

BASIS PEORIA SCIENCE BOWL

ROUND ROBIN ROUND 1

TOSS-UP

1) Biology– *Multiple Choice* A plant exposed to sunlight on its left side will elongate via a process called positive phototropism towards the source of light. Which plant hormone is responsible for such tropisms?

W) Cytokinin
X) Abscisic Acid
Y) Auxin
Z) Gibberellin

ANSWER: Y

BONUS

1) Biology – *Short Answer* Dicot plants are defined as having two cotyledons among a variety of other characteristics. Which of the following, if any, is classified as a Dicot plant?

1) Hibiscus
2) Orchid
3) Rose

ANSWER: 1 AND 3

TOSS-UP

2) Chemistry – *Short Answer* What is the pH of a 1.0 M solution of HCl?

ANSWER: 0

BONUS

2) Chemistry – *Multiple Choice* Which of the following is not a strong acid?

W) HNO_3
X) H_2SO_4
Y) HNO_2
Z) HI

ANSWER: Y

TOSS-UP

3) Physics – *Multiple Choice* Which of the following is not true about momentum?

W) Momentum is measured in Newtons per second

X) Momentum is a vector
Y) Momentum is conserved in both elastic and inelastic collisions
Z) Momentum is equal to mass times velocity

ANSWER: W) MOMENTUM IS MEASURED IN NEWTONS PER SECOND

BONUS

3) Physics – *Short Answer* Which of the following has the greatest momentum?
W) A 1000kg elephant at rest
X) A 40kg car traveling at 10 m/s
Y) A 15kg scooter traveling at 15 m/s
Z) A 1kg cat traveling at 50m/s

ANSWER: X) A 40KG CAR TRAVELING AT 10 M/S

TOSS-UP

4) Math – *Short Answer* To the nearest whole number, what is the length of the hypotenuse of a right triangle with legs of length 24 and 8?

ANSWER: 25

BONUS

4) Math – *Multiple Choice* Which of the following is a pythagorean triple?

W) 5, 10, 11
X) 6, 9, 12
Y) 5, 12, 14
Z) 8, 15, 17

ANSWER: Z

TOSS-UP

5) Earth and Space – *Short Answer* Which period in the Paleozoic Era is often referred to as the Age of Fish?

ANSWER: DEVONIAN

BONUS

5) Earth and Space – *Short Answer* The last great Snowball Earth occurred mostly in which period, which is named after this event?

ANSWER: CRYOGENIAN

TOSS-UP

6) Energy – *Multiple Choice* Which of the following is not a path function?

W) Work
X) Heat Capacity
Y) Enthalpy
Z) Heat

ANSWER: Y) Enthalpy

BONUS

6) Energy – *Short Answer* What two quantities are constant when calculating Gibbs' free energy?

ANSWER: Pressure and temperature

TOSS-UP

7) Biology – *Short Answer* Which of the five main lobes of the brain contains the auditory cortex and is thus responsible for gathering and compiling data from the auditory nerve?

ANSWER: TEMPORAL OR TEMPORAL LOBE

BONUS

7) Biology – *Multiple Choice* The Sodium Potassium pump regulates the cell potential of neurons and is located in the cell membrane. The pump transports three Sodium molecules out of the cell for every two potassium molecules transported in. What type of transport is the Sodium Potassium Pump engaged in?

W) Active Transport
X) Diffusion
Y) Facilitated Diffusion
Z) Osmosis

ANSWER: W

TOSS-UP

8) Chemistry – *Multiple Choice* Which of the following is the longest bond?

W) Carbon Carbon Single Bond
X) Carbon Carbon Double Bond
Y) Carbon Carbon Triple Bond
Z) Carbon Nitrogen Triple Bond

ANSWER: W

BONUS

8) Chemistry – *Short Answe*r Which of the following has the highest bond dissociation energy?

W) H2
X) F2
Y) Br2
Z) N2

ANSWER: Z

TOSS-UP

9) Physics – *Short Answer* What law of optics states that the incident index multiplied by the sine of the incident angle is equal to the refracted index multiplied by the sine of the refracted angle?

ANSWER: SNELL'S LAW

BONUS

9) Physics – *Short Answer* What is the term for materials that have the same optic properties in all directions?

ANSWER: ISOTROPIC

TOSS-UP

10) Math – *Short Answer* Factor the following expression. $A^2 - 6AB + 9B^2$

ANSWER: $(A-3B)^2$

BONUS

10) Math – *Short Answer* Simplify the fraction with numerator $(3X^2+4XY+Y^2)$ and denominator $(X^2+2XY+Y^2)$

ANSWER: (3X+Y)/(X+Y)

TOSS-UP

11) Earth and Space – *Short Answer* What feature is formed when a glacier flows over an already existing moraine?

ANSWER: DRUMLIN

BONUS

11) Earth and Space – *Short Answer* When a tributary glacier meets the main glacier, and the two glaciers eventually recede, what feature is formed, in which a waterfall may also occur?

ANSWER: HANGING VALLEY

TOSS-UP

12) Energy – *Short Answer* What law states that the entropy of an isolated system always increases?

ANSWER: Second Law of Thermodynamics

BONUS

12) Energy – *Multiple Choice* Which of the following best describes the zeroth law of thermodynamics?

