

Round 10

1. MATHEMATICS

Toss Up: Short Answer

If the log of n is 10, what is the log of $100n$?

Bonus Answer: 12

Bonus: Short Answer

How many ways are there to seat 5 people around a circular table, if rotations are ignored?

Bonus Answer: 24

2. BIOLOGY

Toss Up: Multiple Choice

How many amino acids are there?

W) 18

X) 20

Y) 22

Z) Too many to count.

Toss Up Answer: Z

Bonus: Short Answer

In feet, how long is the small intestine?

Bonus Answer: 20

3. CHEMISTRY

Toss Up: Short Answer

What is the hybridization of the molecular bonds of Ammonia?

Bonus Answer: sp^3

Bonus: Short Answer

Which element is most likely to act as an ideal gas?

Bonus Answer: Hydrogen (Accept: H)

4. EARTH and SPACE

Toss Up: Multiple Choice

Which of the following minerals breaks in parallel sheets?

W) Pyroxene

X) Halite

Y) Muscovite

Z) Calcite

Toss Up Answer: Y

Bonus: Multiple Choice

During a supernova, what percentage of the total energy released is composed of neutrinos?

W) 10

X) 50

Y) 75

Z) 99

Bonus Answer: Z

5. EARTH and SPACE

Toss Up: Short Answer

Order the four gas giants in size from the largest to the smallest.

Bonus Answer: Jupiter, Saturn, Uranus, Neptune

Bonus: Multiple Choice

Which one of these statements about Neptune's moon, Triton, is true?

W) It orbits in retrograde motion.

X) Its orbit is highly eccentric.

Y) It fractured billions of years ago and reformed.

Z) It does not have an atmosphere.

Bonus Answer: W

6. CHEMISTRY

Toss Up: Short Answer

What is the only letter that does not appear in the Periodic Table of Elements?

Bonus Answer: J

Bonus: Short Answer

Which element has the largest atomic radius?

Bonus Answer: Cesium (Accept: Cs)

7. MATHEMATICS

Toss Up: Short Answer

If the first term in an arithmetic sequence is 2 and the third term is 6, find the 10th term.

Bonus Answer: 20

Bonus: Short Answer

Compute the sum of the first 100 positive integers.

Bonus Answer: 5050

8. EARTH and SPACE

Toss Up: Multiple Choice

What upwelling ocean current off the coast of South America causes the most productive marine ecosystem in the world?

W) Gulf Stream

X) South Pacific Gyre

Y) Humboldt Current

Z) Cromwell Current

Toss Up Answer: Y

Bonus: Short Answer

What compound makes Neptune blue?

Bonus Answer: Methane

9. ENERGY

Toss Up: Multiple Choice

Which country generates the highest percentage of its energy from nuclear power?

- W) France
- X) China
- Y) Britain
- Z) Denmark

Toss Up Answer: W

Bonus: Short Answer

List the operating temperatures from lowest to highest of these types of fuel cells

PEMFC

PAFC

MCFC

SOFC

Bonus Answer: 1,2,3,4

10. MATHEMATICS

Toss Up: Short Answer

Find the perimeter of a right triangle with legs 11 and 60.

Bonus Answer: 132

Bonus: Short Answer

In a 15-75-90 degrees right triangle with hypotenuse 4, what are the lengths of the shorter and longer leg, respectively? Exact answers please.

Bonus Answer: radical 6 - radical 2, radical 6 + radical 2

11. BIOLOGY

Toss Up: Multiple Choice

How are insects classified from other arthropods?

W) The body is divided into four segments.

X) They are parasites.

Y) The body is divided into three segments.

Z) They require water to survive.

Toss Up Answer: Y

Bonus: Short Answer

What is the only molecule that exists in all three states of matter on Earth?

Bonus Answer: Water

12. MATHEMATICS

Toss Up: Short Answer

If Bruce can do a job in 3 hours, and Clark can do the same job in 4 hours, how long, in hours, will it take them to do the job if they work together? You may leave your answer as a fraction.

Bonus Answer: 12/7

Bonus: Short Answer

What is the eccentricity of an ellipse with $a = 5$ and $b = 4$?

Bonus Answer: 3/5

13. EARTH and SPACE

Toss Up: Short Answer

The Kappa Cygnids and the Northern Delta Aquarids are names for what phenomena?

Bonus Answer: Meteor Showers

Bonus: Short Answer

What substance is responsible for Neptune's blue-green color?

Bonus Answer: Methane gas (accept methane)

14. BIOLOGY

Toss Up: Multiple Choice

What is MYC?

W) Holoenzyme

X) Oncogene

Y) DNA

Z) Scientist name

Toss Up Answer: X

Bonus: Short Answer

What is the pacemaker of the heart?

Bonus Answer: SA (sinoatrial) node

15. EARTH and SPACE

Toss Up: Short Answer

All of Saturn's moons are composed predominantly of what substance?

