**TOSS UP**

1. BIOLOGY *Multiple Choice* In Drosophila the initial cells created by cleavage divisions contain different developmental signals from the egg, setting individual cells off on different developmental paths. What is the name of this pattern of development?  
   W) Regulative development  
   X) Mosaic development  
   Y) Inductive development  
   Z) Organized development  
   ANSWER: X) MOSAIC DEVELOPMENT

**BONUS**

1. BIOLOGY *Short Answer* Using the diagram, 1) Label the processes occurring in parts 1-4. 2) Label part A, and determine the 3 other necessary parts which all vertebrates have during at least one part of their life.ANSWER: 1) Fertilization, cleavage, gastrulation, neuralation; 2) notochord, hollow dorsal nerve cord, pharyngeal slits, post anal tail.

**TOSS UP**

1. PHYSICS *Short Answer* Which law of thermodynamics states that “It is impossible for any process to have as its sole result the transfer of heat from a cooler to a hotter body”?ANSWER: SECOND LAW

**BONUS**

1. PHYSICS *Short Answer* Using the diagram, 1) What type of engine does this describe?, 2) Label strokes A-E of the engine.ANSWER: 1) internal combustion, 2)Intake, Compression, Ignition, power, exhaust

**TOSS UP**

1. CHEMISTRY *Short Answer* What rule is can be simply stated as “In elimination reactions, the most substituted alkene usually predominates”?  
     
   ANSWER: ZAITSEV’S RULE

**BONUS**

1. CHEMISTRY *Short Answer* Answer the 2 questions about the compounds shown.ANSWER: (a) 1 -chlorobutane; (b) 1 -iodobutane;

**TOSS UP**

1. EARTH AND SPACE SCIENCE *Short Answer* What is the process of continental growth in which buoyant fragments of crust are attached to continents during plate motions?ANSWER: accretion

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Using the pictures, 1) Classify lava types A and B, 2) What is C, a form of lava which forms when basaltic magma cools underwater?ANSWER: A- aa, b- pahoehoe, c- pillow lava

**TOSS UP**

1. MATH *Short Answer* If x+y= -10, and x-y= 2, then what are the values of x and y if x<y?  
     
   ANSWER: x= -4 , y= -6

**BONUS**

1. MATH *Short Answer* What is the maximum number of circles (as shown) that fit in the square?ANSWER: 68

**TOSS UP**

1. ENERGY *Multiple Choice* What is the name of the machine that geothermal power plants use to clean the air of hydrogen sulfide and other gases?ANSWER: scrubber system

**BONUS**

1. ENERGY *Short Answer* What element has recently been discovered to work as a possible room temperature superconductor, working at 30 K, much higher than previous superconductors which would only work at temperatures much closer to absolute zero?ANSWER: IRON

**TOSS UP**

1. BIOLOGY *Short Answer* Denote by name or number all of the following 4 statements which is or are true of arthropods.1. Arthropods are segmented protostomes with jointed appendages.  
   2. Compound eyes are composed of many independent visual units, often thousands of them, called ommatidia.  
   3. Crustaceans use chelicerae to feed.   
   4. Insects of the order Odonata are among the most primitive of insects.   
     
   ANSWER: 1, 2 and 4

**BONUS**

1. BIOLOGY *Short Answer* Using the phylogenetic tree, classify the 4 arthropods given to their distinct classes. ANSWER: A- Arachnid, b- modern crustaceans, c-insects, d-millipedes

**TOSS UP**

1. PHYSICS *Short Answer* What is the name of the phenomenon during which the inelastic scattering of photons in matter results in a decrease in energy, and increase in wavelength, of an X-ray or gamma ray photon?ANSWER: compton effect/scattering

**BONUS**

1. PHYSICS *Short Answer* Using the diagram, 1) What law does this graph depict?, 2) What is the name given to the event which would occur along the black curve?ANSWER: 1-planck’s law, 2- ultriviolet catastrophe

**TOSS UP**

1. CHEMISTRY *Short Answer* What is the name of the aromatic nitrogen analogue of benzene?  
     
   ANSWER: PYRIDINE

**BONUS**

1. CHEMISTRY *Short Answer* Using the diagram, 1) What is the name of the band at 254 nanometers?, 2)Would you classify the molar absorptivities of the three to six small sharp peaks in the band as either strong or weak?ANSWER: 1-Benzenoid band, 2- weak

**TOSS UP**

1. EARTH AND SPACE SCIENCE *Short Answer* If pressure tendencies are plotted on our map, we can draw lines connecting points of equal pressure change. What are the names of these lines?ANSWER: ISALLOBARS

**BONUS**

1. EARTH AND SPACE SCIENCE *Short Answer* Using the diagram, label cells A-C, and also the area labeled D.ANSWER: a-hadley, b-ferrel, c-polar, d- doldrums