Round 2

1. EARTH and SPACE

Toss Up: Multiple Choice

Within the early Earth's vast molten region, substances underwent a process known as differentiation, during which
W) substanes of low density rise to Earth's surface, while those of high density sink toward its center
X) substances of high density float to Earth's surface, while those of low density sink toward its center.
Y) substances of high and low density chemically combine to form uniformly dense substances.
Z) substances of high density form gases, while those of low density form solids.

Toss Up Answer: W

Bonus: Multiple Choice

Earth's magnetic field is likely a result of
W) convection currents in Earth's mantle
X) convection currents in Earth's core
Y) a high concentration of iron in Earth's crust
Z) high-energy particles in the solar wind

Bonus Answer: X

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2. PHYSICS

Toss Up: Multiple Choice

Sound waves can propagate through a plasma because of:
W) high coulomb interactions between particles
X) high density of particles
Y) high energy of particles
Z) high kinetic pressure force

Toss Up Answer: W

Bonus: Short Answer

Which description(s) of plasma is most often used to understand the macroscopic features of plasma: Single particle theory, kinetic theory, fluid description

Bonus Answer: Fluid description

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3. CHEMISTRY

Toss Up: Short Answer

Which famous chemist was responsible for creating the field of colloid chemistry and created laws for effusion and diffusion

Bonus Answer: Graham

Bonus: Short Answer

What law, proposed by Joseph Proust, states that a chemical compound will always have its own characteristic ratio of elemental components?

Bonus Answer: The Law of Definite Proportions (Law of constant composition)

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4. EARTH and SPACE

Toss Up: Multiple Choice

Which statement best describes how galaxies generally move?
W) Galaxies move toward one another.
X) Galaxies move away from one another.

Y) Galaxies move randomly.
Z) Galaxies do not move.

Toss Up Answer: X

Bonus: Multiple Choice

The observable universe is estimated to be roughly 16-20 billion years old. Which statement best describes why a galaxy located 25 billion light-years from Earth may not be visible to an observer on Earth?
W) Galaxies 25 billion light-years away would emit no visible light.
X) Light from beyond 20 billion light years has not yet reached Earth.
Y) Light from beyond 20 billion light years passed out galaxy before Earth existed.
Z) No galaxies are located farther than 5 billion light-years from Earth.

Bonus Answer: X

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5. EARTH and SPACE

Toss Up: Multiple Choice

Rock samples brought back from the Moon show absolutely no evidence of chemical weathering. This is most likely due to
W) the lack of an atmosphere on the Moon
X) extremely low surface temperatures on the Moon
Y) lack of biological activity on the Moon
Z) large quantities of water in the lunar "seas"

Toss Up Answer: W

Bonus: Multiple Choice

A major belt of asteroids is located between Mars and Jupiter. What is the approximate average distance between the Sun and this major asteroid belt?
W) 110 million kilometers
X) 220 million kilometers
Y) 390 million kilometers
Z) 850 million kilometers

Bonus Answer: Y

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6. MATHEMATICS

Toss Up: Multiple Choice

Which of the following salts is responsible for the browning of pretzels?
W) Sodium Chloride
X) Sodium Hydroxide
Y) Potassium Chloride
Z) Potassium Carbonate

Toss Up Answer: X

Bonus: Short Answer

Consider the reaction A + 2B yields 4C. Assume all species in the reaction are gaseous. If the reaction is at equilibrium, and the concentration of every species is 2 molar, calculate the equilibrium constant of the reaction.

Bonus Answer: 2

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7. ENERGY

Toss Up: Short Answer

What is the term for oil derived from oil shales or tar sands?

Bonus Answer: Syncrude

Bonus: Multiple Choice

Burning of which of the following fuels produces the least amount of carbon dioxide per unit of energy?

W) coal

X) oil

Y) natural gas

Z) all of these produce the same amount of CO_2

Bonus Answer: Y

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8. EARTH and SPACE

Toss Up: Multiple Choice

The surface of Venus is much hotter than would be expected, considering its distance from the Sun. Which statement best explains this fact?

W) Venus has many active volcanoes.

