

Round 27

1. PHYSICS

Writer: Banpreet Singh

Toss Up: Short Answer

Since the specific gravity of lead is 11.35, it is how

many times as dense as water?

Bonus Answer: 11.35

Bonus: Short Answer

What Greek letter denotes angular acceleration?

Bonus Answer: alpha

2. PHYSICS

Writer: Brian Lim

Toss Up: Short Answer

What is the charge of a muon?

Bonus Answer: -1 [or -1e]

Bonus: Multiple Choice

As an object falls freely, how does the energy of the object change?

W) kinetic energy and potential energy both increase

X) kinetic energy and potential energy both decrease

Y) kinetic energy increases while potential energy decreases

Z) kinetic energy decreases while potential energy increases

Bonus Answer: Y

3. PHYSICS

Writer: Brian Lim

Toss Up: Short Answer

What is the term for the conditions at which a substance begins behaving like a supercritical fluid?

Bonus Answer: critical point

Bonus: Multiple Choice

What property can be used to determine the amount of energy of a photon?

W) speed

X) direction

Y) polarization

Z) frequency

Bonus Answer: Z

4. PHYSICS

Writer: Brian Lim

Toss Up: Multiple Choice

For a solid sphere rotating about its center whose mass is uniformly distributed, what expression is equivalent to the moment of inertia?

W) mr^2

X) $\frac{1}{2}mr^2$

Y) $\frac{2}{3}mr^2$

Z) $\frac{2}{5}mr^2$

Toss Up Answer: Z

Bonus: Multiple Choice

For a rod with uniformly distributed mass, what is the ratio between the moment of the inertia about its center to the moment of inertia about one of its ends?

W) $\frac{1}{4}$

X) $\frac{1}{2}$

Y) 2

Z) 4

Bonus Answer: W

5. MATHEMATICS

Writer: Larry Wong

Toss Up: Short Answer

The figure represented by the equation $\frac{x^2}{36} + \frac{y^2}{16} = 1$ is centered about what x-y coordinate point?

Bonus Answer: (0,0)

Bonus: Short Answer

In a right triangle, $\sin(A)$ is $\frac{3}{5}$, what is $\tan(A)$?

Bonus Answer: $\frac{3}{4}$

6. MATHEMATICS

Writer: Larry Wong

Toss Up: Short Answer

What is the sum of coefficients of $(1+x^7)^7$?

Bonus Answer: 128

Bonus: Short Answer

Find x if $\log_{[base\ 5]}(x) = -2$.

Bonus Answer: $\frac{1}{25}$

7. MATHEMATICS

Writer: Larry Wong

Toss Up: Short Answer

What is 15 in base 2?

Bonus Answer: 1111

Bonus: Short Answer

What is 14 in hexadecimal?

Bonus Answer: E

8. MATHEMATICS

Writer: Larry Wong

Toss Up: Short Answer

What is the sum of the first 100 positive odd integers?

Bonus Answer: 10000

Bonus: Short Answer

How many degrees are in an interior angle of a Hexacontagon?

Bonus Answer: 174

9. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

What type of plant has seeds?

W) Sperm

X) Angiosperm

Y) Gymnosperm

Z) Egg

Toss Up Answer: X

Bonus: Short Answer

By name or number, identify the characteristics that gymnosperms and angiosperms share from this list: leaves, stems, roots, and seeds

Bonus Answer: all of them

10. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

Microspores of gymnosperms eventually develop into

W) seeds

X) cotyledons

Y) female gametophytes

Z) pollen grains

Toss Up Answer: Z

Bonus: Multiple Choice

Microspores of angiosperms eventually develop into

W) cotyledons

X) female gametophytes

Y) pollen grains

Z) archegonia

Bonus Answer: Y

11. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

What type of joint allows for rotational movement?

Bonus Answer: ball-and-socket joint

Bonus: Short Answer

What type of joint allows for gliding or sliding movement?

Bonus Answer: plane joint

12. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

A gene that is phenotypically expressed in the homozygous state but has its expression masked in the presence of a dominant gene is called:

Bonus Answer: recessive

Bonus: Multiple Choice

Sequences of DNA that are easily and naturally copied from one location in the genome and inserted elsewhere are called

- W) jumping genes
- X) crossing over genes
- Y) recessive genes
- Z) deletion genes

Bonus Answer: W

13. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

Small, circular, double-stranded DNA molecules that naturally exist in bacterial cells and provide bacteria antibiotic resistance are called:

Bonus Answer: plasmids

Bonus: Multiple Choice

Small and round bacteria that grow in a chain are called

- W) streptococci
- X) staphylobacilli
- Y) spirillum
- Z) diplococci

Bonus Answer: W

14. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

How many mature egg cells result from mitosis?

