

Round 16

1. MATHEMATICS

Writer: Elias Milborn

Toss Up: Short Answer

Giving your answer as up, down, left, or right, the graph of the equation $x = 5y - 8y^2 - 1$ opens in which direction

Bonus Answer: left

Bonus: Short Answer

If chord AB is 8 units from the center of a circle O with a radius of 17, what is the length of chord AB?

Bonus Answer: 30

2. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Multiple Choice

How many miles per hour is the Earth moving?

W) 65,000

X) 67,000

Y) 69,000

Z) 70,000

Toss Up Answer: X

Bonus: Short Answer

When magma hardens into rock, which type of rock is it?

Bonus Answer: Igneous

3. MATHEMATICS

Writer: Elias Milborn

Toss Up: Multiple Choice

Which of the following is an accurate representation of the inverse of $f(x) = x^3 - 5$?

W) $x^3 - 5$

X) $(x - 5)^3$

Y) $(x - 5)^{(1/3)}$

Z) $1/(x-5)^3$

Toss Up Answer: Y

Bonus: Short Answer

The three sides of a triangle are 5cm, 6cm, and 8cm. What is the cosine of the smallest angle in reduced fractional form?

Bonus Answer: 25/32

4. CHEMISTRY

Writer: Shantanu Jha

Toss Up: Multiple Choice

Which quantum number describes the specific orbital of an electron within a subshell?

W) Spin Projection

X) Magnetic

Y) Principal

Z) Azimuthal

Toss Up Answer: X

Bonus: Short Answer

What scientist disproved the caloric theory, which stated that an invisible gas transferred heat between objects?

Bonus Answer: James Prescott Joule (accept: James Joule)

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5. MATHEMATICS

Writer: Elias Milborn

Toss Up: Multiple Choice

What are the solutions for x in the following equation: $x^2 - 2x = 8$?

- W) 0
- X) 0 and -2
- Y) 4 and -2
- Z) -4 and 2

Toss Up Answer: Y

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Bonus: Multiple Choice

The sum of the squares of reciprocals of all positive integers equals which of the following?

- W) $\pi^{1/2}$ (read as square root of pi)
- X) $\pi/3$
- Y) $\pi^{2/6}$
- Z) $\pi^{3/12}$

Bonus Answer: Y

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6. CHEMISTRY

Writer: Elias Milborn

Toss Up: Multiple Choice

Which of the following is a weak electrolyte?

- W) ammonia
- X) dilute sulfuric acid
- Y) 1 Molar sulfuric acid
- Z) dilute perchloric acid

Toss Up Answer: W

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Bonus: Short Answer

What is the most common name for the conformation for the ring structure of cyclohexane adopts to reach a strain-free value?

Bonus Answer: Chair

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7. MATHEMATICS

Writer: Calvin Aw

Toss Up: Short Answer

What was the first name of the person who discovered the Fibonacci Sequence?

Bonus Answer: Leonardo

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Bonus: Short Answer

What is the full name of the man who invented the Power of a Point?

Bonus Answer: Jacob Steiner

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8. CHEMISTRY

Writer: Elias Milborn

Toss Up: Short Answer

What is the IUPAC name for $\text{SnCl}_2 \cdot 6\text{H}_2\text{O}$?

Bonus Answer: Tin (II) Chloride Hexahydrate

Bonus: Multiple Choice

Which of the following elements has the valence electron configuration of $3s^2 3p^3$?

W) Phosphorous

X) Oxygen

Y) Bromine

Z) Nitrogen

Bonus Answer: W

9. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Multiple Choice

Rounded to the nearest thousand, what is the circumference of the globe?

W) 25,000

X) 26,000

Y) 27,000

Z) 28,000

Toss Up Answer: W

Bonus: Short Answer

In which country are the oldest rocks on Earth located?

Bonus Answer: Canada

10. CHEMISTRY

Writer: Elias Milborn

Toss Up: Multiple Choice

What is the mass of an electron relative to a proton?

W) 9.1×10^{-31}

X) 8.2×10^{-14}

Y) $1/1836$

Z) 0.51

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following is not a component of a phospholipid?

W) water

X) glycerol

Y) fatty acid

Z) phosphate group

Bonus Answer: W

11. BIOLOGY

Writer: Larry Wong

Toss Up: Short Answer

What is the genus of the common domestic dog?

Bonus Answer: Canis

Bonus: Short Answer

What family does the *Carcharodon carcharias* belong to?

Bonus Answer: Lamnidae

12. CHEMISTRY

Writer: Elias Milborn

Toss Up: Multiple Choice

Which of the following elements, in gaseous state, has the highest electron affinity?

