

Round 30

1. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A bulldozer does 30,000 joules of work to push another boulder a distance of 20 meters. How much force is applied to push the boulder?

Bonus Answer: 1,500 N

Bonus: Short Answer

A 450-newton gymnast jumps upward a distance of 0.50 meters to reach the uneven parallel bars. How much work, in joules, did she do before she even began her routine ?

Bonus Answer: 225

2. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A conveyor-belt, horizontally, moves a 600Kg bag a distance of 100 meters through the airport. How much work was done?

Bonus Answer: No work was done

Bonus: Short Answer

A dryer has a power rating of 2500 watts. To dry a few towels this dryer uses 6,750,000 joules of energy. How long will it take to dry these towels, in minutes

Bonus Answer: 45 minutes

3. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A 1-kilogram ball is thrown into the air with an initial velocity of 30 m/sec. How high in the air did it travel ?

Bonus Answer: 46 meters

Bonus: Short Answer

What is the velocity of an 500-kilogram elevator that has 4,000 joules of energy?

Bonus Answer: 4 m/sec

4. PHYSICS

Writer: Charles Zhang

Toss Up: Multiple Choice

What is the thrust of a rocket ejecting fuel at 200 kg/s and with an exhaust velocity of 1500 m/s?

- W) 30000 newton meters
- X) 60000 newton meters
- Y) 90000 newton meters
- Z) 300000 newton meters

Toss Up Answer: W

Bonus: Multiple Choice

A solid disk with a rotational inertia of $5 \text{ kg}\cdot\text{m}^2$ (READ AS: kilogram meters squared) and a radius of 0.25 m rotates on a fixed axis perpendicular to the disk and through its center. If a force of 2 N is applied tangentially to the disk, what is the work done by the force after half of a revolution to the nearest tenth?

- W) 0.4 J
- X) 0.8 J
- Y) 1.6 J
- Z) 3.1 J

Bonus Answer: Y

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5. MATHEMATICS

Writer: Hussain Waris

Toss Up: Multiple Choice

Which of the following best characterizes every transcendental number?

- W) Irrational
- X) A linear combination of e or π in which the coefficients are non-zero
- Y) A real number that is not a root of any non-zero polynomial with rational coefficients
- Z) e or π

Toss Up Answer: W

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Bonus: Short Answer

Which of the following numbers are transcendental numbers: 1) e ; 2) $\sqrt{2}$; 3) i^i ; 4) π ?

Bonus Answer: e , i^i , π [Accept any permutation of 1, 3, and 4]

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6. MATHEMATICS

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7. MATHEMATICS

Writer: Henry Zheng

Toss Up: Multiple Choice

What is the least positive integer with exactly six factors?

- W) 6
- X) 12
- Y) 18
- Z) 24

Toss Up Answer: X

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Bonus: Short Answer

Giving your answer as one, two, three, or four, in what quadrant will θ terminate if $\sin \theta$ and $\sec \theta$ are both negative?

Bonus Answer: 3

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8. MATHEMATICS

Writer: Andrew Chen

Toss Up: Short Answer

A square is inscribed in a circle, which is inscribed in a unit square. What is the area of the smaller square?

Bonus Answer: $1/2$

Bonus: Short Answer

What is the remainder when 7^{420} is divided by 3?

Bonus Answer: 1

9. BIOLOGY

Writer: Nten Nylam

Toss Up: Multiple Choice

All of the following processes involve hydrogen bonding except

- W) DNA replication
- X) Protein folding
- Y) Formation of ice crystals
- Z) Binding of an enzyme and substrate

Toss Up Answer: Z

Bonus: Multiple Choice

Which of these is not an example of eukaryotic post-transcriptional modification?

- W) The 3' end of the growing strand is cleaved
- X) After splicing, exons are rejoined to make a final mRNA transcript
- Y) Exons, non-coding regions, are removed via splicing
- Z) A poly-A tail is added to the 5' end

Bonus Answer: Y

10. BIOLOGY

Writer: Nten Nylam

Toss Up: Multiple Choice

From where do autotrophs obtain their carbon, nutrients, and minerals?

- W) From the sun
- X) From human activities
- Y) The inorganic environment
- Z) From the atmosphere

Toss Up Answer: Y

Bonus: Short Answer

What is the name of the parasite that causes malaria?

Bonus Answer: Plasmodium parasites (also accept plasmodium)

11. BIOLOGY

Writer: Kerwin Chen

Toss Up: Short Answer

The vision of a person with myopia can be corrected with which type of lens?

Bonus Answer: diverging, concave

Bonus: Short Answer

What is the name of the surgical procedure in which cuts are made around the cornea to allow for the correction of myopia?

Bonus Answer: Radial keratotomy

12. BIOLOGY

Writer: Kerwin Chen

Toss Up: Short Answer

What are the names of the two bones in your forearm?

Bonus Answer: radius and ulna

Bonus: Short Answer

How many carpal bones does a person have in each arm?

Bonus Answer: 8

13. BIOLOGY

Writer: Kerwin Chen

Toss Up: Short Answer

Which scientist is often considered the father of microbiology?

Bonus Answer: Leeuwenhoek

Bonus: Short Answer

Which English scientist coined the word "cell"?

Bonus Answer: Robert Hooke, Hooke

14. BIOLOGY

Writer: Kerwin Chen

Toss Up: Short Answer

What is the liquid underneath the cornea called?