W) Energy cannot be created or destroyed; it can only be changed from one form to another.
X) If two thermodynamic systems are each in thermal equilibrium with a third system, then they are all in equilibrium with each other.
Y) When the temperature of a perfect crystal is 0, then its entropy will also be 0.
Z) In a closed system, the change in energy of the system is always 0.

ANSWER: X) If two thermodynamic systems are each in thermal equilibrium with a third system, then they are all in equilibrium with each other.

TOSS-UP

13) Biology – *Short Answer* A woman with type AB blood and Man with Type O blood seek to have a child. Which of the following, if any, are the possible blood types of their offspring?

1) A
2) O
3) AB

ANSWER: 1 ONLY

BONUS

13) Biology – *Short Answer* This steroid has four main rings and is responsible for regulating membrane rigidity within the phospholipid bilayer. What is the name of this lipid?

ANSWER: CHOLESTEROL

TOSS-UP

14) Chemistry – *Short Answer* If 3 moles of gas in a sealed, isolated container exert 5 atm of pressure, what will be the pressure when all things constant, there are 6 moles of gas?

ANSWER: 10 atm

BONUS

14) Chemistry – *Short Answe*r Assuming R=8, what is the molar mass of a gas with a density of 1g/cm^3, temperature of 27 C, and pressure of 16 atm.

ANSWER: 150 g/mol

TOSS-UP

15) Physics – *Multiple Choice* Which of the following is not an SI unit?

W) Siemens
X) Maxwell
Y) Ohm
Z) Weber

ANSWER: W) MAXWELL

BONUS

15) Physics – *Short Answer* What is the term for the ratio of the change in electric charge of a system to the corresponding change in its electric potential?

ANSWER: CAPACITANCE

TOSS-UP

16) Math – *Short Answer* What is the prime factorization of 270?

ANSWER: $2*3^3*5$

BONUS

16) Math – *Short Answer* What is the 10th prime number?

ANSWER: 29

TOSS-UP

17) Earth and Space – *Short Answer* A type I supernova is different from a type II supernova because it lacks what element?

ANSWER: HYDROGEN

BONUS

17) Earth and Space – *Multiple Choice* Rank the following spectral classes in order from dimmest to brightest: A0, G2, A5, G4.

W) A0, A5, G2, G4
X) A5, A0, G4, G2
Y) G2, G4, A0, A5
Z) G4, G2, A5, A0

ANSWER: Z) G4, G2, A5, A0

TOSS-UP

18) Energy – *Multiple Choice* Which of the following is not a unit of energy?

W) Calorie
X) (kgm^2)/(s^2)
Y) Joule
Z) Volt

ANSWER: Z) Volt

BONUS

18) Energy – *Multiple Choice* The value of 1 horsepower is closest to which of the following quantities?

W) 7.50 Watts
X) 75.0 Watts
Y) 750 Watts
Z) 7,500 Watts

ANSWER: Y) 750 Watts

TOSS-UP

19) Biology – *Short Answer* Fish living in both saltwater and freshwater experience major osmotic issues with maintaining water balance from being either hypertonic or hypotonic to their environment. As such, they possess intermembrane proteins to help maintain osmotic balance that some prokaryotes also possess. What are these proteins called?

ANSWER: AQUAPORINS

BONUS

19) Biology – *Short Answer* A *Nautilus* is a soft bodied organism that resides within a thick external shell. Its body has several grooves and its shell is divided into several compartments. The organism also has a clear concentration of nerves towards the anterior end of its body. What Phylum does the *Nautilus* belong to?

ANSWER: MOLLUSCA

TOSS-UP

20) Chemistry – *Short Answer* If a reaction has K_c=5, what is the equilibrium constant of the reverse reaction?

ANSWER: 0.2

BONUS

20) Chemistry – *Short Answer* Given the reaction $CaCO3(s) \rightarrow CaO(s) + CO2$ has a K_eq=3, what is the pressure of $CO2$ at equilibrium?

ANSWER: 3

TOSS-UP

21) Physics – *Multiple Choice* What law states that at any junction in an electrical circuit, the sum of the currents flowing into that junction is equal to the sum of the currents flowing out of that junction?

W) Kirchoff's Loop Law
X) Ohm's Law
Y) Maxwell's Law
Z) Kirchoff's Junction Rule

ANSWER: Z) KIRCHOFF'S JUNCTION RULE

BONUS

21) Physics – *Short Answer* Three resistors with the same resistance are all connected in parallel. What is the resistance of an individual resistor, in Ohms, if the combined resistance is 10 Ohms?

ANSWER: 30

OSS-UP

22) Math – *Short Answer* What is the geometric mean of 8 and 10? Simplify your answer.

ANSWER: $4\sqrt{5}$

BONUS

22) Math – *Short Answer* Find the average of the arithmetic mean and geometric mean for the following three numbers 5, 8, 25. Give your answer as an improper fraction in lowest terms.

ANSWER: 34/3

TOSS-UP

23) Earth and Space – *Short Answer* 51 Pegasi was the first sun-like star to be known to have what?

ANSWER: A PLANET

BONUS

23) Earth and Space – *Short Answer* 51 Pegasi b is an example of what class of planet, whose members display orbits under 0.1 AU and masses near or above that of Jupiter.
ANSWER: HOT JUPITERS