

# Science Bee Round 4

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## Regulation Tossups

(1) A Nevada state park is co-named after this extinct vertebrate order whose genus *Stenopterygius* [[steh-NOP-teh-RIH-jee-us]] is often paired with *Tursiops* [[TUR-see-ops]] as examples of convergent evolution. Competition from other pelagic [[peh-LAH-jik]] species such as mosasaurs [[MOH-sah-sors]] may have contributed to this order's end around 93 million years ago. For the point, identify this order of marine reptiles whose scientific name means "fish-lizard."

ANSWER: **Ichthyosaura** [[IK-thee-oh-SORE]] (or **Ichthyosaurs**; or **Ichthyopterygia** [[IK-thee-oh-tuh-ree-gee-uh]])

(2) The word for these solids comes from the Greek for "ice," and some of the "poly" variety of these substances include ceramics and most metals. When viewed under a microscope, these substances form a highly-ordered lattice structure. These substances are homogeneous solids with natural geometric plane faces. For the point, identify these types of substances, liquid forms of which are found in flat screen TVs and computer monitors.

ANSWER: **Crystals** (accept **Crystalline Solids**)

(3) This substance may possibly include photinos and gravitinos. Those particles which may be found in this substance are examples of weakly interacting massive particles, or WIMPs. This substance may be categorized into cold, hot, or warm types based on its velocity. Posited to make up 68% of the mass-energy in the universe, this is, for the point, what yet-unobserved substance that does not absorb or reflect light?

ANSWER: **Dark Matter** (prompt on "WIMP" before mentioned; accept **Cold Dark Matter**; accept **Hot Dark Matter**; accept **Warm Dark Matter**; do not accept or prompt on "Dark Energy")

(4) The catecholamine [[CAT-uh-KOHL-uh-meen]] hypothesis of a certain disease led to the development of this family of medications and their tricyclic class. Iproniazid [[EYE-pro-NYE-uh-zid]] was one of the earliest modern versions of these medications. Citalopram is one of the most prescribed types of this medication whose classes include SSRIs. For the point, name this class of medications that balance chemicals in the brain to combat a prevalent mental health disorder.

ANSWER: **Antidepressants**

(5) This structure's scala media and scala tympani are separated by the basilar membrane. This structure forms the bony labyrinth with the vestibule and semicircular canals. This structure contains the organ of Corti, which is lined with sensitive hair cells. This structure is connected to the middle ear by the oval window. For the point, name this structure of the inner ear named for its resemblance to a snail shell.

ANSWER: **Cochlea** (prompt on "Inner Ear" or "Ear")

(6) Through moisture collected from this naturally-occurring process, devices such as the Groasis Waterboxx can help trees grow in dry areas. Adiabatic expansion sometimes allows this phase transition to take place in zones of low thermodynamic pressure. This process is defined as a change of matter from gas to liquid, or the reverse of vaporization. For the point, identify this natural phenomenon that forms dew and causes liquids to bead on glass surfaces.

ANSWER: **Condensation**

(7) This condition can cause retinopathy by altering the function of the optic fundus. In addition to high protein levels in the blood, this condition is the primary symptom of preeclampsia. This condition that can be treated with beta blockers or calcium channel blockers is defined by elevated measurements of systolic and diastolic values. For the point, name this condition that can be measured with an inflatable cuff on the arm.

ANSWER: **Hypertension** (or **High Blood Pressure**)

(8) This region contains the only large moon with a retrograde orbit. That moon contained within this region is called Triton, and it is part of a series of objects in this region known as KBOs. This region, which is hundreds of times larger than a similar region containing asteroids, extends from Neptune to the edges of the solar system. For the point, identify this belt named for a Dutch astronomer that contains gas, dust, and dwarf planets.

ANSWER: **Kuiper** Belt

(9) The magnetic field due to a current-carrying wire is proportional to this power of distance from the wire by the Biot-Savart [[BEE-yote suh-VART]] law. The gravitational potential energy between two masses is proportional to this power of distance. Resistance to this power is directly proportional to current at constant voltage. Volume is raised to this power in the formula for density. For the point, identify this variable in the equation  $4x - 3 = -7$ .

ANSWER: **-1** (prompt on "One Over;" don't prompt on "One")

(10) Slide rules and nomograms are among the simplest of these types of computers. These types of computers can be found in mechanical watches and flight computers. These types of computers were largely rendered obsolete by counterparts that use binary numbers and arithmetic. For the point, name this type of computer system that relies on continuous variations of physical phenomena, contrasted with digital computers.

