

## Round 6

### 1. PHYSICS

Writer: Shantanu Jha

Toss Up: Multiple Choice

What French physicist, living from 1623-1662, discovered the basic principles of pressures on fluids?

- W) Andre Marie Ampere
- X) Charles-Augustin de Coulomb
- Y) Joseph-Louis Lagrange
- Z) Blaise Pascal

Toss Up Answer: Z

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Bonus: Multiple Choice

Supersymmetry is a proposed extension of space-time symmetry relating what 2 basic classes of elementary particles?

- W) Bosons and Fermions
- X) Hadrons and Leptons
- Y) Leptons and Mesons
- Z) Fermions and Mesons

Bonus Answer: W

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### 2. PHYSICS

Writer: Shantanu Jha

Toss Up: Multiple Choice

What was the first object created by people that produces a sonic boom (albeit a very small one)?

- W) Bullet
- X) Bullwhip
- Y) Slingshot
- Z) Jet Plane

Toss Up Answer: X

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Bonus: Multiple Choice

What kind of semiconductors are essentially all pure semiconductor material?

- W) p-type
- X) n-type
- Y) intrinsic
- Z) extrinsic

Bonus Answer: Y

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### 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

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Bonus: Short Answer

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

Bonus Answer: 4 m/sec

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#### 4. 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

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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

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#### 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

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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

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#### 6. MATHEMATICS

Writer: Larry Wong

Toss Up: Multiple Choice

If  $\log_x (1/8) = -3/2$ , then x is equal to

W) -4

X) 4

Y)  $1/4$

Z) 10

Toss Up Answer: X

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Bonus: Multiple Choice

f is a function such that  $f(x) < 0$ . The graph of the new function g defined by  $g(x) = |f(x)|$  is a reflection of the graph of f

W) on the y axis

X) on the x axis

Y) on the line  $y = x$

Z) on the line  $y = -x$

Bonus Answer: X

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#### 7. MATHEMATICS

Writer: Larry Wong

Toss Up: Short Answer

What is the distance in space between the points with coordinates (- 3,6,7) and (2,-1,4)?

**Bonus Answer: 9.11**

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**Bonus: Multiple Choice**

The diameter and height of a right circular cylinder are equal. If the volume of the cylinder is 2, what is the height of the cylinder?

W) 1.37

X) 1.08

Y) 0.86

Z) 0.8

**Bonus Answer: W**

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## 8. MATHEMATICS

**Writer: Ivan Zhang**

**Toss Up: Multiple Choice**

What is asymptote of the function:  $f(x) = 1/x$ ?

W)  $y = 0$

X)  $x = 0$

Y)  $x = 0, y = 1$

Z)  $x = 0, y = 0$

**Toss Up Answer: Z**

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**Bonus: Short Answer**

Plugging the divergent series,  $1 + 2 + 3 + 4 + \dots$ , into the Riemann Zeta Function results in which number?

**Bonus Answer: -1/12**

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## 9. MATHEMATICS

**Writer: Ivan Zhang**

**Toss Up: Multiple Choice**

What is the square root of 2 (to the nearest tenths)?

W) 1.7

X) 1.5

Y) 1.3

Z) 1.4

**Toss Up Answer: Z**

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**Bonus: Short Answer**

What is the equation of a circle with circumference  $6\pi$  that is positioned 3 points above the x axis and 4 points before the y axis?

**Bonus Answer:  $(x-4)^2 + (y+3)^2 = 9$**

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## 10. BIOLOGY

**Writer: Shamaul Dilmohamed**

**Toss Up: Short Answer**

What is the name given to the jellylike substance filling the chamber behind the lens of the human eye?

**Bonus Answer: vitreous humor**

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**Bonus: Short Answer**

Name the clear watery liquid that surrounds the brain and spinal cord and fills the four cavities or ventricles of the brain.

**Bonus Answer: Cerebrospinal Fluid**

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## 11. BIOLOGY

**Writer: Shamaul Dilmohamed**

**Toss Up: Short Answer**

The chromosomes responsible for characteristics other than sex are known by what name?

