

Round 2

1. CHEMISTRY

Writer: Ivan Zhang

Toss Up: Short Answer

What is the largest ion with an equal amount of protons and neutrons?

Bonus Answer: Ca^{20+}

Bonus: Short Answer

Who is regarded as the father of the modern periodic table? (1st and last name)

Bonus Answer: Dmitri Mendeleev

2. BIOLOGY

Writer: Jason Mohabir

Toss Up: Multiple Choice

Which of the following is true regarding anthrax:

W) Anthrax is caused by a virus

X) Anthrax is highly contagious

Y) Inhalation anthrax and cutaneous anthrax are caused by separate strains of *Bacillus anthracis*

Z) Inhalation Anthrax requires infection with a large number of spores

Toss Up Answer: Z

Bonus: Short Answer

Give the binomial nomenclature of the pathogen that causes anthrax:

Bonus Answer: *Bacillus anthracis*

3. CHEMISTRY

Writer: Zoe Orlin

Toss Up: Short Answer

What element has the largest atomic radius?

Bonus Answer: Francium

Bonus: Multiple Choice

What is the most electronegative element?

W) Francium

X) Beryllium

Y) Fluorine

Z) Lithium

Bonus Answer: Y

4. MATHEMATICS

Writer: Janine Goh

Toss Up: Short Answer

In what type of triangle is the angle bisector, the altitude and the median the same line?

Bonus Answer: Isosceles or equilateral triangle

Bonus: Short Answer

Find the other roots of $x^3 + 6x^2 - 13x - 42$ if one of them is -2

Bonus Answer: -7, 3

5. EARTH and SPACE

Writer: Janine Goh

Toss Up: Short Answer

What is the speed of light in km/hr, in scientific notation, to 2 decimal places?

Bonus Answer: 1.08×10^9

Bonus: Multiple Choice

How many sub levels does Cesium have?

W) 9

X) 10

Y) 11

Z) 12

Bonus Answer: Z

6. CHEMISTRY

Writer: Janine Goh

Toss Up: Short Answer

Which group of the periodic table has a fully filled d orbital?

Bonus Answer: Group 12

Bonus: Short Answer

Name 2 elements that behave both as a metal and non-metal

Bonus Answer: Any 2: Boron, silicon, germanium, arsenic, antimony, tellurium, (polonium)

7. MATHEMATICS

Writer: Hussain Waris

Toss Up: Multiple Choice

A set is countable:

W) If and only if it is finite.

X) If and only if a surjection can be made between the set and the natural numbers.

Y) If it has the same cardinality as some subset of the natural numbers.

Z) If it has the same cardinality as some subset of the real numbers.

Toss Up Answer: Y

Bonus: Short Answer

Who was the famous German mathematician that invented Set Theory and effectively proved the uncountableness of the reals?

Bonus Answer: Georg Cantor (accept Cantor)

8. CHEMISTRY

Writer: Janine Goh

Toss Up: Short Answer

Which group of elements has the lowest ionization energy?

Bonus Answer: Alkali metals

Bonus: Short Answer

What are the elements in group 5 called?

Bonus Answer: Pnictogens

9. PHYSICS

Writer: Raafiul Hossain

Toss Up: Multiple Choice

In the absence of air resistance, the magnitude of the vertical component of a projectile's acceleration
W) is constant until the projectile hits the ground.

X) always decreases with time until the projectile hits the ground.

Y) is equal to the magnitude of the horizontal component of the projectile's acceleration.

Z) increases and/or decreases with time, depending on the projectile's velocity.

Toss Up Answer: W

Bonus: Multiple Choice

In the laboratory, the speed of sound is measured to be 344 meters per second, different from the actual value of 343 meters per second. What is the percent error in the measurement?

W) 1%

X) 1%

Y) 10%

Z) 0.30%

Bonus Answer: Z

10. CHEMISTRY

Writer: Janine Goh

Toss Up: Multiple Choice

Which of the following elements are Lanthanides?

W) Lawrencium

X) Meltnerium

Y) Seaborgium

Z) Terbium

Toss Up Answer: Z

Bonus: Short Answer

What unit does electronegativity use?

Bonus Answer: No unit

11. BIOLOGY

Writer: Jason Mohabir

Toss Up: Multiple Choice

Pine, fir, spruce, cedar, larch and cypress are the famous timber-yielding plants. All these belong to:

W) angiosperms

X) gymnosperms

Y) monocotyledons

Z) dicotyledons

Toss Up Answer: X

Bonus: Multiple Choice

The population of algae in soil is [blank] that of either bacteria or fungi.

W) generally smaller than

- X) generally greater than
- Y) equal to
- Z) none of these

Bonus Answer: W

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12. PHYSICS

Writer: Raafiul Hossain

Toss Up: Multiple Choice

How long is a meter stick?

- W) 36 inches
- X) 100 mm
- Y) 10 cm
- Z) 1 m

Toss Up Answer: Z

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Bonus: Multiple Choice

Which combination of the following statements is wrong? I. A body can have a constant speed but a varying velocity. II. A body can have a constant velocity but a varying speed. III. A body can have a zero velocity and finite acceleration.