X) Venus as a slow rate of rotation

Y) The clouds of Venus are highly reflective

Z) The atmosphere of Venus contains a high percentage of carbon dioxide.

Toss Up Answer: Z

Bonus: Multiple Choice

The existence of Pluto and Neptune was accurately predicted through the study of the movements of

W) comets

X) other planets

Y) stars

Z) the Sun

Bonus Answer: X

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9. MATHEMATICS

Toss Up: Multiple Choice

Give the range for the following six values 2, 7, 11, 19, 25, 33:

W) 2

X) 31

Y) 33

Z) 15

Toss Up Answer: X

Bonus: Short Answer

What percent of a circle is 6/5pi radians?

Bonus Answer: 216

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10. MATHEMATICS

Toss Up: Short Answer

In a normal distribution, approximately what percentage of the cases, to the nearest whole number, falls within 4

standard deviations of the mean:

Bonus Answer: 100%

Bonus: Multiple Choice

Which of the following properties would you use to compute the chances of rolling either a 7 or an 11 with a pair of dice:

W) multiplicative
X) conditional
Y) independent
Z) additive

Bonus Answer: Z

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11. BIOLOGY

Toss Up: Short Answer

What sequence on the mRNA of specific proteins determines whether or not the ribosome translating the mRNA will be bound to the rough endoplasmic reticulum?

Bonus Answer: Signal sequence (OR targeting signal, localization signal, localization sequence, transit peptide, or leader sequence)

Bonus: Short Answer

What are the three types of articulating vertebrae in the human vertebral column?

Bonus Answer: Cervical, thoracic, and lumbar vertebrae

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12. MATHEMATICS

Toss Up: Short Answer

What is the volume of a sphere of radius "R"?

Bonus Answer: (4/3)piR^3

Bonus: Short Answer

Using an x-y coordinate axis, the figure represented by the equation [x^2/36] + [y^2/16] =1 is centered about what x-y coordinate point?

Bonus Answer: (0,0) ; the origin

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13. CHEMISTRY

Toss Up: Multiple Choice

What is the hybridization of the sulfur atom is SF4?

W) sp2
X) sp3
Y) sp3d
Z) sp3d2

Toss Up Answer: Y

Bonus: Short Answer

Which famous chemist proposed the modern kinetic molecule theory for gasses?

Bonus Answer: Bernoulli

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14. PHYSICS

Toss Up: Multiple Choice

The rate of heat flow by conduction through a slab does NOT depend upon the

W) temperature difference between opposite faces of the slab
X) thermal conductivity of the slab
Y) slab thickness
Z) specific heat of the slab

Toss Up Answer: Z

Bonus: Multiple Choice

Inside a room at a uniform comfortable temperature, metallic objects generally feel cooler to the touch than wooden objects do. This is because:
W) a given mass of wood contains more heat than the same mass of metal
X) metal conducts heat better than wood
Y) the equilibrium temperature of metal in the room is lower than that of wood
Z) the human body, being organic, resembles wood more closely than it resembles metal

Bonus Answer: X

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15. BIOLOGY

Toss Up: Multiple Choice

In living cells, chemical processes, such as synthesis, all require the action of
W) specialized antibiotics
X) hormones
Y) salts
Z) biological catalysts

Toss Up Answer: Z

Bonus: Short Answer

The process of meiotic cell division in a human male usually forms what?

Bonus Answer: Four monoploid cells

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16. EARTH and SPACE

Toss Up: Multiple Choice

A star like Earth's Sun will eventually
W) explode in a supernova
X) become a black hole
Y) change into a white dwarf
Z) become a neutron star

Toss Up Answer: Y

Bonus: Multiple Choice

Two nebulae, A and B, of equal volume are beginning to contract and form stars A and B. Nebula A has 10,000 times the mass of nebula B. Which of the following predictions is most accurate?
W) Star A will use up its fuel faster than star B.
X) Star A will probably be much redder than star B.
Y) Star B will be much hotter than star A.
Z) Stars A and B will be identical in volume.

Bonus Answer: W

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17. CHEMISTRY

Toss Up: Short Answer

Which famous chemist formulated the rule that mass is conserved through chemical reactions?

