bonus: Multiple Choice**

Which of the following is the strongest spectral line in the visible
region of the hydrogen spectrum

W) red Balmer line

X) orange Lyman line

Y) green Paschen line

Z) blue Brackett line

**Bonus Answer: W**

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## 3. PHYSICS

**Writer: Nicholas Adit**

**Toss Up: Multiple Choice**

What is the wavelength of a 5 Hz wave that travels with a speed of 10 m/s ?

W) 0.25 m

X) 0.5 m

Y) 1 m

Z) 2 m

**Toss Up Answer: Z**

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**Bonus: Short Answer**

A string, fixed at both ends, supports a standing wave with a total of 4 nodes. If the length of the string is 6 m, what is the wavelength of the wave?

**Bonus Answer: 4 m**

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## 4. PHYSICS

**Writer: Nicholas Adit**

**Toss Up: Multiple Choice**

A charge of mass m and charge q is moving in a circle of radius r and speed v due to a uniform magnetic field B. If the speed is doubled to 2v, what happens to the period, T ?

W) T increases by a factor of 2

X) T increases by a factor of 4

Y) T stays the same

Z) T decreases by a factor of 2

**Toss Up Answer: Y**

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**Bonus: Short Answer**

A particle of charge –0.04 C is projected with speed 2 × 104 m/s into a uniform magnetic field, B, of strength 0.5 T. If the particle's velocity as it enters the field is perpendicular to B, what is the magnitude of the magnetic force on this particle?

**Bonus Answer: 400 N**

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## 5. 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**

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**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**

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## 6. MATHEMATICS

**Writer: Larry Wong**

**Toss Up: Short Answer**

How many  x intercepts in y = X ^ 2  + 1?

**Bonus Answer: 0**

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**Bonus: Short Answer**

How many degrees are in pi/3 radians?

**Bonus Answer: 60**

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## 7. MATHEMATICS

**Writer: Larry Wong**

**Toss Up: Short Answer**

If 3x -y = 12, what is the value of 8^x/2^y ?

**Bonus Answer: 2^12 or 4096**

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**Bonus: Short Answer**

What is the argument of 2 + 2i?

**Bonus Answer: 45**

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## 8. MATHEMATICS

**Writer: Larry Wong**

**Toss Up: Short Answer**

What is the sum of the coefficients of (x + 1) to the 6th power?

**Bonus Answer: 64**

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**Bonus: Short Answer**

What is the height of a triangle with an area of 64 and a base of 5?

**Bonus Answer: 25.6**

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## 9. MATHEMATICS

**Writer: Elias Milborn**

**Toss Up: Short Answer**

On a blueprint, if 3/4 of an inch represents 1 foot, then 2 inches will represent what distance, in feet, expressed as the most reduced simple fraction?

**Bonus Answer: 8/3**

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**Bonus: Short Answer**

Assuming that the probability of A is 0.3, the probability of B is 0.3, and the probability of A union B is 0.5, providing your answer as decimals to the nearest 10th, what are the probabilities respectively of A intersection B and the complement of the quantity A union B?

**Bonus Answer: 0.1 and 0.5**

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## 10. BIOLOGY

**Writer: Shanjeed Ali**

**Toss Up: Short Answer**

Through what process do cells engulf extracellular particles?

**Bonus Answer: Phagocytosis**

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**Bonus: Multiple Choice**

Which of the following is not a function of the Golgi Body?

W) separates proteins and lipids according to their destination

X) modifies certain molecules

Y) manufacturing ribosomes

Z) packaging materials into vesicles for transport outside the cell

**Bonus Answer: Y**

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## 11. BIOLOGY

**Writer: Siam Muquit**

**Toss Up: Multiple Choice**

Which of these is an example of an inhibiting hormone?

W) Somatostatin

X) ACTH

Y) ADH

Z) GH

**Toss Up Answer: W**

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**Bonus: Short Answer**

In the secondary messenger system characteristic of water-soluble hormones, what enzyme is often used to produce ATP?

**Bonus Answer: Adenyl cyclase**

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## 12. BIOLOGY

**Writer: Zoe Orlin**

**Toss Up: Multiple Choice**

Every cell in a puppy's skin, eyes, and leg muscles contains

W) equal amounts of ATP

X) identical genetic information

Y) proteins that are all identical

Z) organelles for the synthesis of glucose

**Toss Up Answer: X**

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**Bonus: Short Answer**

Oxygenated blood contains a high percentage of

**Bonus Answer: Hemoglobin**

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## 13. BIOLOGY

**Writer: Zoe Orlin**

**Toss Up: Multiple Choice**

Global warming has been linked to a decrease in

W) the size of polar icecaps

X) temperature of Earth

Y) rate of species extinction

Z) rate of carbon dioxide production

**Toss Up Answer: W**

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**Bonus: Multiple Choice**

Why is a mushroom a heterotroph?

