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Science Bowl Questions

General Science Questions: 25 Toss-ups and Bonuses

1. Toss-up: GENSCI: Multiple Choice: Which of the following would most directly require the use of Ohm’s Law?

W. Finding the Potential Energy of a Battery, given its Voltage and Charge

X. Finding the Frictional Force between a block of wood and the ground

Y. Finding the Voltage of a battery by measuring the current across a resistor of known resistance

Z. Finding the temperature of a body, given its specific heat and internal energy

ANSWER: Y

Bonus: GENSCI: Short Answer: Apply Ohm’s Law to a circuit containing a resistor of 2 Ohms and a voltage of 10 Ohms to find the current.

ANSWER: 5 Amps

1. Toss-up: GENSCI: Multiple Choice: Which of the following Industrial Processes is used to create ammonia today?

W. Haber Process

X. Ostwald Process

Y. Contact Process

Z. Frasch Process

ANSWER: W

Bonus: GENSCI: Short Answer: Name the industrial chemical, which is commonly called the “king of chemicals” and is produced by the Contact Process.

ANSWER: Sulfuric Acid

1. Toss-up: GENSCI: Short Answer: What is the name of the famous group of islands on which Charles Darwin found the observations needed to crystallize his theory on natural selection?

ANSWER: Galapagos Islands

Bonus: GENSCI: Short Answer: Name the famous book, which went on sale on the 22 of November, 1859, in which Darwin set out one long argument of detailed observations, inferences and consideration of anticipated objections to his theory of natural selection?

ANSWER: *On the Origin of Species*

1. Toss-up: GENSCI: Multiple Choice: This famous scientist discovered the proton and founded the idea of a small, dense, positively charged nucleus, in his famed gold-foil experiment. Is he:

W. J.J. Thomson

X. Neils Bohr

Y. Albert Einstein

Z. Ernest Rutherford

ANSWER: Z (shame to Rio)

Bonus: GENSCI: Multiple Choice: Ernest Rutherford, in 1932, predicted the existence of a neutrally charged particle, also in the nucleus, which mediated proton-proton repulsion, which he called the neutron. What scientist, in 1935, won the Nobel Prize in Physics for his discovery of the neutron?

ANSWER: James Chadwick

1. Toss-up: GENSCI: Short Answer: Name the physicist that was awarded the Nobel Prize in recognition of her services to the advancement of chemistry by the discovery of the elements radium and polonium.

ANSWER: Marie Curie

Bonus: GENSCI: Multiple Choice: In 1945, this scientist won the Nobel Prize in Physics, on his work on creating the Exclusion Principle, which stated that no two electrons could occupy the same quantum numbers.

W. Albert Einstein

X. Wolfgang Pauli

Y. Erwin Schrödinger

Z. Max Born

ANSWER: X

1. Toss-up: GENSCI: Multiple Choice: A solution of pH 13 is how many times more basic than a solution with a pH of 9?

W. 4

X. 40

Y. 10,000

Z. 40,000

ANSWER: Y

Bonus: GENSCI: Short Answer: Given that the molar mass of carbon is 12, that of oxygen is 16, and that of hydrogen is 1, give the mass in grams of 1 mole of formaldehyde, or CH2O.

Answer: 30

1. Toss-up: GENSCI: Multiple Choice: Which of the following units is NOT an SI base unit?

W. mole

X. gram

Y. second

Z. candela

ANSWER: X

Bonus: GENSCI: Short Answer: Give the unit for energy, the Joule, in SI base units.

ANSWER: m2 kg s-2 (order not important)

1. Toss-up: GENSCI: Multiple Choice: When you are looking at the octane rating, ranging from 88 to 97 in the US, of a certain brand of gasoline at the gas pump, what you are really measuring is:

W. Gasoline’s electrical conductivity

X. Gasoline’s ability to release more power in its combustion

Y. Gasoline’s resistance to knocking

Z. Gasoline’s flammability

ANSWER: Y

Bonus: GENSCI: Multiple Choice: One would want gasoline with a higher octane number because:

W. Of its resistance to creating explosions larger than the cylinder can handle

X. Of its increased power to compress the piston

Y. Of its tendency to release less carbon dioxide

Z. Of its decreased flammability, preventing you’re engine from catching on fire

ANSWER: W

1. Toss-up: GENSCI: Multiple Choice: Recently, a group of three American biologists won the 2009 Nobel Prize for Medicine:

W. for their discovery of how chromosomes are protected by telomeres and the enzyme telomerase

X. for their discovery of HIV

Y. for their discovery of human papilloma viruses causing cervical cancer

Z. for their studies of the structure and function of the ribosome

ANSWER: W

Bonus: GENSCI: Short Answer: What protein, which exhibits fluorescence when exposed to blue light, was the discovery for which Tsien, Shimomura, and Chalfie, two Americans and one Japanese scientist, won the Nobel Prize in Chemistry for 2008?

