

Round 1

Regulation Tossups

(1) The growth of these organisms can be increased via aeration in a phenomenon called the Pasteur effect. In a metabolic process, these organisms convert sugar into a 2-carbon compound, resulting in their use in the production of bioethanol. The phylum Ascomycota contains this organism's *S. cerevisiae* type that is named for brewers. For the point, name these single-celled microorganic fungi necessary for fermentation and commonly used in baking.

ANSWER: **Yeast** (accept Brewer's **Yeast**)

(2) This quantity is proportional to temperature, but inversely proportional to pressure from the combined gas law. This quantity has a value of 22.4 for one mole of an ideal gas. For the point, name this quantity describing the space occupied by a substance, usually expressed in liters.

ANSWER: **Volume**

(3) These expressions are classified as analytic because they are a finite power series. The Fundamental Theorem of Algebra states that every one of these expressions with degree "n" and complex coefficients has "n" complex roots. For the point, name these expressions that contain coefficients and variables, like "x squared minus one."

ANSWER: **Polynomials** (prompt on "Quadratic" by asking "What larger class do quadratics belong to?")

(4) AFFF and CAFS are compounds used for this task that are usually manifested as foam. Portable devices used for this task most commonly contain compressed CO₂ and dry ABC powder. Extinguishers and water are used in, for the point, what task commonly performed by first responders using a hose?

ANSWER: **Fire Fighting** (accept any answer regarding **Putting Out** or **Extinguishing Fires**)

(5) Low levels of factors VIII [[EIGHT]] and IX [[NINE]] typify this disorder that primarily comes in A and B types. A set of symptoms similar to this disorder is known as von Willebrand disease. Sufferers of this disorder are unable to perform a biological process that requires the interaction of fibrin and platelets. For the point, identify this genetic disorder associated with the Romanov family that results in the blood's inability to clot.

ANSWER: **Hemophilia** (accept **Hemophilia A** or **Hemophilia B** before mentioned)

(6) Impurities from this element's "pig" form are removed in the Bessemer process. With cobalt and nickel, this element is naturally ferromagnetic, and this element oxidizes to form a red compound called rust. For the point, name this transition metal with symbol Fe [[F-E]] that alloys with carbon to make steel.

ANSWER: **Iron** (accept **Fe** before mentioned)

(7) This desert is the alleged home of a "Death Worm," which may be the Tartar sand boa. This desert was formed by the rain shadow of the Tibetan Plateau, and it is the native habitat of the Bactrian camel. China constructed a "Green Wall" to contain, for the point, what large Asian desert that covers southern Mongolia?

ANSWER: **Gobi** Desert

(8) The strong form of this concept is refuted in the Chinese room argument. A test for this concept evaluating indistinguishability from human conversation is named for Alan Turing. For the point, name this concept that refers to a computer's ability to think like a human brain.

ANSWER: **Artificial Intelligence** (or **A.I.**)

(9) The genome of this organism was completely sequenced in 2000, and the white-eyed mutation of this organism is often studied in introductory biology classes. This organism was used by Thomas Hunt Morgan to study heredity and sex-linked traits. For the point, name this common insect and model organism.

ANSWER: **Fruit Fly** (or **Drosophila melanogaster**)

(10) Use of this material must be halved by 2030 to meet the criteria of the Paris Agreement. Satellites like Sentinel-5P monitor this material's sulfur dioxide output, and varieties of this material include lignite and anthracite. For the point, name this fuel source composed mostly of solid carbon.

ANSWER: **Coal** (accept **Lignite** or **Anthracite** before mentioned; prompt on "Fossil Fuels")

(11) Two of these particles behave as a boson in a Cooper pair, and these particles name the most stable flavor of neutrino. These particles and stable leptons possess antiparticles called positrons, and these particles are the quanta and force carrier of the electromagnetic force. For the point, name these negatively charged particles that orbit the nucleus of an atom.

ANSWER: **Electrons**

(12) A specific class of these compounds is named for Gilbert Lewis. The Bronsted-Lowry definition of these compounds involves the donation of hydrogen ions in solution. The acetic form of these compounds is found in vinegar. For the point, name these compounds which exhibit a pH below 7, contrasted with bases.

ANSWER: **Acids** (accept Super**acid**; accept Lewis **Acid**)

(13) This molecule is rapidly copied in the lab technique PCR, and the enzyme helicase splits this molecule before it is replicated by a polymerase. This molecule contains adenine, cytosine, guanine, and thymine. For the point, name this double-helix structure that contains genetic information.

ANSWER: **DNA** (accept **Deoxyribonucleic Acid**)

(14) This man's namesake transformation converts between coordinate systems that differ only by relative motion. This scientist was the first to formalize the concept of inertia, and he is famous for making discoveries that supported Copernicus's heliocentric theory. For the point, name this Italian polymath who improved the telescope.

ANSWER: **Galileo Galilei** (accept either; accept **Galilean** Invariance; accept **Galilean** Transformation; accept **Galilean** Moons)

(15) The warming effect of this natural phenomenon has increased the biodiversity of areas like Nantucket. The Antilles Current connects with this phenomenon at the intersection of the Florida Strait. For the point, name this warm ocean current that originates in the southern US and makes its way along the eastern coastline through the North Atlantic.

ANSWER: **Gulf Stream**

(16) Primary examples of these compounds are oxidized to aldehydes and carboxylic acids, while secondary types are oxidized to ketones. These compounds are characterized by the presence of a hydroxyl group. Methanol and ethanol are the simplest members of, for the point, what class of compounds found in beer and liquor?

