Hoon Min

9th Grade

**TOSS-UP**

1. BIOLOGY *Multiple Choice* Xanthine, theobromine, caffeine, uric acid, isoguanine. What is common about all of these molecules?

W) They are all soluble.

X) They are all inorganic molecules.

Y) They are all pyrimidines.

Z) They are all purines.

ANSWER: Z) They are all purines.

**BONUS**

1. BIOLOGY *Multiple Choice* The glucose that we can digest is known as amylose, or starch. What is the difference between this and cellulose, another form of glucose?

W) Starch possesses an alpha linkage that cellulose does not.

X) Starch possesses a beta linkage that cellulose does not.

Y) Starch has an extra lone pair that makes it easier to digest.

Z) Starch is a stereoisomer of cellulose.

ANSWER: W) Starch possesses an alpha linkage that cellulose does not.

**TOSS-UP**

1. CHEMISTRY *Short Answer* How many carbon atoms are there on the ring portion of a glucose molecule?

ANSWER: 5

**BONUS**

1. CHEMISTRY *Short Answer* How many lone pairs exist on a glucose molecule, and on which atom or atoms are they located on?

ANSWER: 2, Oxygen

**TOSS-UP**

1. PHYSICS *Short Answer* Einstein’s Twin Paradox states that the twin on earth will be what relative to the twin traveling near the speed of light?

ANSWER: Older

**BONUS**

1. PHYSICS *Short Answer* If one is walking eastwards, in which directing is the frictional force from one’s shoes directed?

ANSWER: Downwards

**TOSS-UP**

1. ENERGY *Short Answer* Approximately what percentage of the world’s electricity is derived from nuclear sources?

W) 5%

X) 15%

Y) 25%

Z) 35%

ANSWER: X) 15%

**BONUS**

1. ENERGY *Short Answer* Which nation uses the most nuclear energy as a percentage of total energy usage?

ANSWER: France

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Multiple Choice* Which observatory and country is the world’s current largest full dish radio telescope located?

W) [Jodrell Bank Observatory](http://en.wikipedia.org/wiki/Jodrell_Bank_Observatory), [Cheshire](http://en.wikipedia.org/wiki/Cheshire), [England](http://en.wikipedia.org/wiki/England)

X) Arecibo Observatory, Puerto Rico

Y) Effelsberg, Germany

Z) Guizhou, China

ANSWER: X) Arecibo Observatory, Puerto Rico

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* You see lightning from the backseat of a car going at 30 meters per second. Five seconds later, you hear thunder. How far away from you did the lightning occur in meters to 2 significant digits?

ANSWER: 1900 meters away

**TOSS-UP**

1. MATHEMATICS *Short Answer* What theorem does the Law of Cosines turn into when the angle tested is 90 degrees?

ANSWER: Pythagorean Theorem

**BONUS**

1. MATHEMATICS *Short Answer*

**TOSS-UP**

1. BIOLOGY *Short Answer* How many hydrogen bonds exist between the pairs Adenine, Thiamine, and Guanine and Cytosine?

ANSWER: 2, 3

**BONUS**

1. BIOLOGY *Short Answer* Extremophile bacteria are more likely to have more of which DNA pairings?

ANSWER: G-C pairings

**TOSS-UP**

1. CHEMISTRY *Multiple Choice* Which of the following is not an aromatic compound?

W) 4 carbon ring with two double bonds

X) 3 carbon ring with one double bond

Y) 6 carbon ring with two double bonds

Z) 6 carbon ring with three double bonds

ANSWER: Y) 6 carbon ring with two double bonds

**BONUS**

1. CHEMISTRY *Short Answer* For a molecule to be aromatic, what general formula must its pi electrons follow?

ANSWER: 4n+2

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Multiple Choice* El Nino mainly prevents which current flow that directly results in the destruction of fishing industries?

W) warm water flowing to the South American coast

X) cold water flowing to the Asian coast

Y) cold water rising to the South American coast

Z) warm water circulating through the Pacific

ANSWER: Y) cold water rising to the South American coast

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Compared to normal years, which of the following describe how El Nino affects the water levels in Asia compared to the Americas.

1) higher water levels in Asia than usual

2) higher water levels in the Americas than usual

3) roughly equal water levels between Asia and the Americas

4) overall higher water levels in the Americas than in Asia

ANSWER: 2, 3

**TOSS-UP**

1. MATHEMATICS *Short Answer* There are two inclined planes, one with hypotenuse 13, and distance 12, while the other has a hypotenuse of 5 , and distance of 5. What is the difference in the work done, if a ball is rolled up both planes?

ANSWER: 0

**BONUS**

1. MATHEMATICS *Short Answer* How do we derive the formula for the surface area of a sphere?

ANSWER: differentiating the formula for the volume of a sphere

**TOSS-UP**

1. PHYSICS *Short Answer* Give the formula for calculating buoyant force.

ANSWER: buoyant force is equal to mass of the object times (1-density of fluid over density of the object)

**BONUS**

1. PHYSICS *Short Answer* If one went swimming in mercury, one’s buoyant mass would change. Calculate the new buoyant force if one’s mass is 60 kilograms, and has a density of 1.5 g/mL. Hg= 13.5

ANSWER: -480 kg

**TOSS-UP**

1. ENERGY *Short Answer* What is the current fastest growing energy technology?

ANSWER: Solar power

**BONUS**

1. ENERGY *Short Answer* About how many times more watts arrive in the form of solar power than we currently use?

W) 200 times

X) 3000 times

Y) 6000 times

Z) 10000 times

ANSWER: Y) 6000 times

**TOSS-UP**

1. CHEMISTRY *Short Answer* What is the name for the stereoisomers that are not enantiomers, and have two centers?

ANSWER: Diastereomers

**BONUS**

1. CHEMISTRY *Short Answer* If the ideal gas law states that PV=nRT, then, complete the statement, PV=(weight times RT) divided by what?