ANSWER: GFP (Green Fluorescent Protein)

1. Toss-up: GENSCI: Multiple Choice: Which of the following devices can convert electric energy to gravitational potential energy?

W. motor

X. elevator

Y. heater

Z. laser

ANSWER: X

Bonus: GENSCI: Multiple Choice: A nuclear power plant uses radioactive uranium to convert water to steam, which drives a turbine, turning a generator to produce electricity. Which of the following represents two of the three forms of energy represented in this process, assuming 100% efficiency?

W. chemical and mechanical energy

X. chemical and heat energy

Y. nuclear and heat energy

Z. nuclear and light energy

ANSWER: Y

1. Toss-up: GENSCI: Multiple Choice: Which of the following numbers represents the correct amount of significant figures in the number 0.0430?

W. 1

X. 2

Y. 3

Z. 4

ANSWER: 3

Bonus: GENSCI: Short Answer: Give the answer, paying close attention to significant digits and units, of the area of a rectangle with a longer side of length 5.00 m and a shorter side of length 2.1 m in m2.

ANSWER: 11 m2

1. Toss-up: GENSCI: Multiple Choice: Which of the following chemical formulas represents the common household chemical “Milk of Magnesia”?

W. MgO

X. C6H12O6

Y. Mg(OH)2

Z. MgCH2

ANSWER: Y

Bonus: GENSCI: Short Answer: Name the chemical name of the common compound containing phosphorous, which is an additive to Coca-Cola and other sodas, and serves as a common buffer system in the body.

ANSWER: Phosphoric Acid

1. Toss-up: GENSCI: Short Answer: This biologically significant molecule is considered the messenger of information from the nucleus of the cell to the ribosome for translation into protein. What is its name?

ANSWER: RNA (Accept: m-RNA)

Bonus: GENSCI: Multiple Choice: What multifunctional nucleotide is considered the energy carrier molecule of the cell, initiates metabolic reactions and is produced by the breakdown of energy storage molecules?

W. ATP

X. DNA

Y. Triglyceride

Z. Glucose

ANSWER: W

1. Toss-up: GENSCI: Multiple Choice: The organic compound diethyl ether had uses in the late 19th century as which of the following:

W. antifreeze

X. anesthetic

Y. solvent

Z. antiseptic

ANSWER: X

Bonus: GENSCI: Short Answer: Diethyl ether is an organic compound of the ether group. It contains two ethyl groups, or C2H5 groups, bridged by what common heteroatom?

ANSWER: oxygen

1. Toss-up: GENSCI: Multiple Choice: If one plans to titrate base with a standard solution of acid of known concentration, which instrument would they keep the acid to add, drop by drop, to the base solution?

W. flask

X. beaker

Y. buret

Z. graduated cylinder

ANSWER: Y

Bonus: GENSCI: Multiple Choice: Which of the following flasks would be used for preparing liquids with volumes of high precision? It is a flask with an approximately pear-shaped body and a long neck with a circumferential fill line.

W. Erlenmeyer Flask

X. Florence Flask

Y. Büchner Flask

Z. Volumetric Flask

ANSWER: Z

1. Toss-up: GENSCI: Multiple Choice: As of 2008, about how much of the United States’ total power consumption came from nuclear energy?

W. 10%

X. 20%

Y. 30%

Z. 40%

ANSWER: X

Bonus: GENSCI: Which of the following scientists won the Nobel Prize in 1944 for the discovery of fission of heavy nuclei?

W. Einstein

X. Oppenheimer

Y. Hahn

Z. Fermi

ANSWER: Y

1. Toss-up: GENSCI: Multiple Choice: Approximately how many times more energy is released in the fission of one U-235 nucleus than in the combustion of one octane molecule?

W. 100 times

X. 1000 times

Y. 100,000 times

Z. 10,000,000 times

ANSWER: Y

Bonus: GENSCI: Multiple Choice: In nuclear physics, Lawson’s criterion concern themselves with which of the following?

