

Round 3

Regulation Tossups

(1) Mary Anning collected these objects in Lyme Regis. Types of these objects include coprolites, and an arrangement of these objects comprise "Sue" at Chicago's Field Museum. *Iguanodon* and *Diplodocus* were identified after discovering, for the point, what objects dug up by paleontologists?

ANSWER: **Fossils** (accept Dinosaur **Bones**)

(2) The constellation Sagittarius is identified by this number in the Messier catalogue. This number is the smallest even two-digit number whose digits sum to 10. This number is the atomic number of Nickel, as well as the number of days in two fortnights. For the point, identify this number, the product of 4 times 7.

ANSWER: **28**

(3) The positive displacement type of these devices continuously traps and moves small amounts of fluids. The diaphragm type of these devices alternates fluid motion between two chambers separated by a flexible rubber seal. Pressure is reduced in the vacuum type of these devices, and reciprocal examples of these devices power hand-operated wells. For the point, name these devices used to inflate tires.

ANSWER: **Pump** (accept Positive Displacement **Pump**; accept Diaphragm **Pump**; accept Vacuum **Pump**; accept Reciprocating **Pump**; accept Tire **Pump**)

(4) This molecule is silenced by proteins in the Argonaute family. Micro and small interfering variants of this molecule are noncoding, and one type of this molecule links amino acids to form proteins. Ribosomal, messenger, and transfer are types of, for the point, what single-stranded nucleic acid that does not contain deoxyribose?

ANSWER: **RNA** (or **Ribonucleic Acid**; accept **RNA** Interference or **miRNA** or **siRNA** or **microRNA** or **Small Interfering RNA** or **rRNA** or **tRNA** or **mRNA** or **Ribosomal RNA** or **Transfer RNA** or **Messenger RNA**)

(5) A condition affecting this organ is named for physician Norman Barrett. Another condition of this organ can be prevented with H₂ receptor or proton pump inhibitors and by avoiding spicy foods. Stomach acid enters this organ in acid reflux and GERD [[GURD]]. For the point, identify this tubular organ that transports food from the mouth to the stomach.

ANSWER: **Esophagus**

(6) Temperature increases with elevation in this layer of the atmosphere until its upper boundary, where the ozone layer can be found. In this layer of the atmosphere, certain cirrus clouds can occur above the tropopause. For the point, name this atmospheric layer where U2 spy planes have operated for decades and from which the extreme sport athlete Felix Baumgartner jumped and survived.

ANSWER: **Stratosphere**

(7) It's not Aquarius, but a meteor shower named for this constellation is produced by Halley's comet. A feature in this constellation is formed by the stars Alnitak, Alnilam, and Mintaka, and this constellation's brightest stars are Rigel and Betelgeuse. A mythological hunter names, for the point, what constellation with a famous belt?

ANSWER: **Orion**

(8) The cirque and valley-head are types of these formations. Ridges protruding from these formations are called nunataks, and the thermal state of these formations makes them either temperate or polar. These formations move via basal sliding, and their leftover deposits are called eskers. For the point, identify these slow-moving formations of ice.

ANSWER: **Glaciers** (accept Temperate **Glaciers** or Polar **Glaciers**)

(9) One of these animals orbited the Earth aboard Sputnik 2, becoming the first animal in space. These animals were the subject of an experiment in which they developed an association between meat powder and a ringing bell that resulted in their salivation. Ivan Pavlov studied, for the point, what domestic animals that belong to the canine family?

ANSWER: **Dogs** (accept **Canines** or **Canids** before mentioned; accept **Laika**; accept Pavlov's **Dogs**)

(10) This person recorded their best known achievement in the journal *20 Hrs., 40 Min.*. This person is the namesake of the scholarship fund awarded by a women's organization known as the Ninety-Nines. This person was last seen traveling from New Guinea with navigator Fred Noonan. For the point, name this female aviator who disappeared in 1937.

ANSWER: Amelia Mary **Earhart**

(11) Serum is a colorless component of this substance. An inability of the body to perform one process involving this substance can result in hemophilia. Clotting is a process that takes place in, for the point, what substance within the human body composed of cells and plasma that is classified in types such as O negative?

ANSWER: **Blood** (accept **Blood** Clot; accept **Blood** Type)

(12) The boundary between part of this region and its upper neighbor is sometimes named for Keith Bullen or Inge Lehmann. Analysis of seismic waves and the magnetic field have determined the outer portion of this layer is likely a solid ball composed of a nickel-iron alloy. For the point, identify this innermost geologic layer of Earth.

ANSWER: Earth's **Core** (accept Inner **Core**; accept Outer **Core**)

(13) The shell model of this structure predicts islands of stability in isotopes with large magic numbers that have a higher average binding energy. A famous experiment discovered this structure by firing alpha particles at a sheet of gold foil. For the point, name this structure at the center of the atom.

ANSWER: Atomic **Nucleus** (or Atomic **Nuclei**)

(14) This molecule and water are produced in the Sabatier [[sah-bah-TYEH]] process, and this molecule and carbon dioxide are the main components of biogas [[BIO-gas]]. This molecule is the main constituent of natural gas, and it is emitted from volcanoes and swamps. For the point, identify this simplest alkane with formula CH₄.

