

(MS) Science Bee Round 1

Regulation Tossups

(1) The ratio of this force's interaction between two bodies is given by a coefficient symbolized mu. The "dry" form of this force manifests in kinetic and static types, and its maximum threshold produces traction. The viscosity of fluids is due to, for the point, what force produced by an object's resistance to relative motion?

ANSWER: **Friction** (accept Coefficient of **Friction**; accept **Mu** before mentioned; accept Dry **Friction**; accept Kinetic **Friction**; accept Static **Friction**; prompt on "Viscosity" before mentioned)

(2) These structures are assembled using proteins such as condensin. Abnormal configurations in these structures include aneuploidy and polyploidy. Anomalies in these structures can lead to conditions such as Turner syndrome and Down syndrome. For the point, identify these structures that carry genetic information and come in 23 pairs.

ANSWER: **Chromosomes** (accept X **Chromosome**; accept Y **Chromosomes**)

(3) Liver disease can cause this organ to develop enlarged veins called varices. This is the uppermost organ that uses peristalsis to transport nutrients after they have been turned into a bolus. The epiglottis regulates entry to the trachea and this organ, the lining of which is irritated in acid reflux. For the point, name this organ and tube that carries food from the throat to the stomach.

ANSWER: **Esophagus**

(4) Neil Sloane and Simon Plouffe used "N\$" [["N Dollar Sign"]] to denote the "super" form of this function. This function is generalized for complex numbers by the gamma function, and in its most basic use this function counts the possible permutations of n distinct objects. For the point, name this function of n which gives the product of all of n's preceding integers, denoted by an exclamation point.

ANSWER: **Factorial**

(5) Types of this crop grown in the U.S. include Runner, Spanish, and Virginia. This crop is commonly used in Thai cuisine and in the southern U.S where it may be eaten boiled and dropped in cola. Over 100 uses for this crop were developed at the Tuskegee Institute by George Washington Carver. For the point, identify this legume which can be ground into a namesake butter.

ANSWER: **Peanuts** (or **Groundnuts**; or *Arachis hypogaea*)

(6) The luxation of this bone is one of the most common causes of lameness in dogs. This is the largest sesamoid bone in the human body. Striking the tendon named for this bone with a rubber hammer is one of the most common reflex tests. Both the femur and the tibia articulate with, for the point, what triangular bone also known as the kneecap?

ANSWER: **Patella** (accept **Kneecap** before mentioned)

(7) When this element's oxide contains certain chromium impurities it forms rubies, a red type of corundum. Processing this element involves extracting it with the Bayer process and smelting it in the Hall-Héroutl [[ay-ROO]] process. Like gallium, this element is most commonly extracted from bauxite ore. For the point, name this transition metal that is used to make foil and soda cans.

ANSWER: **Aluminum** (or **Al**; accept **Aluminium**)

(8) James Cook observed this object's transit from Tahiti at the behest of the Royal Society during his circumnavigation of the globe. The Greeks believed this planet to be two separate bodies known as the "Light-Bringer" and the "Western Object," while Galileo discovered the distinct phases of this planet. The Roman Goddess of beauty names, for the point, what second-farthest planet from the Sun?

ANSWER: **Venus**

(9) Xerocoles [[ZEER-uh-coles]] are animals that have adapted to live in these biomes. It's not a tundra, but most of Antarctica is this type of biome. These biomes are formed by weathering processes that cause rocks to break into granular pieces, which can sometimes be eroded by the wind and produce sandstorms. For the point, name these barren landscapes containing long stretches of sand.

ANSWER: **Desert**

(10) Many cysts form in this organ due to elevated levels of androgens in a condition alternately known as Stein-Leventhal syndrome. The hormones progesterone and estrogen are produced by this organ, which is connected to the uterus by the Fallopian tubes. Eggs are produced in, for the point, what female reproductive organs?

ANSWER: **Ovary** (or **Ovaries**; accept Polycystic **Ovary** Syndrome)

(11) In a gas, this quantity is proportional to the average kinetic energy, and an increase in this quantity will also increase the gas's volume according to Charles's Law. The amount of heat energy needed to raise this quantity by one unit is measured in calories, and this quantity reaches its lowest point at 0 Kelvin. For the point, name this quantity given in units of Celsius or Fahrenheit.

ANSWER: **Temperature**

(12) This organelle is subject to proton leak when particles migrate into its matrix. This organelle contains folds known as cristae, and it contains its own DNA. This organelle accomplishes its most-associated task by oxidizing pyruvate and NADH. Primarily responsible for producing ATP, this is, for the point, what organelle known as the "Powerhouse of the Cell?"

ANSWER: **Mitochondria** (or **Mitochondrion**; accept **Mitochondrial** DNA)

(13) The sarcoplasmic reticulum stores ions of this element that are used in muscle contraction. Gypsum is mostly composed of a sulfate of this element, and a carbonate of this element is the main component of limestone. For the point, identify this element and earth metal that is commonly found in milk and used to build strong bones.

ANSWER: **Calcium** (or **Ca**)

(14) Deuteranopia and tritanopia are forms of this condition that can be diagnosed by asking patients to identify numbers made of dots in the Ishihara test. The most common form of this condition is caused by mutations on the X chromosome that affect the development of cone cells in the retina. For the point, name this condition that affects a person's ability to perceive reds, blues, and greens.

