

## Round 34

### 1. BIOLOGY

**Toss Up: Short Answer**

Defects in the myelin sheath lead to what disease?

**Bonus Answer: Multiple Sclerosis**

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**Bonus: Short Answer**

From which parent do we inherit mitochondrial DNA?

**Bonus Answer: Mothers, maternal**

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### 2. PHYSICS

**Toss Up: Short Answer**

The constant potential difference across a 2 ohm resistor is 20 volts. How many watts of power are dissipated by this resistor?

**Bonus Answer: 200 Watts**

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**Bonus: Multiple Choice**

Which of the following scientists is responsible for the exclusion principle which states that two objects may NOT occupy the same space at the same time? Was it:

W) Heisenberg

X) Bohr

Y) Teller

Z) Pauli

**Bonus Answer: Z**

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### 3. MATHEMATICS

**Toss Up: Short Answer**

What is the slope of a line parallel to  $45x=9y+5$ ?

**Bonus Answer: 5**

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**Bonus: Multiple Choice**

How many vertical asymptotes does  $f(x)=(x^2+2x+1)/(x^3-x)$  have?

W) 0

X) 1

Y) 2

Z) 3

**Bonus Answer: Y**

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### 4. CHEMISTRY

**Toss Up: Multiple Choice**

Which would be the easiest way to burn an iron nail?

W) Hold an iron nail with crucible tongs, and heat strongly in the flame of a bunsen burner.

X) Use the above method with an oxyacetylene torch to reach highest temperatures.

Y) Grind the nail into very small, dust-sized particles and spray them into a flame.

Z) Dissolve the nail in acid to make the oxide.

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

What is a reasonable and safe substitute for zinc in reduction reactions in aqueous solutions?

- W) S
- X) F2
- Y) K
- Z) Cd

**Bonus Answer: Z**

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**5. PHYSICS****Toss Up: Short Answer**

What is the name of the first American physicist to win two Nobel prizes? (very random lol)

**Bonus Answer: John Bardeen (can accept just last name?)**

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**Bonus: Multiple Choice**

If the resultant force acting on a body of constant mass is zero, the body's momentum is:

- W) constant
- X) 0
- Y) increasing
- Z) decreasing

**Bonus Answer: W**

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**6. EARTH and SPACE****Toss Up: Short Answer**

In the stratosphere, what happens to the temperature as altitude increases?

**Bonus Answer: increases**

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**Bonus: Short Answer**

What does radar stand for?

**Bonus Answer: RAdio Detection And Ranging**

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**7. MATHEMATICS****Toss Up: Short Answer**

Compute:  $\sqrt{(3 \cdot 4 \cdot 5 - 60)^2}$

**Bonus Answer: 0**

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**Bonus: Short Answer**

Compute  $(34/17 - 2 + 5) \cdot (96 + -144) \cdot (1/(46 - 130/5))$

**Bonus Answer: -12**

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**8. EARTH and SPACE****Toss Up: Multiple Choice**

How is the ISS powered?

- W) Solar Energy from photovoltaic cells
- X) Nuclear Power
- Y) A combination of solar energy and nuclear power

Z) Rocket fuel

**Toss Up Answer: W**

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**Bonus: Short Answer**

Who was the first American astronaut in space?

**Bonus Answer: Alan Shepard**

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## 9. CHEMISTRY

**Toss Up: Short Answer**

An ideal gas in a closed inflexible container has a pressure of 6 atmospheres and a temperature of 27°C. What will be the new pressure of the gas if the temperature is decreased to -73°C?

**Bonus Answer: 4 atmospheres**

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**Bonus: Multiple Choice**

When CO<sub>2</sub> is bubbled through distilled water at 25°C, which of the following is most likely to occur?

W) Solid carbon will form

X) The pH of the solution will be reduced

Y) The water will boil

Z) Methane gas will be formed

**Bonus Answer: X**

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## 10. BIOLOGY

**Toss Up: Short Answer**

What part of the brain controls the interaction between the two hemispheres?

**Bonus Answer: corpus callosum**

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**Bonus: Short Answer**

Which lobe of the brain is known for spatial reasoning and navigation?

**Bonus Answer: parietal lobes**

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## 11. PHYSICS

**Toss Up: Short Answer**

A 40 kilogram girl climbs a vertical distance of 5 meters in twenty seconds at a constant velocity. How much work has the girl done?

**Bonus Answer: 2000 joules / 1960 joules (accept either)**

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**Bonus: Short Answer**

A machine performs 8 Joules of work in 2 seconds. How much power is delivered by this machine?

**Bonus Answer: 4 Watts**

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## 12. BIOLOGY

**Toss Up: Multiple Choice**

Which of the following enzymes makes C<sub>4</sub> and CAM species more efficient in hotter, dryer climates?

W) phosphofructokinase

X) Rubisco

Y) DNA polymerase

Z) PEP Carboxylase

**Toss Up Answer: Z**

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**Bonus: Short Answer**

During the light dependent reactions, on what membrane does ATP synthesis take place via ATP Synthase?