ANSWER: **Analog**

(11) Polybaric melting was proposed as a model for this rock's petrogenesis, and this rock's intrusive equivalent is called gabbro. The Apollo 15 mission returned many samples of this rock that composes lunar maria. The pillow type is one variety of this rock can that is formed from the cooling of mafic lava. For the point, name this type of black, igneous rock that constitutes more than 90% of volcanic rock on Earth.

ANSWER: **Basalt** (accept Pillow **Basalt**)

(12) This process is regulated by the release of hormones called ecdysteroids. In some animals, a form of this process ends with a product called an exuviae [[ecks-YOO-vee-eye]], and that process involves removal of the cuticle during growth. In cats and dogs, this process usually takes place during the spring when mammals lose their "winter coat." Often seen in insects who lose their exoskeleton, this is, for the point, what process commonly associated with snakes shedding their skin?

ANSWER: **Molting** (accept **Shedding** before mentioned; accept **Sloughing**; prompt on answers involving animals losing an outer layer of fur, skin, or exoskeleton)

(13) Certain types of these events produce "beads" that are named for English astronomer Francis Baily. In 1868, French astronomer Pierre Janssen discovered helium by observing the chromosphere during one of these events that produce a syzygy during totality. Occultations occur during these events when one body moves in front of another. For the point, name these events during which observers on Earth have their view of an astronomical object obscured.

ANSWER: **Eclipse** (accept Solar **Eclipses**; accept Lunar **Eclipses**; accept Total **Eclipses**)

(14) The Cutter Incident resulted in an outbreak of this disease. One person created a vaccine for this disease and declined profits, asking Edward R. Murrow "Could you patent the sun?" The March of Dimes was founded to create a cure for this disease for which Albert Sabin created an oral vaccine. Jonas Salk developed a vaccine to fight, for the point, what disease that left Franklin Delano Roosevelt in a wheelchair?

ANSWER: **Polio** (accept **Poliomyelitis**; accept **Poliovirus**; accept **Heine-Medin** disease; prompt on "Infantile Paralysis")

(15) Along with germanium and gallium, this is the main element used in the construction of semiconductors. After oxygen, this element is the most common in the Earth's crust. This plentiful element is used in the manufacture of computer chips. This element is the most common element used in glass, and a dioxide of this element is the main component of sand. For the point, name this metalloid element with the symbol Si.

ANSWER: **Silicon** (accept **Si** before mentioned; accept **Silica**; accept **Silicon** Dioxide)

(16) A translocation between chromosomes 9 and 22 creates the Philadelphia chromosome in one form of this disease, which also has acute lymphoblastic and chronic myelogenous [[MY-uh-"LODGE"-uh-nuss]] types. This condition can be identified by elevated levels of granulocytes on a complete blood count, and it typically proliferates as single cells in the bloodstream, unlike lymphomas. For the point, name this type of cancer that begins in the bone marrow and affects white blood cells.

ANSWER: **Leukemia** (accept specific types; prompt on "Cancer;" do not accept or prompt on "Lymphoma")

(17) A pigment composed of this element and cyanide is known as Prussian blue. This element with atomic number 26 is rarely found in a metallic state in the earth's crust, though it can be deposited there by meteorites. The presence of this element in ores such as hematite makes it the fourth most common element in the crust. For the point, name this element with symbol Fe, an oxide of which is the main component in rust.

ANSWER: **Iron** (accept **Ferrum** before "Fe" is mentioned)

(18) A field of science named for this man was popularized by William Bateson. This man published a now-lost study of Cypriot honeybees, and this man is the namesake of a paradox describing the "too good to be true" nature of his findings. This man's studies originated still-used terms such as random segregation and independent assortment. The theory of recessive and dominant traits derives from, for the point, what friar who studied the genetics of pea plants?

ANSWER: Gregor **Mendel**

(19) The main components of these materials are called sima and sial. The Scotia example of one of these features is bounded by the Shackleton Fracture Zone, and that feature was responsible for creating the deepest point in the Southern Ocean. These features form the uppermost part of the lithosphere, and their convergence formed the Himalayas. For the point, identify these structures that cause continental drift.

ANSWER: **Tectonic Plates** (prompt on partial answers)

(20) This positive integer is the smallest counterexample to Euler's sum of powers conjecture. This number is the greatest number in the Fibonacci sequence that is also a perfect square. This integer is the smallest three-digit square such that itself and its digits in reverse are both non-palindrome three-digit perfect squares. This number can be found by squaring the greatest common factor of 24 and 36. For the point, name this number equal to 12 times 12.

ANSWER: **144**

(21) This structure's previous model was named for biologists Hugh Davson and James Danielli. That model was replaced by the fluid mosaic model that treats this entity as a two-dimensional liquid. Integral and peripheral proteins can be found in this structure that contains a phospholipid bilayer and selectively allows certain nutrients to pass. For the point, name this semi-permeable layer that separates the interior of a cell from the exterior.

