Iolani Science Bowl Invitational
Single Elimination 1

Tossup

Earth and Space - *Multiple Choice* Which of the following correctly describes a yazoo [yah-zoo] stream?

W) A stream that lies on the floodplain of another river, running parallel to said river
X) A stream created by the confluence of two other streams
Y) A stream originating from the ocean
Z) A stream that drains into a basin with no outlet

Answer: W) A STREAM THAT LIES ON THE FLOODPLAIN OF ANOTHER RIVER RUNNING PARALLEL TO SAID RIVER [RE]

Bonus

Earth and Space - *Multiple Choice* What name is given to the curved glacial valleys created by the erosion of mountains?

W) Horns
X) Cirques
Y) Aretes
Z) Eskers

Answer: X) CIRQUES [RE]

Tossup

Biology - *Short Answer* What term describes the inactivated X chromosome in female mammals?

Answer: BARR BODY

Bonus

Biology - *Short Answer* Order the following three blood vessels in terms of INCREASING blood flow velocity: I - Arteries, II - Capillaries, III - Veins

Answer: II, III, I

Commented [1]: these seem easier than some rr's to me

Tossup

Chemistry - *Multiple Choice* Which of the following atoms has the largest atomic radius?

W) Carbon

X) Cesium
Y) Calcium
Z) Chlorine

Answer: X) CESIUM [AI]

Bonus

Chemistry - *Short Answer* Which of the following three ions have the same electron configuration as argon? I. Cl-; II. Li+; III. K+

Answer: I, III. Cl-, K+ [AI]

Tossup

Math - *Short Answer* What is the determinant of a matrix with top row 5, 7 and bottom row 3, 8?

Answer: 19 [RE]

Bonus

Math - *Short Answer* What is the area between the curves y = x^2 and y = sqrt(x)?

Answer: 1/3 [RE]

Tossup

Physics - *Short Answer* An adiabatic process involves no net exchange of what quantity between thermodynamic systems?

Answer: HEAT [RE]

Bonus

Physics - *Multiple Choice* Which of the following effects explains the oddly long life of a water droplet over an extremely hot surface due to the formation of an insulating layer of vapor?

W) Leidenfrost Effect
X) Hydrothermal Suspension
Y) Joule-Thomson Effect
Z) Paschen-Back Effect

Answer: W) LEIDENFROST EFFECT [RE]

Tossup

Earth and Space - *Multiple Choice* Which of the following is not an asteroid type?

W) C-Type

X) S-Type
Y) T-Type
Z) M-Type

Answer: Y) T-TYPE [AE]

Bonus

Earth and Space - *Short Answer* Identify all of the following three statements that are true about comets. I. Long period comets likely originate from the Asteroid Belt; II. Comets have two distinct tails; III. Naked eye comets usually have low eccentricities.

Answer: II [AE]

Tossup

Biology - *Multiple Choice* Brennan wants to compare the organelles within his liver cells and the cells of his green onion plant. Which organelle would you NOT expect to see in both cells?

W) Mitochondria
X) Centrosome
Y) Peroxisome
Z) Rough ER

Answer: X) CENTROSOME

Bonus

Biology - *Short Answer* Order the following three steps of muscle contraction in order following the binding of ATP to myosin: I - Myosin binds to actin, II - Thin filament moves towards the center of the sarcomere, III - ATP Hydrolysis

Answer: III, I, II

Tossup

Chemistry - *Short Answer* A sample of gas is held above a beaker of water. If the concentration of carbon dioxide in the water is tripled, by what factor does the partial pressure of carbon dioxide in the gas sample increase?

Answer: 3 [AE]

Bonus

Chemistry - *Multiple Choice* Brennan dissolves a solute B into a solvent water, and uses Raoult's Law to predict the vapor pressure. If water's interactions with itself and B's interactions with itself are both weaker than water's interactions with B, the actual vapor pressure:

W) Is lower than Brennan's prediction
X) Is the same as Brennan's prediction
Y) Is higher than Brennan's prediction
Z) Cannot be predicted from this information

Answer: W) IS LOWER THAN BRENNAN'S PREDICTION [AE]

Tossup

Math - *Short Answer* What is the value of the integral of f(x) = x^3 from 0 to 1?

Answer: 1/4 [RE]

Bonus

Math - *Short Answer* - In Game Theory, a zero sum game is a game where one player's loss equals another player's gain. Name all of the following 3 games that are zero sum games.

1) Chess
2) Poker
3) Prisoner's Dilemma

Answer: 1 and 2 ONLY [EC]

Tossup

Physics - *Short Answer* A Gaussian sphere surrounds a particle of charge +2 coulombs. If the charge doubles and the sphere is changed into a Gaussian cube with the same center, by what factor is the original flux multiplied?

