1. Chemistry Short Answer- What is the name of the first noble gas synthesized in 1962 by Neil Bartlett?

**ANSWER:** Xenon

Bonus Chemistry Short Answer- Which of the following is not true about buckyballs?

**W.** Heating a buckyball breaks the covalent bonds, which allows an efficient method of trapping noble gases like helium

**X.** A buckyball has been modified so that it can fit the active site of a HIV virus, which uses many uncharged arms to grasp the enzyme

**Y.** Buckyballs, when bonded with metals, become superconducting

**Z.** The most common forms of buckyballs are C60 and C70

**ANSWER:** X

1. Physics Short Answer- What type of luminescence occurs when a sugar crystal releases light after being struck?

**ANSWER:** Triboluminescence

Bonus Physics Short Answer- What excited gas is released in triboluminescence?

**ANSWER:** Nitrogen

1. Chemistry Short Answer- What is the empirical formula for CH3(CH2)14CO2H, which is another name for palmitic acid?

**ANSWER:** C8H16O

Bonus Chemistry Short Answer- By name of number, denote all of the following four statements that is true about charcoal.

1. Charcoal can be found in lump, extruded, or refined forms
2. Charcoal can adsorb colored impurities from raw sugar solutions
3. Sugar charcoal is one of the purest forms of carbon
4. Activated charcoal can be used in the adsorption of poisons
5. Earth and Space Science Multiple Choice- About how much of the incoming solar radiation does the Earth’s surface absorb?

**W.** 15%

**X.** 25%

**Y.** 70%

**Z.** 50%

**ANSWER:** Z

Bonus Earth and Space Science Short Answer- Order the following three layers of the atmosphere from least temperature to highest temperature, relative to the amount of air.

Tropopause, Stratopause, Mesopause

**ANSWER:** Mesopause, tropopause, stratopause or 3, 1, 2

1. Biology Short Answer- Which of the following four statements is incorrect?
2. The two clades of vertebrates that make up the lobed fin fish are actinopterygii and dipnoi, which stand for coelacanths and lungfishes
3. The four chordate characteristics are a notochord, a ventral hollow nerve cord, pharyngeal slits, and a muscular post-anal tail
4. In tunicates, the four chordate characteristics gradually become less and less obvious except for the pharyngeal clefts
5. Only two lineages of lobe-fins are left in the world, coelacanths and lungfishes

**ANSWER:** 1, 2, and 4

Bonus Biology Short Answer- What is the name of vertebrates with lungs or lung derivatives?

**ANSWER:** Osteichthyans

1. Earth and Space Science Short Answer- Which constellation includes the stars Albali, Ancha, and Situla, and is part of the Zodiac?

**ANSWER:** Aquarius

Bonus Earth and Space Science Short Answer- If a star the same size as the sun had a surface temperature that was three times as hot as the sun’s surface, then how many times more energy would each square meter of that star radiate?

**ANSWER:** 81

1. General Science Multiple Choice- The per capita birth rate of a population is known as its:

**W.** Mortality

**X.** Population density

**Y.** Natality

**Z.** Carrying capacity

**ANSWER:** Y

Bonus General Science Short Answer- If a rope the exact circumference of the earth was wrapped around the earth, how many more feet would need to be added to the rope for there to be a uniform one foot space between the rope and the earth at all locations on the rope?

**ANSWER:** 6 feet

1. Physics Short Answer- What is the name of the sensor that uses a transparent crystal, plastic, or organic liquid that fluoresces when struck by ionizing radiation?

**ANSWER:** Scintillation counter

Bonus Physics Short Answer- By name or number, denote all of the following four that is true about scintillation counters?

1. It was invented by Joan Strothers while she was working on the Manhattan project
2. It was based on the earlier work of Becquerel, who discovered radioactivity
3. The detector shows response at lower energies of photons due to Compton scattering
4. Cesium iodide is used for the detection of gamma waves

**ANSWER:** 2 and 3

1. Math Short Answer- What is the sum of the internal angles of a nonagon?

**ANSWER:** 1260

Bonus Math Short Answer- How many primes are there under 40?

**ANSWER:** 12

1. Biology Short Answer- What is the name of a relationship in which there is a single male and many females?

**ANSWER:** Polygyny

Biology Short Answer- What is the name of the type of associative learning that is also known as trial-and-error learning, where an animal learns to associate one of its own behaviors with a reward or punishment and then tends to repeat or avoid that behavior?

**ANSWER:** Operant conditioning