

Round 2

Regulation

(Tossup 1) When this phenomenon is present at different frequencies, the difference is detected as a beat. Because this phenomenon cannot travel in a vacuum, it is absent in outer space. Mach 1 is the speed of this phenomenon, a longitudinal wave whose strength is measured in decibels. For the point, name this phenomenon that causes sonic booms.

ANSWER: sound

(Tossup 2) This planet was the focus of the Viking program which revealed the existence of “Chaos terrain.” A volcano over two times as high as Mount Everest, the Olympus Mons, is located on this planet. In 2011, NASA landed the Curiosity rover on this planet to search for traces of ancient water. For the point, name this 4th planet from the sun, whose iron-rich soil gives its surface a red color.

ANSWER: Mars

(Tossup 3) Argillaceous minerals are defined as containing this material whose minerals include chlorite and smectite. This material is on the bottom of the Wentworth scale as it is finer than all material including silt. Terracotta is made from refining this material. For the point, name this natural material that is often glazed and fired in a kiln in pottery making.

ANSWER: clay

(Tossup 4) Alfred Nobel’s blasting caps used a fulminate of this element. Amalgams are alloys containing this metal, whose height fluctuations inside a tube were used to measure air pressure in the first barometer. The FDA recommends that young children and pregnant women avoid eating swordfish due to high levels of this toxic metal. Name this liquid metal with symbol Hg.

ANSWER: mercury (accept Hg before it is read)

(Tossup 5) The speed of these substances can be measured by their turnover number, and they are “homogeneous” if they are in the same phase as the reactants. Iron serves as one of these substances in the Haber-Bosch process. Enzymes are biological examples of these compounds that lower activation energy of a reaction. For the point, name these compounds that speed up a reaction without being consumed.

ANSWER: catalysts (prompt on enzymes before it is read)

(Tossup 6) If these structures have no petiole, they are called sessile. The C4 pathway isolates carbon fixation to bundle sheath cells in these structures, though most other plants utilize the palisade and spongy mesophyll in them. A waxy cuticle coats these structures, which exchange gas through pores called stomata. These primary sites of photosynthesis change color and fall due to seasonal changes. For the point, name these flat plant structures.

ANSWER: leaf (accept leaves)

(Tossup 7) Wires with non-zero values for this quantity produce a magnetic field. The same amount of this quantity must enter and leave a junction according to Kirchhoff's law for this quantity. By Ohm's Law, voltage over resistance is equal to this quantity. This quantity is symbolized I and is measured in Amperes. For the point, name this quantity that measures the flow of electric charge per second, and can either be alternating or direct.

ANSWER: electric current (accept alternating current; accept direct current)

(Tossup 8) For two substances, the mixture with the lowest value for this temperature is called eutectic. Certain substances undergo crystallization after reaching this temperature. One property of this temperature for a substance is that it is lowered when another substance is added. For water, this temperature, at which it transitions to ice, is 0 degrees Celsius. For the point, name this temperature at which a substance changes from a solid to a liquid.

ANSWER: melting point (accept freezing point)

(Tossup 9) This scientist names a conjecture about packing spheres into the most space possible. He's not Newton, but this scientist's second law states that an object sweeps out equal area in equal time. This astronomer worked under Tycho [TIKE-oh] Brahe and proposed the planets move in ellipses in his book the Epitome of Copernican Astronomy. For the point, name this 17th century German astronomer who names three laws of planetary motion.

ANSWER: Johannes Kepler

(Tossup 10) Lactic acid is transported from muscles to this organ to produce glucose in the Cori cycle. The falciform ligament divides this organ into left and right lobes. This largest internal organ in the body produces a digestive fluid that is stored in the gallbladder. Excessive alcohol consumption can cause cirrhosis, or scarring, of this organ. For the point, name this organ that produces bile, detoxifies blood, and becomes inflamed in hepatitis.

ANSWER: liver

(Tossup 11) A gas equal to one of this unit at standard temperature and pressure will fill up 22.4 liters of volume. This SI unit is equivalent to the number of atoms in 12 grams of carbon 12. Avagadro's number relates one of this unit to 6.022 times 10 to the 23rd molecules or atoms. For the point, name this unit in chemistry which shares its name with a small burrowing mammal.

ANSWER: mole

(Tossup 12) The Smithsonian's National Museum of American History displayed a giant one of these devices until 1998 that was named for Jean Foucault – who first used this device to demonstrate the rotation of the earth. The double variety of this device displays chaotic motion. In 1656, Christiaan Huygens invented a clock that kept time with this device. For the point, name this device, a suspended mass that's used in Grandfather clocks.