- W) 0
- X) 1
- Y) 2
- Z) 3

Toss Up Answer: W

Bonus: Multiple Choice

How many mature egg cells result from meiosis?

- W) 0
- X) 1
- Y) 2
- Z) 3

Bonus Answer: X

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15. BIOLOGY

Writer: Mohammed Jamil

Toss Up: Multiple Choice

When outside of the lymph vessel, the lymph is called

- W) Interstitial Fluid
- X) Hemocel
- Y) Plasma
- Z) Blood

Toss Up Answer: W

Bonus: Multiple Choice

Which of the following is not true about platelets

- W) They are involved in blood clotti
- X) They are present in blood
- Y) They are cells that broke away from megakaryocytes
- Z) They have cytoplasm

Bonus Answer: Y

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16. BIOLOGY

Writer: Josh Tish

Toss Up: Multiple Choice

The amino acid sequences encoded by the red and green visual pigment genes in humans are 96% identical. These two loci are found close together on the X chromosome. What mechanism most likely led to the evolution of these two genes?

- W) Horizontal gene transfer followed by sequence divergence
- X) Gene duplication followed by sequence divergence
- Y) Inversion of the human X chromosome
- Z) Polyploidization

Toss Up Answer: X

Bonus: Multiple Choice

Genetic drift is best described as:

- W) evolutionary change due to natural selection.
- X) changes in the proportion of homozygous recessive individuals due to random mating.
- Y) a random change in allele frequencies that benefits the population.
- Z) evolutionary change due to random events.

Bonus Answer: Z

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17. BIOLOGY

Writer: Josh Tish

Toss Up: Multiple Choice

SNPs can be characterized by all of the following EXCEPT for:

- W) always causing diseases.

X) being common in a population.

Y) acting as a point mutation.

Z) acting as a transition mutation.

Toss Up Answer: W

Bonus: Short Answer

Which of the following cells are phagocytic?

1.Megakerocyte

2.Dendritic cells

3.Natural killer cells

4.Neutrophils

5.Monocytes

Bonus Answer: 2, 4, 5

(Dendritic cells, Neutrophils, Monocytes)

18. CHEMISTRY

Writer: Jason Weng

Toss Up: Multiple Choice

How much heat, in kJ, is needed to heat 1 kg of water 1 Kelvin if the specific heat of water is 4.18?

W) 4.18 kJ

X) 41.8 kJ

Y) 418 kJ

Z) 4180 kJ

Toss Up Answer: Z

Bonus: Multiple Choice

What is the molecular geometry of phosphorous trifluoride according to the VSEPR theory?

W) Bent

X) Seesaw

Y) Trigonal pyramid

Z) T-shape

Bonus Answer: Y

19. CHEMISTRY

Writer: Hanna Yang

Toss Up: Short Answer

What characteristic of water causes its temperature to change slowly in response to the environment?

Bonus Answer: High Specific Heat

Bonus: Short Answer

What is the most abundant molecule in the human body?

Bonus Answer: Water

20. CHEMISTRY

Writer: Hanna Yang

Toss Up: Short Answer

Name the polyatomic ion with formula SO_4^{2-}

Bonus Answer: Sulfate

Bonus: Multiple Choice

Which of the following is a base?

W) $C_6H_{12}O_6$

X) NaOH

Y) HCl

Z) PO_4

Bonus Answer: X

21. CHEMISTRY

Writer: Hanna Yang

Toss Up: Multiple Choice

Which of the following reactions is expected to produce a precipitate?

W) $CdSO_4 + K_2S \rightarrow CdS + K_2SO_4$

X) $CoCl_2 + Na_2SO_4 \rightarrow CoSO_4 + NaCl$

Y) $HI + Zn(NO_3)_2 \rightarrow ZnI + H(NO_3)_2$

Z) $Pb(NO_3)_2 + K_2SO_4 \rightarrow 2KNO_3 + PbSO_4$

Toss Up Answer: W

Bonus: Short Answer

Name the precipitate for the following reaction: $3CaCl_2 + 2Na_3PO_4 \rightarrow ? + ?$

Bonus Answer: $Ca_3(PO_4)_2$ (Calcium Phosphate)

22. CHEMISTRY

Writer: Hanna Yang

Toss Up: Short Answer

What element is mixed with gold to make rose gold / pink gold?

Bonus Answer: Copper

Bonus: Short Answer

What two elements are mixed with gold to make white gold?

Bonus Answer: Silver and Copper

23. EARTH and SPACE

Writer: Zoe Orlin

Toss Up: Short Answer

Where is the majority of Earth's freshwater "locked up"?

Bonus Answer: Antarctica

Bonus: Short Answer

What are the four terrestrial planets?

Bonus Answer: Earth, Mars, Mercury, Venus

24. 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

25. 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
