

Round 35

1. PHYSICS

Writer: Brian Lim

Toss Up: Multiple Choice

Which of the following is a process used to produce an alternating current in an electric generator?

- W) a loop of wire is spun in a magnetic field
- X) a loop of wire is pushed in the direction of a magnetic field
- Y) a loop of wire is pushed perpendicular to a magnetic field
- Z) a magnet is pushed towards a wire

Toss Up Answer: W

Bonus: Short Answer

What is the SI unit for magnetic flux?

Bonus Answer: weber

2. PHYSICS

Writer: Mohammed Jamil

Toss Up: Multiple Choice

A loaded freight car A with a mass of 14,000 kg moves at a constant velocity of 15 m/s on a horizontal railroad track and collides with an empty car B with a mass of 6,000 kg moving at 5 m/s. After the collision the cars stick to each other and moves like one object. What is the velocity of two cars after the collision?

- W) 6 m/s
- X) 8 m/s
- Y) 10 m/s
- Z) 12 m/s

Toss Up Answer: Z

Bonus: Multiple Choice

When two objects collide elastically the momentum is conserved. Which of the following is true about the kinetic energy during the collision?

- W) The kinetic energy is lost
- X) The kinetic energy is gained
- Y) The kinetic energy is conserved
- Z) The kinetic energy completely transforms into thermal energy

Bonus Answer: Y

3. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A bullet travels through the air, it slows down due to air resistance. How does the bullet's momentum change as a result?

Bonus Answer: The bullet's momentum decreases as its speed decreases.

Bonus: Short Answer

How can a small force produce a large change in momentum ?

Bonus Answer: A small force can produce a large change in momentum if the force acts on an object for a long period of time.

4. PHYSICS

Writer: Mohammed Jamil

Toss Up: Short Answer

A horse moves a sleigh 1.00 kilometer by applying a horizontal 2,000-newton force on its harness for 45 minutes. What is the power of the horse?

Bonus Answer: 741 watts

Bonus: Short Answer

A force of 100 newtons is used to move an object a distance of 15 meters with a power of 25 watts. Find the work done and the time it takes to do the work.

Bonus Answer: work = 1,500 joules; time = 60 seconds

5. 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

6. 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

7. 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

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8. 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

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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

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9. MATHEMATICS

Writer: Hanna Yang

Toss Up: Short Answer

What is the name of the principle that states that 5 avocados cannot be placed in 4 holes without 2 of them being placed in the same one?

Bonus Answer: Pigeonhole Principle

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Bonus: Short Answer

In triangle ABC with integer side lengths, $AB = 7$, $BC = 14$, and $AC < 9$. Find AC.

Bonus Answer: 8 (Triangle Inequality)

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10. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

What type of organisms convert nitrogen-containing organic molecules into nitrates?

Bonus Answer: Decomposers

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Bonus: Short Answer

What type of organisms comprise the greatest biomass in a terrestrial food chain?

Bonus Answer: Producers

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11. BIOLOGY

Writer: Henry Zheng

Toss Up: Short Answer

What is the powerhouse of the cell?

Bonus Answer: Mitochondria

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Bonus: Short Answer

Where does photosynthesis take place?

Bonus Answer: Chloroplast

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12. 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

13. 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

14. 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

15. 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

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16. 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

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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

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17. 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

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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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18. CHEMISTRY

Writer: Brian Lim

Toss Up: Multiple Choice

Iron is in which category of elements?

- W) alkali metals
- X) alkaline metals
- Y) transition metals
- Z) metalloids

Toss Up Answer: Y

Bonus: Short Answer

What is the term for the temperature and pressure at which a substance exists at three phases at once in thermal equilibrium?

Bonus Answer: triple point

19. CHEMISTRY

Writer: Nten Nylam

Toss Up: Short Answer

Boyle's Law describes the relationship between what qualities of a gas/container?

Bonus Answer: Pressure and volume (accept in any order)

Bonus: Short Answer

What are acids with more than 2 ionizable hydrogens called?

Bonus Answer: polyprotic acids

20. CHEMISTRY

Writer: Brian Lim

Toss Up: Short Answer

What is the term for the conditions at which a substance begins to behave as a supercritical fluid?

Bonus Answer: critical point

Bonus: Multiple Choice

For a sample of a liquid, what is true about the relationship between temperature and vapor pressure?

- W) the relationship depends on the substance
- X) vapor pressure increases with temperature
- Y) vapor pressure decreases with temperature
- Z) vapor pressure is unaffected by changes in temperature

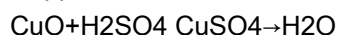
Bonus Answer: X

21. 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

22. 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

23. EARTH and SPACE

Writer: Mohammed Haque

Toss Up: Multiple Choice

Which of the following moon's do not belong to Jupiter?

W) Europa

X) Thebe

Y) Titan

Z) Lo

Toss Up Answer: Y

Bonus: Multiple Choice

What element is Jupiter mainly composed of?

W) Hydrogen

X) Fluorine

Y) Xenon

Z) Arsenic

Bonus Answer: W

24. EARTH and SPACE

Writer: Mohammed Haque

Toss Up: Multiple Choice

Which of the following is the best description of Jupiter's red spot ?

W) A Giant Tornado

X) A Hurricane

Y) A Weather Phenomenon.

Z) Non of the above

Toss Up Answer: X

Bonus: Multiple Choice

What are the light and dark strips that band around Jupiter?

W) Bands and belts

X) Belts and zones

Y) Bands and Zones

Z) Non of the above

Bonus Answer: X

25. EARTH and SPACE

Writer: Mohammed Haque

Toss Up: Multiple Choice

Which of the following moons do not belong to Saturn?

- W) Titan
- X) Dione
- Y) Europa
- Z) Mimas

Toss Up Answer: Y

Bonus: Multiple Choice

What is Saturn's orbital period (Earth years)?

- W) 15 years
- X) 24 years
- Y) 29 years
- Z) 17 years

Bonus Answer: Y
