Andrew Chen

Assorted Round 10-2

# Tossup

PHYSICS – MULTIPLE CHOICE

According to Hooke’s Law, as the stress on an object increases:

w. The strain decreases proportionally.

x. The strain increases proportionally.

y. The strain does not change.

z. Hooke’s Law does not relate stress to strain.

Answer: x. The strain increases proportionally.

# Bonus

PHYSICS – SHORT ANSWER

Using Hooke’s Law, calculate the spring constant for a spring that could accelerate a 50kg block horizontally at 10m/s, when displaced 5 meters.

Answer: 200N/m

# Tossup

CHEMISTRY – MULTIPLE CHOICE

Which of the following molecules has a bent molecular geometry?

w. ammonia

x. carbon dioxide

y. carbon monoxide

z. water

Answer: z. water

# Bonus

CHEMISTRY – SHORT ANSWER

According to the molecular geometry of water, how many sigma bonds, pi bonds, and lone pairs, respectively, are in one molecule?

Answer: 2 sigma, 0 pi, 2 lone pairs

# Tossup

BIOLOGY – SHORT ANSWER

During protein formation in a cell, if a protein needed to packed and processed for secretion, to which organelle would it go after exiting the Endoplasmic Reticulum in a transport vescicle?

Answer: Golgi Apparatus (accept: Bodies)

**Bonus**

BIOLOGY – SHORT ANSWER

What currently accepted model of the function of the Golgi Apparatus proposes that each sac of the Golgi dynamically advances as it processes the proteins and lipids within?

Answer: cisternal maturation model

**Tossup**

ASTRONOMY – SHORT ANSWER

What type of stellar remnant remains after a low-to-medium mass star consumes or loses its outer layers, and leaves a degenerate glowing core behind?

Answer: white dwarf

**Bonus**

ASTRONOMY – MULTIPLE CHOICE

Out of the following spectral classes, which one would the most white dwarves be found in?

w. O

x. A

y. K

z. T

Answer: x. A

**Tossup**

EARTH SCIENCE – SHORT ANSWER

What branch of geology specifically studies rocks and the conditions that they form, encompassing both macroscopic and microscopic details?

Answer: petrology

**Bonus**

EARTH SCIENCE – MULTIPLE CHOICE

What branch of petrology would focus on mostly rocks such as phylite, gneiss, and schist?

w. igneous

x. sedimentary

y. metamorphic

z. experimental

Answer: y. metamorphic

**Tossup**

GENERAL SCIENCE – MULTIPLE CHOICE

What general purpose computer programming language was developed in 1972 for use in the UNIX operating system, but now is popularly used for the development of application software?

w. FORTRAN

x. HTML

y. Java

z. C

Answer: z. C

**Bonus**

GENERAL SCIENCE – SHORT ANSWER

In the programming language C, what useful reference indicator records the physical address of an object stored in memory, allowing one to navigate memory locations easily?

Answer: pointer

**Tossup**

MATH – SHORT ANSWER

If the likelihood of either two events happening is not changed by the occurrence of the other, what term in probability can be used to describe this situation?

Answer: mutually exclusive

**Bonus**

MATH – SHORT ANSWER

If P(A) = 0.5, P(B) = 0.2, and P(B|\\*read pipe\*\A) = 0.3, what is the probability that B will occur given that A occurs?

Answer: 0.3

**Tossup**

PHYSICS – SHORT ANSWER

In kinematics, what is the term for the rate of change of angular momentum in respect to time?

