**TOSS-UP**

1. PHYSICS *Short Answer* In a parallel resistance circuit consisting of one circuit with 10 ohms resistance and the other made up of another parallel circuit 15, calculate the total resistance.

ANSWER: Ohms

**BONUS**

1. PHYSICS *Short Answer* In a circuit consisting of a 24 volt battery and parallel resistors with resistances of 8 Ohms and 4 Ohms, calculate the total current in the system.

ANSWER: 9 Amperes

**TOSS-UP**

1. CHEMISTRY *Short Answer* Rank the following in order of decreasing bond angles.

1: NH4

2: BF3

3: NH3

ANSWER: 2, 1, 3

**BONUS**

1. CHEMISTRY *Short Answer* The molecule AX5Y has how many different stereoisomers?

ANSWER: 1

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Multiple Choice* Which of the following best describes the interaction between the Pacific Plate and the North American Plate?

W) Divergent Boundary

X) Transform Boundary

Y) Convergent Boundary

Z) Convection Current

ANSWER: X) Transform Boundary

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Name the discoverer of the Continental Drift Theory, and name one set of two continents that he used as proof for the theory.

ANSWER: Alfred Wegener; Europe/North America OR Africa/South America

**TOSS-UP**

1. BIOLOGY *Short Answer* When one develops sepsis, what product is formed that also decreases the pH of blood?

ANSWER: Lactic Acid

**BONUS**

1. BIOLOGY *Multiple Choice* Which mode delays the signal from the upper to the lower chamber of the heart?

ANSWER: AV Node OR Atrio- Ventricular Node

**TOSS-UP**

1. ENERGY *Short Answer* Today, what is the most exploited source of renewable energy?

ANSWER: Hydroelectric Energy

**BONUS**

1. ENERGY *Short Answer* What cycle is needed to regenerate pyruvate from lactic acid?

ANSWER: Cori’s Cycle

**TOSS-UP**

1. MATHEMATICS *Short Answer* Give the double derivative of 5+ 6.

ANSWER: 30x + 12

**BONUS**

1. MATHEMATICS *Short Answer* A circle is inscribed in a triangle with side lengths 3, 4, and 5. Find the radius of the circle.

ANSWER: 1

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Multiple Choice* Dark Energy tends to do what in the universe?

W) Increase Temperature

X) Give off x-rays

Y) Increase speed of expansion

Z) Decrease temperature

ANSWER: Y) Increase speed of expansion

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Name the five dwarf planets.

ANSWER: Eris, Ceres, Pluto, Haumea, Makemake

**TOSS-UP**

1. CHEMISTRY *Short Answer* What does VSEPR stand for?

ANSWER: Valence Shell Electron Pair Repulsion

**BONUS**

1. CHEMISTRY *Short Answer* Using VSEPR, determine the five possible ways bonds can be positioned in relation to the central atom.

ANSWER: Linear, Trigonal Planar, Tetrahedral, Trigonal Bipyramidal, Octahedral

**TOSS-UP**

1. PHYSICS *Multiple Choice* The seemingly random motion of pollen on still water is a result primarily of what?

W) uneven movement of water molecules

X) small micro-currents in the water

Y) temperature differences within the water

Z) air currents moving the water

ANSWER: W) uneven movement of water molecules

**BONUS**

1. PHYSICS *Short Answer* Whose theory states that the root mean square is proportional to the square root of time?

ANSWER: Einstein

**TOSS-UP**

1. MATHEMATICS *Short Answer* The first differentiation of the formula for the volume of a sphere is the formula for what?

ANSWER: Surface area of a sphere

**BONUS**

1. MATHEMATICS *Short Answer* An one mile long train enters a 10 mile long tunnel at a speed of 2 miles an hour. How long will it be until the train fully emerges from the tunnel?

ANSWER: 5.5 hours OR 5 and a half hours OR 5 hour 30 minutes

**TOSS-UP**

1. CHEMISTRY *Multiple Choice* What process is used to increase the elasticity of rubber?

W) Bessemer Process

X) Vulcanization

Y) Immersification

Z) Dehydrogenation

ANSWER: X) Vulcanization

**BONUS**

1. CHEMISTRY *Short Answer* Who first discovered the benefits of the Vulcanization process to create a durable tire brand?

