

## Round 2

### Regulation Tossups

(Tossup 1) Heat is produced by non-shivering thermogenesis in this bodily tissue. An abundance of mitochondria gives a signature "brown" color to one form of this tissue, whose mass in the body is regulated by the hormone leptin. Patients with a BMI score greater than 30 have amassed large amounts of this tissue, which can be surgically removed using liposuction. For the point, name this tissue that accumulates in people with obesity.

Answer: **fat tissue** (or adipose tissue)

(Tossup 2) Arsenic gives off this color when burned in a flame test. This is the color of hydrated copper sulfate salts, as well as a pigment containing iron and cyanide that is named for the country Prussia. Titrations often use a bromothymol derivative of this color as an indicator. Litmus paper turns this color in solutions with a pH greater than 7, which act as bases. For the point, name this color of cobalt, as well as the natural dye indigo.

Answer: **blue**

(Tossup 3) Rope, cone, and wedge are classifications of these weather phenomena. Waterspouts are these phenomena that can occur over lakes and oceans. Dust devils are types of these phenomena. These phenomena are rated 0 to 5 on the Enhanced Fujita scale, which uses damage indicators. An "alley" of these features is located in the Great Plains. For the point, name these rotating funnel-shaped columns of air.

Answer: **tornadoes** (accept twisters)

(Tossup 4) Haworth projections and Fischer projections are used as a 2-dimensional representation of these compounds. Amylose and amylopectin are types of these compounds. Biological polymerization of these compounds is accomplished with glycosidic bonds. The lac operon allows bacteria to metabolize lactose, one of these compounds. For the point, name this group of compounds that includes fructose and glucose.

Answer: **sugars** (or carbohydrates or (poly/mono)saccharides)

(Tossup 5) The Le Verrier [luh vuhREE ay] ring of this astronomical body might be shepherded by Despina. A storm on this planet is called the Scooter. Voyager 2 discovered Proteus, one of this body's satellites. This planet has a great dark spot, and its largest moon, which notably has a retrograde orbit, is Triton. For the point, name this eighth planet from the sun, more massive than Uranus which is named for the Roman god of the sea.

Answer: **Neptune**

(Tossup 6) Nathaniel Hodges recounts being one of the only physicians to stay in this city during a 17th-century plague in Loimologia. Henry Whitehead assisted John Snow in mapping the outbreak of cholera to a contaminated pump on Broad Street in this city. The royal court of Charles II fled this city for Oxford during this city's "Great Plague." For the point, name this English capital, home of the Royal Observatory.

Answer: **London**

(Tossup 7) Verapamil is one "channel blocker" of this ion. At fertilization, there is a spike in the concentration of this ion in the cytosol, known as its namesake "bomb" or "wave." This element's plus 2 cation [CAT-i-ON] is stored in the sarcoplasmic reticulum of muscle cells. Sunlight helps the body produce vitamin D, which helps absorb this element that is also found in milk. For the point, name this element that is found in bones and has symbol Ca.

Answer: **calcium** (prompt on Ca)

(Tossup 8) Asymmetric elongated protrusions called yardangs form in these biomes. Sailing stones may trace tracks in playas of this biome. Geologic features in these ecosystems include ergs and their namesake "pavement." These biomes are often found near mountains because they can be created by the rain-shadow effect. For the point, name these dry biomes that generally contain lots of sand, exemplified by the Sahara.

Answer: **deserts**

(Tossup 9) John Turkevich developed a method for synthesizing nanoparticles of this element. Aqua regia is principally used to make an electrolyte for the Wohlwill process by dissolving this metal. Ernest Rutherford discovered the nucleus by firing alpha particles at a foil made of this element. Iron pyrite is sometimes called the "fool's" version of this element. For the point, name this shiny yellow metal, commonly awarded to first place finishers ahead of silver.

Answer: **gold** (prompt on Au)

(Tossup 10) This structure is above the Moho discontinuity. Cratons are the strongest portions of this layer. The outer part of the lithosphere is made up of this layer, which comes in oceanic and continental forms. It is generated at mid-ocean ridges and destroyed at subduction zones. It is primarily composed of silica and oxygen. Resting atop the mantle, For the point, name this outermost layer of the Earth's surface.

Answer: **crust**

(Tossup 11) Their reproductive cycles can be described as lytic or lysogenic. Reverse transcriptase is used by the "retro" type of these entities to create DNA. They are surrounded by a protein coat called a capsid. Infections caused by these pathogens cannot be treated with antibiotics, and thus they are often countered with vaccines. Smallpox and measles are caused by, For the point, which pathogens, examples of which include HIV and influenza?

