Round 34

1. PHYSICS

Writer: Aaron Gee

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

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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2. PHYSICS

Writer: Aaron Gee

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?)

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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3. PHYSICS

Writer: Aaron Gee

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)

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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4. PHYSICS

Writer: Aaron Gee

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

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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5. PHYSICS

Writer: Aaron Gee

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

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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6. MATHEMATICS

Writer: Hanna Yang

Toss Up: Short Answer

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

Bonus Answer: 5

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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7. MATHEMATICS

Writer: Hanna Yang

Toss Up: Short Answer

Compute: sqrt((3*4*5-60)^2)

Bonus Answer: 0

Bonus: Short Answer

Compute (34/17 - 2 + 5) * (96 + -144) * (1/ (46 - 130/5))

Bonus Answer: -12

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8. MATHEMATICS

Writer: Hanna Yang

Toss Up: Multiple Choice

Simplify: (24*63)/(72*21)
W) 1
X) 3
Y) 7
Z) 1/3

Toss Up Answer: W

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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9. MATHEMATICS

Writer: Jason Weng

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

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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10. BIOLOGY

Writer: Olivia Gallager

Toss Up: Short Answer

Defects in the myelin sheath lead to what disease?

Bonus Answer: Multiple Sclerosis

Bonus: Short Answer

From which parent do we inherit mitochondrial DNA?

Bonus Answer: Mothers, maternal

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11. BIOLOGY

Writer: Olivia Gallager

Toss Up: Short Answer

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

Bonus Answer: corpus callosum

Bonus: Short Answer

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

Bonus Answer: parietal lobes

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12. BIOLOGY

Writer: Olivia Gallager

Toss Up: Multiple Choice

Which of the following enzymes makes C4 and CAM species more efficient in hotter, dryer climates?

W) phosphofructokinase

X) Rubisco

Y) DNA polymerase

Z) PEP Carboxylase

Toss Up Answer: Z

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. BIOLOGY

Writer: Sean Vaysburd

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

Bonus: Short Answer

What membrane bound structures in cells are important for exocytosis?

Bonus Answer: transport vesicles

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14. BIOLOGY

Writer: Sean Vaysburd

Toss Up: Short Answer

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

Bonus Answer: Fluid Mosaic Model

Bonus: Short Answer

Who came up with the fluid mosaic model?

Bonus Answer: SJ Singer and GL Nicolson

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15. BIOLOGY

Writer: Sean Vaysburd

Toss Up: Short Answer

Where is prokaryotic genetic material located?

Bonus Answer: plasmids

Bonus: Short Answer

Do prokaryotic cells have cell walls?

Bonus Answer: Yes

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16. BIOLOGY

Writer: Sean Vaysburd

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

Bonus: Short Answer

Do prokaryotic cells have ribosomes?

Bonus Answer: Yes

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17. BIOLOGY

Writer: Sean Vaysburd

Toss Up: Short Answer

What is the central dogma?

Bonus Answer: DNA to RNA to Protein.

Bonus: Short Answer

What types of RNA are used in translation.

Bonus Answer: mRNA and tRNA

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18. CHEMISTRY

Writer: Prangon Ghose

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

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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19. CHEMISTRY

Writer: Nicholas Adit

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

Bonus: Multiple Choice

When CO_2 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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20. CHEMISTRY

Writer: Prangon Ghose

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

Bonus: Multiple Choice

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

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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21. 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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22. CHEMISTRY

Writer: Nicholas Adit

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

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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23. EARTH and SPACE

Writer: Shanjeed Ali

Toss Up: Short Answer
In the stratosphere, what happens to the temperature as altitude increases?

Bonus Answer: increases

Bonus: Short Answer
What does radar stand for?

Bonus Answer: RAdio Detection And Ranging

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24. EARTH and SPACE

Writer: George Papastefanou

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

Bonus: Short Answer

Who was the first American astronaut in space?

Bonus Answer: Alan Shepard

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25. EARTH and SPACE

Writer: Shanjeed Ali

Toss Up: Short Answer

The Ring of Fire surrounds which ocean?

Bonus Answer: Pacific Ocean

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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