W. Necessary amounts of U-235 to develop a critical mass of Uranium ready to undergo fission

X. Necessary neutron bombardation to start a nuclear fission reaction

Y. Necessary plasma ion density and confinement time in a nuclear fusion reaction to generate more output power than input power

Z. The range of subatomic particles with variation in their masses

ANSWER: Y

1. Toss-up: GENSCI: Multiple Choice: About how many people are expected to die in the United States of Pancreatic Cancer in 2008?

W. 1,000

X. 35,000

Y. 100,000

Z. 1,000,000

ANSWER: X

Bonus: GENSCI: Multiple Choice: What is the expected mortality rate of Pancreatic Cancer in the United States in 2008?

W. 50%

X. 80%

Y. 95%

Z. 99.9%

ANSWER: Y

1. Toss-up: GENSCI: Short Answer: Given the following clues, name the disease. This disease is transmitted by ticks in the genus Ixodes and caused by a pathogenic bacterium of the Genus Borrelia. It causes a bulls-eye type rash and can causes a variety of symptoms, including problems in the areas of the brain, eyes, nerves, joints, and heart.

ANSWER: Lyme Disease

Bonus: GENSCI: Multiple Choice: Which of the following areas of the US would one suspect to have a higher concentration of Lyme Disease infections, due to a higher number of ticks?

W. Eastern coast

X. Midwest

Y. Western Coast

Z. Alaska

ANSWER: W

1. Toss-up: GENSCI: Multiple Choice: In what year 1995, this minute, almost massless particle was discovered, its identity first affirmed by Fermi. What is this particle?

W. Photon

X. Graviton

Y. Neutron

Z. Neutrino

ANSWER: Z

Bonus: GENSCI: Multiple Choice: The BCS-theory, theorized in 1976, set the basis for what physical phenomenon observed?

W. The Second Law of Thermodynamics

X. Interference Pattern

Y. Low-Temperature Superconductivity

Z. The Particle Nature of Light

ANSWER: Y

1. Toss-up: GENSCI: Short Answer: Who was the recipient of the very first Nobel Prize for Chemistry back in 1901?

W. Jacobus H. van’t Hoff

Bonus: GENSCI: Multiple Choice: In what year was Heavy Hydrogen, or Deuterium, discovered by Harold C. Urey in the US?

W. 1913

X. 1934

Y. 1944

Z. 1951

ANSWER: X

1. Toss-up: GENSCI: Short Answer: What enzyme is considered the smallest biological molecular motor, and exists at the end of the electron transport chain in Eukaryotes?

ANSWER: ATP-synthase

Bonus: GENSCI: Short Answer: Name one fish that is a sequential hermaphrodite, that is, it has both male and female sexual organs and can change sex naturally in its lifetime.

ANSWER: Clownfish

1. Toss-up: GENSCI: Multiple Choice: Approximately how many people died from Hurricane Katrina in 2005?

W. 100

X. 2000

Y. 5000

Z. 10000

ANSWER: X

Bonus: GENSCI: Short Answer: What hurricane is considered the most deadly in the United States history, killing 6,000 to 8,000 at the turn of the 20th century.

ANSWER: Galveston Hurricane

1. Toss-up: GENSCI: Short Answer: What is the name of the order of mammals that is characterized by animals which lay eggs?

ANSWER: Monotremes

Bonus: GENSCI: Multiple Choice: Other than the duck-billed platypus, what other monotreme is currently a nonextinct species that roams Australia?

W. koala bear

X. kangaroo

Y. great panda

Z. spiny echidna

ANSWER: Z

1. Toss-up: GENSCI: Multiple Choice: Which of the following UN-derived scientific organizations won the Nobel Peace Prize in 2007 for compiling and exposing scientific evidence on climate change and providing scenarios on how to reduce global emissions?

W. US Environmental Protection Agency

X. Intergovernmental Panel on Climate Change

Y. UN Clean Air Policy

Z. UN Environment Program

ANSWER: X

Bonus: GENSCI: Multiple Choice: Why did the US, and then the rest of the world, ban Chlorofluorocarbons (CFC’s) in the 1990’s?

W. Because they contributed to glacial ice melting

X. Because they depleted the ozone layer

Y. Because they accumulated in rivers and oceans, threatening to decimate underwater ecosystems

Z. Because they decimated the avian population of infected areas by causing developmental defects

ANSWER: X