

Round 25

1. MATHEMATICS

Writer: Hanna Yang

Toss Up: Multiple Choice

Which of the following is a triangular number?

- W) 2
- X) 6
- Y) 9
- Z) 11

Toss Up Answer: X

Bonus: Short Answer

What is the greatest common factor of 456 and 460?

Bonus Answer: 4

2. BIOLOGY

Writer: Zoe Orlin

Toss Up: Multiple Choice

Every cell in a puppy's skin, eyes, and leg muscles contains

- W) equal amounts of ATP
- X) identical genetic information
- Y) proteins that are all identical
- Z) organelles for the synthesis of glucose

Toss Up Answer: X

Bonus: Short Answer

Oxygenated blood contains a high percentage of

Bonus Answer: Hemoglobin

3. PHYSICS

Writer: Aaron Gee

Toss Up: Multiple Choice

The collision between a photon and a free electron was first explained by which of the following scientists?

- W) Compton
- X) Hertz
- Y) Einstein
- Z) Newton

Toss Up Answer: W

Bonus: Multiple Choice

The Tesla and the Gauss are units of measure of

- W) magnetic field strength
- X) conductance
- Y) light
- Z) electrical current

Bonus Answer: W

4. EARTH and SPACE

Writer: Yae June Lee

Toss Up: Multiple Choice

What happened to the melted rock after it goes through solidification to form basalt?

W) It occurred rapidly, with fine grained minerals

X) Slowly, coarse grained minerals

Y) Rapidly, coarse trained minerals

Z) Slowly, fine grained minerals

Toss Up Answer: W

Bonus: Short Answer

What are two surface traits that affect the rate of surface runoff?

Bonus Answer: Slope of land surface, soil type or composition, vegetation, porosity of soil, soil saturation.(any two of these answers are acceptable.)

5. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

Besides solid, liquid, and gas, what is the fourth form of matter?

Bonus Answer: Plasma

Bonus: Short Answer

In Einstein's universe, what is the fourth dimension?

Bonus Answer: Time

6. MATHEMATICS

Writer: Hanna Yang

Toss Up: Short Answer

What is the smallest even triangular number?

Bonus Answer: 6

Bonus: Multiple Choice

If p and q are inversely proportional, and p = 7 when q = 24, then find p when q =12.

W) 3.5

X) 7

Y) 12

Z) 14

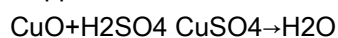
Bonus Answer: Z

7. CHEMISTRY

Writer: Mohammed Jamil

Toss Up: Short Answer

Copper sulfate can be made by warming copper oxide with sulfuric acid. The equation for the reaction is:



Calculate the maximum mass of copper oxide which can react with 9.8 g of sulfuric acid in this reaction.

(Relative atomic masses: H=1, O=16, Cu=64)

Bonus Answer: 8g

Bonus: Short Answer

It takes 83ml of a 0.45M NaOH solution to neutralize 235mL of an HCl solution.What is the concentration of the HCl

solution ?

Bonus Answer: 0.16 M

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8. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

The frequency of a wave is 50 Hertz and its wavelength is 25 meters. What is the velocity of this wave?

Bonus Answer: 1250 meters/second

Bonus: Short Answer

The focal length of a concave spherical mirror is equal to 1 meter. What is the radius of curvature of this mirror?

Bonus Answer: 2 meters

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9. EARTH and SPACE

Writer: Yae June Lee

Toss Up: Multiple Choice

What is the relationship between size of a particle and the capillarity of soil?

W) As soil particle increases, capillarity increases.

X) As soil size increases, capillarity decreases.

Y) As soil size increases, capillarity stays the same.

Z) As soil size increases, the capillarity curves in a parabola.

Toss Up Answer: X

Bonus: Short Answer

Why do polar jet streams vary throughout the seasons?

Bonus Answer: The rays of the sun shift north of the equator during the summer.

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10. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

A quarter of a wavelength is equal to how many degrees of phase?

Bonus Answer: 90 degrees

Bonus: Short Answer

Davisson and Germer scattered electrons from a crystal of nickel. The scattered electrons formed a strong diffraction pattern. What important conclusion was drawn from this experiment?

Bonus Answer: Electrons act like waves

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11. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

What is the electron configuration of Mg(2+)?

Bonus Answer: 1s2 2s2 2p6

Bonus: Short Answer

What is the electron configuration of Cu(2+)?

Bonus Answer: 1s2 2s2 2p6 3s2 3p6 3d9

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12. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which of these is an example of an inhibiting hormone?

- W) Somatostatin
- X) ACTH
- Y) ADH
- Z) GH

Toss Up Answer: W

Bonus: Short Answer

In the secondary messenger system characteristic of water-soluble hormones, what enzyme is often used to produce ATP?

Bonus Answer: Adenyl cyclase

13. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Multiple Choice

What do the Neon, Fluorine(1-) and Magnesium(2+) have in common?

