Iolani Science Bowl Invitational
Round Robin 2

Tossup

Earth and Space - *Multiple Choice* What crystal habit, often displayed by tremolite and actinolite, is known to cause lung cancer due to the extremely small needles created?

W) Hopper
X) Bladed
Y) Tabular
Z) Asbestiform

Answer: Z) ASBESTIFORM [RE]

Bonus

Earth and Space - *Multiple Choice* Brennan the geologist is studying Earth's interior using seismic waves. Which of the following of Earth's layers can S waves NOT travel through?

W) Crust
X) Mantle
Y) Outer Core
Z) Inner Core

Answer: Y) OUTER CORE [RE]

Tossup

Biology - *Short Answer* Brennan is breeding Puffles where color is controlled by a single allele. He notices when he crosses a true-breeding strain of blue Puffles with a true-breeding strain of red Puffles, some of the progeny are purple. What term describes the relationship between the blue and red alleles?

Answer: INCOMPLETELY DOMINANT (ACCEPT: INCOMPLETE DOMINANCE)

Bonus

Biology - *Short Answer* What is the maximum number of molecules of O_2 that hemoglobin can bind to?

Answer: 4

Commented [1]: i know this is insanely baby food, maybe just smthn about oxygen carrying, 4 subunits w/ alpha and beta, answer is just hemoglobin. if you think too easy this isn't too bad

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Tossup

Chemistry - *Short Answer* How many moles of water would you expect to form from reacting one mole of glucose in excess oxygen to produce water and carbon dioxide?

Answer: 6 [JK]

Bonus

Chemistry - *Short Answer* A sample of SO_2 gas takes 20 seconds to effuse through a porous plug. If the molar mass of SO_2 is 64 grams per mole, and the molar mass of helium gas is 4 grams per mole, how long, in seconds, would it take the same amount of helium to effuse through the plug?

Answer: 5 (seconds) [AI]

Tossup

Math - *Short Answer* Brennan the coordinate mathematician is studying how to strictly define geometric elements off a certain set of points. How many points must he use to strictly define a plane?

Answer: 3 [RE]

Bonus

Math - *Short Answer* Michael, Ryan, Samuel, Alan, and Gina are seated around a table. How many ways are there to arrange them if Gina and Alan must sit next to each other?

Answer: 12 [RE]

Tossup

Physics - *Short Answer* What phenomenon occurs when a photon incident on a material ejects an electron?

Answer: PHOTOELECTRIC EFFECT [RE]

Bonus

Physics - *Short Answer* What term denotes the minimum energy required to release an electron in the photoelectric effect?

Answer: WORK FUNCTION [RE]

Tossup

Earth and Space - *Multiple Choice* Which of the following stars is not on the Main Sequence?

W) Sirius
X) Betelgeuse [beetle-juice]
Y) The Sun
Z) Vega

Answer: X) BETELGEUSE [AE]

Bonus

Earth and Space - *Multiple Choice* Which of the following is not a dwarf planet?

W) Chariklo (*char-ee-klo*)
X) Pluto
Y) Haumea (*how-may-ah*) (*it's Hawaiian!*)
Z) Ceres (*seer-ees*)

Answer: W) CHARIKLO [AE]

Tossup

Biology - *Short Answer* Identify all of the following four organelles which have a double-membrane:
I - Nucleus
II - Golgi Apparatus
III - Mitochondria
IV - Chloroplast

Answer: I, III, IV

Bonus

Biology - *Short Answer* Identify all of the following four characteristics that all members of Chordata possess.
I - Notochord
II - Backbone
III - Pharyngeal Slits
IV - Post-Anal Tail

Answer: I, III, IV

Tossup

Chemistry - *Multiple Choice* A molecule with many unpaired electrons can be described as which of the following?

W) Paramagnetic
X) Diamagnetic
Y) Supermagnetic
Z) Undermagnetic

Answer: W) PARAMAGNETIC [JK]

Bonus

Chemistry - *Short Answer* Identify all of the following three types of intermolecular forces that are present between hydrogen sulfide molecules.
I. London dispersion forces
II. Dipole-dipole forces
III. Hydrogen bonding

Answer: I and II

Tossup

Math - *Short Answer* What is the value of arcsin(0.5) in radians?

Answer: PI/6 [RE]

Bonus

Math - *Multiple Choice* Which of the following is the correct decimal expansion of 2/7?

W) 0.142857 repeating
X) 0.275481 repeating
Y) 0.285714 repeating
Z) 0.314832 repeating

Answer: Y) 0.285714 REPEATING [RE]

Tossup

Physics - *Short Answer* Brennan stands 6 meters away from a plane mirror. If he then proceeds to run away from his image at a blazing 10 m/s, at what speed does Brennan perceive his image as moving away from him?