Answer: **viruses**

(Tossup 12) One type of these materials that exist only at very low temperatures is named for Nevill Mott. These materials have a large bandgap. Capacitors often consist of two parallel plates surrounding one of them called a dielectric. Below their breakdown voltage, these materials have very high resistivity. Glass and rubber are examples of, For the point, what materials that block the flow of electric current, which are contrasted with conductors?

Answer: electrical **insulators**

(Tossup 13) For buffer systems, this quantity is calculated using the Henderson-Hasselbalch equation. Phenolphthalein [FEE noll THAY leen] changes from clear to pink as this quantity increases. Mixing compounds with a large difference in this value can lead to a neutralization reaction. It is defined as the negative logarithm of a solution's proton concentration. For the point, name this scale that goes from 1 to 14 with low values for acids and high values for bases.

Answer: **pH**

(Tossup 14) Gelo II is the addressee of this man's treatise The Sand Reckoner, where this polymath attempts to count the grains of sand in the world. This man constructed a heat ray to sink the Roman navy during the prolonged siege. He wrote the work On Floating Bodies. For the point, name this Syracusan scientist who shouted "Eureka" after discovering a namesake buoyancy principle.

Answer: **Archimedes**

(Tossup 15) Bragg's law is used to quantify the scattering of this form of light in a form of crystallography. Tesla generated images using this radiation of a human foot in 1896 though credit for their invention is given to W.C. Roentgen. This phenomenon lies between the more energetic gamma rays and less energetic UV rays on the electromagnetic spectrum. For the point, name this form of radiation that can penetrate through soft tissue to image bone.

Answer: **x-rays** (accept x-radiation)

(Tossup 16) This mathematician names a constant defined as the limiting difference between the harmonic series and natural logarithm with Masceroni. This mathematician is often credited with discovering graph theory to solve the Seven Bridges of Königsberg problem. This man discovered the number which serves as the base of the natural logarithm. For the point, name this Swiss mathematician from the 18th century who names the transcendental number  $e$ .

Answer: Leonhard **Euler**

(Tossup 17) Organisms in this kingdom form an often mutualistic relationship with plants in mycorrhizae [my KUH rize ay]. Members of this kingdom have hyphae that make up their mycelium. Algae form a symbiotic relationship with them in lichen ["Iye ken"]. The death cap is a highly poisonous organism in this kingdom. For the point, name this kingdom of organisms that are primarily decomposers, like molds, yeasts, and mushrooms.

Answer: **fungi** or **fungus**

(Tossup 18) It's not "potential," but an "infinite well" described by this word is the particle in a box model. This is the first word in the molecular geometry of xenon tetrafluoride. To predict genotypes, biologists use the "Punnett" type of this diagram. The numbers described by this word can be expressed as the sum of consecutive triangular numbers. For the point, name this shape that describes numbers like nine and sixteen.

Answer: **squares** (accept infinite square well; accept square planar; accept Punnett square; accept square numbers)

(Tossup 19) Apoplastic transport occurs within this structure. A middle lamella can be found between two of these structures. Beta-lactam antibiotics inhibit the synthesis of this structure. Gram staining distinguishes between different thicknesses of these structures in bacteria. This structure is found in plant and bacterial cells but not animal cells. For the point, name this rigid structure that surrounds cells and is made of cellulose in plants.

Answer: **cell wall**

(Tossup 20) This non-greek letter is used to describe a "pinch" experienced during plasma confinement. A "score" denoted with this letter is an observed value minus the sample mean divided by the sample standard deviation. As opposed to the XY system of humans, male birds have two sex-determining chromosomes denoted by this letter. For the point, name this letter used to denote the third axis on a coordinate plane.

Answer: **z**

(Tossup 21) A mathematical statement named for this shape can be shown by using the Cauchy-Schwarz inequality. A cevian is a line that divides one of these shapes into two parts. The altitudes of this shape meet at the orthocenter, and the interior angles of these shapes sum to 180 degrees. The Pythagorean theorem applies to the right examples of these shapes. Scalene and obtuse are classifications of, for 10 points, what geometric figures with three sides?