- W) They are isotopes of each other
- X) They are isomers of each other
- Y) They are isoelectronic with each other
- Z) They have nothing in common

Toss Up Answer: Y

Bonus: Multiple Choice

The half-life of francium-212 is 19 minutes. How many minutes will it take for 1 gram of this isotope to decay to 0.125 grams?

- W) 4.75 min
- X) 9.5 min
- Y) 38 min
- Z) 57 min

Bonus Answer: Z

14. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Through what process do cells engulf extracellular particles?

Bonus Answer: Phagocytosis

Bonus: Multiple Choice

Which of the following is not a function of the Golgi Body?

- W) separates proteins and lipids according to their destination
- X) modifies certain molecules
- Y) manufacturing ribosomes
- Z) packaging materials into vesicles for transport outside the cell

Bonus Answer: Y

15. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

The focal length of a concave mirror is 2 meters. An object is positioned 8 meters in front of the mirror. Where is the image of this object formed?

Bonus Answer: 8/3 or 2.66 meters in front of the mirror

Bonus: Multiple Choice

A standing wave is formed on a tightly stretched string. The distance between a node and an antinode is how many wavelengths?

W) 1/2

X) 1/4

Y) 1/8

Z) 1

Bonus Answer: X

16. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

In DNA, to which carbon of the sugar is the nitrogenous base bonded?

Bonus Answer: Accept one OR one prime

Bonus: Short Answer

On which carbon of the sugar is the hydroxyl group located?

Bonus Answer: Accept three OR three prime

17. EARTH and SPACE

Writer: Elias Milborn

Toss Up: Multiple Choice

Which of the following is a term specifically given to water that replenishes an aquifer?

W) Recharge

X) Discharge

Y) Hydraulic

Z) Permeable

Toss Up Answer: W

Bonus: Multiple Choice

When a strong south wind occurs along the west coast of North America, Ekman transport causes water to move to which of the following?

W) onshore

X) offshore

Y) alongshore to the south

Z) alongshore to the north

Bonus Answer: W

18. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Which two scientists proved that DNA replication was semi-conservative?

Bonus Answer: Meselson and Stahl

Bonus: Short Answer

Meselson and Stahl replaced an element in DNA with an isotope in order to tag the original DNA molecule. Which element did they replace?

Bonus Answer: Nitrogen

19. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

The speed at which a wave propagates down a string is 300 meters per second. If the frequency of this wave is 150 Hertz, what is the wavelength of this wave?

Bonus Answer: 2 meters

Bonus: Multiple Choice

When a physical property such as charge exists in discrete "packets" rather than in continuous amounts, the property is said to be:

- W) quantized
- X) random
- Y) discontinuous
- Z) nonexistant

Bonus Answer: W

20. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Who discovered that DNA has equal amounts of adenine and thymine as well as equal amounts of guanine and cytosine?

Bonus Answer: Accept Erwin Chargaff OR Chargaff

Bonus: Short Answer

What method was used to obtain Photograph 51, which was used to determine the structure of DNA?

Bonus Answer: X-ray diffraction

21. MATHEMATICS

Writer: Hanna Yang

Toss Up: Multiple Choice

If 8 moles dig 8 holes in 8 years, how many holes can 4 moles dig in 1461 days?

- W) 1
- X) 2
- Y) 4
- Z) 8

Toss Up Answer: X

Bonus: Short Answer

If 9 moles dig 24 holes in 10 days, how many holes can 3 moles dig in 5 days?

Bonus Answer: 4

22. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Short Answer

Where are short tandem repeats usually located?

Bonus Answer: Accept introns OR noncoding DNA

Bonus: Short Answer

Why do DNA molecules travel through the gel in gel electrophoresis?

Bonus Answer: DNA has a negative charge

23. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

What is the element formed by the beta decay of Carbon-14?

Bonus Answer: Nitrogen-14

Bonus: Short Answer

If the abundance of Lithium-6 (6.0 amu) is 7.500% and the abundance of Lithium-7 (7.0 amu) is 92.500%, what is the average atomic mass to the tenth place?

Bonus Answer: 6.9 amu

24. BIOLOGY

Writer: Shanjeed Ali

Toss Up: Multiple Choice

What stimulates root branching in plants?

W) Gibberellin

X) Auxin

Y) Ethylene

Z) Cytokinin

Toss Up Answer: X

Bonus: Multiple Choice

A plant with low levels of gibberellin will have:

W) high levels of ethylene

X) decreased levels of lignin

Y) undeveloped leaves

Z) decreased growth

Bonus Answer: Z

25. CHEMISTRY

Writer: Prangon Ghose

Toss Up: Short Answer

What is the correct formula for Aluminum Oxide?

Bonus Answer: Al_2O_3 (accept: Aluminum 2 Oxygen 3)

Bonus: Short Answer

What is the formal charge of oxygen in H_3O^+ ?

Bonus Answer: +1 (do not accept 1)
