1. BIOLOGY *Short Answer*- What is the name of the phylum of plants whose phylum is derived from the word *Hepaticus*?

ANSWER: LIVERWORT

BIOLOGY *Short Answer*- What is the name of the part of the bryophyte that conducts the material from the foot to the capsule? Anthocerophytes lack these.

ANSWER: SETA

1. CHEMISTRY *Short Answer*- What is the chemical formula of potassium tetrachloroaluminate?

ANSWER: ALCL4K

CHEMISTRY *Short Answer*- What is the longhand name of Al2O2?

ANSWER: DIALUMINIUM DIOXIDE

1. PHYSICS *Short Answer*- What is the name of the device that includes two p-n junctions in a “sandwich” configuration?

ANSWER: BIPOLAR JUNCTION TRANSISTOR

PHYSICS *Short Answer*- List the following three in order of how electrons flow in a bipolar junction transistor?

BASE, EMITTER, COLLECTOR

ANSWER: 2, 1, AND 3

1. EARTH AND SPACE SCIENCE *Short Answer*- What is the name of the layer of the ocean that has an insufficient amount of light for plant photosynthesis?

ANSWER: DISPHOTIC ZONE

EARTH AND SPACE SCIENCE *Short Answer*- Order the following five layers of the ocean from deepest to shallowest.

MESOPELAGIC, BATHYALPELAGIC, HADOPELAGIC, EPIPELAGIC, ABYSSOPELAGIC

ANSWER: HADOPELAGIC, ABYSSOPELAGIC, BATHYALPELAGIC, MESOPELAGIC, EPIPELAGIC (ACCEPT: 3, 5, 2, 1, 4)

1. MATH *Multiple Choice*- There is an area enclosed by the functions f(x) = , y = 0, and x = 4. Which of the following has the largest volume?

W) Rotating the function around the x-axis

X) Rotating the function around the y-axis

Y) Rotating the function around the line x = 4

Z) Rotating the function around the line y = x

ANSWER: X

MATH *Short Answer*- The area enclosed by the functions f(x) = x3 and f(x) = x5 is revolved around the x-axis. What is the volume?

ANSWER: 4π/77

1. BIOLOGY *Multiple Choice*- Methanogens are

W) Obligate aerobes

X) Facultative aerobes

Y) Obligate anaerobes

Z) Facultative anaerobe

ANSWER: Y

BIOLOGY *Short Answer*- What is the name of the type of cell that, instead of having a F plasmid to contribute to a F­- cell, contains the F factor in its chromosome?

ANSWER: HFR CELL

1. CHEMISTRY *Multiple Choice*- In terms of direction, in which direction does protactinium lie compared to actinium?

W) To the right

X) To the left

Y) Above

Z) Below

ANSWER: W

CHEMISTRY *Short Answer*- What is the name of a substance in which a molecule sits in a cage of other molecules?

ANSWER: CLATHRATES

1. PHYSICS *Short Answer*- What is the name of the theory that first theorized the weak-force mediator particles, including their masses?

ANSWER: ELECTROWEAK THEORY

PHYSICS *Short Answer*- What are the names of the two weak-force mediators?

ANSWER: Z0 AND BOSON

1. EARTH AND SPACE SCIENCE *Multiple Choice*- If you hold your arm out as far as it can go and you clench your fist, then the number of degrees across the sky that the width of your fist takes up is approximately:

W) 1°

X) 5°

Y) 10°

Z) 20°

ANSWER: Y

EARTH AND SPACE SCIENCE *Short Answer*- To the hundrenth place, what is the Dawes limit of DS-3 telescope if its primary mirror diameter is 12?

ANSWER: .38 arcseconds

1. MATH There is a trapezoid formed from a rectangle and two distinct right triangles. If the height of the trapezoid is 12 and the hypotenuse of the two right triangles are 15 and 20, then if the total area of the trapezoid is 210, then what is the length of the shortest side of the trapezoid? Stall a little longer.

ANSWER: 5

MATH *Multiple Choice*- If the side lengths of a kite is 34 and 20, then which of the following is the area of the kite? The length of the longer diagonal is 42.

W) 644

X) 672

Y) 696

Z) 718

ANSWER: X

1. BIOLOGY *Short Answer*- What is the name of the type of organism that is class Cestoda? They use their scolex to attach to the intestinal lining of its host and has sacs of sex organs called proglottids?

ANSWER: TAPEWORMS

BIOLOGY *Multiple Choice*- Which of the following is false about Rotifera?

W) Rotifers have an alimentary canal, unlike cnidarians

X) The word *rotifer* is derived from the Latin word meaning “rotation”

Y) Rotifers exhibit parthenogenesis, where males survive long enough to fertilize eggs

Z) Rotifers are pseudocoelomates

ANSWER: X

1. CHEMISTRY *Short Answer*- What is the name for the distortion of a trigonal planar molecule towards a tetrahedral molecular geometry?

ANSWER: PYRAMIDALIZATION

CHEMISTRY *Short answer*- What is the name of the molecular geometry that belongs primarily to the molecular point group D­5h?

ANSWER: PENTAGONAL BIPYRAMIDIAL

1. PHYSICS *Short Answer*- If the density of a planet is D, what is the new density, in terms of D, if the distance from the planet to its star is increased 289 times?

ANSWER: D

PHYSICS *Short Answer*- If K is the rotational kinetic energy of a solid object, then if the angular speed of the object is decreased by a factor of and the moment of inertia for that rotation axis is increased by a factor of , then in terms of K, what is the new rotational kinetic energy?

