

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

2. 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

3. 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

4. MATHEMATICS

Writer: Hanna Yang

Toss Up: Short Answer

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

Bonus Answer: 0

Bonus: Short Answer

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

Bonus Answer: -12

5. 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

6. MATHEMATICS

Writer: Hanna Yang

Toss Up: Multiple Choice

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

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: $(x-1)/((37)(x+1))$

7. 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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8. 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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9. 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

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

11. 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

12. 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

13. 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 CO₂ 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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14. 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

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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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15. 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

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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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16. 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

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Bonus: Short Answer

What membrane bound structures in cells are important for exocytosis?

Bonus Answer: transport vesicles

17. 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

18. 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

19. 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

20. 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

21. 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

22. 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

23. 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

24. 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

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