ANSWER: **Alcohols** (accept Primary **Alcohol** or Secondary **Alcohol**; prompt on specific molecules like "Methanol" or "Ethanol;" prompt on "Hydroxyl")

(17) Fat is stored in the subcutaneous layer of this organ that makes up the integumentary system. Exocrine glands secrete an oily substance called sebum to lubricate this organ, which is the largest in the human body. The dermis and epidermis are layers of, for the point, what organ affected by eczema and acne?

ANSWER: **Skin** (accept **Dermis** before mentioned; accept **Epidermis** before mentioned)

(18) These cells are coated with a myelin sheath, which allows them to quickly transmit action potentials. These cells are split into "sensory" and "motor" types and separated from each other by synapses. For the point, name these signal-transmitting nerve cells, the basic units of the nervous system.

ANSWER: **Neurons** (accept **Nerve Cells** before mentioned)

(19) The *Cassini-Huygens* [[HOY-genz]] space-research mission discovered many of this body's physical features, including the String of Pearls and Great White Spot. The second-largest moon of this planet is called Rhea, and other moons of this planet include Enceladus [[en-keh-LAH-duss]]. Titan is the largest moon of, for the point, what sixth planet from the Sun, located between Jupiter and Uranus?

ANSWER: **Saturn**

(20) The core collapse type of these events occurs when stars accumulate extremely massive iron cores. Thermal runaways can be seen in the type 1a form of these events that occur when a white dwarf surpasses the Chandrasekhar [[shon-druh-SAY-karr]] limit. For the point, name these extraordinary large stellar explosions.

ANSWER: **Supernova** (do not accept or prompt on just "Nova")

(21) Eye movement desensitization and reprocessing is a therapy developed for this condition that was formerly known as shell shock. Flashbacks and recurring nightmares are characteristic symptoms of this condition. For the point, name this psychological condition caused by experiencing horrible events, commonly associated with soldiers.

ANSWER: **PTSD** (or **Post-traumatic Stress Disorder**; prompt on "Shell Shock" before mentioned)

(22) Unlike addition, this operation is not commutative for matrices in general. The use of numerous instances of this operation upon one number is called exponentiation. Often thought of as a form of repeated addition, this is, for the point, what operation that when applied to 2 and 3 yields 6?

ANSWER: **Multiplication**

(23) An unnamed ring of this planet parallels the orbit of its moon Galatea. Objects in a one-to-two resonance with this planet are known as "twotinos," and a spinning storm on this planet is known as the Great Dark Spot. Triton is a moon of, for the point, what planet in the solar system, located farthest from the Sun?

ANSWER: **Neptune**

(24) A procedure known as CABG ["Cabbage"] is used to remove blockages in these structures. Most of these structures carry oxygenated blood, and the largest of these structures is the aorta. A person's pulse can be detected by feeling, for the point, what blood vessels that carry blood away from the heart?

ANSWER: **Arteries** (or **Artery**)

(25) One of these devices was codenamed D1 and was deployed at Flers-Courcelette [[FLEHR koor-suh-LET]] in France. The Soviet T-34 type of these devices was first deployed against the invading Germans in World War Two. The Battle of El Alamein debuted one of these devices with a fully rotating gun turret. The M4 Sherman was one type of, for the point, what heavily armored military vehicles?

ANSWER: **Tanks** (accept British **Mark I**; or Male **Tanks**; or T-34 **Tanks**; or M4 Sherman **Tanks**)

(26) These devices can include a light-blocking component called a coronagraph. Protesters on Mauna Kea are trying to prevent the construction of a Thirty-Meter one of these devices. NASA administrator James Webb is a namesake of, for the point, what type of devices, one of which is named for Edwin Hubble?

ANSWER: **Telescopes** (accept Space **Telescopes**; accept James Webb Space **Telescope**; accept Hubble Space **Telescope**)

(27) A paper by this scientist proposed a new calculation for mean squared displacement of particles. That paper on Brownian motion and another on mass-energy equivalence were half of this man's 1905 "Annus Mirabilis." For the point, name this scientist who, in that same year, published explanations of the photoelectric effect and special relativity.

ANSWER: Albert **Einstein**

(28) One form of this element is named after Buckminster Fuller, while another form of this element ranks at the top of the Mohs hardness scale. Graphite is a form of this element, which together with oxygen and hydrogen forms molecules of glucose. For the point, name this element, the fundamental basis of organic molecules and life.

ANSWER: **Carbon** (or **C**)

(29) Subjects with increased resistance to this hormone may be identified via risk factors such as elevated levels of free fatty acids. The effect of this hormone is opposed by glucagon, and this hormone is released by beta cells in the islets of Langerhans of the pancreas. For the point, name this hormone involved in blood sugar modulation, which is often taken by people with type 1 diabetes.

ANSWER: **Insulin**

(30) These animals were hypothesized to be juvenile examples of the *Torosaurus*. Two species of this animal were the *horridus* and *prorsus*, and these animals were first thought to be an extinct type of bison. The *Tyrannosaurus rex* was likely the primary predator of, for the point, what dinosaurs that may have defended themselves with their three horns?

ANSWER: ***Triceratops***

Extra Questions

(1) The earliest estimate of this quantity depended on indirect estimates of the number of particles of latex. Jean Perrin defined this constant, denoted capital N , as the number of atoms in 16 grams of oxygen. For the point, name this constant, approximately 6 times 10 to the 23rd power, that equals the number of particles in a mole.

ANSWER: **Avogadro's** Constant (or **Avogadro's** Number; prompt on "N" before mentioned)

(2) The product of the linear dimension and flow speed is divided by this quantity to give the Reynolds number. This quantity's kinematic form is equal to its dynamic form divided by the density of the fluid. For the point, name this quantity, a measure of a fluid's internal resistance to flow.

ANSWER: **Viscosity**