Round 2

TOSSUP

1) BIOLOGY *Short Answer* What gland secretes epinephrine?

ANSWER: ADRENAL GLAND(S)

BONUS

1) BIOLOGY *Short Answer* By name or number, identify all of the following that do not have chloroplasts: 1) Fungi; 2) Algae; 3) Animals; 4) Plants

ANSWER: 1 AND 3 (ACCEPT: FUNGI AND ANIMALS)

TOSSUP

2) CHEMISTRY *Multiple Choice* At STP, which element is most expected to exist as a monatomic gas?

W) Calcium
X) Hydrogen
Y) Nitrogen
Z) Neon

ANSWER: Z) NEON

BONUS

2) CHEMISTRY *Short Answer* If there are 0.01 moles of hydronium ions in a 10L solution, what is the pH of the solution?

ANSWER: 3

TOSSUP

3) MATH *Short Answer* What is the term that describes a function that is the slope of the tangent line of another function?

ANSWER: DERIVATIVE

BONUS

3) MATH *Short Answer* In a 2 x 2 matrix, with the row 1 reading 3, 4; and row 2 reading 2, 5; find the determinant.

ANSWER: 7

TOSSUP

4) EARTH AND SPACE *Short Answer* What are the names of both moons of Mars?

ANSWER: PHOBOS AND DEIMOS

BONUS

4) EARTH AND SPACE *Short Answer* What are the names of the two rovers that were sent to Mars in 2003 for NASA's Mars Exploration Rover Mission?

ANSWER: SPIRIT AND OPPORTUNITY

TOSSUP

5) PHYSICS *Multiple Choice* Which of the following is not a vector quantity?

W) Work
X) Force
Y) Displacement
Z) Velocity

ANSWER: W) WORK

BONUS

5) PHYSICS *Short Answer* When a 500 gram block is lifted up 3 meters, assuming g is 9.8 m/s^2, what is the change in potential energy of the block in joules?

ANSWER: 14.7 JOULES

TOSSUP

6) ENERGY *Multiple Choice* Scientists at Argonne National Laboratory recently researched a new way to observe diamond anvil pressure experiments. Most of the events that occur in these anvils are illuminated by x-ray and visible light. What type of light has photon energy between the energy levels of these two types of electromagnetic radiation?

W) Radio
X) Infrared
Y) Ultraviolet
Z) Gamma

ANSWER: Y) ULTRAVIOLET

BONUS

6) ENERGY *Multiple Choice* What is the amount of radioactive material needed to maintain a nuclear chain reaction called?

W) Critical volume
X) Critical mass
Y) Sustainable volume
Z) Sustainable mass

ANSWER: X) CRITICAL MASS

TOSSUP

7) CHEMISTRY *Short Answer* Fullerenes are allotropes of what element?

ANSWER: CARBON

BONUS

7) CHEMISTRY *Short Answer* In a fullerene, each carbon atom is bonded to how many other carbon atoms?

ANSWER: 3

TOSSUP

8) BIOLOGY *Multiple Choice* At which stage of meiosis do cells from a sperm cell precursor contain a haploid set of chromosomes, each consisting of two sister chromatids?

W) Anaphase I
X) Metaphase I

Y) Prophase II
Z) Anaphase II

ANSWER: Y) PROPHASE II

BONUS

8) BIOLOGY *Short Answer* What do you call the process where a phosphate group is added to a substance using the energy of sunlight?

ANSWER: PHOTOPHOSPHORYLATION (DO NOT ACCEPT: PHOSPHORYLATION)

TOSSUP

9) PHYSICS *Multiple Choice* Given that g = -10 m/s^2, calculate the average velocity of a ball dropped from a building during the 5th second of its fall, assuming negligible air resistance.

W) -45 m/s
X) -50 m/s
Y) -55 m/s
Z) -60 m/s

ANSWER: X) -50 M/S

BONUS

9) PHYSICS *Multiple Choice* A plane points its head 45 degrees east of north and flies at 141 km/hr. If the plane is flying into a wind blowing due west at 100 km/hr, what is the net direction and speed that the plane travels with respect to the ground, to the nearest whole number?

W) Due north at 141 km/hr
X) Due east at 141 km/hr
Y) Due north at 100 km/hr
Z) Due east at 100 km/hr

ANSWER: Y) DUE NORTH AT 141 KM/HR

TOSSUP

10) MATH *Short Answer* Convert $r = 2019\ csc(\theta)$ (pronounce: R EQUALS 2019 COSECANT THETA) from polar form to rectangular form.

ANSWER: Y = 2019

BONUS

10) MATH *Short Answer* Find the cosine of the angle which makes a minor arc with length 2 pi in a circle with a radius of 6.

ANSWER: 1/2

TOSSUP

11) EARTH AND SPACE *Multiple Choice* Redshift of distant galaxies is evidence for which of the following?

W) Expansion of the universe
X) The Uncertainty Principle
Y) Black holes
Z) Dark matter

ANSWER: W) EXPANSION OF THE UNIVERSE

BONUS

11) EARTH AND SPACE *Short Answer* List the planets of the solar system in order farthest from the sun to closest to the sun.

ANSWER: NEPTUNE, URANUS, SATURN, JUPITER, MARS, EARTH, VENUS, MERCURY

TOSSUP

12) BIOLOGY *Short Answer* Name this catabolic process, a partial degradation of organic fuels that occurs without the use of oxygen, generating ethanol, lactate, or other products.

ANSWER: FERMENTATION

BONUS

12) BIOLOGY *Short Answer* Name the two fluids that makes up the majority of the extracellular fluid in the human body.