ANSWER: **Color Blindness** (accept **Achromatopsia**)

(15) These particles ionize gas molecules in a Townsend avalanche. The Davisson-Germer experiment demonstrated the wave-like behavior of these particles, which were first theorized in a cathode ray tube by J.J. Thomson. This particle's charge is equal in magnitude but opposite in sign to that of the proton. For the point, name these negatively charged particles that orbit a nucleus.

ANSWER: **Electrons**

(16) Calomel reference electrodes often contain the chloride of this element. An experiment performed by Torricelli [[torr-uh-CHELL-ee]] measured atmospheric pressure using units of millimeters of this element whose primary ore is cinnabar. For the point, name this metal symbolized "Hg" that is liquid at room temperature.

ANSWER: **Mercury** (accept **Hg** before mentioned; accept **Quicksilver**)

(17) Methods for reducing the presence of these animals include using ovitraps. According to the World Health Organization, this animal annually kills more humans than any other. One disease spread by these animals is caused by a plasmodium parasite, and other diseases spread by these animals include West Nile virus. For the point, name these insects that bite humans and spread diseases like yellow fever and malaria.

ANSWER: **Mosquitoes** (accept **Culicidae**)

(18) One of these bodies was studied and visited by NASA's *Deep Impact* probe. The inner portion of these bodies is known as the nucleus, and these bodies were notably modeled by Fred Whipple who referred to them as "dirty snowballs." A coma typically follows, for the point, what icy objects that can sometimes also produce a tail, one of which is named for Edmond Halley?

ANSWER: **Comets**

(19) These phenomena are measured by instruments such as a mareograph. These phenomena exceed their usual levels during storm surges. Spring and neap are two types of this phenomenon, extreme examples of which affect bodies of water such as the Bay of Fundy. For the point, identify this phenomenon, the rise and fall of sea levels.

ANSWER: **Tides** (accept **Tidal** Forces; accept Spring **Tide**; accept Neap **Tide**; accept **Storm Surge** before mentioned)

(20) The case *Diamond v. Chakrabarty* declared that these rights can be applied to living organisms. The World Trade Organization's TRIPS Agreement governs these rights that last for 20 years after their initial claim. For the point, name this type of intellectual property that legally prevents others from unauthorized replication of an invention.

ANSWER: **Patents** (prompt on "Copyright")

(21) One of the largest species of this kind of bird went extinct after Maori settlers killed off its primary food source, the moa. The golden species of this bird is an apex predator, while the most widespread species of this bird in the U.S. preys on fish and is known for its white head feathers. For the point, name this type of large raptor, the bald species of which was named the national bird of America.

ANSWER: **Eagles**

(22) This scientist cited the anonymous text *Vestiges* to reject the theory of transmutation. This scientist's most famous work inspired his cousin Francis Galton to invent eugenics. This scientist studied finches in the Galápagos Islands while sailing on the HMS *Beagle*. For the point, name this scientist who proposed natural selection and wrote *On the Origin of Species*.

ANSWER: Charles **Darwin**

(23) Maya examples of the triadic forms of these structures include El Mirador in Guatemala. These structures are called frustums when their top portion is removed. The "step" type of these structures include the ziggurats of ancient Mesopotamia. I.M. Pei constructed one of these structures using glass and steel for the Louvre. For the point, identify this shape exemplified by a Great structure in Giza.

ANSWER: **Pyramids** (accept Triadic **Pyramid**; accept Step **Pyramids**; accept Great **Pyramid** of Giza; prompt on "Ziggurat" before mentioned)

(24) The Cassini and Huygens [[HOY-ghenz]] probes were sent to study this planet and its moons. This planet, the least dense in the solar system, is the farthest from Earth that can be seen without a telescope. This planet's largest moon, Titan, is suggested as a potential location for extraterrestrial life. For the point, name this sixth planet from the sun, noted for its extensive ring system.

ANSWER: **Saturn**

(25) The subaqueous extrusion of this material produces its pillow type. The mafic type of this material has high contents of oxides of magnesium and iron. The Hawaiian words 'a'ā [[AH-ah]] and pahoehoe [[PAH-ho-ee-ho-ee]] describe different types of this material that is stored in underground magma chambers. For the point, identify this material expelled from erupting volcanoes.

ANSWER: **Lava** (accept **Magma** before mentioned; accept Pillow **Lava**; Mafic **Lava**; accept '**A'ā** or **Pahoehoe** before mentioned)

Extra Questions

(1) The ground state of this element is referred to as its triplet form. This element is the second-most prevalent element in the Earth's atmosphere after nitrogen. A molecule containing three atoms of this element is called ozone. For the point, identify this element necessary for human respiration that produces carbon dioxide when expelled.

ANSWER: **Oxygen** (or **O**)

(2) This number is the smallest that is a prime power of a different prime. This is the number of atoms in the valence shell of a main group element. A polygon with this number of sides has internal angles that sum to 1080. This is the number of vertices on a cube, and this is the number of cups in four pints. For the point, identify this number, the square root of 64.

ANSWER: **8**