ANSWER: Charles Goodyear

**TOSS-UP**

1. BIOLOGY *Short Answer* Which nerve slows down the SA node in the heart?

ANSWER: Vegus Nerve

**BONUS**

1. BIOLOGY *Short Answer* The ending of the vagi nerves releases what hormone when danger is not threatening?

ANSWER: Acetylcholine

**TOSS-UP**

1. BIOLOGY *Short Answer* Sympathetic nerves release what hormone when danger is imminent?

ANSWER: Norepinephrine

**BONUS**

1. BIOLOGY *Multiple Choice* When acetylcholine is released, the nodes become more permeable to what ion?

W) Magnesium

X) Chlorine

Y) Potassium

Z) Sodium

ANSWER: Y) Potassium

**TOSS-UP**

1. CHEMISTRY *Short Answer* A tetrahedral molecule has what bond angle?

ANSWER: 109.5 Degrees

**BONUS**

1. CHEMISTRY *Short Answer* Name the family that contains 90 degree bonds, can be highly explosive, and also be used to inactivate an enzyme in Parkinson’s disease.

ANSWER: Cubanes

**TOSS-UP**

1. MATHEMATICS *Short Answer* What is the triple integral of the equation 24x+12?

ANSWER: + 2

**BONUS**

1. MATHEMATICS *Short Answer* What angle theorem did the Ancient Greeks take advantage of to calculate the radius of the Earth?

ANSWER: Alternating Angles

**TOSS-UP**

1. ENERGY *Multiple Choice* Carbon makes up what percentage of petroleum by weight?

W) 30-40%

X) 40-50%

Y) 70-80%

Z) 80-90%

ANSWER: Z) 80-90%

**BONUS**

1. ENERGY *Short Answer* Bears are able to hibernate because they store up what kind of fat?

ANSWER: Brown Fat

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Short Answer* When two spiral galaxies collide, what shape galaxy forms?

ANSWER: Elliptical Galaxy

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Which galaxy is the Milky Way headed to collide with in about 3 billion years?

ANSWER: Andromeda (Galaxy)

**TOSS-UP**

1. PHYSICS *Short Answer* Which of the following affects the frequency of a pendulum?

1: Mass

2: Initial Velocity

3: Length of string attached

ANSWER: 3 ONLY

**BONUS**

1. PHYSICS *Short Answer* Who first stated the law for determining the time of the period of a pendulum bob’s swing?

ANSWER: Christiaan Huygens

**TOSS-UP**

1. BIOLOGY *Short Answer* Which alcohol causes permanent blindness is ingested?

ANSWER: Methanol

**BONUS**

1. BIOLOGY *Multiple Choice* Which of the following is the essential component to the smell perceived?

W) Number of carbons

X) Shape of the molecule

Y) Bond angles in the molecule

Z) Length of the molecule

ANSWER: X) Shape of the molecule

**TOSS-UP**

1. CHEMISTRY *Multiple Choice* Mustard Gas is lethal to humans because it does what?

W) Creates HCl in moist areas of the human body

X) produces cyanide gas when it mixes with air

Y) forms an alkali compound

Z) forms a free- radical

ANSWER: W) Creates HCl in moist parts of the human body

**BONUS**

1. CHEMISTRY *Short Answer* The molecule AX3 can take the form of which three molecules?

ANSWER: Trigonal Planar, Tetrahedral, Trigonal Bipyramidal

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Short Answer* The existence of similar mountain ranges on the opposite sides of the Atlantic is an example of what theory?

ANSWER: Continental Drift

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* What is the common name for the belt of hot spots and volcanic activity around the Pacific Rim?

ANSWER: (Pacific) Ring of Fire

**TOSS-UP**

1. CHEMISTRY *Short Answer* Nitrate has how many resonance forms?

ANSWER: 3

**BONUS**

1. CHEMISTRY *Short Answer* How many different groups must be around a carbon to form an enantiomer?

ANSWER: 4

**TOSS-UP**

1. CHEMISTRY *Multiple Choice* Which of the following is different between enantiomers?

W) Density

X) Optic Properties

Y) Chemical Reactivity

Z) Polarity

ANSWER: X) Optic Properties

**BONUS**

1. CHEMISTRY *Short Answer* In a chemical equation, what do you put in front of each compound to differentiate between enantiomers?

ANSWER: L, D

**TOSS-UP**

1. MATHEMATICS *Short Answer* What is the sum of the exterior angles of an octagon?

ANSWER: 360 Degrees

**BONUS**

1. MATHEMATICS *Short Answer* What is the sum of the interior angles of a dodecagon?

ANSWER: 1800 Degrees

**TOSS-UP**

1. PHYSICS *Multiple Choice* What physical principle do figure skaters use as they spin faster with arms tucked in?

W) Decreasing Air Friction

X) Conservation of Angular Momentum

Y) Centrifugal Force

Z) Bernoulli’s Principal

**BONUS**

1. PHYSICS *Multiple Choice* If two vectors have angle theta between them, the cross- product of these two vector is obtained by multiplying the product of the two vectors with what?

W) sin theta

X) cos theta

Y) tan theta

Z) cosec theta

ANSWER: W) sin theta