

Round 11

1. PHYSICS

Writer: Jason Weng

Toss Up: Multiple Choice

What is the centripetal force if the mass of an object is 10 grams and its centripetal force is 10 m/s^2 ?

W) 100

X) 10

Y) 1

Z) 0.1

Toss Up Answer: Z

Bonus: Short Answer

A man pulls a 5 kg object with 100 Newton of force forward across a flat plain at constant speed. If the coefficient of friction between the ground and the object is 1.0, what is the magnitude of the acceleration of the object? Use 10 m/s^2 for gravity.

Bonus Answer: 10 m/s^2

2. PHYSICS

Writer: Banpreet Singh

Toss Up: Short Answer

At what angle should a projectile be launched from a horizontal surface to have the maximum range?

Bonus Answer: 45 degrees

Bonus: Short Answer

A mass of 8 kg is hanging vertically from the bottom of a spring with a spring constant of 10^3 N/m . To the nearest hundredths place, in meters, what is the displacement?

Bonus Answer: 0.08 meters

3. PHYSICS

Writer: Hanna Yang

Toss Up: Multiple Choice

Which of the following is true about a light wave?

W) Its energy is directly proportional to its wavelength.

X) Its energy is directly proportional to its frequency.

Y) Its energy is directly proportional to its amplitude.

Z) Its energy is not related to any other of its properties.

Toss Up Answer: X

Bonus: Short Answer

Find the electrostatic force between two perfect spheres, both with charge 1 and are 1 meter apart from each other. Give your answer in scientific notation.

Bonus Answer: $8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$

4. PHYSICS

Writer: Kerwin Chen

Toss Up: Short Answer

Which greek letter is used to denote shear stress?

Bonus Answer: tao

Bonus: Short Answer

Which greek letter is sued to denote coefficient of viscosity?

Bonus Answer: mu

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5. MATHEMATICS

Writer: Ahmad Alnasser

Toss Up: Short Answer

Write an equation for a sine function with an amplitude of $\frac{5}{3}$, a period of $\pi/2$, and a vertical shift of 4 units up.

Bonus Answer: $y = (\frac{5}{3})\sin(4x) + 4$

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Bonus: Short Answer

Two large and 1 small pumps can fill a swimming pool in 4 hours. One large and 3 small pumps can also fill the same swimming pool in 4 hours. How many hours will it take 4 large and 4 small pumps to fill the swimming pool.

Bonus Answer: 1 hour and 40 minutes

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6. MATHEMATICS

Writer: Yevgeniy Gorbachev

Toss Up: Multiple Choice

If a regular hexagon has a side length of 2, what is its area?

W) $3\sqrt{6}$

X) $6\sqrt{3}$

Y) $\sqrt{18}$

Z) $6\sqrt{2}$

Toss Up Answer: X

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Bonus: Multiple Choice

If $f(x)$ is $(\ln(x^2))/(e^x)$, what is $f'(x)$ in simplest form?

W) $((x^2)/2x + \ln(x^2))/(e^{2x})$

X) $((2/x) - \ln(x^2))/(e^2)$

Y) $(\ln(4/x))/(e^{2x})$

Z) $((2x/(x^2)) - \ln(x^2))/(e^{2x})$

Bonus Answer: X

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7. MATHEMATICS

Writer: George Zhou

Toss Up: Multiple Choice

$3^{12}=27^x$. What is the value of x?

W) $x=12$

X) $x=4$

Y) $x=6$

Z) $x=3$

Toss Up Answer: X

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Bonus: Short Answer

$3^{12}+3^{11}+3^{10}=b \cdot 3^a$ What is the positive difference between the product and the sum of a and b?

Bonus Answer: 107

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8. MATHEMATICS

Writer: George Zhou

Toss Up: Multiple Choice

Donald Trump has $10x+5$ apples where $x=3$. How many apples does he have if he eats two of them?

- W) 35
- X) 39
- Y) 30
- Z) 33

Toss Up Answer: Z

Bonus: Short Answer

Donald Trump has a tower consisting of 0.00405×10^{45} grams of gold. How many kilograms of gold is in his tower?

Express in scientific notation.

Bonus Answer: 4.05×10^{39} (kilograms of gold)

9. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

The resting potential of a neuron is dependent on what two ions?

- W) lead and calcium ions
- X) calcium and phosphate ions
- Y) sodium and potassium ions
- Z) potassium and phosphate ions

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following is NOT a type of neuron?

- W) sensory
- X) motor
- Y) association
- Z) stimulatory

Bonus Answer: Z

10. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

Melatonin (pron: mel-eh-toe-nin) is produced by the:

- W) skin
- X) pineal gland
- Y) liver
- Z) pituitary gland

Toss Up Answer: X

Bonus: Multiple Choice

Which of the following statements is TRUE of insulin?