ANSWER: **Cell Membrane** (accept **Membrane**)

(22) Hermann Oberth names a maneuver using these devices that is also known as the "powered flyby." In *A Method of Reaching Extreme Altitudes*, the father of this technology, Robert Goddard, wrote that he aimed to escape from Earth's gravitation altogether. A three-stage type of this device called the Saturn V was used by NASA to launch Skylab. For the point, identify these devices that produce thrust and are powered by liquid or solid propellants.

ANSWER: **Rockets** (accept Liquid **Rocket**)

(23) The two suborders of these creatures are distinguished by their cirri filaments. These animals have been observed hunting with fish and punching them in order to keep them in line. The blue-ringed species is the most venomous of these animals that possess three hearts, and the giant Pacific species is the largest of these mollusks. For the point, name these intelligent, eight-armed cephalopods that squirt ink when startled.

ANSWER: **Octopuses** (or **Octopi**; or **Octopodes**)

(24) Potent examples of these objects are partially composed of boron and neodymium. In one of the earliest uses of these naturally occurring objects, navigators created compasses from lodestones. Nikola Tesla gives his name to the SI unit measuring the strength of the field around these objects. For the point, name these objects that exhibit properties that allow them to attract materials such as iron, nickel, and cobalt.

ANSWER: **Magnets** (accept **Magnetic Field**; accept Permanent **Magnets**; accept **Electromagnets**)

(25) A vehicle named for a flame of this color set a land speed record at the Bonneville Salt Flats in Utah in 1970. A cetacean named for this color is the largest of its type to use baleen in digestion. A type of common algae is described as green and this color, while this color names the most widespread jay in the U.S. For the point, identify this color, shades of which appear in gemstones such as lapis lazuli and sapphires.

ANSWER: **Blue**

(26) Charles Darwin wrote the treatise *The Power of Movement in* [these organisms], explaining how they rotate in a process called circumnutation. They're not fungi, but this general class of organisms utilize phototropism, which allows them to orientate towards light through the use of hormones called auxins. For the point, name these organisms that can be split into angiosperms and gymnosperms, examples of which include flowers and trees.

ANSWER: **Plants** (accept **Plantae**)

(27) An experiment which compared this constant in different directions is known as the Michelson-Morley experiment. Motion that appears to exceed this constant is termed superluminal. Albert Einstein theorized that this constant was independent of observation and included it as the "C" in his equation for the special theory of relativity. For the point, identify this universal constant which is measured at approximately 186,000 miles per second.

ANSWER: **Speed of Light** (or **Lightspeed**; accept **C** before mentioned)

(28) The largest examples of these animals are the ratites. These animals are the only surviving theropods and, like snakes, these animals use a ZW sex determination system. Archaeopteryx [[ar-kay-OP-tuh-ricks]] was once considered to be the earliest known type of these animals. Examples of these animals that have keen eyesight and kill prey with their feet are known as raptors. For the point, name these warm blooded, egg-laying, feathered animals.

ANSWER: **Birds** (or **Aves**; or **Avians**)

(29) This satellite may have been created after a collision with another object called Theia some 4.5 billion years ago. Both the lowest and highest points on this body were created by an impact that resulted in the South Pole-Aitken basin. This satellite is the second-brightest object in the solar system. Approximately one-quarter the diameter of the Earth, this is, for the point, what natural satellite, the primary target of the Apollo space missions?

ANSWER: Earth's **Moon** (or **Luna**)

(30) The crew of Skylab 3 brought two of these creatures named Arabella and Anita to see how zero-gravity affected their behavior, revealing the fact that these animals need light to orient themselves. A copper engraving of one of these creatures eating a hummingbird inspired the name of the Goliath birdeater, a member of one subset of these arthropods. For the point, name these web-spinning arachnids, types of which include the tarantula and black widow.

ANSWER: **Spiders** (accept **Tarantula** before mentioned; prompt on "Arachnids" before mentioned)

### Extra Questions

(1) The "Maunder Minimum" is a period of decreased activity on the surface of this object, theorized to have contributed to the Little Ice Age. Between every one to five days, this object's Coronal Mass Ejections reach Earth. This body, which emits visible light, UV light, and infrared radiation, is largely composed of hydrogen and helium. For the point, name this massive star at the center of our solar system.

ANSWER: **Sun** (prompt on "Stars")

(2) The extinct American species of this animal prompted the evolution of the pronghorn. In Asia, these felids are critically endangered and are confined to a small region of Gujarat in India. Because these cats have fixed bones that make them unable to roar, they are the largest non-American cats that can purr. For the point, name this type of big cat that chase after gazelles at speeds sometimes exceeding 60 miles per hour.

ANSWER: **Cheetah**