

Round 6

1. PHYSICS

Writer: Lakeside

Toss Up: Short Answer

The reason that microscopic black holes that could be created by collisions in particle accelerators are not feared to consume the Earth is because of what hypothesized black body radiation due to quantum effects?

Bonus Answer: HAWKING RADIATION

Bonus: Short Answer

Which law in electromagnetism describes the magnetic field generated by a steady current and results in a B field consistent with both Ampere's law and Gauss' law for magnetism?

Bonus Answer: BIOT-SAVART LAW

2. ENERGY

Writer: Oxford

Toss Up: Short Answer

Which DOE national lab conducted the Manhattan project?

Bonus Answer: Oak Ridge (Accept: Oak Ridge National Lab)

Bonus: Short Answer

During the Manhattan project, which two atomic bombs were created?

Bonus Answer: Thin man and Fat man

3. MATHEMATICS

Writer: Brooklyn Tech

Toss Up: Multiple Choice

Find x when $(x^2)-4x-12 = 0$

W) $x=\{6, -2\}$

X) $x=\{6, 2\}$

Y) $x=\{-6, 2\}$

Z) $x=\{-6, -2\}$

Toss Up Answer: Y

Bonus: Short Answer

Given: triangle abc is a right angle, d is the midpoint of line ab and e is the midpoint of line Bc, $de \parallel ac$ $de=7$, $ac=14$, $ad=5$ find db

Bonus Answer: 5

4. ENERGY

Writer: Oxford

Toss Up: Short Answer

Which branch of the National Energy Technology Laboratory was started the earliest?

Bonus Answer: Pittsburgh

Bonus: Multiple Choice

Which DOE national lab was started the earliest?

W) Lawrence Berkley National Lab

X) Thomas Jefferson National Accelerator Facility

Y) Fermi National Lab

Z) SLAC National Lab

Bonus Answer: W

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5. CHEMISTRY

Writer: Brooklyn Tech

Toss Up: Multiple Choice

Which of the following substances would be expected to have the highest melting point?

- W) Sodium Chloride
- X) Calcium Chloride
- Y) Potassium Hydride
- Z) Magnesium Oxide

Toss Up Answer: Z

Bonus: Multiple Choice

HF is a weak acid when compared with HCl. How can this be explained?

- W) HF has a stronger covalent bond than does HCl
- X) HF has a weaker covalent bond than does HCl
- Y) HF has hydrogen bonding, while HCl has dipole-dipole bonding
- Z) HF has dipole-dipole bonding, while HCl has hydrogen bonding

Bonus Answer: W

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6. MATHEMATICS

Writer: Brooklyn Tech

Toss Up: Multiple Choice

What is the following in degrees? $7\pi/8$

- W) 157 degrees
- X) 155 degrees
- Y) 157.5 degrees
- Z) 200 degrees

Toss Up Answer: Y

Bonus: Short Answer

Find the following in radian: 280 degrees

Bonus Answer: $14\pi/9$

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7. EARTH and SPACE

Writer: Brooklyn Tech

Toss Up: Multiple Choice

How old is universe

- W) 15 b
- X) 14b
- Y) 1 year
- Z) 0

Toss Up Answer: X

Bonus: Multiple Choice

D

- W) D
- X) D
- Y) D
- Z) D

Bonus Answer: W

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8. BIOLOGY

Writer: Brooklyn Tech

Toss Up: Short Answer

Which of the following is a disease extracted from deer ticks, also known as *Borrelia burgdorferi*?

Bonus Answer: Lyme disease, or borreliosis

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Bonus: Short Answer

What brain-eating illness is obtained from eating other humans, very similar to Mad Cow disease?

Bonus Answer: Kuru

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9. CHEMISTRY

Writer: Brooklyn Tech

Toss Up: Multiple Choice

Sodium hydroxide and copper(II) nitrate solutions are mixed. What precipitates out?

- W) No precipitate because no reaction occurs
- X) Copper
- Y) Sodium Nitrate
- Z) Copper(II) Hydroxide

Toss Up Answer: Z

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Bonus: Short Answer

What is the oxidation number of Manganese in MnO_2 ?

Bonus Answer: +4

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10. BIOLOGY

Writer: Brooklyn Tech

Toss Up: Short Answer

What element is needed for the creation of thyroid hormones?

Bonus Answer: Iodine

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Bonus: Short Answer

Name one thyroid hormone.

Bonus Answer: thyroxine/ triiodothyronine

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11. EARTH and SPACE

Writer: Brooklyn Tech

Toss Up: Multiple Choice

How old is universe

- W) 15 b
- X) 14b
- Y) 1 year
- Z) 0

Toss Up Answer: X

Bonus: Multiple Choice

D

W) D

X) D

Y) D

Z) D

Bonus Answer: W

12. BIOLOGY

Writer: Brooklyn Tech

Toss Up: Multiple Choice

Who created amino acids using a model of earth's early environment?

W) Charles Darwin

X) Robert Hooke

Y) Stanley Miller

Z) Francis Crick

Toss Up Answer: Y

Bonus: Short Answer

What is the scientific name of spiny sea urchin?