Bonus Answer: Lavosier

Bonus: Multiple Choice

Which of the following is the strongest oxidizing agent?

W) Pb2+

X) I2

Y) Ag+

Z) Pb

Bonus Answer: Y

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18. PHYSICS

Toss Up: Multiple Choice

The zeroth law of thermodynamics allows us to define:

W) work

X) pressure

Y) temperature

Z) thermal equilibrium

Toss Up Answer: Y

Bonus: Short Answer

Which physicist contributed to the understanding of electrical circuits and coined the term “black body” radiation?

Bonus Answer: Kirchoff

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19. CHEMISTRY

Toss Up: Multiple Choice

The change in entropy is zero for:

W) reversible adiabatic processes

X) reversible isothermal processes

Y) reversible processes during which no work is done

Z) . all adiabatic processes

Toss Up Answer: W

Bonus: Multiple Choice

The Hall-Heroult process is used in the production of:

W) Mg

X) Fe

Y) Al

Z) Au

Bonus Answer: Y

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20. PHYSICS

Toss Up: Multiple Choice

In order for two sound waves to produce audible beats, it is essential that the two waves have:

W) the same amplitude

X) slightly different amplitudes
Y) the same number of harmonics
Z) slightly different frequencies

Toss Up Answer: Z

Bonus: Multiple Choice

A 200-cm organ pipe with one end open is in resonance with a sound wave of wavelength 270cm. The pipe is operating in its
W) fundamental frequency
X) second harmonic
Y) third harmonic
Z) fourth harmonic

Bonus Answer: X

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21. CHEMISTRY

Toss Up: Multiple Choice

Monatomic, diatomic, and polyatomic ideal gases each undergo slow adiabatic expansions from the same initial volume and the same initial pressure to the same final volume. The magnitude of the work done by the environment on the gas:
W) is greatest for the polyatomic gas
X) is greatest for the diatomic gas
Y) is greatest for the monatomic gas
Z) is the same only for the diatomic and polyatomic gases

Toss Up Answer: W

Bonus: Multiple Choice

The mean free path of a gas molecule is:
W) the shortest dimension of the containing vessel
X) the cube root of the volume of the containing vessel
Y) average distance between adjacent molecules
Z) average distance a molecule travels between intermolecular collisions

Bonus Answer: Z

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22. CHEMISTRY

Toss Up: Multiple Choice

The root-mean-square sped of molecules in a gas is:
W) the most probable speed
X) that speed such that half the molecules are moving faster than vrms and the other half are moving slower
Y) the average speed of the molecules
Z) none of these

Toss Up Answer: Z

Bonus: Multiple Choice

An ideal monatomic gas has a molar specific heat Cv at constant volume of:
W) R

X) 3R/2
Y) 5R/2
Z) 7R/2

Bonus Answer: X

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23. BIOLOGY

Toss Up: Multiple Choice

The general term for a depression in a bone is
W) fossa
X) canal or meatus
Y) facet
Z) foramen

Toss Up Answer: W

Bonus: Multiple Choice

The suture that separates the parietal bones from the occipital bone is the...
W) coronal suture
X) lambdoid suture
Y) sagittal suture.
Z) squamous suture.

Bonus Answer: X

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24. BIOLOGY

Toss Up: Multiple Choice

Which of these bones is part of the axial skeleton?
W) rib
X) clavicle
Y) coxa
Z) femur

Toss Up Answer: W

Bonus: Multiple Choice

A small, flattened articular surface is a
W) facet
X) fossa
Y) tuberosity
Z) ramus

Bonus Answer: W

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25. BIOLOGY

Toss Up: Multiple Choice

This structure on the fibula forms part of what we commonly call our "ankle bone."
W) lateral malleolus
X) medial malleolus
Y) lateral condyle

Z) lateral epicondyle

Toss Up Answer: W

Bonus: Multiple Choice

The ball of the foot is the junction between the...

W) carpals and metacarpals.

X) metatarsals and phalanges.

Y) metacarpals and phalanges.

Z) tarsals and metatarsals.

Bonus Answer: X

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