**Bonus Answer: thylakoid, thylakoid membrane**

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**13. EARTH and SPACE**

**Toss Up: Short Answer**

The Ring of Fire surrounds which ocean?

**Bonus Answer: Pacific Ocean**

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**Bonus: Multiple Choice**

What kind of volcano is Mauna Loa?

W) cone

X) shield

Y) subglacial

Z) stratovolcano

**Bonus Answer: X**

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**14. MATHEMATICS**

**Toss Up: Multiple Choice**

Simplify:  $(24 \cdot 63) / (72 \cdot 21)$

W) 1

X) 3

Y) 7

Z)  $1/3$

**Toss Up Answer: W**

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**Bonus: Short Answer**

Simplify  $(333(x^4 - x^2)) / (9(x^2 + 2x + 1)(x^2))$

**Bonus Answer:  $(x-1)/((37)(x+1))$**

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**15. BIOLOGY**

**Toss Up: Short Answer**

What is the name of the proteins in cell membranes that allow for rapid transport of water into and out of the cell?

**Bonus Answer: Aquaporins**

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**Bonus: Short Answer**

What membrane bound structures in cells are important for exocytosis?

**Bonus Answer: transport vesicles**

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**16. CHEMISTRY**

**Toss Up: Multiple Choice**

Which of the following is not commonly produced by eletrolysis?

W) NaOCl

X) Al

Y) Fe

Z) NaOH

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

Which of the following pairs of constants are not mathematically related to each other?

- W) Equilibrium constant and Gibbs Free Energy
- X) Rate Constant and Activation Energy
- Y) Standard Cell Voltage and Equilibrium Constant
- Z) Standard Cell Voltage and Rate Constant

**Bonus Answer: Z**

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**17. BIOLOGY****Toss Up: Short Answer**

What is the most current model of the cell membrane called?

**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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**18. CHEMISTRY****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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**19. BIOLOGY****Toss Up: Short Answer**

Where is prokaryotic genetic material located?

**Bonus Answer: plasmids**

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**Bonus: Short Answer**

Do prokaryotic cells have cell walls?

**Bonus Answer: Yes**

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**20. CHEMISTRY****Toss Up: Short Answer**

In 12.4 hours, a 100 gram sample of an element decays so that its mass is 25 grams. What is the approximate half-life

of this radioactive substance?

**Bonus Answer: 6.2 hours**

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**Bonus: Multiple Choice**

Which of the following will raise the boiling point of a sample of water?

- W) Heat the water
- X) Mix gasoline into the water
- Y) Bring the water to a higher altitude
- Z) Dissolve table sugar in the water

**Bonus Answer: Z**

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## 21. PHYSICS

**Toss Up: Multiple Choice**

If the distance between two objects, each of mass 'M', is tripled, the force of attraction between the two objects is

- W) 1/2 original force
- X) 1/3 original force
- Y) 1/9 original force
- Z) unchanged

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

In physics, a radian per second is a unit of:

- W) angular displacement
- X) angular velocity
- Y) angular acceleration
- Z) angular momentum

**Bonus Answer: X**

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## 22. BIOLOGY

**Toss Up: Multiple Choice**

Which of the following places contains ribosomes?

- W) Rough endoplasmic reticulum
- X) Smooth endoplasmic reticulum
- Y) Cell wall
- Z) lysosomes

**Toss Up Answer: W**

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**Bonus: Short Answer**

Do prokaryotic cells have ribosomes?

**Bonus Answer: Yes**

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## 23. PHYSICS

**Toss Up: Multiple Choice**

A certain spring is known to obey Hooke's Law. If a force of 10 newtons stretches the spring 2 meters, how far will a 30 newton force stretch the spring?

- W) 1 meter
- X) 60 meters
- Y) 6 meters
- Z) 16 meters

**Toss Up Answer: Y**

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**Bonus: Multiple Choice**

A block of metal which weighs 60 newtons in air and 40 newtons under water has a density, in kilograms per meter cubed, of:

- W) 1000
- X) 3000
- Y) 5000
- Z) 7000

**Bonus Answer: X**

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**24. BIOLOGY**

**Toss Up: Short Answer**

What is the central dogma?

**Bonus Answer: DNA to RNA to Protein.**

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**Bonus: Short Answer**

What types of RNA are used in translation.

**Bonus Answer: mRNA and tRNA**

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**25. MATHEMATICS**

**Toss Up: Multiple Choice**

Given  $P(x) = x^2 + ax + b$  and  $P(1) = 9$ , what is  $a + b$ ?

- W) 8
- X) 10
- Y) 9
- Z) 1

**Toss Up Answer: W**

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**Bonus: Multiple Choice**

Factor the following completely:  $(4x^4) - (20x^2) + 16$

- W)  $(x+1)(x-1)(x+2)(x-2)$
- X)  $(x+1)(x+1)(x-2)(x-2)$
- Y)  $4(x+1)(x-1)(x+2)(x-2)$
- Z)  $4(x+1)(x+1)(x-2)(x-2)$

**Bonus Answer: Y**

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