(E) Science Bee Round 3

Regulation Tossups

(1)   The virus causing this disease, uncommonly referred to as "hydrophobia", emerges from protein aggregates in the brain called Negri bodies. Foaming at the mouth is notable symptom of, for the point, what viral disease, caused by the genus Lyssavirus, that is spread through animal bites?

ANSWER: **Rabies** (accept **Rabies** Encephalitis; accept **Hydrophobia** before mentioned; accept **Lyssa** before "Lyssavirus" is mentioned)

(2)   These particles, first proposed by George Zweig and Murray Gell-Mann, are believed to be among the essential building blocks of matter and are considered a fundamental secondary group of elementary particles. These particles come in six forms, and they partner with other elementary particles to form protons and neutrons. For the point, name these charged particles with flavors such as top, charm, and strange.

ANSWER: **Quark**s (accept **Quark** Model; accept Up **Quark**s; accept Down **Quark**s; accept Charm **Quark**s; or Strange **Quark**s; accept Top **Quark**s; accept Bottom **Quark**s)

(3)   The Bajau people of Southeast Asia have enlarged forms of this organ as an adaptation for diving. Parts of this organ branch into arteries surrounded by PALS tissue. Damage to this organ can result in overwhelming sepsis from encapsulated organisms. Sickle cell anemia can sequester this organ that contains white and red pulp. For the point, name this abdominal organ that destroys old red blood cells.

ANSWER: **Spleen**

(4)   These molecules, which are made up of four polypeptide chains, are divided into two Fab fragments and one Fc fragment, and vaccines stimulate the production of these molecules in order to provide immunity against diseases. Immunoglobulin is another name for, for the point, what Y-shaped proteins that regulate the immune response by binding to an antigen?

ANSWER: **Antibody** (or **Antibodies**; accept **Immunoglobulin**s before mentioned)

(5)   The density of this region renders it invisible to the naked eye, except in times of a solar eclipse. This region features dynamic jets of plasma called spicules, which emerge from its homogenous layer. For the point, name this middle layer of the Sun's atmosphere, sitting between the solar transition region and the photosphere.

ANSWER: **Chromosphere**

(6)   A "space" named after this man is the fundamental space of geometry. This man proved that there are infinitely many primes by constructing their product plus one. The parallel postulate is found in one set of writings by this man. For the point, name this mathematician from Alexandria who wrote the landmark math treatise *Elements*.

ANSWER: **Euclid** of Alexandria (accept **Euclid**ean Space)

(7)   This object was called Stella Maris in the medieval period, and this object was preceded in its role by Kochab and Pherkad. This object's southern counterpart is called Sigma Octantis, and in Lakota this celestial object is known as "The Star that Sits Still." For the point, name this brightest star of Ursa Minor, or the "Little Dipper," often called the "North Star."

ANSWER: **Polaris** (accept **Alpha Ursae Minoris** until mentioned; prompt on "North Star" or "Pole Star" until mentioned)

(8)   Applications of this function include determining the length of vectors and the geometric mean. This function appears above 5 in the numerator of the Golden Ratio and can be expressed as the one-half power in exponential notation. For the point, name this function, which when applied to negative one is i and when applied to 9 is 3.

ANSWER: **square root**

(9)   It's not palladium, but this hetero-atom is found in an organo-metallic species in the Suzuki reaction. This second-row element is used to yield an alcohol in an anti-Markovnikov reaction from an alkene. This element usually only forms three bonds to other elements, resulting in an empty p-orbital. The lightest metalloid is, for the point, what element with atomic symbolized B?

ANSWER: **Boron** (accept **B** before mentioned)

(10)   The value of this quantity is low for systems containing an abundance of hydronium ions. The isoelectric point of a molecule is this quantity when the net charge is zero. When this quantity is low for a solution, litmus paper turns red, and blood usually has a value of about 7.4 for this quantity. For the point, name this measure of the acidity of a solution.