Answer: torque

**Bonus**

PHYSICS – MULTIPLE CHOICE

In what SI units is torque most often measured in?

w. Joules

x. Newton-meters

y. Newton-radians

z. Joules/radian

Answer: x. Newton-meters

**Tossup**

CHEMISTRY – MULTIPLE CHOICE

When balancing a chemical equation, which of the following quantities does NOT need to be included?

w. The temperature of the system

x. The phase state of each reactant

y. The stochiometric coefficients for each product

z. Charge indicators on any molecule

Answer: w. The temperature of the system

**Bonus**

CHEMISTRY – SHORT ANSWER

Complete and balance the following equation: NaOH(aq) + Fe(NO3)3(aq) ->:

Answer: 3NaOH(aq) + Fe(NO3)3(aq) -> 3NaNO3(aq) + Fe(OH)3(s)

**Tossup**

BIOLOGY – SHORT ANSWER

The human skeleton is divided into what two locational divisions, comprising of 80 and 126 bones?

Answer: axial and appendicular

**Bonus**

BIOLOGY – MULTIPLE CHOICE

Which of the following bones is part of the axial skeleton?

w. clavicle  
 x. pelvis

y. radius

z. sternum

Answer: z. sternum

**Tossup**

ASTRONOMY – MULTIPLE CHOICE

In a Hertzsprung-Russell Diagram, what is plotted on the vertical axis and how is it plotted?

w. logarithmic luminosity

x. linear luminosity

y. logarithmic temperature

z. linear temperature

Answer: w. logarithmic luminosity

**Bonus**

ASTRONOMY – SHORT ANSWER

Even though the sun appears to be a dim star located in the center of the H-R diagram, it is actually brighter than about what percent of the stars in our galaxy? (accept:+/-5%)

Answer: 85%

**Tossup**

EARTH SCIENCE – SHORT ANSWER

What scale used in meteorology measures wind speeds via observed sea conditions?

Answer: Beaufort scale

**Bonus**

EARTH SCIENCE – SHORT ANSWER

What term on the Beaufort scale, which corresponds to number 12, is described as huge waves, very widespread damage, and winds over 73mph?

Answer: hurricane-force (accept: hurricane)

**Tossup**

GENERAL SCIENCE – SHORT ANSWER

What optical phenomenon, also known as a nimbus or a Gloriole, is created when ice crystals in high-level clouds disperses light from a bright object, such as the Sun, into a circle around it?

Answer: halo

**Bonus**

GENERAL SCIENCE – MULTIPLE CHOICE

The vast majority of halos tend to subtend how large of an arc?

w. 10 degrees

x. 22 degrees

y. 38 degrees

z. 90 degrees

Answer: x. 22 degrees

**Tossup**

MATH – SHORT ANSWER

A parellelogram has side lengths all equal to 4, and internal angles of 60 degrees and 120 degrees. What specific shape could this be?

Answer: rhombus

**Bonus**

MATH – SHORT ANSWER

What is the area of a rhombus with side lengths 4 and internal angles 60 degrees and 120 degrees? Express in simplest radical form.

Answer: 8sqrt3

**Tossup**

PHYSICS – MULTIPLE CHOICE

What law states that the period of a gravitationally revolving body is proportional to the radius of orbit to the 3/2 power?

w. Kepler’s First Law

x. Kepler’s Second Law

y. Kepler’s Third Law

z. Newton’s Law of Gravitation

Answer: y. Kepler’s Third Law

**Bonus**

PHYSICS – SHORT ANSWER

According to Kepler’s Third Law, a planet orbiting the sun at a distance of 4AU would have a period of revolution of approximately how many Earth years?

Answer: 8 years

**Tossup**

CHEMISTRY – SHORT ANSWER

What concept in chemistry refers to the mixing of atomic orbitals to form new bonding orbitals, constituting an important part of valence bond theory?

Answer: orbital hybridization

**Bonus**

CHEMISTRY – MULTIPLE CHOICE

In a molecule such as carbon dioxide, how is the carbon atom hybridized?

w. sp3

x. sp2

y. sp

z. carbon is not hybridized

Answer: y. sp

**Tossup**

BIOLOGY – MULTIPLE CHOICE

In what part of cellular respiration is pyruvate converted to carbon dioxide, generating some NADH and energy in the process?

w. Calvin cycle

x. Krebs cycle

y. glycolysis

z. oxidative phosphorylation

Answer: x. Krebs cycle

**Bonus**

BIOLOGY – SHORT ANSWER

Before entering the Krebs cycle, pyruvate must first be dehydrated into what molecule?