Answer: 2 [RE]

Bonus

Physics - *Multiple Choice* Which of the following is not a type of damping for a simple harmonic oscillator?

W) Ultradamped
X) Overdamped
Y) Critically Damped
Z) Underdamped

Answer: W) ULTRADAMPED [RE]

Tossup

Earth and Space - *Short Answer* Order the following 3 types of silicates in increasing number of bridging, or shared oxygens. I. Phyllosilicates; II. Nesosilicates; III. Inosilicates

Answer: II, III, I [RE]

Bonus

Earth and Space - *Multiple Choice* A northwesterly moving, ideal current, in the southern hemisphere, would cause the net movement of water in which of the following directions?

W) Northwest
X) Northeast
Y) Southwest
Z) Southeast

Answer: Y) SOUTHWEST [RE]

Tossup

Biology - *Multiple Choice* A flower that lacks a fragrance and is not colorful is most likely pollinated by which of the following?

W) Bee
X) Bird
Y) Wind
Z) Bat

Answer: Y) WIND

Bonus

Biology - *Short Answer* Identify all of the following three statements which are functions of RNA within a human cell: I - Serves as hereditary material, II - Catalyzing chemical reactions, III - Silencing gene expression

Answer: II, III

Tossup

Chemistry - *Short Answer* Which of the following three scenarios will cause the solubility of CO_2 in water to increase?
I. The temperature of the system is increased.
II. More CO_2 is added to the system.
III The partial pressure of CO_2 is increased.

Answer: II, III. [AI]

Commented [2]: correction. was formerly: I, II.

Bonus

Chemistry - *Multiple Choice* Which of the following oxyacids would you expect to be the strongest?

W) HNO
X) HNO2
Y) HNO3
Z) HNO4

Answer: W) HNO4 [RE]

Tossup

Math - *Short Answer* What is the derivative of the function f(x) = x^15 - x^2 at x = 1?

Answer: 13 [RE]

Bonus

Math - *Multiple Choice* How many non-negative integers satisfy the inequality x^3 + 5x^2 - x - 5 < 0?

W) 0
X) 1
Y) 2
Z) Infinitely many

Answer: X) 1 [RE]

Tossup

Physics - *Short Answer* Identify all of the following 3 things that are quantized. I. Charge; II. Light; III. Spin

Answer: ALL [RE]

Bonus

Physics - *Multiple Choice* In what type of thermodynamic process is no work done?

W) Adiabatic
X) Isobaric
Y) Isochoric
Z) Isothermal

Answer: Y) ISOCHORIC [RE]

Tossup

Earth and Space - *Multiple Choice* Which of the following is least likely to have emission lines?

W) Globular Cluster
X) Wolf-Rayet Star
Y) Planetary Nebula
Z) Active Galaxy

Answer: W) GLOBULAR CLUSTER [AE]

Bonus

Earth and Space - *Short Answer* In kilometers per second, what is the recessional velocity of a galaxy 20 megaparsecs away?

Answer: 1400 [AE]

Tossup

Biology - *Multiple Choice* Which of the following organisms most likely follows a Type III survivorship curve?

W) Oyster
X) Human
Y) Bird
Z) Elephant

Answer: W) OYSTER

Bonus

Biology - *Multiple Choice* Which of the following would you expect to increase the activity of phosphofructokinase?

W) High AMP concentration
X) High Citrate concentration
Y) High ATP concentration
Z) High Pyruvate concentration

Answer: W) HIGH AMP CONCENTRATION

Tossup

Chemistry - *Short Answer* Identify all of the following three properties that generally increase as you move left to right on the periodic table. I. Ionization Energy; II. Electron Affinity; III. Atomic Radius

Answer: I, II [AE]

Bonus

Chemistry - *Short Answer* Order the following three elements in terms of increasing electronegativity. I. Potassium; II. Chlorine; III. Silicon

Answer: I, III, II [AE]

Tossup

Math - *Multiple Choice* Which of the following polynomials is divisible by x + 2?

W) x^2 + 4
X) x^3 + 8
Y) x^4 + 16
Z) x^5 + 32

Answer: X) x^3 + 8 [RE]

Bonus

Math - *Short Answer* What is A6B base 12 in base 10?

Answer: 1523 [RE]

Tossup

Physics - *Short Answer* What effect occurs when a particle moves faster than the phase velocity of light in a dielectric medium?

Answer: CHERENKOV RADIATION [RE]

Bonus

Physics - *Multiple Choice* A particle of charge -2 coulombs travels at 100 m/s in the positive x-direction. If a 5 Tesla magnetic field is set up in the positive y direction, what is the magnitude and direction of the resulting magnetic force is newtons?

W) Positive z, 1000
X) Positive z, 500
Y) Negative z, 1000
Z) Negative z, 500

Answer: Y) NEGATIVE Z, 1000 [RE]