Euros Science Bee Round 2 (Middle School and Elem.)

Regulation Tossups

(1) The "wolf" variety of this organism is hazardous to mammals because it contains the toxic yellow pigment vulpinic acid. The autotrophic component of this organism delivers organic compounds through photosynthesis, while the fungal component of this organism provides structure and protection. Often mistaken for moss, this is, for the point, what complex organism composed of a fungus and an alga or cyanobacterium living in a symbiotic partnership?

ANSWER: **Lichen** (accept Wolf **Lichen**; prompt on "Fungus" or "Algae"; do NOT accept "Moss")

(2) Instead of curly brackets, this language uses syntactic indentation to distinguish blocks of code. This programming language emphasizes human readability by using words like “and” and “not” instead of symbols. For the point, name this popular programming language named after a British comedy group that shares its name with a type of snake.

ANSWER: **Python**

(3) The "Gilbert" form of these features are characterized by a tripartite structure of topset and bottomset beds. "Regressive" forms of these features can form at the coastal side of narrow channels, and the "tide-dominated" examples of these features are known for their dendritic structure. These features, which are similar to alluvial fans, can extend into the ocean due to the build-up of sediments. For the point, name these triangle-shaped regions where a river splits up as it reaches another body of water.

ANSWER: River **Delta**s (accept Regressive **Delta**; accept Tide-dominated **Delta**; accept Gilbert **Delta**; prompt on answers such as "River Mouths")

(4) For two charges, this quantity is equal to the product of the two charges, the distance between them, and the Coulomb constant k. For any object in simple harmonic motion, this quantity is directly proportional to the square of the distance from the equilibrium position. For the point, name this quantity that is possessed by an object due to its configuration and position, rather than its motion.

ANSWER: **Potential** Energy

(5) Electroreceptors in the pores of these animals are known as Ampullae of Lorenzini. Cladoselache was a genus of early predecessors to these animals, which contain multiple rows of replaceable teeth. The “whale” variety of these animals is the largest extant fish species. For the point, name these animals that include “hammerhead” and “great white” varieties.

ANSWER: **Sharks**

(6) Under standard conditions, this metal is the least dense solid element. Despite being among the lightest elements, this alkali metal is less common than potassium, though it is the heaviest element produced by the Big Bang. Found in salt flats and used to produce batteries from its ions, this is, for the point, what lightest metal positioned to the left of beryllium and is the third element on the periodic table?

ANSWER: **Lithium** (accept **Li**)

(7) Specific sequences of this acid can be detected and analyzed using a technique called Northern blotting. Catalytic types of this nucleic acid can cleave or join phosphodiester bonds, demonstrating its ability to act as a functional enzyme, known as ribozyme. For the point, name this nucleic acid whose distinctive feature is its uracil base.

ANSWER: **RNA** (accept **Ribonucleic Acid**; do NOT accept "DNA")

(8) The namesake of these devices was a spectroscopy pioneer who worked with Gustav Kirchhoff to discover rubidium and cesium. In these devices, the Venturi effect allows air into a cylinder so that it mixes with another product passed through a rubber tube attached to a nozzle. These devices were created by their namesake and Peter Desaga to maximize heat efficiency in coal-gas lamps. A German scientist names, for the point, what small gas burners used in chemistry labs?

ANSWER: **Bunsen** Burners (accept Robert Wilhelm Eberhard **Bunsen**)

(9) This scientist built on the work of al-Haytham to become the first to show that human sight results from images being projected onto the retina. This scientist names a law stating that equal area is "swept out" in equal time by an orbiting body, and this scientist developed a relation between the square of an orbital period and the cube of that orbit's semimajor axis. For the point, name this German astronomer who developed three laws of planetary motion.

ANSWER: Johannes **Kepler** (accept **Kepler**'s Laws of Planetary Motion)

(10) A gold standard treatment of this disease includes artemisinin-based combination therapies, which typically involve companion drugs such as lumefantrine and mefloquine. A degree of protection against this infectious disease is seen in heterozygous carriers of sickle cell anemia. Caused by parasites belonging to *Plasmodium* genus, this is, for the point, what infectious disease transmitted by infected *Anopheles* mosquitos?

ANSWER: **Malaria**

(11) In chemical species that contain these types of bonds, the Born-Haber cycle and lattice energy is used to calculate the change in enthalpy. If the Pauling scale electronegativity difference between two species is greater than 1.7, this type of bond can be formed. Potassium fluoride and sodium chloride crystals are held together by, for the point, what kind of bonds formed between a metal and a non-metal and a metal?

ANSWER: **Ionic** Bonds

(12) In most male patients with this condition, increases in estradiol result in the development of breast tissue. If this condition is caused by a bile duct blockage, it can be treated with ursodiol. The majority of cases of this condition are caused by severe hepatitis infections and its most famous symptom is jaundice. For the point, name this scarification of the liver often caused by long-term alcoholism.

ANSWER: **Cirrhosis** (accept **End-stage Liver Disease** before “liver” is mentioned, then prompt afterwards; prompt on “Liver Disease”)

(13) This compound is synthesized in the plasma membrane from UDP-glucose by the namesake synthase, a multi-subunit enzymatic complex. The bacterial form of this compound is a major component in biofilm, and 90 percent of cotton fibers are made of this compound. In a plant cell, multiple chains of this polysaccharide create microfibrils. For the point, name this structural polysaccharide, the main component of plant cell walls.