Bonus Answer: Strongylocentrotus droebachiensis

13. PHYSICS

Writer: Brooklyn Tech

Toss Up: Short Answer

Solve for x to the nearest thousandth: $3 \times 2^{(5x)} = 216$

Bonus Answer: X=1.234

Bonus: Multiple Choice

How many points of intersection between the graphs: $y-x-2=0$ and $(x-1)^2 + (x-3)^2 = 8$

W) 1

X) 2

Y) 0

Z) Not enough information to answer

Bonus Answer: W

14. BIOLOGY

Writer: Brooklyn Tech

Toss Up: Short Answer

What is the name of the family white-tailed deer, elk, and moose belong to?

Bonus Answer: Cervidae

Bonus: Multiple Choice

in which of these species of deer do antlers grow on both genders?

W) Reindeer

X) White-tailed deer

Y) Fallow deer

Z) All of the previously mentioned species have antlers on both genders

Bonus Answer: W

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15. MATHEMATICS

Writer: Brooklyn Tech

Toss Up: Short Answer

What is the exact value of $\sin(225)$ and $\cos(225)$?

Bonus Answer: $-(\sqrt{2})/2$ for both

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Bonus: Short Answer

What is the exact value of the period of the sine wave in radian form: $y=4\sin(5x)$

Bonus Answer: $2\pi/5$

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16. EARTH and SPACE

Writer: Brooklyn Tech

Toss Up: Multiple Choice

What sphere do meteors burn up fastest?

W) Mesosphere

X) Stratosphere

Y) Exosphere

Z) Thermosphere

Toss Up Answer: W

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Bonus: Multiple Choice

Which planet has the smallest maximum eastern elongation?

W) Neptune

X) Mercury

Y) Venus

Z) Mars

Bonus Answer: X

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17. BIOLOGY

Writer: Brooklyn Tech

Toss Up: Multiple Choice

What does DNA code for?

W) Acid mine

X) Amino acids

Y) Glucose

Z) Apple Pie

Toss Up Answer: X

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Bonus: Short Answer

Who created the idea of evolution?

Bonus Answer: Who created the idea of evolution?

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18. EARTH and SPACE

Writer: Lakeside

Toss Up: Short Answer

The Age of Reptiles followed which mass extinction event?

Bonus Answer: PERMIAN-TRIASSIC (Accept: PERMIAN)

Bonus: Multiple Choice

The most abundant deposits of coal date from what period?

W) Permian

X) Hadean

Y) Devonian

Z) Carboniferous

Bonus Answer: Z

19. MATHEMATICS

Writer: Brooklyn Tech

Toss Up: Short Answer

What is the value of theta if $\cos(\theta) = -\frac{\sqrt{2}}{2}$?

Bonus Answer: 225 degrees or $5\pi/4$. Adding 360 degrees any amount of times to 225 degrees or 2π any amount of times to $5\pi/4$ is acceptable.

Bonus: Short Answer

Find the value of $\sin(\theta)$ in the expression $\sin(\arctan(x))$

Bonus Answer: x

20. EARTH and SPACE

Writer: Lakeside

Toss Up: Short Answer

Which glacial structures, similar to roche moutonnees but opposite in orientation, are formed when glaciers retreat over an area that contains a particularly hard rock core?

Bonus Answer: DRUMLINS

Bonus: Multiple Choice

Which of the following glacial landforms is created by a braided stream flowing from the front end of a glacier?

W) eskers

X) kames

Y) moraines

Z) outwash fans

Bonus Answer: Z

21. PHYSICS

Writer: Brooklyn Tech

Toss Up: Short Answer

What is the units for displacement?

Bonus Answer: Meters

Bonus: Short Answer

Name all seven SI base units.

Bonus Answer: ampere, mole, meter, kelvin, second, kilogram, candela

22. MATHEMATICS

Writer: Brooklyn Tech

Toss Up: Short Answer

Graph theory is the study of graphs (mathematical structures that represent the relationship between objects through vertices or points and edges or connections between points). Describe the relationship of vertices, edges, and faces through a mathematical equation.

Bonus Answer: V (the number of vertices) - E (number of edges) + F (number of faces) = 2

Bonus: Short Answer

Name the type of path that doesn't repeat any edges and has the same initial and final vertex.

Bonus Answer: Euler Circuit

23. CHEMISTRY

Writer: Brooklyn Tech

Toss Up: Short Answer

What is the most electropositive element on the periodic table?

Bonus Answer: Francium

Bonus: Short Answer

What is the lightest element to have isotopes that are all radioactive?

Bonus Answer: Technetium

24. EARTH and SPACE

Writer: Lakeside

Toss Up: Short Answer

Order the following four substances from least to greatest in terms of hardness: fluorite, topaz, corundum, and tooth enamel.

Bonus Answer: FLUORITE, TOOTH ENAMEL, TOPAZ, CORUNDUM

Bonus: Short Answer

Evidence supporting which hypothesized process, whose name was coined by Robert Dietz, includes an observed upper age limit of 200 million years for the associated material? This process produces zebra-stripe lineations in combination with reversals of the Earth's magnetic field reversals.

Bonus Answer: SEAFLOOR SPREADING

25. CHEMISTRY

Writer: Brooklyn Tech

Toss Up: Multiple Choice

The law which states that the amount of gas dissolved in a liquid is proportional to its partial pressure is

W) Dalton's law

X) Gay Lussac's law

Y) Henry's law

Z) Raoult's law

Toss Up Answer: Y

Bonus: Multiple Choice

The most malleable metal is

W) platinum

X) silver

Y) iron

Z) gold

Bonus Answer: Z

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