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Science Bowl

Assorted Lightning Round 4: 25 Toss-ups

1. Chemistry: Multiple Choice: The respective electron-pair geometry, molecular geometry, and central atom hybridization in Krypton difluoride (KrF2) is represented correctly in which of the following choices?

W. Trigonal Bipyramidal; Bent; dsp3

X. Trigonal Bipyramidal; Linear; dsp3

Y. Octahedral; Bent; d2sp3

Z. Octahedral; Linear; d2sp3

ANSWER: X

1. Biology: Multiple Choice: Which of the following hormones regulates the activity of pigment-containing cells in the skin of some amphibians, fishes and reptiles, and appears to act on neurons in the brain, inhibiting hunger in mammals?

W. Growth Hormone

X. Adrenocorticotropic Hormone

Y. Prolactin

Z. Melanocyte-Stimulating Hormone

ANSWER: Z

1. Earth Science: Short Answer: What phenomenon, which drives plate motion, results because old oceanic lithosphere is more dense than the underlying astheosphere, and therefore pulls the trailing plate along?

ANSWER: Slab Pull

1. Astronomy: Multiple Choice: Which of the following types of variable stars was discovered and separated into a different class of variables in 1933? Previously called "cluster variables", because of their strong, but not exclusive, association with globular clusters, 90% of the variables found in globular clusters are these type of variable.

W. Cepheid Variable

X. W Virginis Variable

Y. RR Lyrae Variable

Z. Delta Scuti Variable

ANSWER: Y

1. General Science: Short Answer: Name one of the scientists, who in 1927, conducted an experiment which involved diffracting an electron beam off a Nickel crystal, confirming the de Broglie hypothesis that electrons have wave-like properties and can be diffracted.

ANSWER: Clinton Davisson OR Lester Germer

1. Physics: Multiple Choice: Which of the following is the correct value for the equivalent resistance of the circuit where one 10 ohm, one 25 ohm, and one 50 ohm light bulb are connected in parallel to a DC 10 V battery, assuming no internal battery resistance?

W. 1/5 ohms

X. 25/4 ohms

Y. 85 ohms

Z. 12,500 ohms

ANSWER: X

1. Math: Short Answer: Factor the following polynomial expression: x2 - 7x + 10 over the integers.

ANSWER: (x-5)(x-2)

1. General Science: Multiple Choice: Produced as a colorless, water-miscible organic liquid for use in the manufacture of polymers, this compound is a polar ether with a wide liquid range as a useful solvent.

W. Dimethyl Sulfoxide

X. Acetone

Y. Hexane

Z. Tetrahydrofuran

ANSWER: Z

1. Earth Science: Multiple Choice: What is the name for the localized storms that often form when the surface of a weather map indicates no apparent cause for a snowstorm to occur due to the temperature contrast between lakes and adjacent land areas? These snowstorms make Buffalo and Rochester, New York, among the snowiest cities in the US.

W. Maritime Polar Snows

X. Continental Lake Snows

Y. Lake-Effect Snows

Z. Nor'easters

ANSWER: Y

1. Biology: Short Answer: What is the name of the dorsal fold in the intestine of the earthworm and other Annelids that increases the surface area for nutrient digestion?

ANSWER: Typhlosole

1. Biology: Multiple Choice: Which of the following describes collections of abiotically produced molecules surrounded by a membrane-like structure that may have exhibited some properties of early life, including simple reproduction and metabolism, on the early earth?

W. Probionts

X. Ribozymes

Y. Stromatolites

Z. Endosymbionts

ANSWER: W

1. Chemistry: Multiple Choice: Le Chatelier's Principles predicts which of the following actions below to cause the endothermic reaction 1-propene → cyclopropane to form more reactants than initially present at equilibrium?

W. increasing the system temperature

X. increasing the system pressure

Y. decreasing the system temperature

Z. decreasing the system pressure

ANSWER: Y

1. Physics: Short Answer: Give the name of the classical theorem which states that the internal kinetic energy, or thermal energy, of a particle of an ideal gas at thermal equilibrium must be distributed equally along all the modes of vibration for that particle.

ANSWER: Equipartition Theorem

1. Math: Multiple Choice: In the xy-coordinate system, the point (√6, k) is the point of intersection of the groups y = x2 - 7 and y = -x2 + j, where k and j are constants. What is the value of j?

W. 5

X. 4

Y. 3

Z. -1

ANSWER: W

1. Astronomy: Short Answer: In the spectral class classification of a star, name the spectral class, in which over three-fourths of main-sequence stars fall into, that contains red stars with surface temperatures less than 3700 K and sizes less than one-half of the mass of the sun.

ANSWER: Class M

1. Chemistry: Multiple Choice: Which of the following buffer solutions would best be able to buffer a solution at a pH of around 8.5 to 10.5?

W. HCN / NaCN

X. HNO2 / NaNO2

Y. NaHSO4 / Na2SO4

Z. NaOH / NaCl

ANSWER: W

1. Physics: Short Answer: Given that the reactivity of capacitance of a circuit is 5, the reactivity of inductance is 9, and the resistance is 3, find the impedance Z of the AC circuit in Ohms.

ANSWER: 5 Ω

1. Biology: Multiple Choice: The fibers responsible for the elastic resistance properties of tendons, found in fibrous connective tissue, are of which of the following types?

W. Elastin Fibers

X. Fibrin Fibers

Y. Collagenous Fibers

Z. Reticular Fibers

ANSWER: Y

1. Earth Science: Multiple Choice: Which of the following is the most common biogenous sediment on the ocean flood, having a consistency of thick mud, that is produced by organisms such as foraminifera and coccolithophores?

W. Siliceous Ooze

X. Calcareous Ooze

Y. Abyssal Clay

Z. Evaporites

ANSWER: X

1. Chemistry: Short Answer: What is the molecular geometry, as predicted by VSEPR, of iodine trifluoride, IF3?

ANSWER: T-shaped (Distorted T)

1. Biology: Short Answer: What is one characteristic that separates chordates from all other animals?

W. True coelom

X. Post-anal tail

Y. Blastopore, which becomes the anus

Z. Bilateral symmetry

ANSWER: X

1. Physics: Multiple Choice: In fluid mechanics, what instability is formed at a non-accelerating interface between two interfaces of a continuous fluid when one part of the fluid shears the other interface creating a wavy pattern at where the interfaces meet? This instability commonly forms in cloud systems here on Earth.

W. Kelvin-Helmholtz Instability

X. Rayleigh-Taylor Instability

Y.  Richtmyer–Meshkov Instability

Z. Poisson-Boltzmann Instability

ANSWER: W

1. General Science: Multiple Choice: Which of the following men was an influential mathematician whose notation in mathematics is still used today? He pioneered the power series, developed a formula for the faces, vertices, and edges of polyhedra, and wrote one of the first academic treatises on topology?

W. Euler

X. Lagrange

Y. Fermat

Z. Poisson

ANSWER: W

1. Earth Science: Multiple Choice: What is the name for the leeward slope of a sand dune, which maintains an angle of about 34°, and migrates in the direction of air movement?

W. Cross Face

X. Descending Face

Y. Barchan Face

Z. Slip Face

ANSWER: Z

1. Math: Multiple Choice: Which of the following mathematical disciples was first formed by the theory of plane and space curves and of surfaces in three dimensional Euclidean and non-Euclidean manifolds, written in the 18th century, and contains among its subdisciplines Riemann geometry and Finsler geometry?

W. Topology

X. Measure Theory

Y. Abstract Algebra

Z. Differential Geometry

ANSWER: Z