ANSWER: **Cellulose** (accept **Cellulose** Synthase; accept Bacterial **Cellulose**)

(14) On the unit form of these shapes, the steradian, is used as a measurement of the solid angle, based on the included share of this shape's surface area. These shapes have the highest volume to surface ratio of all solids because their surface contains the set of all points equidistant from a fixed center. For the point, identify these shapes whose volume can be calculated using the formula "four-thirds times pi times radius cubed"?

ANSWER: **Sphere**s

(15) When this substance is subjected to high pressure, mushroom-like intrusions called laccoliths form, and the cooling of this substance results in plutons. Namesake "chambers" contain this substance, whose intrusions form sills and dykes. For the point, name this molten substance that, when erupted, becomes lava.

ANSWER: **Magma** (accept **Magma** Ocean; do NOT accept or prompt on "Lava")

(16) This quantity is unusually low along the equator due to gaps in the Hadley cells. Most aircraft use an altimeter that measures this quantity to infer altitude. Zones where this quantity is high typically experience calm weather whereas low zones of it are dominated by severe storms. For the point, name this atmospheric quantity measured with a barometer in Pascals or millimeters of mercury.

ANSWER: Atmospheric **Pressure** (or Air **Pressure**; or Barometric **Pressure**)

(17) The "power density" that is experienced by these objects is increased by turbulence, and these objects become more powerful as the velocity, density, and effective area increase. These objects move when air pressure decreases on one side from natural displacement, eventually causing a generator to spin. For the point, name these tall devices that convert wind energy into electrical energy.

ANSWER: Wind **Turbine**s

(18) Rudites, arenites, and lutites describe types of this type of rock. This type of rock often occurs in strata, which are used for dating, and this type of rock often originates from the erosion of other forms of rocks. Limestone and sandstone are examples of, for the point, what major type of rock, which can be formed from deposited dirt, pre-existing rocks, or the decomposition of dead organisms?

ANSWER: **Sediment**ary Rock (anti-prompt on "Limestone" or "Sandstone" before mentioned)

(19) Robert MacArthur and E. O. Wilson formulated a theory of these ecosystems' biogeography. In an example of adaptive radiation, these ecosystems experienced diversification among its *Thraupidae* species, which are not truly finches. Charles Darwin documented the diversification of, for the point, what ecosystems exemplified by Madagascar and the Galápagos?

ANSWER: **Island**s (or **Archipelago**s; accept **Island** Biogeography)

(20) In 2014, the *Cassini* spacecraft identified 101 of these structures on the surface of Saturn's moon Enceladus. The crusts and layers of these structures are surrounded by a porous siliceous sinter and two types of these structures include the cone and fountain. Iceland's volcanoes form many of, for the point, what rare type of hot springs which periodically erupt and send jets of water and steam into the air?

ANSWER: **Geyser**s (prompt on "Hot Spring")

(21) This country currently manages the only other manned space station besides the ISS. This country's Tianwen-One mission made it the only non-American country to land a probe on Mars, and this country was the first to have a successful landing on the far side of the Moon with the Chang'e [["chang-uh"]] Four mission. The CNSA is led by, for the point, what country whose space agency is headquartered in Beijing?

ANSWER: People's Republic of **China** (or **Zhonghua** Renmin Gongheguo; accept **PRC**; do not accept the "Republic of China" or "Taiwan")

(22) Jean-Pierre Christin and Carl Linnaeus [[lih-NAY-uss]] are credited with reversing the numbers on a scale devised by this scientist. Converting from a scale named for a German-Dutch scientist to a scale named for this Swedish scientist involves subtracting 32 and multiplying by five-ninths. For the point, name this scientist who devised a temperature scale in which water freezes at zero degrees.

ANSWER: Anders **Celsius**

(23) The oldest operating one of these facilities in the world is the Royal Eise Eisinga [[EY-seh EY-sing-HAH]] in the Netherlands. Equipment used in these facilities include lasers by Pangolin Systems, as well as projectors by the Carl Zeiss Company. Examples of these facilities include the Samuel Oschin in the Griffith Observatory and the Hayden in the Rose Center for Earth and Space. For the point, name these facilities which simulate the night sky on a domed ceiling.

ANSWER: **Planetarium**s (accept **Orrery**; accept Samuel Oschin **Planetarium**; accept Hayden **Planetarium**)

(24) One Nobel Prize winner from this country was awarded for discovering the mechanism of spontaneous broken symmetry. This country's Mikimoto company produced the world's first cultured pearls, and mass-produced laptops were pioneered by this country's Toshiba Company. Kawasaki Heavy Industries is also located in, for the point, what country home to tech companies such as Sony and Nintendo?

ANSWER: **Japan** (or **Nippon**-koku; or **Nihon**-koku)

(25) Matter attracted to these objects, such as Sagittarius A Star, are heated within accretion disks that create quasars. When solving Einstein's field equations, the Schwarzschild radius defines one parameter of these objects by their event horizon. For the point, name these regions of extremely strong gravity, which are formed after the death of extremely massive stars.

ANSWER: **Black Hole**s

Extra Question

(1) This naturally occurring substance is the most widely used anode material for lithium-ion batteries. This substance ability to glide smoothly is partly due to the weak van der Waals bonds and gases between its stacked trigonal layers. This substance, which was once called plumbago, can be subjected to high temperatures and pressures to produce diamond. For the point, name this stable, crystalline form of carbon, most commonly used in pencil and erroneously called lead.

ANSWER: **Graphite**