Round 5

1. BIOLOGY

Toss Up: Multiple Choice

What hormone is an antioxidant, forms cadmium with other metals, and is produced to help regulate the circadian cycle for animals?

W) Epinephrine

X) Thyroxine

Y) Calcitonin

Z) Melatonin

Toss Up Answer: Z

Bonus: Short Answer

Myasthenia gravis is a disease characterized by muscle weakness and fatigue, and is caused when antibodies inhibit a chemical in the human body. What is this chemical?

Bonus Answer: Acetylcholine

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2. 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

Convert 6/5 pi radians to degrees

Bonus Answer: 216

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3. 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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4. MATHEMATICS

Toss Up: Short Answer

In a normal distribution, approximately what percentage of the sample, 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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5. EARTH and SPACE

Toss Up: Multiple Choice

Which of the following statements best describes the difference between a galaxy and a nebula?

W) A galaxy consists of stars; a nebula consists of dust and gas.
X) There are two types of nebula, but only one type of galaxy.
Y) A galaxy always emits light; a nebula never emits light.
Z) A galaxy consists of matter; a nebular consists of energy.

Toss Up Answer: W

Bonus: Short Answer

What is the plot of luminosity versus surface temperature for stars, discovered independently by two astronomers, called?

Bonus Answer: Hertzsprung-Russell Diagram (H-R diagram)

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6. PHYSICS

Toss Up: Multiple Choice

A closed hemispherical shell of radius R is filled with fluid at uniform pressure p. The net force of the fluid on the curved portion of the shell is given by:

W) 2πR^2p (read as 2 pi times R squared times p)
X) 4πR^2p (read as 4 pi times R squared times p)
Y) πR^2p (read as pi times R squared times p)
Z) (4/3)πR^2p (read as 4 over 3 times pi times R squared times p)

Toss Up Answer: Y

Bonus: Short Answer

A boat floating in fresh water displaces 16, 000N of water. How many newtons of saltwater would it displace if it floats in saltwater of specific gravity 1.17?

Bonus Answer: 16, 000

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7. ENERGY

Toss Up: Multiple Choice

Oil, coal, and natural gas supply what percent of energy used in the US?

W) 10
X) 35
Y) 55

Z) 90

Toss Up Answer: Z

Bonus: Multiple Choice

A permeable rock that contains hydrocarbon fluids and gasses is called:

W) An oil trap

X) A source bed

Y) An oil reservoir

Z) An oil pocket

Bonus Answer: Y

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8. EARTH and SPACE

Toss Up: Multiple Choice

Which instrument is used to study the composition of stars?

W) sextant

X) spectroscope

Y) seismograph

Z) chronometer

Toss Up Answer: X

Bonus: Multiple Choice

An observer viewing the sky through a telescope sees a fuzzy, glowing region in the constellation Orion. The region has an irregular shape, and some stars seem to be shining through it. The observer is most likely viewing a

W) planet

X) comet

Y) meteor

Z) nebula

Bonus Answer: Z

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9. PHYSICS

Toss Up: Short Answer

Given G as the gravitational constant and there exists an equilateral triangle with side length "a" and identical objects with mass of "x" what is the total gravitational potential energy of an object with mass "y" that is located at the center?

Bonus Answer: - G*(xy) 3*sqrt(3)/a

Bonus: Multiple Choice

Given G as the gravitational constant and there exists an equilateral triangle with side length "a" and identical objects with mass of "x" what is the total gravitational potential energy of this system?

W) - 9*sqrt(3)*G*(xy)/a (read as negative nine times square root of 3 times G times the second power of x divided by a)

X) - 3*sqrt(3)*G*(x^2)/a (read as negative three times square root of 3 times G times the second power of x divided by a)

Y) - 3*G*(x^2)/a (read as negative three times G times the second power of x divided by a)

Z) - sqrt(3)*G*(x^2)/a (read as negative square root of 3 times G times the second power of x divided by a)

Bonus Answer: Y

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10. MATHEMATICS

Toss Up: Short Answer

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

Bonus Answer: (4/3)piR^3

Bonus: Short Answer

What is the degree of a vertex in a complete graph K_n (K sub n)?

Bonus Answer: (0,0) ; the origin

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11. PHYSICS

Toss Up: Multiple Choice

What's the critical angle in radians when a ray passes from a medium with index of refraction of 1.4 to a medium with index of refraction of 0.7?

W) PI/2

X) PI/3

Y) PI/6

Z) PI

Toss Up Answer: Y

Bonus: Short Answer

A concave spherical mirror has a focal length of 12 cm. If an object is placed 6 cm in front of it the image position is:

Bonus Answer: 12cm behind the mirror (accept -12cm)

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12. EARTH and SPACE

Toss Up: Multiple Choice

Which observation provides the best evidence that Earth revolves around the Sun?

W) Stars seen from Earth appear to circle Polaris

X) Earth's planetary winds are deflected by the Coriolis effect

Y) The change from high ocean tide to low ocean tide is a repeating pattern

Z) Different star constellations are seen from Earth at different times of the year.

Toss Up Answer: Z

Bonus: Short Answer

What is the name of the paradox that asks why the night sky is dark if the universe is infinite and should contain an infinite about of stars?

Bonus Answer: Olbers paradox

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13. PHYSICS

Toss Up: Short Answer

The Kondo effect describes this quantity's divergence at low temperatures. Strain gauges operate by detecting changes in this quantity, because it is proportional to length and inversely proportional to cross-sectional area. Its AC-circuit extension is the complex quantity impedance, and its inverse, measured in siemens, is the conductance. Equal to voltage divided by current, according to Ohm's law, it is high for insulators and low for conductors.Name this measure of how much an object opposes electric current.