Answer: 20 m/s [RE]

Bonus

Physics - *Short Answer* A ball is launched with velocity 10 m/s at an angle of 45 degrees. Neglecting air resistance and taking gravity as 10 m/s^2, how far does the ball travel before hitting the ground again?

Answer: 10 METERS [RE]

Tossup

Earth and Space - *Multiple Choice* Brennan the meteorologist is responsible for telling locals what the weather will be. Sensors picked up that air temperature suddenly dropped and clouds with significant vertical development began forming. What type of weather can he expect?

W) Light Rain
X) Warm breezes
Y) Radiation fog
Z) Thunderstorms

Answer: Z) THUNDERSTORMS [RE]

Bonus

Earth and Space - *Multiple Choice* Which of the following oceans does the Nazca Plate primarily underlie?

W) The Atlantic
X) The Pacific
Y) The Indian
Z) The Arctic

Answer: X) THE PACIFIC [RE]

Tossup

Biology - *Short Answer* What term describes the interaction between a clownfish and an anemone, where both parties benefit?

Answer: MUTUALISM

Bonus

Biology - *Short Answer* Brennan is studying a particular strain of yeast where color is controlled by a single gene. Brennan induces a substitution of a nucleotide in this gene but notices the yeast stay the same color. What term best describes the mutation Brennan caused in the yeast?

Answer: SILENT MUTATION (Accept: Synonymous)

Tossup

Chemistry - *Short Answer* In the Lewis structure for hydrogen sulfide, how many lone pairs are present?

Answer: 2 (pairs) [AI]

Bonus

Chemistry - *Short Answer* 84 g of a pure sample of a hydrocarbon contains 72 g of carbon. What is the empirical formula of this molecule?

Answer: CH2 [JK]

Tossup

Math - *Short Answer* What is the exterior angle of a regular 6-sided polygon?

Answer: 60 degrees [RE]

Bonus

Math - *Multiple Choice* What is the limit of the function with numerator x^2 + 5x + 4 and denominator x^2 + 9x + 20 as x approaches -4?

W) -1
X) -2
Y) -3
Z) -4

Answer: Y) -3 [RE]

Tossup

Physics - *Short Answer* A block of mass 5 kg is attached via a string to a 15 kg mass. Taking gravitational acceleration to be 10 m/s^2, if the string is then placed over a massless pulley, forming a simple Atwood machine, what is the acceleration of the two blocks?

Answer: 5 m/s^2 [RE]

Bonus

Physics - *Multiple Choice* A thermodynamic process is graphed as a curve on a P-V diagram. Which of the following quantities is given by the area under the curve?

W) Heat
X) Internal Energy
Y) Temperature
Z) Work

Answer: Z) WORK [RE]

Tossup

Earth and Space - *Short Answer* What is the name for large regions of ionized hydrogen, in which star formation has often recently taken place?

Answer: H-II REGION [AE]

Bonus

Earth and Space - *Multiple Choice* If the universe's density were greater than the critical density of the universe, what shape would the universe have?

W) Open
X) Closed
Y) Ajar
Z) Flat

Answer: X) CLOSED [AE]

Tossup

Biology - *Short Answer* What term describes gaps in the myelin sheath of a neuron?

Answer: NODES OF RANVIER

Bonus

Biology - *Multiple Choice* Which of the following traits would you NOT expect to observe in a monocot?

W) Parallel venation in leaves
X) Flowers with six petals
Y) Vascular bundles arranged in a ring
Z) Fibrous root system

Answer: Y) VASCULAR BUNDLES ARRANGED IN A RING

Tossup

Chemistry - *Short Answer* Identify all of the following liquids, which, when used as the mobile phase in thin layer chromatography on cellulose paper, would travel further than ethanol.
I. Hexanes;
II. Ammonia;
III. Water

Answer: I only [RE]

Commented [2]: sketch

Commented [3]: fix later

Bonus

Chemistry - *Short Answer* What name is given to the famous mixture of nitric acid and sulfuric acid, capable of dissolving gold?

Answer: AQUA REGIA [RE]

Tossup

Math - *Short Answer* Identify all of the following 4 shapes that must have perpendicular diagonals.
I. Square;
II. Parallelogram;
III. Kite;
IV. Rhombus

Answer: I, III, IV [RE]

Bonus

Math - *Short Answer* A 6 sided dice is rolled twice. What is the probability that the sum of the two numbers is a perfect square?

Answer: 7/36 [RE]

Tossup

Physics - *Short Answer* Brennan exerts a 20 newton force on a 2 kg block initially at rest over a distance of 5 meters. What is the final velocity of the block in m/s?

Answer: 10 m/s [RE]

Bonus

Physics - *Multiple Choice* Scientists building extremely powerful microscopes have been limited by the wavelength of light. Instead they've turned to using what subatomic particle instead of photons?

W) Electrons
X) Gluons
Y) Neutrinos
Z) Neutrons

Answer: W) ELECTRONS [RE]