Sriram Pendyala

Science Bowl

Assorted Lightning Round 5: 25 Toss-ups

1. Chemistry: Multiple Choice: Which of the following represents the constituents of the Nitrogen-Nitrogen bond in the only stable conformation of the molecule Diazene, whose molecular formula is N2H2?

W. one sigma bond only

X. one sigma bond and one pi bond

Y. one sigma bond and two pi bonds

Z. one sigma bond and three pi bonds

ANSWER: X

1. Earth Science: Short Answer: What are the names of prominent features of the Colorado Plateau that are large step-like folds in otherwise horizontal sedimentary strata that appear to be the result of reactivating of steeply dipping fault zones located in basement rocks beneath the plateau?

ANSWER: Monocline

1. Astronomy: Short Answer: What is the name for a rotating circumstellar disk of dense gas surrounding a newly formed star, a T Tauri star, or a Herbig star, that form molecular hydrogen clouds and accrete matter?

ANSWER: Protoplanetary Disk

1. Biology: Multiple Choice: Name the class of amine hormones synthesized from the amino acid tyrosine, among which are the hormones norepinephrine and epinephrine.

W. Mineralcorticoids

X. Adreocorticotropoids

Y. Catcholamines

Z. Glucocasamines

ANSWER: Y

1. General Science: Short Answer: Name the scientist, who died last Monday and won the Nobel Prize in 1992, who correctly formulated that ATP phosphorylation changes a protein's shape and function, and can be the main mechanism for energy coupling in the cell.

ANSWER: Edwin G. Krebs

1. Physics: Multiple Choice: Which of the following is always true in any isothermal change?

W. ΔU = 0

X. q = 0

Y. ΔG = 0

Z. ΔS = 0

ANSWER: W

1. Math: Short Answer: Find the derivative of the following function:

ANSWER:

1. General Science: Multiple Choice: What is the name of the group of specific organic compounds, such as C3H4, which only contain species where one carbon atom is connected with two double bonds to two other carbons?

W. Dienes

X. Prolenes

Y. Allenes

Z. Alkenes

ANSWER: Y

1. Earth Science: Multiple Choice: In many polar oceans, the mass of diatoms and the mass of zooplankton peak at different times of the year. Which of the following describes best the productivity of polar oceans?

W. Diatoms peak in summer; Zooplankton peak in fall

X. Diatoms peak in spring; Zooplankton peak in fall

Y. Diatoms peak in spring; Zooplankton peak in summer

Z. Diatoms peak in summer; Zooplankton peak in spring

ANSWER: Y

1. Biology: Short Answer: What are the names of differentiated plant cells that are grouped in strands or cylinders, and help young parts of the plant shoot? They have unevenly thickened cell walls, and often compose the part of young stems and petioles just below their epidermis.

ANSWER: Collenchyma Cells

1. Biology: Multiple Choice: Which of the following experiments used radioactive sulfur and phosphorous to trace the fates of protein and DNA, respectively, of T2 phages that infected bacterial cells?

W. Griffith Experiment

X. Avery-Carty-MacLeod Experiment

Y. Chargaff Experiment

Z. Hershey-Chase Experiment

ANSWER: Z

1. Chemistry: Multiple Choice: Le Chatelier's Principles predicts which of the following actions below to cause the exothermic reaction N2O4 → 2 NO2 to form more products at a new equilibrium than initially present at equilibrium?

W. increasing the system volume

X. increasing the system temperature

Y. increasing the system pressure by adding He gas

Z. decreasing the system pressure by removing He gas

ANSWER: W

1. Physics: Short Answer: What law, which describes paramagnetism, states that the magnetization of a paramagnetic sample is directly proportional to the magnitude of the external magnetic field, and inversely proportional to the absolute temperature T?

ANSWER: Curie's Law

1. Math: Multiple Choice: On a square gameboard that is divided into *n* rows of *n* squares each, *k* of these squares lie along the boundary of the gameboard. Which of the following is a possible value of *k*, given that *n* is a positive integer?

W. 25

X. 34

Y. 42

Z. 52

ANSWER: Z

1. Astronomy: Short Answer: What is the name for an astronomical object, conjectured to be some form of magnetar, that emits large bursts of gamma rays and X-rays at irregular intervals? Evidence for them was first found in a supernova remnant in the Large Magellanic Cloud.

ANSWER: Soft Gamma Repeater (SGR)

1. Chemistry: Multiple Choice: Which of the following is the correct arrangement of the following elements in terms of increasing atomic radius:

Mg, Na, P, Si, Ar

W. Ar, Si, P, Na, Mg

X. Mg, Na, P, Si, Ar

Y. Mg, Na, Ar, P, Si

Z. Ar, P, Si, Mg, Na

ANSWER: Z

1. Physics: Short Answer: Find the amount of heat released when a disk of radius 0.5 meters and 8 kilograms spinning through an axis that passes through its center, is brought to rest from moving with an angular velocity of 10 radians/sec.

ANSWER: 50 Joules

1. Biology: Short Answer: What type of immune system molecules are made by mainly dendritic cells, macrophages, and B cells, and display peptide fragments of antigens to both cytotoxic T cells and helper T cells?

ANSWER: Class II MHC (Major Histocompatibility Complex)

1. Earth Science: Short Answer: In addition to violent eruptions of volcanoes, large composite cones may generate a type of mudflow, which occur when volcanic debris becomes saturated with water and rapidly move down steep volcanic slopes?

ANSWER: Lahars

1. Chemistry: Short Answer: What is the name of the state function that describes the amount of work a process can do and the spontaneity of processes at constant volume. It is defined as the Internal energy of the system minus its absolute temperature times its entropy.

ANSWER: Helmholtz Free Energy (A)

1. Biology: Multiple Choice: Which of the following is NOT a group of species within the phylum chordata that has a notochord, but NO vertebral column?

W. Petromyzontida

X. Urochordata

Y. Cephalochordata

Z. Myxini

ANSWER: W

1. Physics: Multiple Choice: Which of the following choices is NOT an assumption that one could make about an ideal fluid?

W. Laminar Flow

X. Rotational Flow

Y. Nonviscous Flow

Z. Incompressible Flow

ANSWER: X

1. General Science: Multiple Choice: Which of the following types of radiation is produced by the acceleration of ultrarelativistic charged particles through strong magnetic fields?

W. Cyclotron radiation

X. Bremsstrahlung

Y. Alpha Radiation

Z. Synchotron Radiation

ANSWER: Z

1. Earth Science: Multiple Choice: What type of fog forms when warm, moist air moves over a cool surface, the result being a blanket of fog? It is one of the most common types of fogs, and commonly forms in San Francisco Bay.

W. Advection Fog

X. Radiation Fog

Y. Upslope Fog

Z. Evaporation Fog

ANSWER: W

1. Math: Short Answer: What is the equation of the directrix of the parabola represented by the implicit equation x2 = 8y?

ANSWER: y = -2