- W) Fluorine
- X) bromine
- Y) sulfur
- Z) chlorine

Toss Up Answer: W

Bonus: Multiple Choice

In order to calculate the heat of fusion for a piece of ice placed in warm water, you must know:

- W) The energy released by the warm water and the mass of the water
- X) The energy released by the warm water and the mass of the ice
- Y) the energy released by the ice and the mass of the warm water
- Z) the energy released by the ice and the mass of the ice

Bonus Answer: X

13. PHYSICS

Writer: Nicholas Adit

Toss Up: Multiple Choice

Negative charges are accelerated by electric fields toward points

- W) at lower electric potentials
- X) at higher electric potentials
- Y) where the electric field is weaker
- Z) where the electric field is stronger

Toss Up Answer: X

Bonus: Multiple Choice

The potential at point A in an electric field is 10V higher than at point B. If a negative charge, $q = -2 \text{ C}$, is moved from point A to point B, then the potential energy of this charge will

- W) decrease by 20 J
- X) decrease by 5 J
- Y) increase by 5 J
- Z) increase by 20 J

Bonus Answer: Z

14. BIOLOGY

Writer: Elias Milborn

Toss Up: Short Answer

What scientist in 1936, building on the discoveries of Szent-Gyorgyi [SENT-GEE-or-gee], postulated the basic reactions of the tricarboxylic acid cycle?

Bonus Answer: Krebs

Bonus: Short Answer

If a plant that is heterozygous for each of three independently-assorting traits is allowed to self-fertilize, what portion of the offspring would be heterozygous for all three traits?

Bonus Answer: 1/8

15. PHYSICS

Writer: Nicholas Adit

Toss Up: Multiple Choice

A sphere of charge +Q is fixed in position. A smaller sphere of charge +q is placed near the larger sphere and released from rest. The small sphere will move away from the large sphere with

- W) decreasing velocity and acceleration
- X) decreasing velocity and increasing acceleration.
- Y) increasing velocity and decreasing acceleration.
- Z) increasing velocity and increasing acceleration.

Toss Up Answer: Y

Bonus: Short Answer

If the distance between two positive point charges is tripled, then the strength of the electrostatic repulsion between them will decrease by a factor of

Bonus Answer: 9

16. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Short Answer

Does a person weigh less at the equator or the poles?

Bonus Answer: Equator

Bonus: Short Answer

Does one move faster on the equator or on the poles?

Bonus Answer: Equator

17. BIOLOGY

Writer: Elias Milborn

Toss Up: Short Answer

What is the main respiratory pigment of skeletal muscle cells?

Bonus Answer: Myoglobin

Bonus: Multiple Choice

If a parent organism experiences a mutation, then all subsequent offspring of that individual will:

- W) always carry the mutated gene, but only as a recessive.
- X) Always carry the gene, but never express it phenotypically
- Y) only carry the mutated gene if it is heritable
- Z) never carry the gene as mutations can never be heritable

Bonus Answer: Y

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18. PHYSICS

Writer: Nicholas Adit

Toss Up: Short Answer

The mean distance from Saturn to the sun is 9 times greater than the mean distance from Earth to the sun. How long is a Saturn year?

Bonus Answer: 27 Earth years

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Bonus: Short Answer

An object moves at constant speed in a circular path. True statements about the motion include which of the following?

- I. The velocity is constant.
- II. The acceleration is constant.
- III. The net force on the object is zero since its speed is constant.

Bonus Answer: None of them (The vectors are changing)

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19. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which term describes organisms that can only tolerate a narrow range of temperatures?

- W) Eurythermal
- X) Stenothermal
- Y) Acrithermal
- Z) Anglothermal

Toss Up Answer: X

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Bonus: Multiple Choice

What is the name of the ecological phenomenon, related to the Small Population hypothesis, that describes a species' path to extinction due to inbreeding and genetic drift?

- W) Inbreeding depression
- X) Outbreeding depression
- Y) Extinction cascade
- Z) Extinction vortex

Bonus Answer: Z

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20. PHYSICS

Writer: Shanjeed Ali

Toss Up: Short Answer

How many orbitals are there in the third electron shell?

Bonus Answer: 9

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Bonus: Short Answer

Who discovered the neutron?

Bonus Answer: James Chadwick

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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

Bonus: Short Answer

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

Bonus Answer: *Helicobacter pylori*

22. PHYSICS

Writer: Nicholas Adit

Toss Up: Multiple Choice

An object of mass 2 kg has a linear momentum of magnitude 6 kg • m/s. What is this object's kinetic energy?

- W) 3 J
- X) 6 J
- Y) 9 J
- Z) 12 J

Toss Up Answer: Y

Bonus: Short Answer

Two objects, one of mass 3 kg and moving with a speed of 2 m/s and the other of mass 5 kg and speed 2 m/s, move toward each other and collide head-on. If the collision is perfectly inelastic, find the speed of the objects after the collision.

Bonus Answer: 0.5 m/s

23. BIOLOGY

Writer: Yae June Lee

Toss Up: Short Answer

What type of endocytosis is used when it uses pseudopods to move cells between membranes?

Bonus Answer: Receptor mediated endocytosis.

Bonus: Multiple Choice

How can small intestine increase its surface area?

- W) Rugae
- X) Villi
- Y) Cecae
- Z) Sphincters

Bonus Answer: X

24. BIOLOGY

Writer: Yae June Lee

Toss Up: Short Answer

Why do we need oxygen for cellular respiration?

Bonus Answer: Oxygen is the final electron acceptor for cellular respiration.

Bonus: Short Answer

How are saturated fat and unsaturated fat different?(refer to bonds)

Bonus Answer: Saturated fats are single bonded, and straight. Unsaturated fats are double bonds and curved.

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25. BIOLOGY

Writer: Yae June Lee

Toss Up: Short Answer

Which plant tissue conducts water from the roots to the leaves?

Bonus Answer: Xylem

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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