Bonus Answer: aqueous humor

Bonus: Short Answer

What is the jellylike tissue behind the lens called?

Bonus Answer: vitreous humor

15. BIOLOGY

Writer: Larry Wong

Toss Up: Multiple Choice

What is the scientific name for a perentie?

W) Varnus giganteus

X) Lupus canis

Y) Faunus Lacerta

Z) Varnus priscus

Toss Up Answer: W

Bonus: Short Answer

What does HIV stand for?

Bonus Answer: Human Immunodeficiency Virus

16. BIOLOGY

Writer: Kerwin Chen

Toss Up: Short Answer

What is the medical term for lazy eye?

Bonus Answer: amblyopia

Bonus: Short Answer

What is the medical term for the clouding of the lens of the eye?

Bonus Answer: cataracts

17. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

What makes the fur of polar bears white?

- W) White pigment
- X) No pigment and transparency of fur
- Y) White pigment and transparency of fur
- Z) Transparency of fur

Toss Up Answer: X

Bonus: Short Answer

The term superbugs is usually used to refer to what?

Bonus Answer: Antibiotic-resistant bacteria

18. CHEMISTRY

Writer: Larry Wong

Toss Up: Multiple Choice

Which of the following statements about catalysts is true?

- W) They increase the value of the equilibrium constant.
- X) They increase the amount of product present at equilibrium.
- Y) They increase the concentration of the reactants.
- Z) They reduce the activation energy of the reaction.

Toss Up Answer: Z

Bonus: Multiple Choice

What is the product of water and pentyl ethanoate under acidic conditions?

- W) Ethanoic acid and pentanol
- X) Butanol and water
- Y) Ethanoic acid, two equivalents
- Z) Pentanol, two equivalents

Bonus Answer: W

19. CHEMISTRY

Writer: Ivan Zhang

Toss Up: Short Answer

What is the name given to the point at which a substance can exist in all 3 phases of matter?

Bonus Answer: Triple Point

Bonus: Short Answer

What is the name given to group 16 elements?

Bonus Answer: Calcogens

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20. CHEMISTRY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following element is not a newly named (as of November 2016) element?

- W) nihonium
- X) paostinism
- Y) moscovium
- Z) tennessine

Toss Up Answer: X

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Bonus: Multiple Choice

Who reorganized the periodic table based on atomic number?

- W) Mendeleev
- X) Moseley
- Y) Pablo
- Z) Escobar

Bonus Answer: X

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21. CHEMISTRY

Writer: Larry Wong

Toss Up: Multiple Choice

Which alcohol will most easily react with HCl to form an alkyl halide?

- W) Primary alcohol
- X) Secondary alcohol
- Y) Tertiary alcohol
- Z) Quaternary alcohol

Toss Up Answer: Y

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Bonus: Multiple Choice

The mass defect for an isotope was found to be 0.410 amu/atom. Calculate the binding energy in kJ/mol of atoms.

- W) 3.69×10^{10} kJ/mol
- X) 1.23×10^{20} kJ/mol
- Y) 3.69×10^{13} kJ/mol
- Z) 1.23×10^3 kJ/mol

Bonus Answer: W

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22. CHEMISTRY

Writer: Larry Wong

Toss Up: Multiple Choice

A Geiger-Muller tube is a

- W) gas ionization detector
- X) cloud chamber

Y) fluorescence detector

Z) spectrophotometer

Toss Up Answer: W

Bonus: Short Answer

The principle that states: If you disturb a system at equilibrium, the equilibrium moves in the direction that tends to reduce the disturbance is called?

Bonus Answer: Le Chatelier's Principle

23. EARTH and SPACE

Writer: Andrew Chen

Toss Up: Short Answer

What is the name of the underground point at which an earthquake originates?

Bonus Answer: hypocenter

Bonus: Multiple Choice

How fast is the East African Rift expanding?

W) 2 mm per year

X) 1 cm per year

Y) 5 cm per year

Z) 20 cm per year

Bonus Answer: X

24. EARTH and SPACE

Writer: Mohammed Jamil

Toss Up: Multiple Choice

Which of the following renewable energy sources do not involve water

W) Geothermal energy

X) Hydroelectric power

Y) Tidal power

Z) Biomass

Toss Up Answer: Z

Bonus: Multiple Choice

Which gas is attributed to be the cause of ozone depletion

W) Carbon di Oxide

X) Chlorofluorocarbons

Y) Nitrogen

Z) Methane

Bonus Answer: X

25. EARTH and SPACE

Writer: Benjamin Avrahami

Toss Up: Multiple Choice

Fog forms when the difference between temperature and dew point is:

W) More than 7.5 degrees Celsius

X) Between 5 and 7.5 degrees Celsius

Y) Between 2.5 and 5 degrees Celsius

Z) Less than 2.5 degrees Celsius

Toss Up Answer: Z

Bonus: Multiple Choice

Name how the environmental lapse rate changes going from the troposphere into the stratosphere:

W) In the troposphere, it is positive; in the tropopause, it is negative; in the stratosphere, it is positive

X) In the troposphere, it is negative; in the tropopause, it is positive; in the stratosphere, it is negative

Y) In the troposphere, it is positive; in the tropopause, it is zero; in the stratosphere, it is negative

Z) In the troposphere, it is negative; in the tropopause, it is zero; in the stratosphere, it is positive

Bonus Answer: Y
