



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. The [Jurassic](#) period is the second period of the [Mesozoic](#) Era. During the Jurassic, 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, with each cell having the same number of chromosomes as the parent nucleus.
5. The function of the [liver](#) is to filter blood and produce bile.
6. [Symbiosis](#) is an interaction between two organisms that are in close physical association. The four forms of symbiosis are [mutualism](#), [commensalism](#), [parasitism](#), and [competition](#). Mutualism involves two organisms benefiting from one another. Commensalism occurs when one species benefits from the other without harming them in the process. Parasitism occurs when one species harms another organism while also benefiting them. Competition occurs when two species compete for the same resources.
7. [Ribonucleic acid](#) (RNA) carries out instructions for cells to grow and replicate. A form of RNA, [messenger RNA](#), 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 [kidneys](#) remove wastes and extra fluid from the body.
11. Animals utilize a defense mechanism called [camouflage](#), or cryptic coloration, to disguise their appearances from predators.
12. Eukaryotic cells contain an organelle called the [mitochondrion](#), which is referred to as the “powerhouse of the cell.”

Astronomy

1. [Orion](#) is a constellation on the celestial equator. It is named after 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](#) in an effort to explore Jupiter and Saturn, but the mission has been extended. Voyager 2 is still the only spacecraft to have visited the outer planets: Uranus and Neptune.
4. The [Apollo](#) program was a NASA mission with the mission to explore the Moon.
5. A [black hole](#) is an incredibly dense region in space where the gravity is so strong, light cannot escape.
6. Planets that have [rings](#) surrounding them are [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 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 with the atomic number 28. Its 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 is the simplest amine.
4. [Distillation](#) is a process in which liquids are separated via boiling. [Azeotropes](#) are mixtures that cannot be separated by distillation.
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 non-metal 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. His theoretical [Turing machine](#) manipulates symbols on strips of tape to implement [algorithms](#).
2. The programming language, [Java](#), was developed by James Gosling in 1990 at Sun Microsystems. Gosling did a demonstration for Java with a personal digital assistant device called the Star7.
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](#). Common causes of acid rain include the burning of fossils, typically produced by vehicles and factories.
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 .
3. [Pi](#) is a transcendental number, defining a circle, that is the ratio of any circle's circumference to its diameter. It is equal to approximately 3.14.

Physics

1. [Robert J. 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](#). Another form of energy is what is called [potential energy](#), which is the stored energy of an object when it is at rest.
3. [Archimedes](#) (287 BCE-212 BCE) was a Greek mathematician from Syracuse who discovered a principle pertaining to [buoyancy](#). Apocryphally, he realized this while soaking in his bathtub, shouting "Eureka!" ("I have found it!") when the insight occurred to him.
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 discovered his theory of general relativity and his famous equation: $E=mc^2$.
7. [Simple machines](#) refer to the basic devices used to apply a force. The six simple machines are the screw, wheel and axle, lever, inclined plane, pulley, wedge.