- W) I
- X) II
- Y) III
- Z) NONE

Bonus Answer: Z

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13. MATHEMATICS

Writer: Andrew Chen (Senior)

Toss Up: Multiple Choice

Simplify the following expression: $(x^3+27)/(x+3)$ if $x=12$

- W) 125
- X) 117
- Y) 136
- Z) 109

Toss Up Answer: X

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Bonus: Short Answer

Find all the real solutions of $x^4-18=-2$

Bonus Answer: $x=2, x=-2$

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14. BIOLOGY

Writer: Jason Mohabir

Toss Up: Short Answer

Nitrogen fixation refers to the direct conversion of atmospheric nitrogen gas into:

Bonus Answer: ammonia

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Bonus: Short Answer

The transformation of nitrates to gaseous nitrogen is accomplished by microorganisms in a series of biochemical

reactions. The process is known as:

Bonus Answer: denitrification

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15. EARTH and SPACE

Writer: Janine Goh

Toss Up: Short Answer

In which hemisphere are constellations named after scientific instruments?

Bonus Answer: Southern

Bonus: Short Answer

What is the latin name for the constellation that the big dipper is a part of?

Bonus Answer: Ursa Major

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16. BIOLOGY

Writer: Aaron Gee

Toss Up: Short Answer

Nitrogenous base that occurs in RNA but not in DNA?

Bonus Answer: Uracil

Bonus: Short Answer

Which of the following correctly explains how a favorable genetic trait can increase in frequency in a population?

Bonus Answer: Natural Selection

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17. EARTH and SPACE

Writer: Janine Goh

Toss Up: Short Answer

What is the general name for blood disorders?

Bonus Answer: Thalassemia

Bonus: Multiple Choice

Which of the following is a housekeeping gene?

W) Ubiquitin

X) Haemoglobin

Y) Ovalbumin

Z) Pyronisin

Bonus Answer: W

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18. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following correctly states the composition of blood?

W) 45 % RBC, 55% Plasma

X) 65 % RBC, 25% Plasma

Y) 85 % RBC, 15% Plasma

Z) 35% RBC, 65% Plasma

Toss Up Answer: W

Bonus: Multiple Choice

What is the function of basophils?

- W) to engulf pathogens through phagocytosis
- X) to stimulate inflammation by releasing histamine
- Y) to kill RBCs
- Z) to remove pathogens from RBCs

Bonus Answer: X

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19. PHYSICS

Writer: Raafiul Hossain

Toss Up: Multiple Choice

The graphs of the two equations $y = ax^2 + bx + c$ and $y = Ax^2 + Bx + C$, such that a and A have different signs and that the quantities $b^2 - 4ac$ and $B^2 - 4AC$ are both negative,

- W) 1 intersections
- X) 2 intersections
- Y) None
- Z) I do not know

Toss Up Answer: Z

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Bonus: Multiple Choice

For x greater than or equal to zero and less than or equal to 2π , $\sin x$ and $\cos x$ are both decreasing on the intervals

- W) $(0, \pi/2)$
- X) $(\pi/2, \pi)$
- Y) $(\pi, 3\pi/2)$
- Z) $(3\pi/2, 2\pi)$

Bonus Answer: X

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20. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which gland releases the antidiuretic hormone?

- W) pituitary
- X) hypothalamus
- Y) pancreas
- Z) testes

Toss Up Answer: X

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Bonus: Multiple Choice

Which part of the heart functions as a pacemaker?

- W) AV node
- X) S node
- Y) SA node
- Z) SA pacemaker

Bonus Answer: Y

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21. PHYSICS

Writer: Aaron Gee

Toss Up: Multiple Choice

Radiocarbon is produced in the atmosphere as a result of?

- W) collision between fast neutrons and nitrogen nuclei present in the atmosphere
- X) action of ultraviolet light from the sun on atmospheric oxygen
- Y) action of solar radiations particularly cosmic rays on carbon dioxide present in the atmosphere
- Z) lightning discharge in atmosphere

Toss Up Answer: W

Bonus: Multiple Choice

Nuclear sizes are expressed in a unit named

- W) Fermi
- X) angstrom
- Y) newton
- Z) Tesla

Bonus Answer: W

22. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following is the most common organic compound on Earth?

- W) chitin
- X) glucose
- Y) phospholipids
- Z) cellulose

Toss Up Answer: Z

Bonus: Multiple Choice

Which of the following syndrome occurs in women born with only 1 X chromosome?

- W) Marfan Syndrome
- X) Turner Syndrome
- Y) Prader-Willi syndrome
- Z) Porphyria

Bonus Answer: X

23. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

For the hydrogen atom, which series describes electron transitions to the N=1 orbit, the lowest energy electron orbit?

Bonus Answer: Lyman series

Bonus: Short Answer

Electric current may be expressed in which one of the following

units?

Bonus Answer: coulombs/second

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24. BIOLOGY

Writer: Ivan Zhang

Toss Up: Multiple Choice

Which of the following conditions causes an autoimmune response to eating glucose?

- W) Anaplasmosis
- X) Anisakiasis
- Y) celiac disease
- Z) Candidiasis

Toss Up Answer: Y

Bonus: Multiple Choice

What is colony collapse disorder characterized by?

- W) The disappearance of many male worker bees
- X) The death of the queen bee
- Y) The destruction of the honey produced by bees
- Z) The destruction of the structure of a bee hive

Bonus Answer: W

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25. PHYSICS

Writer: Aaron Gee

Toss Up: Short Answer

In the SI system of measure, what is the unit of capacitance?

Bonus Answer: FARAD

Bonus: Short Answer

How much work in joules is done by friction on a sled weighing 100 newtons during a 10 meter displacement? The coefficient of sliding friction is 0.1.

Bonus Answer: 100

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