National Science Bee

2023-2024 Regional Finals Study Guide – Red Question Set

Instructions: This study guide should be your first resource in preparing for the National Science Bee Regional Finals on the Red Question Set. Most of the facts below are found at some point in the 120 questions that compose the Red 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!

Biology

1. Proteins are macromolecules composed of long, folded chains of amino acids.
2. Malaria is a disease caused by the Plasmodium protozoa, which is transmitted to humans via mosquitos.
3. During the Jurassic period, megafauna, such as the dinosaurs, were the dominant life form on Earth.
4. Mitosis is a process that occurs when a cell replicates into two identical daughter cells.
5. The function of the liver is to filter blood and produce bile.
6. Mutualism is a form of symbiosis where two organisms benefit from one another.
7. A form of ribonucleic acid (RNA), messenger RNA (mRNA), carries out code from DNA that is important for the production of proteins.
8. The Tyrannosaurus Rex is a species of carnivorous dinosaur that lived during the late Cretaceous period.
9. Viruses multiply by infecting host cells with genetic material.
10. The function of the kidney is to filter blood, produce urine, and remove wastes and excess fluid from the body.
11. Animals utilize a defense mechanism called camouflage to disguise their appearances from predators.
12. Eukaryotic cells contain an organelle called the mitochondria, which is referred to as the "powerhouse of the cell."

Astronomy

1. Orion is a constellation on the celestial equator that is named for a hunter in Greek mythology.
2. The Big Bang Theory suggests that our universe expanded 13.8 billion years ago from a single point.

3. In 1977, NASA launched two spacecrafts, Voyager 1 and Voyager 2 to explore Jupiter and Saturn, but the mission has since been extended.

4. The Apollo program was a NASA mission with the goal to explore the Moon.

5. A black hole is an incredibly dense region in space where gravity is so strong, light cannot escape.

6. Planets that have rings surrounding them include Jupiter, Saturn, Uranus, and Neptune.

7. Areas of the Sun where the magnetic field is 2,500 times stronger than Earth are called sunspots.

8. Dark matter is a hypothetical, invisible form of matter believed to account for nearly 85% of matter in the universe.

9. Objects in the constellation Andromeda include the spiral galaxy of the same name.

10. Asteroids are tiny, rocky objects that orbit the Sun.

Chemistry

1. Nickel is a silvery-white metal whose resistance to corrosion is why it is used in stainless steel.

2. The goal of alchemy was to transform base metals, such as copper or lead, into silver or gold.

3. Ammonia, or NH3, is a colorless gas and the simplest amine.

4. Distillation is a process in which liquids are separated by boiling.

5. The first element of the periodic table is hydrogen, which is also the most abundant element in the universe.

6. Temperature is the measure of hotness or coldness of an object or environment, measured in degrees Celsius, Fahrenheit, or Kelvin.

7. Iodine is a halogen and mineral that is added to salt which, when consumed, aids the thyroid gland in producing a hormone important for cell function.

8. A solution is a homogeneous mixture composed of two or more substances. Perfume, rubbing alcohol, and salt water are all examples of solutions.

Computer Science

1. Alan Turing (1912-1954) was an English mathematician and computer scientist, who named a test that can determine whether a computer can imitate human intelligence.

2. The programming language Java was developed by James Gosling in 1990 at Sun Microsystems.

3. Computer memory is a system that serves as storage space for data and instructions on a device.

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. Corals are marine invertebrates that consist of tiny polyps. The largest coral reef system in the world is the Great Barrier Reef, which stretches for 1,429 miles over an area of 133,000 square miles.

3. Monsoons are cycles of regular directional winds that cause dry and rainy seasons in the Earth's tropics.

4. A rainforest is a biome characterized by evergreen trees and high amounts of rainfall. A notable example is the Amazon rainforest, which covers 40% of South America.

5. Human activities have contributed to the formation of acid rain. A common cause of acid rain is the burning of fossil fuels.
6. Subdivisions of periods are referred to as epochs. The current geological epoch is the Holocene.
7. Metamorphic rocks are formed after a rock undergoes a change after being exposed to intense heat or pressure. Slate, soapstone, and marble are all examples of metamorphic rocks.

Math

1. Vectors are mathematical quantities that have both magnitude and direction; examples include velocity and acceleration.
2. Exponentiation is a mathematical operation that sets a number x to the power of another number y, such as x^y.
3. Pi is the ratio of any circle's circumference to its diameter. It is equal to approximately 3.14.

Physics

1. J. Robert Oppenheimer (1904-1967) led the Manhattan Project, which was an American-led collaborative effort to develop the atomic bomb during World War II.
2. An object that is in motion contains a form of energy called kinetic energy.
3. Archimedes (287 BCE-212 BCE) was a Greek mathematician from Syracuse who discovered a principle pertaining to buoyancy.
4. Mass is the measurement of how much matter an object has, such as stars. Mass differs from weight as weight measures the gravitational force on an object.
5. Protons are subatomic particles that contain a positive charge. They are found in the nucleus of an atom, along with the neutrally-charged neutron.
6. Albert Einstein (1879-1955) was a German-American physicist who developed the theory of general relativity and his famous equation: $E=mc^2$.