Answer: **triangles** (accept specific triangles like "right" triangle or "equilateral" triangle)

(Tossup 22) Products of alternative splicing are sent to this complex which has an A, P, and E site. This complex's subcomponents are produced by the nucleolus. The rough endoplasmic reticulum is distinguished from the smooth ER by the presence of these complexes attached to it. They are present in bacteria and commonly mistaken for organelles despite lacking a membrane. tRNA and mRNA are involved in translation at, For the point, what complexes that manufacture cellular proteins?

Answer: **ribosomes**

(Tossup 23) Andreas Magraff is credited with the discovery of this element by heating calamine ore and carbon in a sealed vessel. This metal is required by the African claw frog's transcription factor IIIa ["three a"] which contains this metal's binding domain referred to as its namesake "finger." Copper is alloyed with this metal to make brass. Supplements of this metal are used to treat symptoms of the common cold. For the point, name this element with atomic symbol Zn.

Answer: **zinc**

(Tossup 24) This element transitions to superfluidity at its lambda point. Georges [JOR jay] Rayet [RAY-uh] detected this element as an unknown yellow spectral line from the sun. Alpha particles are nuclei of this element's most abundant isotope. This is the second-most abundant element in the universe after hydrogen. For the point, name this second-lightest element used in balloons.

Answer: **helium** (prompt on He)

(Tossup 25) Intense pressure, such as meteor impacts, can generate a "shocked" form of this mineral. This mineral is found at the base of the Goldich dissolution series and Bowen's reaction series. This mineral's piezoelectric properties make it important in clocks. Amethyst is a purple variety of this mineral. For the point, name this mineral with a hardness of 7 on the Mohs scale, a silicate with overall formula SiO<sub>2</sub>.

Answer: **quartz**

(Tossup 26) The statistician Ronald Fischer found that this man's results were "shocking" because they were too exact, suggesting that this scientist falsified his ratios. Variations studied by this scientist include yellow, wrinkled, and smooth. This man discovered the Law of Segregation and the Law of Independent Assortment. This scientist coined the terms dominant and recessive to refer to genetic traits. For the point, name this Augustinian monk, the "father of modern genetics," who studied pea plants.

Answer: Gregor **Mendel**

(Tossup 27) This planet may cause a hypothetical phenomenon known as the ashen light. Along with Uranus, this is the only planet in the solar system with a retrograde orbit. This planet's highest point is Maxwell Montes. Due to sulfuric acid in its atmosphere, this planet has the highest surface temperature in the solar system. With the naked-eye, this is the brightest planet in the sky. For the point, name this planet, the second closest to the Sun.

Answer: **Venus**

(Tossup 28) Induction, compression, ignition, and emission are the four strokes of the four-stroke variety of this device. Sadie Carnot developed his namesake cycle for a theoretical one of these devices that takes heat and outputs mechanical work. Rudolf Diesel developed one of these devices that mechanically compresses air in the cylinder to ignite the fuel. For the point, name this device that converts energy into a mechanical form found prominently under the hoods of cars.

Answer: **engines** (or motor)

(Tossup 29) This man devised a model of the solar system using Platonic solids, an idea he wrote about in *Mysterium Cosmographicum*. One law formulated by this man has a proportionality of  $G \times M$  over four pi squared, that law relates the cube of the semimajor axis to the orbital period. This man used observations by Tycho Brahe to formulate his law that all planetary orbits are ellipses. For the point, name this astronomer who devised three laws of planetary motion.

Answer: Johannes **Kepler**

(Tossup 30) A quantity symbolized  $U$  is subtracted from this other quantity to give the Lagrangian, and  $U$  is added to this quantity to give the Hamiltonian. This quantity for an object is equal to momentum squared over two times the mass. Generally, this quantity equals one-half times mass times the velocity squared. A ball rolling down a hill has, For the point, what energy of moving objects which is contrasted with potential energy?

Answer: **kinetic energy** (prompt on energy)

## Extra

(Tossup 31) This is the first word in the name of a crystal-like material that exists in either smectic or nematic phases. These substances exhibit capillary action, and this phase is bypassed by substances that undergo deposition and sublimation. Nitrogen turns from a gas to this phase at negative 196 degrees Celsius. For the point, name this state of matter formed when substances melt.

Answer: **liquid** (accept liquid crystals)

(Tossup 32) One scientist from this country names a reaction that couples an organoboron with a halide. Two mathematicians from this country name an elliptic curve theorem used to prove Fermat's last theorem. An underground structure located in this country provided the first evidence for neutrinos originating from the sun, as well as their oscillations; that experiment is Super-Kamiokande. For the point, name this country of Taniyama, Shimura, and Akira Suzuki.

Answer: **Japan**