Answer: acetyl CoA

**Tossup**

ASTRONOMY – SHORT ANSWER

What objects, found in supernova remnants like the Crab Nebula, are rapidly rotating neutron stars that emit regular intervals of radio waves?

Answer: pulsars

**Bonus**

ASTRONOMY – SHORT ANSWER

In a special type of neutron star, the magnetar, what powers the emission of high-energy radiation from its poles?

Answer: (the decay of) its magnetic field

**Tossup**

EARTH SCIENCE – MULTIPLE CHOICE

What geologic time era, lasting from 65 million years ago to present day, is the most recent?

w. Precambrian

x. Paleozoic

y. Mesozoic

z. Cenozoic

Answer: z. Cenozoic

**Bonus**

EARTH SCIENCE – SHORT ANSWER

How many named epochs have existed in the Cenozoic era?

Answer: 7

**Tossup**

GENERAL SCIENCE – MULTIPLE CHOICE

Which Greek astronomer developed an accurate method of predicting eclipses, discovered precession, invented the astrolabe, and compiled the first star catalog of the Western world?

w. Aristotle

x. Hipparchus

y. Ptolemy

z. Erastosthenes

Answer: x. Hipparchus

**Bonus**

GENERAL SCIENCE – SHORT ANSWER

Today, our magnitude scale still closely resembles Hipparchus’s stellar brightness scale. How many magnitude classes did he sort his stars into?

Answer: 6

**Tossup**

MATH – MULTIPLE CHOICE

How many unique ways are there to arrange 6 people in a line?

w. 6

x. 120

y. 720

z. 46656

Answer: y. 720

**Bonus**

MATH – SHORT ANSWER

Similarly, how many unique ways are there to arrange 6 beads on a bracelet?

Answer: 60

**Tossup**

PHYSICS – SHORT ANSWER

If a 10-Volt battery is hooked up in parallel to a 2 ohm, a 3 ohm, and a 5 ohm resistors, what is the voltage drop across the 3 ohm resistor?

Answer: 10 volts

**Bonus**

PHYSICS – MULTIPLE CHOICE

What is the equivalent resistance of the above circuit, which was 2 ohm, 3 ohm, and 5 ohm resistors in parallel?

w. 10 ohms

x. 1/10 ohms

y. 31/30 ohms

z. 30/31 ohms

Answer: z. 30/31 ohms

**Tossup**

CHEMISTRY – MULTIPLE CHOICE

What gas law, derived from Charles’ Law, Boyle’s Law, and Gay-Lussac’s Law, relates the pressure, volume, and temperature of an ideal gas?

w. Ideal gas law

x. Amagat’s gas law

y. Combined gas law

z. Dalton’s gas law

Answer: y. Combined gas law

**Bonus**

CHEMISTRY – SHORT ANSWER

Using the combined gas law, calculate the new volume of an ideal gas if its previous volume was 20L, and then its absolute temperature was tripled and its pressure was quadrupled.

Answer: 15L

**Tossup**

BIOLOGY – MULTIPLE CHOICE

In what phase in meiosis does crossing over, or synapsis, of homologous chromosomes occur?

w. prophase I

x. metaphase I

y. telophase I

z. prophase II

Answer: w. prophase I

**Bonus**

BIOLOGY – SHORT ANSWER

What is the name of the structures that form in prophase I that consist of the joined homologous chromosomes, thus containing 4 chromatids?

Answer: tetrads (accept: bivalents)

**Tossup**

ASTRONOMY – SHORT ANSWER

If we count the dwarf planets of our solar system as planets, what is the current fifth planet from the sun?

Answer: Ceres

**Bonus**

ASTRONOMY – MULTIPLE CHOICE

As of December 29, 2009, how many objects in our solar system have been classified as dwarf planets?

w. 3

x. 5

y. 7

z. 11

Answer: x. 5