Bonus Answer: Ice

Bonus: Short Answer

What are the scientific names for the two regions of a sunspot?

Bonus Answer: Umbra and penumbra

16. BIOLOGY

Toss Up: Multiple Choice

What is another name for the cell body of neurons?

W) Stroma

X) Soma

Y) Cellulite

Z) Thylakoid

Toss Up Answer: X

Bonus: Short Answer

What molecule do Ras protein's hydrolyze?

Bonus Answer: GTP

17. PHYSICS

Toss Up: Short Answer

What is the magnitude of the magnetic force caused by an electric current of 10 Amperes flowing perpendicular to a magnetic field of 10 Teslas through a length of 10 meters?

Bonus Answer: 1000 Newtons

Bonus: Multiple Choice

Two point charges are placed on the x-axis. The first has a charge of -3 Coulombs and is placed at 0. The second is placed 3 meters to the right of the first and has a charge of 3 Coulombs. What is the dipole moment of these charges?

- W) 9 Coulomb-Meters in the direction of the positive x-axis
- X) 1 Coulomb-Meters in the direction of the positive x-axis
- Y) 9 Coulomb-Meters in the direction of the negative x-axis
- Z) 1 Coulomb-Meters in the direction of the negative x-axis

Bonus Answer: W

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18. BIOLOGY

Toss Up: Multiple Choice

Which part of the brain is associated with coordinated movement?

- W) Cerebrum
- X) Cerebellum
- Y) Diencephalon
- Z) Corpus Callosum

Toss Up Answer: X

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Bonus: Short Answer

What is the major excitatory neurotransmitter in the brain?

Bonus Answer: Glutamate

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19. CHEMISTRY

Toss Up: Short Answer

What is the coordination number of $\text{Ag}_2\text{C}_2\text{O}_4$ (Silver Oxalate)?

Bonus Answer: 2

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Bonus: Short Answer

What two elements are liquid at room temperature?

Bonus Answer: Bromine and Mercury (Accept: Br and Hg)

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20. CHEMISTRY

Toss Up: Short Answer

What is the stoichiometric point when exactly enough titrant is used to react?

Bonus Answer: Equivalence Point

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Bonus: Short Answer

What is the point in a titration at which an indicator changes color?

Bonus Answer: Endpoint

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21. CHEMISTRY

Toss Up: Multiple Choice

For which of the following can the K_{sp} values be compared to determine relative molar solubilities?

- W) Ag_2CrO_4 and AgBr (Read as: Silver Chromate and Silver Bromide)
- X) Ag_2SO_4 and CaSO_4 (Read as: Silver Sulfate and Calcium Sulfate)
- Y) PbCl_2 and PbSO_4 (Read as: Lead two Chloride and Lead two Sulfate)
- Z) ZnS and AgI (Read as: Zinc Sulfide and Silver Iodide)

Toss Up Answer: Z

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Bonus: Short Answer

What is the molecular geometry associated with a coordination number of 6?

Bonus Answer: Octahedral

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22. PHYSICS

Toss Up: Short Answer

What is the total voltage of a circuit with a total current of 10 Amperes running through four resistors placed in parallel, each with a resistance of 4 Ohms?

Bonus Answer: 10 Volts

Bonus: Short Answer

What does the abbreviation MOSFET stand for?

Bonus Answer: Metal-Oxide-Semiconductor Field-Effect Transistor

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23. CHEMISTRY

Toss Up: Multiple Choice

When the reaction of Silver Nitrate (aqueous) and Sodium Chloride (aqueous) goes to completion, what is formed?

W) A Gas

X) Water

Y) An Acid

Z) A Precipitate

Toss Up Answer: Z

Bonus: Multiple Choice

When does the value of pH equal the value of pKa?

W) when $[HA]=[A^-]$ (Read as: the molarity of the conjugate base equals the molarity of the conjugate acid)

X) at the end point of a titration

Y) everywhere in the buffer region

Z) in the Henderson-Hasselbach equation

Bonus Answer: W

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24. PHYSICS

Toss Up: Short Answer

What is the unit of a Poynting vector?

Bonus Answer: Watt/meter² (accept equivalent variations)

Bonus: Short Answer

What's the order of magnitude of a Poynting vector of an EM wave, where the amplitude of the electric field is 300 N/C (newton per coulomb) and the amplitude of the magnetic field is 400 tesla?

Bonus Answer: 11

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25. PHYSICS

Toss Up: Short Answer

What is the equivalent capacitance of three Capacitors - each of 9 micro Farad Capacitance - placed in parallel?

Bonus Answer: 27 micro Farads

Bonus: Short Answer

Determine the amount of charge stored on either plate of a capacitor of 4 micro Farads when connected across a 12

Volt batter.

Bonus Answer: 48 micro Coulombs, 4.8×10^{-5} Coulombs