Bonus Answer: Resistance

Bonus: Short Answer

What's the emf in volts produced by an inductor with an inductance of 0.3 henry and a current with equation I(t)=2t^2+2 after 3 seconds of operation?

Bonus Answer: 3.6 volts

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14. BIOLOGY

Toss Up: Multiple Choice

Oogenesis in humans begins

W) during embryonic development

X) at birth

Y) at puberty

Z) monthly during the menstrual cycle

Toss Up Answer: W

Bonus: Multiple Choice

In birds and mammals, gastrulation begins at the

W) trophoblast

X) blastodisc

Y) blastocyst

Z) primitive streak

Bonus Answer: Z

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15. MATHEMATICS

Toss Up: Short Answer

What shape is the graph of y=X^2+1

Bonus Answer: parabola

Bonus: Short Answer

What is the name of the curve that is one possible inverse of a parabola, its shape resembling a heart, and that also appears in the Mandelbrot set?

Bonus Answer: cardioid

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16. PHYSICS

Toss Up: Multiple Choice

A constant force acting on a body experiencing no change in its environment will give the body:

W) constant acceleration

X) constant speed

Y) constant velocity

Z) zero acceleration

Toss Up Answer: W

Bonus: Multiple Choice

What is the MOST common term for the inwardly directed force exerted on an object to keep the object moving in a circle?

W) Centripetal Acceleration

X) Friction

Y) Normal Force

Z) Centripetal Force

Bonus Answer: Z

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17. CHEMISTRY

Toss Up: Short Answer

What relation does Charles's law describe?

Bonus Answer: V1 / T1 = V2 / T2 (Accept V over T or Volume and temperature)

Bonus: Short Answer

According to VSEPR bonding theory, what type of geometry does a molecule have when the central atom is surrounded by 4 bonded groups, such as in methane?

Bonus Answer: TETRAHEDRAL

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18. BIOLOGY

Toss Up: Multiple Choice

All of the following are found in both roots and stems EXCEPT:
W) Casparian strip
X) primary phloem
Y) primary xylem
Z) secondary xylem

Toss Up Answer: W

Bonus: Multiple Choice

All of the following occur in a phototropic response EXCEPT:
W) Shoots bend toward light
X) Auxin is produced at the shoot tip and diffuses down the stem
Y) Auxin accumulates on the shady side of the shoot
Z) Auxin transport is unidirectional

Bonus Answer: X

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19. CHEMISTRY

Toss Up: Short Answer

What is the general name for a hypothetical gas that obeys Boyles's law at all temperatures and pressures?

Bonus Answer: Ideal

Bonus: Short Answer

Knowing that the chemical name for gypsum is calcium sulfate dihydrate, gypsum is what percent water by weight? Assume the atomic masses of calcium = 40; sulfur = 32 and oxygen = 16.

Bonus Answer: 21

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20. BIOLOGY

Toss Up: Multiple Choice

In plants, male gametes are produced by the
W) ovary
X) pistil

Y) antheridium
Z) archegonium

Toss Up Answer: Y

Bonus: Multiple Choice

The deuterostomes differ from protostomes in all of the following respects EXCEPT:
W) early cleavage of the zygote
X) ultimate function of the opening to the archenteron
Y) number of germ layers in the developing embryo
Z) embryonic origin of the mouth

Bonus Answer: Y

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21. CHEMISTRY

Toss Up: Short Answer

You need to prepare 500 milliliters of a 0.100 molar NaOH solution from a 0.250 molar solution. What volume, in milliliters, of the 0.250 molar solution must be diluted to 500 milliliters?

Bonus Answer: 200

Bonus: Short Answer

Can MASS SPECTROMETRY be used to calculate endpoint ph?

Bonus Answer: No

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22. CHEMISTRY

Toss Up: Multiple Choice

Which of the following is a nonpolar molecule with polar bonds?
W) F2
X) CHF3
Y) HCl
Z) CO2

Toss Up Answer: Z

Bonus: Short Answer

M represents some unknown element. When M2S3 is heated in air, it is converted to MO2. A 4.000g sample of M2S3 shows a decrease in mass of .277 g when it is heated in air. To the nearest whole number, what is the average atomic mass of M?

Bonus Answer: 184 g/mol

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23. CHEMISTRY

Toss Up: Short Answer

What is the theoretical end of a titration?

Bonus Answer: equivalence point

Bonus: Short Answer

In the electrolysis of a copper chloride solution, what forms at the cathode and anode, respectively?

Bonus Answer: CATHODE = COPPER (ACCEPT: Cu); ANODE = CHLORINE (ACCEPT: CHLORINE GAS or Cl2)

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24. CHEMISTRY

Toss Up: Short Answer

A Buchner funnel is a piece of laboratory glassware to carry out what process?

Bonus Answer: Filtration

Bonus: Short Answer

Why are oxygenates used as gasoline additives?

Bonus Answer: they allow for more complete combustion

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25. CHEMISTRY

Toss Up: Short Answer

[note: read as O two [pause] one minus] Name all of the following 4 species that contain an odd number of electrons: O2^1-; O2^2-; SO2; CO

Bonus Answer: O2 ^1-

Bonus: Short Answer

What are the 2 alkenes (read as: al-KEENS) with the shortest carbon chains and lowest molecular weights?

Bonus Answer: ethene, propene (accept ethylene, propylene)

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