ANSWER: **pH** (accept **Power** of **hydrogen**)

(11)   Climates in this biome are categorized under ET in the Koppen climate classification. Soil in this biome often contains large amounts of biomass stored as methane under layers of permafrost. This biome can be found in mostly arctic, alpine, and Antarctic variants. For the point, name this biome characterized by little tree growth, low rain and snowfall, and extensive moss and lichen growth.

ANSWER: **Tundra**

(12)   While the "complacent" type of these features show little variation, "sensitive" types allow for easier cross-dating to assign dates to when they were formed. These things, which are compared on skeleton plots, are "crowded" during periods of drought. Dendrochronology is the process of dating these things, which are affected by amounts of rainfall and are found in the cambium. For the point, name these circular patterns found in wood.

ANSWER: **Tree Ring**s (accept **Growth Ring**s)

(13)   Edward Lorenz believed that the long-term performance of this task was impossible due to the butterfly effect. Remote sensing and radiosondes [["radio"-sahndz]] are used in this task, which is performed pseudo-scientifically on February 2nd with a groundhog. For the point, name this task commonly performed by a meteorologist, who might state that rain is likely tomorrow.

ANSWER: **Weather forecast**ing (accept answers indicating **Forecast**ing the **weather**; or **Predict**ing the **weather** or **Model**ing the **weather**; prompt on partial answers; accept **meteorology** before "meteorologist")

(14)   The predecessors of these rocks undergo diagenesis. Arkose is a feldspar-rich variant of one example of these rocks, while another example of these rocks is primarily composed of calcite and aragonite. Sandstone and limestone are examples of these rocks. For the point, name these rocks that are formed from cementation of particles and are contrasted with igneous and metamorphic rocks.

ANSWER: **Sedimentary** rocks (prompt on "sandstone" or "limestone" before mentioned)

(15)   The time-independent form of an equation named for this man is written as "H psi equals E psi". This man critiqued the Copenhagen interpretation by proposing a situation in which a radioactive source causes a hammer to break open a flask of poison. A thought experiment about a cat that is simultaneously alive and dead was proposed by, for the point, what Austrian physicist?

ANSWER: Erwin **Schrödinger** (accept **Schrödinger**'s cat; accept **Schrödinger** equation)

(16)   KGB intervention may have caused the death of this man and instructor Vladimir Seryogin during a routine flight in 1968. Nazi occupation forced this man and his family to live in a three-meter by three-meter mud hut for years, and this man shouted "Poyekhali!" or, "Off we go," shortly before departing from Baikonur Cosmodrome on Vostok One. For the point, name this Soviet Cosmonaut, the first man in space.

ANSWER: Yuri **Gagarin**

(17)   Hilbert's paradox of the Grand Hotel is a thought experiment that illustrates the counterintuitivity of sets with this property. Georg Cantor denoted a "countable" variety of this property aleph-null. Euclid proved that there are this many prime numbers, while irrational numbers have this many digits after the decimal point. For the point, name this mathematical property denoting a number that is uncountably large.

ANSWER: **Infinity** (accept countable **infinity**)

(18)   The 1902 poem "The Story of Fidgety Philip" made an early reference to these disorders, one of which was referred to by a German neurologist as "word blindness." Dyscalculia is one of these disorders affecting numerical reasoning, and dyslexia is another disorder of this type affecting literacy. Ritalin and Adderall are used to treat, for the point, what disorders in school-aged children?

ANSWER: **Learning** Disorders (or **Learning** Disabilities; accept Neuro**development**al Disorders; ask for less specific information on answers such as "ADHD", "Dyslexia", or other learning disorders)

(19)   In order to correct for the Signor-Lipps effect, the location of where these objects end up are assumed to be in random order. Coprolites [[KAH-pruh-lites]] are an example of the "trace" type of these objects, and geologic relationships can be determined using their "index" type. The Burgess Shale is a source of, for the point, what preserved objects that a paleontologist might find at a dig site?

