2023-2024 Regional Finals Study Guide – White Question Set

Instructions: This study guide should be your first resource in preparing for the National Science Bee Regional Finals on the White Question Set. Most of the facts below are found at some point in the 120 questions that compose the White Question Set. Thus we have selected these facts for this study guide to help make your preparation easier and more efficient. Remember that the questions are all short paragraphs on a particular topic, so if a topic is referenced below, then it is a good idea to learn a bit more about it on your own than what is listed here (since additional facts about a topic will also be referenced in the question). It is also helpful to read the introduction of a Wikipedia page on a topic to gain additional historical context about why it is significant. Please also use our past question sets (especially National Science Bee Regional Finals questions from past years) which are found here. Many of the topics that are found in past years' questions will again be found in the questions at this year's Regional Finals, and at the National Championships too. Good luck!

Astronomy

1. The relationship between a star's luminosity versus its effective temperature is depicted on the Hertzsprung-Russell diagram.
2. Saturn is the sixth planet from the Sun and is the only planet less dense than water.
3. Orion is a constellation on the celestial equator. It is named after a hunter in Greek mythology.
4. A black hole is an incredibly dense region in space where the gravity is so strong that light cannot escape.
5. The Oort Cloud is theorized to be the source of many comets. It is an area that lies beyond the Kuiper Belt at the edge of the Solar System.
6. Ceres is a dwarf planet and the largest object in the asteroid belt.
7. Columbia and Challenger were space shuttles that were destroyed, killing the American astronauts onboard.
8. Exoplanets are planets found around stars outside the solar system.
9. The Soviet Union's launch of Sputnik 1 in 1957 marks the first launch of an artificial satellite into space.
10. Jupiter is the largest planet in the Solar System. A notable characteristic of Jupiter's atmosphere is the Great Red Spot, which is an area of high pressure that produces a vast storm.

Biology

1. The main organ of the cardiovascular system is the heart, which is responsible for pumping blood throughout the body.
2. Kelp is a type of seaweed that grows in large colonies called "forests" in the ocean. It is sensitive to ocean temperature rises and is threatened by global warming.
3. Energy from the sun fuels a biological process called photosynthesis, in which plants and other organisms use sunlight, carbon dioxide, and water to generate glucose and oxygen.
4. The longest bone in the body is the femur, or thigh bone.
5. Hemoglobin is a protein in red blood cells that transports oxygen from respiratory organs throughout the body.
6. The diaphragm is a respiratory organ that is situated below the lungs and heart. It acts as a barrier between the chest and the abdomen.
7. A method of killing microbes in food & liquid by heat, Pasteurization is named after chemist Louis Pasteur who discovered it.
8. A group of RNA viruses called coronaviruses can cause diseases such as SARS and COVID-19.
9. *Drosophila melanogaster*, or the fruit fly, shares 75% of their DNA with humans. Scientists like to observe fruit flies in genetic studies since they have short generation times.
10. Adenosine triphosphate, or ATP, is an energy-storing molecule that fuels cellular activity.
11. A chromosome is made from tightly-packed DNA. X and Y chromosomes are involved in the sex determination of humans and other organisms.

Chemistry

1. Halogens are highly reactive nonmetals that occupy group 17 of the periodic table. Fluorine, chlorine, and iodine are examples of halogens.
2. A mole is a unit of measurement of the amount of a substance. One mole equals 6.02214076x10^23 particles.
3. The most abundant element in the Earth's atmosphere is nitrogen at around 78%, followed by oxygen at nearly 21%.
4. Although the five-cent coin is called the nickel, the coin is only made out of 25% nickel, with the rest consisting of copper.
5. Platinum is a precious metal used to make jewelry and catalytic converters. Its atomic symbol is Pt and is superficially similar to silver.
6. Uranium is a metallic chemical element whose atomic number is 92. Its isotope, Uranium-235, is used to fuel nuclear power plants and nuclear weapons.
7. Welding is a technique used to fuse metals together using high heat. It has many applications in industrial construction, such as bridge-building, military technology, and steel-working.

Computer Science

1. A computer worm is a type of malware that is capable of self-replicating and spreading to other computer systems.

Earth Science

1. The inner core is the innermost layer of the Earth. Unlike the outer core, it is a solid ball made primarily of iron.
2. Ice caps are thick masses of ice and snow that covers a vast area of land.
3. La Niña is the periodic cooling phase of waters across the east-central equatorial Pacific. During La Niña events, stronger trade winds push warm water toward Asia.
4. The layers of the Earth's atmosphere from lowest to highest are the troposphere, stratosphere, mesosphere, thermosphere, exosphere, and the magnetosphere.
5. In caves, dripping water deposits calcium salts, which either form into mounds called stalagmites or stalactites.

Math

1. The average of a set of numbers is calculated by dividing the sum of all numbers in the set with the number of values.
2. Prime numbers are whole numbers greater than 1 that cannot be divided by any whole number other than itself and 1. The numbers 2, 3, 5, 7, and 11 are prime numbers.
3. Real numbers are values found on an infinite number line. Real numbers include all rational and irrational numbers.

Physics

1. J. J. Thomson's plum pudding model and Niels Bohr's planetary model were based on early ideas regarding the structure of an atom.
2. The Manhattan Project was an American-led collaborative effort to develop the atomic bomb during World War II.
3. The speed of light traveling in a vacuum is equal to 299,792,458 meters per second.
4. A boson is a subatomic particle that has a particle spin equal to an integer.
5. Inertia is an object's tendency to resist a change in its state of motion.
6. Protons are subatomic particles that contain a positive charge. They are found in the nucleus of an atom, along with the neutrally-charged neutron.

History of Science

1. The Scientific Revolution took place in the 16th and 17th centuries and was led by figures such as Francis Bacon, who employed the Scientific Method as a way to formally study nature, and by physicists such as Isaac Newton and Galileo.
2. Enrico Fermi (1901-1954) was an Italian-American physicist who created the Chicago Pile-1, the world's first nuclear reactor.
3. Archimedes determined pi by approximating the value as being greater than 223/71 and less than 22/7.