ANSWER: Molar Mass

**TOSS-UP**

1. BIOLOGY *Short Answer* Specifically, where in the cell’s organelles does cellular respiration occur?

ANSWER: Cristae

**BONUS**

1. BIOLOGY *Short Answer* In the second electron transport chain of photosynthesis, what is produced?

ANSWER: NADPH

**TOSS-UP**

1. PHYSICS *Short Answer* If there are two vectors, with magnitudes 5 newtons north, and 10 newtons east, find the dot product of the two vectors.

ANSWER: 0

**BONUS**

1. PHYSICS *Short Answer* If one connects the vertices of a triangle to the midpoints of the opposite sides, what do we obtain? Secondly, what is the ratio between the lines?

ANSWER: Center of Gravity; 2:1

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Short Answer* How many centers are there for a planetary orbit?

ANSWER: 2

**BONUS**

1. EARTH AND SPACE SCIENCE *Multiple Choice* Which planet has the greatest eccentricity?

W) Neptune

X) Pluto

Y) Mercury

Z) Saturn

ANSWER: Y) Mercury

**TOSS-UP**

1. CHEMISTRY *Short Answer* When molten rock cools, how are the crystals layered in relation to lattice energy?

ANSWER: lowest lattice energy at bottom, higher on top

**BONUS**

1. CHEMISTRY *Short Answer* Molecules with an unpaired or lone electron are more commonly known as what?

ANSWER: Free- radicals

**TOSS-UP**

1. BIOLOGY *Short Answer* What is the process that is used to convert carbon dioxide and water into organic compounds.

ANSWER: Calvin Cycle

**BONUS**

1. BIOLOGY *Short Answer* Answer the following three questions. 1) Give the alternate name for the Calvin cycle that mentions what happens to carbon. 2) What is the key enzyme used in this process? 3) Where does the Calvin cycle take place? Be specific.

ANSWER: 1) carbon fixation

2) RuBisCO

3) Stroma

**TOSS-UP**

1. CHEMISTRY *Short Answer* Which processes do we have to use to calculate the lattice energy of a molecule?

ANSWER: Born-Haber Cycle

**BONUS**

1. CHEMISTRY *Short Answer* Give the symbol of the element with the electron configuration 1s22s22p63s1.

ANSWER: Na

**TOSS-UP**

1. EARTH AND SPACE SCIENCE *Short Answer* Which of Neptune’s moons currently holds the record as having the smallest eccentricity of any body in the solar system?

ANSWER: Triton

**BONUS**

1. EARTH AND SPACE SCIENCE *Multiple Choice* Which event on Earth will most likely be affected most by Earth’s gradually changing eccentricity?

W) average temperatures

X) length of seasons

Y) larger tides

Z) length of day

ANSWER: X) Length of seasons

**TOSS-UP**

1. ENERGY *Short Answer* What is an out of control uranium based nuclear fission reaction more commonly known as?

ANSWER: Atomic Bomb

**BONUS**

1. ENERGY *Short Answer* In proposed cold fusion reactions, the main advantage that we gain in this process over preexisting fusion reactions is what?

ANSWER: Fusion at a low temperature

**TOSS-UP**

1. CHEMISTRY *Short Answer* Which of the following would be most soluble in water?

W) 1-propanol

X) 1-butanol

Y) 1-pentanol

Z) 1-hexanol

ANSWER: W) 1-propanol

**BONUS**

1. CHEMISTRY *Short Answer* If a seed crystal is placed into a supersaturated solution of the same substance, describe what will happen to the excess solute.

ANSWER: It will crystallize out of the solution

**TOSS-UP**

1. BIOLOGY *Short Answer* Describe the polar qualities of a cell membrane phospholipid.

ANSWER: polar ionic head, nonpolar tail

**BONUS**

1. BIOLOGY *Short Answer* The purpose of the phospholipid bilayer is to exclude this ion from the cell, and keep this ion in. Name the ions.

ANSWER: sodium out, potassium in

**TOSS-UP**

1. MATHEMATICS *Short Answer* Name the Greek mathematician who first came up with the water displacement principle.

ANSWER: Archimedes

**BONUS**

1. MATHEMATICS *Short Answer* A person goes up a hill at 18mph for 30 minutes, and comes back down at 72mph. What is the total time in minutes?

ANSWER: 37.5 minutes

**TOSS-UP**

1. ENERGY *Short Answer* Farraday’s law involves the cross product of the vectors of which two elements?

ANSWER: Magnetic Field; Velocity

**BONUS**

1. ENERGY *Short Answer* Farraday’s Law is put into practical use in the production of what?

ANSWER: Electricity