ANSWER: **Fossil**s (accept Trace **Fossil**s or Index **Fossil**s or **Fossil**ized Remains; prompt on "Bone" or "Skeleton" or "Remains")

(20)   Features of this celestial body include depressions known as "tiger stripes" and periodic storms like the Great White Spot. The Cassini division can be found within a feature of this planet, which is orbited by the moons Rhea and Titan. An extensive ring system belongs to, for the point, what sixth planet from the Sun?

ANSWER: **Saturn**

(21)   These objects are bound by the Schwarzschild radius, and thermal radiation can be emitted by these entities in a mechanism proposed by Steven Hawking. The surface boundary of these objects is their event horizon, past which nothing can be observed. For the point, name these regions of spacetime with gravity so strong, even light cannot escape it.

ANSWER: **Black hole**s

(22)   Heinrich Gerber is best known for a component used to make these structures, which he invented. One type of these structures can be built using cantilevers and hinges. Elementary forced resonance is given as the reason for why two of these structures named for Tacoma Narrows collapsed in 1940. For the point, name these structures built over bodies of water, famous ones of which include London and Golden Gate.

ANSWER: **Bridge**s (accept Tacoma Narrows **Bridge**; accept London **Bridge**; accept Golden Gate **Bridge**)

(23)   This country's Hamelin Pool hosts the most abundant examples of living stromatolites in the world. The extremely rare ant genus *Nothomyrmecia* lives in the south of this country, and the devil facial tumor disease has affected a carnivorous marsupial, *Sarcophilus harrisii*, from this country. Animals such as the kookaburra and wallaby are native to, for the point, what country, whose researchers often study the Tasmanian devil?

ANSWER: **Australia** (or Commonwealth of **Australia**)

(24)   The Minkowski inequality is a generalization of a statement named for this shape. The area of this shape can be found by multiplying the semiperimeter and inradius, or it can be calculated using Heron's formula. For the point, name this geometric shape that comes in "obtuse" and "acute" varieties and has three sides.

ANSWER: **Triangle** (accept obtuse **triangle**; accept acute **triangle**)

(25)   Anthozoans [[AN-thuh-ZOH-inz]] have cnidocytes [[NY-doh-"sites"]] on these structures, and some ctenophores [[TEH-nuh-FORZ]] have retractable these structures that feature sticky colloblasts. A squid has eight arms and two of these structures, which are used for seizing prey. For the point, name these appendages that are covered with stinging cells in jellyfish.

ANSWER: **Tentacle**s (prompt on "Limb" or "Leg" or "Ray"; prompt on "Arm" before "arms" is mentioned; prompt on "Appendage" before "appendages" is mentioned)

Extra Questions

(1)   A substance referred to as "virga" can be released from these objects that can be divided into roll and shelf types. Human activity can form instances of these entities known as contrails, while nacreous varieties of these entities form above the stratosphere. The appearance of halos from these objects form via the passage of sun light through crystals of ice in the cirrus varieties of these objects. Cumulonimbus is one variety of, for the point, what fluffy white objects in the sky?

ANSWER: **Cloud**s (accept Roll **Cloud**s; accept Shelf **Cloud**s; accept Nacreous **Cloud**s; accept Cirrus **Cloud**s; accept Anvil **Cloud**s; accept Cumulonimbus **Cloud**s)

(2)   One condition that affects this body part is called stenosis, in which bone spurs appear due to the narrowing of the canal found in this body part. Another condition that affects this body part is spondylosis, while in another condition, curvatures resembling the letters "C" or "S" is used to diagnose scoliosis, an abnormal curvature of this body part. The cervical, thoracic, and lumbar are groups of vertebrae in, for the point, what part of the body, also called the backbone?

ANSWER: **Spine** (accept **Backbone** before mentioned)