**Bonus Answer: Autosomes**

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**Bonus: Short Answer**

What is the term given to enzymes whose action is modulated by binding of a molecule to a site other than the active site?

**Bonus Answer: allosteric enzymes**

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## 12. BIOLOGY

**Writer: Larry Wong**

**Toss Up: Short Answer**

What branch of biology deals with the study of insects?

**Bonus Answer: Entomology**

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**Bonus: Multiple Choice**

Which animal does not belong to phylum chordata?

- W) Alligator
- X) ostrich
- Y) octopus
- Z) shark

**Bonus Answer: Y**

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## 13. 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**

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**Bonus: Short Answer**

The term superbugs is usually used to refer to what?

**Bonus Answer: Antibiotic-resistant bacteria**

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## 14. BIOLOGY

**Writer: Kerwin Chen**

**Toss Up: Short Answer**

What is the medical term for lazy eye?

**Bonus Answer: amblyopia**

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**Bonus: Short Answer**

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

**Bonus Answer: cataracts**

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**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**

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**Bonus: Short Answer**

What does HIV stand for?

**Bonus Answer: Human Immunodeficiency Virus**

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**16. BIOLOGY**

**Writer: Kerwin Chen**

**Toss Up: Short Answer**

What is the liquid underneath the cornea called?

**Bonus Answer: aqueous humor**

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**Bonus: Short Answer**

What is the jellylike tissue behind the lens called?

**Bonus Answer: vitreous humor**

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**17. BIOLOGY**

**Writer: Kerwin Chen**

**Toss Up: Short Answer**

Which scientist is often considered the father of microbiology?

**Bonus Answer: Leeuwenhoek**

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**Bonus: Short Answer**

Which English scientist coined the word "cell"?

**Bonus Answer: Robert Hooke, Hooke**

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**18. CHEMISTRY**

**Writer: Prangon Ghose**

**Toss Up: Short Answer**

What two chemical elements are found in sphalerite?

**Bonus Answer: Zinc and Sulfur (accept: Zn and S)**

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**Bonus: Short Answer**

What two chemical elements are found in periclase?

**Bonus Answer: Magnesium and Oxygen (accept: Mg and O)**

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**19. CHEMISTRY**

**Writer: Prangon Ghose**

**Toss Up: Short Answer**

What is the empirical formula of glucose?

**Bonus Answer: CH<sub>2</sub>O**

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**Bonus: Short Answer**

What is the shape of an Acetylene (C<sub>2</sub>H<sub>2</sub>) molecule?

**Bonus Answer: Linear**

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## 20. CHEMISTRY

**Writer: Prangon Ghose**

**Toss Up: Short Answer**

What is the correct formula for Aluminum Oxide?

**Bonus Answer: Al<sub>2</sub>O<sub>3</sub> (accept: Aluminum 2 Oxygen 3)**

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**Bonus: Short Answer**

What is the formal charge of oxygen in H<sub>3</sub>O<sup>+</sup>?

**Bonus Answer: +1 (do not accept 1)**

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## 21. CHEMISTRY

**Writer: Prangon Ghose**

**Toss Up: Short Answer**

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

**Bonus Answer: Nitrogen-14**

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**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**

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## 22. 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**

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**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**

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## 23. EARTH and SPACE

Writer: Banpreet Singh

Toss Up: Short Answer

What formed Kepler and Copernicus on the lunar surface?

Bonus Answer: meteorites

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Bonus: Short Answer

What fundamental force is responsible for Earth's spherical shape?

Bonus Answer: gravity

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## 24. EARTH and SPACE

Writer: Banpreet Singh

Toss Up: Short Answer

The Moon's umbra just fell onto the Earth. Name this phenomenon.

Bonus Answer: Solar eclipse

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Bonus: Short Answer

What galaxy is Earth located in?

Bonus Answer: The milky way galaxy

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## 25. EARTH and SPACE

Writer: Banpreet Singh

Toss Up: Short Answer

What is the largest fault line in California?

Bonus Answer: the San Andreas fault line

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Bonus: Short Answer

The Davis Strait provides a route between what two oceans?

Bonus Answer: The Atlantic and Arctic

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