- W) secreted by the pancreas
- X) involved in the metabolism of glucose
- Y) a protein
- Z) all of the above

Bonus Answer: Z

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11. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

Fertilization of the ovum by the sperm usually occurs in the:

- W) oviduct
- X) vagina
- Y) uterus
- Z) ovary

Toss Up Answer: W

Bonus: Multiple Choice

Which of the following structures is directly attached to the ovary?

- W) oviduct
- X) uterus
- Y) suspensory ligaments
- Z) vagina

Bonus Answer: Y

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12. BIOLOGY

Writer: Henry Zheng

Toss Up: Multiple Choice

During which phase of the cell cycle are normal components of the cell synthesized and assembled?

- W) the M phase
- X) the G1 phase
- Y) the S phase
- Z) the G2 phase

Toss Up Answer: X

Bonus: Short Answer

If an individual has two dissimilar alleles for a trait, with regard to that trait he is said to be:

Bonus Answer: heterozygous

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13. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

How many chromosomes per cell does a Down's Syndrome (trisomy 21) victim have?

Bonus Answer: 47

Bonus: Short Answer

If a male who is heterozygous for an autosomal trait mates with a female who is also heterozygous for that trait, what percent of their offspring are likely to be heterozygous for this trait as well?

Bonus Answer: 50%

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14. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

Glucose is stored as what molecule in plants?

Bonus Answer: starch

Bonus: Short Answer

What is the most common name of the protein that synthesizes DNA?

Bonus Answer: DNA polymerase (ACCEPT: polymerase)

15. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Which of the following is not a strong acid?

W) H_2SO_4

X) HNO_3

Y) HClO

Z) HClO_4

Toss Up Answer: Y

Bonus: Short Answer

In a 1M solution of HClO_4 , what are the two ions and what are their concentrations?

Bonus Answer: 1 M H^+ , 1 M ClO_4^-

16. BIOLOGY

Writer: Elias Milborn

Toss Up: Short Answer

What is the largest internal organ in the human body

Bonus Answer: liver

Bonus: Multiple Choice

Plants that grow under average temperature and moisture are called:

W) halophytes

X) xerophytes

Y) hydrophytes

Z) mesophytes

Bonus Answer: Z

17. BIOLOGY

Writer: Siam Muquit

Toss Up: Multiple Choice

Polio is caused by which type of microbe?

W) Bacteria

X) Fungus

Y) Prion

Z) Virus

Toss Up Answer: Z

Bonus: Short Answer

Which human body system does polio most directly affect?

Bonus Answer: Nervous system (accept Central nervous system)

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18. CHEMISTRY

Writer: Shihab Karim

Toss Up: Multiple Choice

What is the name given to the equation $P_1V_1=P_2V_2$?

W) Ideal Gas Law

X) Charles's Law

Y) Boyle's Law

Z) Gay-Lussac's Law

Toss Up Answer: Y

Bonus: Short Answer

What are bond angles of a tetrahedral?

Bonus Answer: 109.5 degrees

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19. CHEMISTRY

Writer: Shihab Karim

Toss Up: Short Answer

What is the hybridization of CH_4 ?

Bonus Answer: sp^3

Bonus: Short Answer

What intermolecular forces exist in HF?

Bonus Answer: Hydrogen Bonding

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20. CHEMISTRY

Writer: Shihab Karim

Toss Up: Multiple Choice

How many moles of nitrogen are in 35 grams of nitrogen?

W) 3

X) 3.5

Y) 4

Z) 2.5

Toss Up Answer: Z

Bonus: Short Answer

What group is Magnesium a part of?

Bonus Answer: Alkaline Earth Metals

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21. CHEMISTRY

Writer: Henry Zheng

Toss Up: Multiple Choice

A lead chromate solution is typically what color?

W) blue

X) red

Y) yellow

Z) green

Toss Up Answer: Y

Bonus: Multiple Choice

Which of the following molecules exhibits a dipole moment?

W) CH₄

X) H₂S

Y) CO₂

Z) SO₃

Bonus Answer: X

22. CHEMISTRY

Writer: Shihab Karim

Toss Up: Short Answer

List the following atoms in order of increasing electronegativity: fluorine, chlorine, and bromine

Bonus Answer: Fluorine

Bonus: Short Answer

Which element has the highest electronegativity?

Bonus Answer: Fluorine

23. 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

24. EARTH and SPACE

Writer: George Papastefanou

Toss Up: Multiple Choice

The North Pacific Gyre is mostly located within what latitudinal zone?

W) The North Frigid Zone

X) The Torrid Zone

Y) The Horse Latitudes

Z) The North Temperate Zone

Toss Up Answer: Z

Bonus: Short Answer

What ocean current keeps Western Europe relatively warm for its latitude?

Bonus Answer: North Atlantic Current (accept North Atlantic Drift, but not Gulf Stream)

25. EARTH and SPACE

Writer: George Papastefanou

Toss Up: Short Answer

How long does it take for a satellite in geosynchronous orbit to travel once around the Earth?

Bonus Answer: One day

Bonus: Short Answer

What is the orbital period, to the nearest year, of Halley's Comet?

Bonus Answer: 75 years

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