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Science Bowl Round (12 Questions)   
  
Toss-up   
  
1) BIOLOGY Short Answer: By name or number indicate which of the following 3 will most often increase gene transcription:  
1) Methylation  
2) Acetylation  
3) Adding phosphate groups  
ANSWER: 2, 3  
  
BONUS   
  
BIOLOGY Multiple Choice Which enzyme in the ephinephrine signal transduction pathway cleaves glycogen into glucose-1-phosphate?  
W) G protein  
X) Protein kinase A  
Y) Phosphorylase Kinase  
Z) Glycogen phosphorylase  
  
ANSWER: Z  
  
Toss-up  
  
2) Math Short Answer: What is the definite integral of x cubed from 2 to 4?   
  
ANSWER: 12  
  
BONUS   
  
Math Short Answer: What is sum of series ½, ¼, ⅛, etc. as n goes to infinity?  
  
ANSWER: 1   
  
Toss-up  
  
3) CHEMISTRY Short Answer: Which law states that for a fixed amount of gas at constant temperature, volume is inversely proportional to pressure?  
  
ANSWER: Boyle’s  
  
BONUS  
  
CHEMISTRY Short Answer: What is the approximate molar mass of glucose?   
ANSWER: 180 grams  
  
Toss-up   
  
4)  PHYSICS Multiple Choice: Two charges are separated by distance d. If the distance d between the charges is doubled, the electric potential is  
W) quadrupled  
X) doubled  
Y) unchanged  
Z)  halved  
  
ANSWER: Y  
  
BONUS  
  
PHYSICS Short Answer: A man runs thirty meters east in 5 seconds and then forty meters north in five seconds. What is his average velocity?  
ANSWER: 5 meters/ second  
  
Toss-up  
  
5) EARTH/ ASTRO Short Answer: Which comet, dubbed the great comet of 1997, holds the record of 18 months for being visible to the unaided eye?  
ANSWER: Hale-Bopp  
  
BONUS  
  
EARTH/ ASTRO Multiple Choice: What is the approximate deepest level of earthquakes?  
  
W) 300 km  
X) 500 km  
Y) 700 km  
Z) 900 km  
  
ANSWER: Y) 700 km

Toss-up   
  
6) ENERGY Short Answer: Which law states that if two systems are in thermal equilibrium with a third system, they must be in thermal equilibrium with each other?   
  
ANSWER: Zeroth law of thermodynamics  
  
BONUS   
  
ENERGY Short Answer: How much heat in calories is needed to raise 10 grams of water from 75 to 85 degrees Celsius?   
ANSWER: 100  
  
Toss-up   
  
7) BIOLOGY Short Answer: What is the haploid number of humans?  
ANSWER: 23  
  
BONUS  
  
BIOLOGY Short Answer: A gene pool is undergoing Hardy-Weinberg equilibrium for a train governed by Mendelian genetics. If the frequency of the dominant allele is 0.8, give the percent of the popular expected to be homozygous dominant, heterozygous, and homozygous recessive respectively.  
  
ANSWER: 64, 32, 4

TOSS-UP  
  
8) MATH Short Answer:   
  
BONUS  
  
Math Short Answer: An arc is 60 degrees in a circle with a diameter of 18 inches. What is the area? Give your answer as a fraction with pi as the constant.   
  
ANSWER: 81/6 pi  
  
TOSS-UP  
  
9) CHEMISTRY Short Answer: Using name or number denote all the following which affect the reaction rate.   
1) Concentration of reactants  
2) Temperature   
3) Presence of a catalyst   
4) Physical state of reactants  
  
ANSWER: all   
  
BONUS   
  
CHEMISTRY Short Answer: The equilibrium constant for H2 (g)  + I2 (g) double arrows 2HI (g) is 2.5. What is the equilibrium constant, given as a fraction or decimal to the tenth, for 4HI (g) double arrows 2H2 (g) + 2I2 (g)?  
  
ANSWER: 1/ (2.5)^2 or 0.2  
  
TOSS-UP  
  
10) PHYSICS  Multiple Choice: A man pushes a ten kg box a constant velocity over 4 meters. The coefficient of kinetic friction between the box and the floor is 0.3. How much work does the person do?  
W) 12J  
X) 40 J  
Y) 75 J  
Z) 120 J  
  
ANSWER: Z  
  
BONUS  
  
PHYSICS Multiple Choice: A forklift lifts a 100 kg crate at a constant velocity to a height of 8 m over 4 seconds. The forklift holds the crate in place for twenty seconds. How much power in watts does the forklift exert?  
W) 0  
X) 2.0 x 10^3  
Y) 3.2 x 10^3  
Z)  2.0 x 10^4  
  
ANSWER: x  
  
TOSS-UP   
  
11) EARTH/ ASTRO Multiple Choice: The sun is most likely a what generation star?  
  
W) first  
X) 2nd  
Y) 3 rd  
Z) 4th  
  
ANSWER: Y  
  
BONUS   
  
EARTH/ ASTRO Multiple Choice: Which mineral tends to form first in the Bowen series?  
W) olivine  
X) muscovite  
Y) plagioclase  
Z) biotite  
  
ANSWER: W

TOSS-UP

12) ENERGY Multiple Choice: Which of the following is false?  
  
W) ATP in a cell yields -7.3 kcal per mole of free energy.  
X) A cell is about 40% efficient.  
Y) Enzymes can lower activation energy.  
Z) Enzymes can speed up the rate of reaction without being consumed.  
  
ANSWER: W  
  
BONUS   
  
ENERGY Short Answer: Using name/ number, denote all of the following which enzymes can do to speed up a reaction: 1) act as a template for substrate orientation 2) stabilize transition state 3) provide favorable microenvironment 4) participate directly in the reaction.  
  
ANSWER: all