Science Bowl Qs due 2/6/2013

Physics

1. Toss-up  
   A figure skater who, while spinning in place, pulls her arms in to increase her rotational speed, is most closely exhibiting which of the following:
   1. conservation of angular momentum
   2. centrifugal force
   3. satellite motion
   4. centripetal acceleration
2. Bonus  
   In the 19th century, this Scottish scientist showed that all magnetic and all electric phenomena could be described by four equations that often bear his name. What is his name?

Answer: James Clerk Maxwell

1. Toss-up  
   The atom’s nucleus is held together by which of the following:
   1. strong interactions of the quark and gluon constituents of the atom’s nucleus
   2. strong interactions of the quark and lepton constituents of the atom’s nucleus
   3. weak interactions of the quark and lepton constituents of the atom’s nucleus
   4. strong interactions of the lepton and gluon constituents of the atom’s nucleus
2. Bonus

How many more times louder is 70 decibels than 10 decibels?

Answer: One Million

1. Toss-up  
   The Department of Energy’s B-Factory at the Stanford Linear Accelerator Lab is designed to collide electron and positron beams of unequal energies and produce millions of these particles, which are commonly called:
   1. B mesons
   2. B leptons
   3. B muons
   4. B neutrons
2. Bonus  
   What cycle most directly describes the working cycle of a heat engine operating as an ideal engine of maximum thermal efficiency?

Answer: Carnot Cycle

1. Toss-up  
   While at Berkeley, Melvin Calvin used this radioisotope to decipher many of the complex processes of photosynthesis:

Answer: Carbon 14

1. Bonus

Laser is an acronym for what?

Answer: light amplification by stimulated emission of radiation

Biology

1. Toss-up  
   Barbara McClintock is famous for discovering which of the following:
   1. the structure of DNA with Watson and Crick
   2. introns
   3. jumping genes
   4. exons
2. Bonus

The gustatory system has to do mostly with what human sense?

Answer: Taste

1. Toss-up  
   Proteins made up of two or more polypeptide chains are said to possess:
   1. a resistance to denaturation
   2. a quaternary structure
   3. a tertiary structure
   4. an enzymatic refractory period
2. Bonus

Plants gather wavelengths of light NOT absorbed by the main chlorophyll a and b through:

1. photosystem I
2. photosystem II
3. accessory pigments
4. carotenoids
5. Toss-up  
   How many different cranial nerves are there in the human body?

Answer: 12

1. Bonus

Commensalism is when:

1. both species benefit
2. neither species affects the other
3. one species benefits while the other is unaffected
4. both species are harmed
5. Toss-up

George Gamow made a contribution to biology by correctly interpreting the:

1. X-ray crystallographic structure of DNA
2. existence of reverse transcriptase
3. minimum number of letters in the code for amino acids
4. existence of oncogenes
5. Bonus

In mammals, the embryos have a physiological connection to the mothers body during development. This is an example of:

1. viviparity
2. ovoviviparity
3. oviparity
4. parity

Chemistry

1. Toss-up

Which of the following metals react violently with water to produce hydrogen gas:

1. sodium
2. zinc
3. platinum
4. silver
5. Bonus

The Tyndall Effect can be demonstrated when light is passed through which of the following:

1. a colloidal suspension
2. supercritical water
3. aqueous solutions
4. mixtures of gasses
5. Toss-up

The reaction of an acid with an alcohol to form an ester and water is called:

Answer: Esterification

1. Bonus

What are the two most common end-products of alcoholic fermentation?

Answer: Ethanol And Carbon Dioxide

1. Toss-up

Ten grams of dietary fat contains how many food calories?