ANSWER: INTERSTITIAL FLUID AND PLASMA

TOSSUP

13) ENERGY *Multiple Choice* Which of these series of frequencies is emitted in the ultraviolet range?

W) Brackett series
X) Paschan series
Y) Balmer series
Z) Lyman series

Answer: Z) Lyman series

BONUS

13) ENERGY *Multiple Choice* Among the following elements, which one has the most number of oxidation states?

W) Carbon
X) Fluorine
Y) Oxygen
Z) Calcium

Answer: W) Carbon

TOSSUP

14) CHEMISTRY *Multiple Choice* Which of the following cells converts electrical energy into chemical energy?

W) Galvanic
X) Electrostatic
Y) Electrolytic
Z) Voltaic

ANSWER: Y) ELECTROLYTIC

BONUS

14) CHEMISTRY *Short Answer* What is the chemical formula for acetic acid?

ANSWER: CH_3COOH (ACCEPT: $HC_2H_3O_2$ OR $C_2H_4O_2$ OR CH_3CO_2H)

TOSSUP

15) PHYSICS *Short Answer* Sonic the Hedgehog is up to bat. He smashes the baseball pitched at him and dashes to first base, which is 20 meters away, at 100 m/s. He slams the brakes with his feet about 5 meters away, decelerating at -20 m/s^2 (Negative twenty meters per second squared). If Sonic's mass is 35 kg, how much work did it take for him to stop?

ANSWER: -3500 J (Accept equivalents)

BONUS

15) PHYSICS *Multiple Choice* A object's velocity can be described by the vector ($3t^2$ + 2t -, t^3). Calculate the speed of the object at t = 2.

W)$5\sqrt{5}$
X) $7\sqrt{5}$
Y) $8\sqrt{5}$
Z) $16\sqrt{5}$

ANSWER: Y) 8 * SQRT(5)

TOSSUP

16) BIOLOGY *Short Answer* How many kingdoms of classification are there?

ANSWER: 6

BONUS

16) BIOLOGY *Short Answer* A population in Hardy-Weinberg Equilibrium contains 40% dominant alleles and 60% recessive alleles. What percent of the population is heterozygous?

ANSWER: 48%

TOSSUP

17) ENERGY *Multiple Choice* Which of the following is most accurate about wind turbines?

W) They convert potential energy of wind into electricity
X) They convert kinetic energy of wind into electricity
Y) They convert nuclear energy of wind into electricity
Z) They convert chemical energy of wind into electricity

ANSWER: X) THEY CONVERT KINETIC ENERGY OF WIND INTO ELECTRICITY

BONUS

17) ENERGY *Short Answer* The U.S. Navy has recently filed a patent for the compact fusion reactor, which uses this state-of-matter's namesake confinement technology. Name this state-of-matter that is a hot ionized gas.

ANSWER: PLASMA

TOSSUP

18) EARTH AND SPACE *Multiple Choice* What is the most abundant element in the earth's crust?

W) Oxygen
X) Silicon
Y) Aluminum
Z) Iron

ANSWER: W) OXYGEN

BONUS

18) EARTH AND SPACE *Short Answer* What gas is the third most abundant in Earth's atmosphere?

ANSWER: ARGON

TOSSUP

19) MATH *Short Answer* What three dimensional shape has highest ratio of volume to surface area?

ANSWER: SPHERE

BONUS

19) MATH *Multiple Choice* Which of the following numbers has exactly 6 divisors?

W) 24
X) 6
Y) 64
Z) 18

ANSWER: Z) 18

TOSSUP

20) CHEMISTRY *Multiple Choice* A Büchner funnel is most often used for what type of filtration?

W) Cold
X) Hot
Y) Gravity
Z) Vacuum

ANSWER: Z) VACUUM

BONUS

20) CHEMISTRY *Short Answer* What two elements make up the alloy brass?

ANSWER: ZINC AND COPPER

TOSSUP

21) PHYSICS *Multiple Choice* Which of the following is not true about sound?

W) Sound intensity is measured in deciBels
X) Sound waves travel faster on colder days
Y) Sound waves travel faster in water than in air
Z) Sound waves are longitudinal.

ANSWER: X) SOUND WAVES TRAVEL FASTER ON COLDER DAYS

BONUS

21) PHYSICS *Short Answer* Rounded to the nearest number, what is the wavelength of a sound wave in meters that has a frequency of 20 Hertz at 20 degrees Celsius.

ANSWER: 17 METERS

TOSSUP

22) EARTH AND SPACE *Multiple Choice* What is the upper layer of the Earth's mantle called?

W) Lithosphere
X) Asthenosphere

Y) Thermosphere
Z) Moho discontinuity

ANSWER: X) ASTHENOSPHERE

BONUS

22) EARTH AND SPACE *Short Answer* The mantle contains a lot of silicates. By name or number, identify the silicates from the following 4 minerals: 1) olivine, 2) pyroxene, 3) corundum, 4) periclase.

ANSWER: 1 AND 2 (OLIVINE AND PYROXENE)

TOSSUP

23) MATH *Short Answer* Given that 2 adjacent angles in a cyclic quadrilateral are 50 degrees and 60 degrees, what are the values of the other two angles, in degrees?

ANSWER: 120 and 130 DEGREES (ACCEPT IN ANY ORDER)

BONUS

23) MATH *Short Answer* Given that there are 16 sides in a regular polygon, what is the measure of its interior angle in degrees?

ANSWER: 157.5 DEGREES