ANSWER: K

1. EARTH AND SPACE SCIENCE *Short Answer*- What is the name of the ridge on which Olympus Mons is located?

ANSWER: THARSIS RIDGE

EARTH AND SPACE SCIENCE *Short Answer*- What is the name of the huge canyon that separates the two hemispheres of Mars?

ANSWER: VALLES MARINERIS

1. MATH *Short Answer*- What is the maximum amount of times that the equation f(x) = x2 + a and f(x) = x3 + b intersect?

ANSWER: 3

MATH *Short Answer*- What are the real solutions to the equation f(x) = x3 + 5x2 – 2x – 24?

ANSWER: -4, -3, 2

1. BIOLOGY *Short Answer*- During animal development, what does CAM stand for?

ANSWER: CELL ADHESION MOLECULES

BIOLOGY *Short Answer*- What is the name of the protein fibers that make up the matrix required for convergent extension?

ANSWER: FIBRONECTIN

1. CHEMISTRY *Short Answer*- Also known as GLPC, this type of chromatography has a liquid stationary phase that coats the particles in the tube. What is it?

ANSWER: GAS-LIQUID PARTITION CHROMATOGRAPHY

CHEMISTRY *Multiple Choice*- In a gas-solid adsorption chromatography, solute vapors are separated by which of the following?

W) Relative solubility in gas phase

X) Relative solubility in liquid phase

Y) Mass of each compound

Z) Relative attraction for solid particles

ANSWER: Z

1. PHYSICS *Short Answer*- What is the name of the measurement such that the algebraic sum of said measurements must equal zero, as stated in Kirchhoff’s junction rule>

ANSWER: CURRENT (ACCEPT: I)

PHYSICS *Short Answer*- Which of the following is the term for a device that senses the difference in current between hot and neutral conductors and trips when this value exceeds a certain number? It is especially located near outlets outdoors or near water pipes.

W) Ground-fault interrupter

X) Cautionary interrupter

Y) Three-wire interrupter

Z) Current-detecting interrupter

ANSWER: W

1. EARTH AND SPACE SCIENCE *Short Answer*- When looked at under a microscope, many stone meteorites exhibit silicate spheres, called what?

ANSWER: CHONDRULES

EARTH AND SPACE SCIENCE *Short Answer*- When iron meteorites are etched with acid, what large crystalline patterns appear?

ANSWER: WIDMANSTATTEN FIGURES

1. MATH *Multiple Choice*- Twin primes are primes that are two integers apart, such as 3 and 5. Which of the following is the largest pair of twin primes?

W) 101 and 103

X) 1073 and 1075

Y) 1227 and 1229

Z) It goes on indefinitely

ANSWER: Z

MATH *Short Answer*- Whose postulate states that every even number greater than two can be expressed as the sum of two primes?

ANSWER: GOLDBACH’S POSTULATE

1. BIOLOGY *Short Answer*- Named for the 53,000-dalton weight of its protein product, this gene is a tumor-suppressor gene. What is this called?

ANSWER: P53 GENE

BIOLOGY *Short Answer*- Order the following five events in the development of a carcinoma from first to last.

ACTIVATION OF RAS ONCOGENE, ADENOMA, LOSS OF TUMOR-SUPPRESSOR GENE APC, LOSS OF TUMOR SUPPRESSOR GENE P53, POLYP

ANSWER: LOSS OF TUMOR SUPPRESSOR GENE APC, POLYP, ACTIVATION OF RAS ONCOGENE, ADENOMA, LOSS OF TUMOR-SUPPRESSOR GENE P53 (ACCEPT: 3, 5, 1, 2, 4)

1. CHEMISTRY *Short Answer*- What is the name of the theory that supposes that each ligand in an ion can be represented by a point negative charge?

ANSWER: CRYSTAL FIELD THEORY

CHEMISTRY *Short Answer*- 1. Which of the following four is another name for the d-orbitals dxy, dyz, dzx? 2. Which of the following four is another name for the d-orbitals dz2 and dx2 – y2?

1: tg-orbitals

2: eg-orbitals

3: t2g-orbitals

4: e2g-orbitals

ANSWER: 1. 3 2. 2

1. PHYSICS *Short Answer*- The period of a simple pendulum is T. In terms of T, if the length of the pendulum is increased by 7 and the pendulum is moved to a planet where the acceleration due to gravity is 9 times that of the original, then what is the new period?

ANSWER: T/3

PHYSICS *Short Answer*- The period of a conical pendulum is T, its length L, and the acceleration due to gravity G. If the conical pendulum is moved to a new planet and the length is multiplied by 4 and the period decreased by 3, then in terms of G, what would have to be the planet’s acceleration due to gravity?

ANSWER: 36G

1. EARTH AND SPACE SCIENCE *Short Answer*- Water stratification occurs when water masses have different properties. What is the name of the cline caused when there is a sharp change in oxygen content?

ANSWER: CHEMOCLINE

EARTH AND SPACE SCIENCE *Short Answer*- What is the term for the type of lakes which are perennially sealed off by ice from most of the annual seasonal variations in temperature?

ANSWER: AMICTIC

1. MATH *Short Answer*- What is the surface area of a triangular solid with a triangle of side lengths 3, 4, and 5, and a length of 10?

ANSWER: 132

MATH *Short Answer*- If the radius of a right circular cylinder is 3, then what does its height have to be, such that its volume and total surface area is equal?

ANSWER: 6