1. 40 calories
2. 90 calories
3. 60 calories
4. 120 calories
5. Bonus

If CO2 is bubbled through distilled water at room temperature, which of the following will most likely occur:

1. the pH of the water increases
2. the pH of the water decreases
3. the pH of the water is unchanged
4. carbon will precipitate out of solution
5. Toss-up

Element A is a nonmetal with an electronegativity value of 3.0 and element B is a nonmetal with an electronegativity value of 2.5. What kind of bonding will occur between these two elements:

1. nonpolar covalent
2. polar covalent
3. ionic
4. fission
5. Bonus

What colorless liquid was originally produced from the distillation of wood and is often referred to as wood alcohol:

Answer: Methanol

Astronomy

* + 1. Toss-up

**Which of the following constellations cannot be seen in the summer sky of the northern hemisphere?**

1. Libra
2. Orion
3. Ursa Major
4. Cygnus
   * 1. Bonus

**According to Kepler’s Third Law, plotting the squares of the periods of the planet against the cubes of the semi- major axes of their orbits will result in what sort of graph:**

1. a parabolic line
2. a straight line
3. an irregular jagged line
4. a hyperbolic line
   * 1. Toss-up

**What percent of stars in the sky that appear to be single stars are actually binary stars:**

1. about 90%
2. about 50%
3. about 20 %
4. about .5%
   * 1. Bonus

**The 29 ½ days it takes the Moon to complete an orbit around the Earth is called a:**

1. synodic month
2. sidereal month
3. orbital month
4. solar month
   * 1. Toss- up

**The hydrogen envelope that surrounds the comet’s nucleus derives its hydrogen most directly from:**

1. gases escaping from the melting comet’s ice
2. hydrogen captured from interstellar space
3. breakdown of water by ultraviolet light
4. hydrogen in the solar winds
   * 1. Bonus

**What moon of Neptune orbits in a retrograde direction?**

Answer: Triton

* + 1. Toss-up

**Based on "best altitude conditions", during what month in the northern hemisphere is it the best time to observe the full moon?**

Answer: December

1. Bonus

**When a superior planet is at quadrature in reference to the Earth, what is its elongation in degrees?**

Answer: 90o

Earth Science

* + 1. Toss-up-

Which of these pairs of minerals are always found in granites?

w) muscovite and calcite

x) quartz and orthoclase

y) hornblende and talc

z) augite and magnetite

* + 1. Bonus-

What is another name for the semi-precious stone heliotrope?

ANSWER: BLOODSTONE

* + 1. Toss-up-

Which of the following materials is the hardest?

w) calcite

x) silicon carbide

y) topaz

z) quartz

* + 1. Bonus-

Name the extremely fine-grained, wind-blown clay particularly characteristic of the arid and semi-arid southwestern United States, Mexico and South America. This material was used by the southwestern Indians and Mexicans for constructing huts and buildings from prehistoric times.

ANSWER: ADOBE

* + 1. Toss-up-

The black sand of the Hawaiian Islands is composed of which of the following?

w) dark limestone

x) quartz

y) gypsum

z) basalt

* + 1. Bonus-

Name the clay mineral produced by the alteration of potash feldspar which is also used in ceramics.

ANSWER: KAOLINITE

* + 1. Toss-up-

Which of the following areas is closest to the total surface area of the earth in square kilometers?

w) 500 million

x) 500 billion

y) 500 thousand

z) 5 billion

* + 1. Bonus-

What is the name of the white clay which has been used for thousands of years in the fabrication of ceramic bodies? Is it:

w) Talc

x) Kaolin

y) Feldspar

z) Quartz

Mathematics –

* + - 1. Toss-up-

What is the surface area of a sphere of radius "r"?

ANSWER: 4 p R2 or 12.566 x R2

* + - 1. Bonus-

Using an x-y coordinate axis, a parabola is given by the equation y =

x2. Give the x-y coordinates of the focal point for this parabola.

ANSWER: (0,1/4)

* + - 1. Toss-up-

For a right triangle, the sin(A) is 3/5. To what value is the tan(A)

(read: tangent of A) equal?

ANSWER: ¾

* + - 1. Bonus-

The sin(2A) (read: the sine of angle 2A) is equal to which of the following relationships?

w) sin(A) - cos(A)

x) 3sin(A) / cos(A)

y) 2 sin(A) cos(A)

z) tan(A) - 1

* + - 1. Toss-up-

Find x if log5x = -2 ANSWER: 1/25 or .04

* + - 1. Bonus-

If an electronic circuit operates in 100 nanoseconds, how many operations can it perform in one second?

ANSWER: 10 MILLION or 107

* + - 1. Toss-up-

What is i52232? ANSWER: 1

* + - 1. Bonus-

Is ii a real number? ANSWER : Yes