ANSWER: **Methane** (accept **CH₄** before mentioned)

(15) Instabilities in these objects can become swing-amplified, and these objects may be formed via Lindblad resonances. One type of these objects has a flattened rotation curve and appears in the upper part of the Hubble tuning fork. Spiral, elliptical, and irregular are major types of, for the point, what type of galactic objects exemplified by Andromeda and the Milky Way?

ANSWER: **Galaxy** (or **Galaxies**; accept Andromeda **Galaxy** or Milky Way **Galaxy** before mentioned)

(16) This element's methyl compounds bio-accumulate in fish and other seafood. Atmospheric pressure can be measured in millimeters of this element, and alloys of this element are commonly known as amalgams. Remaining liquid at room temperature this is, for the point, what transition metal that has largely been replaced by colored alcohol in glass thermometers?

ANSWER: **Mercury** (or **Hg**; accept **Mercury** Methyl Compounds; accept Millimeters of **Mercury**)

(17) A form of this process on the planet Venus resulted in an atmosphere of 96% carbon dioxide. The opposite of this process has been observed on Titan, where the moon's surface temperature is reduced by 9 Kelvin. For the point, name this effect by which atmospheric radiation warms the surface of the planet by trapping the sun's heat.

ANSWER: **Greenhouse** Effect

(18) A 1999 mission to study the climate of this body was lost due to a miscommunication regarding Imperial and metric units. Extensive soil tests were performed on this body by the *Viking* landers. The *Spirit* and *Opportunity* rovers transmitted extensive data from, for the point, what fourth planet from the sun?

ANSWER: **Mars**

(19) Neurobiological models of these phenomena include the activation-synthesis, and control is maintained in the lucid type of these phenomena. Sigmund Freud divided these occurrences into manifest and latent content in a book titled for their interpretation. Associated with REM sleep, these are, for the point, what nighttime occurrences, terrifying varieties of which are called nightmares?

ANSWER: **Dreams** (accept **Nightmares** before read)

(20) Archimedes explained this natural phenomenon using the center of mass of a triangle. Vitruvius explained this naturally occurring phenomenon by publishing *De Architectura*, and Galileo Galilei apocryphally demonstrated this natural phenomenon by dropping two balls from the same height. For the point, name this natural force that explains why objects fall.

ANSWER: **Gravity** (or **Gravitation**; or **G**)

(21) One of these products invented by Alexey Pajitnov is sometimes used to disrupt visual memory. Congressional hearings concerning these objects questioned whether they cause children to engage in violence, and these products are given ratings based on their content by the ESRB. For the point, name these entertainment products produced by companies such as EA and Nintendo.

ANSWER: **Video Games** (prompt on "Games")

(22) One of these structures was subject to a stress test at its opening by a team of elephants led by P.T. Barnum. A poorly designed one of these structures nicknamed Galloping Gertie collapsed due to failure caused by resonance. Cantilever and suspension, are types of, for the point, what structures that Roman engineers designed to span the Danube and Tiber Rivers?

ANSWER: **Bridges** (accept Cantilevered **Bridges**; accept Suspension **Bridges**; accept Brooklyn **Bridge**; accept Tacoma Narrows **Bridge**)

(23) This planet's orbit marks the outer limit of the asteroid belt. An Italian scientist discovered four moons of this planet in the 17th century, including Ganymede and Europa. Galileo built a telescope to observe this planet, which is known for its Great Red Spot. For the point, name this fifth planet from the sun, the largest in the solar system.

ANSWER: **Jupiter**

(24) German shelters called schneekragens [[SHNEEK-rah-gins]] guard against these phenomena by offering safe corridors. Terrain, weather, and packing of a certain material are part of a three-part model of this phenomenon that can occur in slab and powder types. Loud noises and other disturbances can trigger, for the point, what destructive natural phenomenon also called a snow slide?

ANSWER: **Avalanches** (accept Slab **Avalanche**; accept Powder Snow **Avalanche**; accept **Snow Slide** before mentioned)

(25) This class of animals vocalizes through the use of a syrinx which can produce especially variable sounds in mynahs and conures. Members of this class of animals have four-chambered hearts and, though warm-blooded, are descended from dinosaurs. For the point, name this general class of vertebrates whose bones are typically hollow to enable flight.

ANSWER: **Birds** (or **Avians**; or **Aves**; accept Mynah **Birds**; accept Conure **Birds**)

Extra Questions

(1) This quantity is the time integral of the impulse, and Coulomb's law states that one type of this quantity between two objects is inversely proportional to their distance squared. This vector quantity is equal to mass times acceleration, according to Newton's second law of motion. For the point, name this vector quantity, examples of which include pushes and pulls.

ANSWER: **Force** (or **F**; accept **Gravity** or **Gravitational** force; accept **Electrostatic** force; prompt on "electric")

(2) An object known as SN 1604 is named after this man, who described it in his *De Stella Nova. Astronomiae Pars Optica* is a work by this scientist who wrote an essay to Ferdinand II in which he proposed a force-based theory of lunar motion. For the point, name this polymath who published three laws of planetary motion.

ANSWER: Johannes **Kepler**