W) it manufactures its own food

X) It divides by mitosis

Y) It tranforms light energy into chemical energy

Z) It obtains nutrients from the environment

**Bonus Answer: Z**

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## 14. BIOLOGY

**Writer: Zoe Orlin**

**Toss Up: Multiple Choice**

What is the main function of a vacuole in a cell?

W) storage

X) coordination

Y) synthesis of molecules

Z) release of energy

**Toss Up Answer: W**

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**Bonus: Multiple Choice**

If 15% of a DNA sample is made up of thymine, T, what percentage is made up of cytosine, C?

W) 15%

X) 35%

Y) 70%

Z) 85%

**Bonus Answer: X**

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## 15. BIOLOGY

**Writer: Zoe Orlin**

**Toss Up: Short Answer**

What is climax vegetation?

**Bonus Answer: The dominant type of vegetation in a biome**

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**Bonus: Short Answer**

What is the climax vegetation of the tundra?

**Bonus Answer: Mosses and/or lichens :D**

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## 16. 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: Forest biome :)**

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## 17. BIOLOGY

**Writer: Larry Wong**

**Toss Up: Short Answer**

What plant hormone causes phototropism?

**Bonus Answer: auxin**

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**Bonus: Short Answer**

What two taxonomic domains are divided based on the presence, or absence, of peptidoglycan?

**Bonus Answer: Eubacteria and Archaebacteria**

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## 18. CHEMISTRY

**Writer: Brian Lim**

**Toss Up: Multiple Choice**

Which best describes a sample that is boiling?

W) Potential energy increases and kinetic energy stays the same

X) Both potential and kinetic energy increase

Y) Potential energy stays the same and kinetic energy increases

Z) Potential energy decreases and kinetic energy increases

**Toss Up Answer: W**

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**Bonus: Short Answer**

What is the IUPAC name for $FeCr_2O_7$?

**Bonus Answer: Iron(II) Dichromate**

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## 19. CHEMISTRY

**Writer: Aryan Bhatt**

**Toss Up: Multiple Choice**

Which of the following is NOT a strong acid?

W) hydrobromic acid (HBr)

X) perchloric acid ($HClO_4$)

Y) hydroiodic acid (HI)

Z) chloric acid ($HClO_3$)

**Toss Up Answer: Y**

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**Bonus: Short Answer**

33mL of 3M Hydrochloric acid is titrated with sodium hydroxide to form water and sodium chloride. How many mols of 11M sodium hydroxide are needed to balance this reaction?

**Bonus Answer: 9 mols**

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## 20. CHEMISTRY

**Writer: Aaron Gee**

**Toss Up: Multiple Choice**

Which of the following is NOT a colligative property?

W) vapor pressure

X) osmotic pressure

Y) boiling point elevation

Z) color fo solution

**Toss Up Answer: Z**

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**Bonus: Multiple Choice**

Which of the following is a type of colloid that is classified as a
sol at room temperature?

W) gelatin

X) milk

Y) whipped cream

Z) marshmallow

**Bonus Answer: W**

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## 21. CHEMISTRY

**Writer: Shanjeed Ali**

**Toss Up: Multiple Choice**

How many elements are diatomic?

W) 5

X) 6

Y) 7

Z) 8

**Toss Up Answer: Y**

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**Bonus: Short Answer**

Which elements are liquid at room temperature?

**Bonus Answer: Mercury, Bromine**

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## 22. CHEMISTRY

**Writer: Shanjeed Ali**

**Toss Up: Short Answer**

What is the net ionic reaction for the reaction between silver nitrate and potassium chloride?

**Bonus Answer: Ag+ + Cl- — > AgCl**

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**Bonus: Short Answer**

Which of the following compounds are insoluble in water: potassium nitrate, barium chromate, nickel(II) hydroxide, and magnesium chloride?

**Bonus Answer: Barium chromate and nickel(II) hydroxide**

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## 23. 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**

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**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**

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## 24. EARTH and SPACE

**Writer: Zoe Orlin**

**Toss Up: Multiple Choice**

What was the magnitude of the largest earthquake ever?

W) 9

X) 9.1

Y) 9.5

Z) 9.6

**Toss Up Answer: Z**

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**Bonus: Multiple Choice**

How much north does the Earth's magnetic north pole move per year?

W) 30 miles

X) 35 miles
Y) 40 miles
Z) 45 miles

**Bonus Answer: Y**

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## 25. EARTH and SPACE

**Writer: Zoe Orlin**

**Toss Up: Multiple Choice**

Moonquakes occur due to
W) Asteriods
X) Tidal stresses
Y) Rotation irregularities
Z) Moonquakes do not happen

**Toss Up Answer: X**

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**Bonus: Short Answer**

Where did the largest earthquake ever happen?

**Bonus Answer: Alaska**

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