ANSWER: pendulum (or Foucault's pendulum; accept pendulum clock; prompt on clock)

(Tossup 13) This organ has sebaceous glands that secrete fluid, and vitiligo affects this organ. Vitamin D is synthesized when UV light hits this organ. One type of cancer of this structure is known as melanoma. The outer layer of this structure is the epidermis, and this is the largest organ in the body. For the point, name this protective layer that covers the body and is harmed in sunburns.

ANSWER: skin

(Tossup 14) Robert Mulliken devised a scheme for calculating this quantity that takes the arithmetic mean of the first ionization energy and electron affinity. Polar bonds occur when the difference in this quantity between bonded elements is greater than 0.8. Linus Pauling developed the idea of this quantity, and gave fluorine the highest value for it. For the point, name this quantity that represents an atom's tendency to attract electrons.

ANSWER: electronegativity

(Tossup 15) Synthesis of this molecule by HMG-CoA reductase is blocked by drugs called statins. This molecule's four-ring structure helps it regulate membrane fluidity. This molecule is transported through the body by HDL and LDL, often called its "good" and "bad" types. High levels of it can cause atherosclerosis, or hardening of the arteries. Cardiovascular disease has been linked to high levels of, for the point, what waxy, fat-like substance?

ANSWER: cholesterol

(Tossup 16) This location is home to manganese nodules, collections of iron and rock often found on abyssal plains. Alternately charged layers of polarized rock in this location serve as evidence for the reversal of Earth's magnetic poles. This region expands due to its namesake spreading which explains continental drift. For the point, name this location, the bottom of Earth's oceans.

ANSWER: seafloor (accept seabed; accept ocean floor; accept abyssal plains before it is read; prompt on ocean; prompt on sea)

(Tossup 17) These structures can contain alternating light and dark areas called ogives which are formed as part of their seasonal movement. Fjords are created by these objects when they cut through bedrock. Icebergs break off of these larger masses in a process called calving. For the point, name these large, moving bodies of ice.

ANSWER: glaciers

(Tossup 18) In an effect named for this device, gravity causes the bending of light. A formula describing these objects simplifies when these devices are very thick or thin. That formula contains terms for two radii, thickness, and focal length. These objects produce real and virtual images depending on whether they are concave or convex. For the point, name these optical devices that focus light to a single point.

ANSWER: lens [accept word forms like lenses and lensing]

(Tossup 19) Problem 48 of the Rhind papyrus computes the area of a field in this shape, while Book 3 of Euclid's Elements and Plato's Seventh Letter explain the properties of this shape. The Lindemann-Weierstrass theorem made the task of squaring this shape impossible. The sagitta is a line segment drawn between the midpoint of a chord and arc of this shape. For the point, name this shape whose area is π multiplied by its radius squared.

ANSWER: circles

(Tossup 20) The energy of this reaction can be measured by a Bomb calorimeter. Types of this reaction include smoldering and spontaneous. This exothermic reaction produces carbon dioxide and water from oxygen and a hydrocarbon fuel source, and they occur commonly in diesel engines. For the point, name this reaction of blowing stuff up that commonly results in flames.

ANSWER: combustion reaction

(Tossup 21) Excess protein in the urine of a person with this condition may indicate pre-eclampsia. Chorionic villus sampling and amniocentesis are used to detect genetic disorders during this condition. People with this condition are prescribed folic acid to prevent neural tube defects, and may also visit an obstetrician to receive an ultrasound. For the point, name this condition that lasts around 9 months and concludes with childbirth.

ANSWER: pregnancy (accept pregnant; accept gestation; accept obvious equivalents)

(Tossup 22) These structures can form out of demineralized pockets known as incipient lesions. It's not trauma-related, but gutta serena and a crown are used in a surgery to fill a deep one of these structures. An untreated one of these structures can require root canal surgery. Build up of plaque can cause the formation of these structures in the enamel. For the point, name these holes that form from tooth decay that dentists fill.

ANSWER: cavity (accept cavities; accept dental caries; prompt on "tooth decay"; prompt on "holes" in the teeth)

(Tossup 23) The energy from these objects can hypothetically be captured using a Dyson sphere. Limits on the formation of these objects include the Tolman-Oppenheimer-Volkoff limit and the Chandrasekhar limit. Extremely dense ones are made up of neutrons, and these objects are plotted on a Hertzsprung-Russell diagram. Some of them explode into highly luminous supernovas when they die. For the point, name these astral balls of burning gas that include the Sun.

ANSWER: stars (accept neutron stars; prompt on "white dwarf")

(Tossup 24) Pedology is the study of this substance whose profile is made up by the O, A, B, C, and R horizons. Along with dust and rocks, regolith is made up of this substance. Desertification results in the loss of nutrition in this material. Clay, silt and sand make up this substance which is formed from bedrock. Dirt is the common name of, for the point, what substance which plants grow in?

ANSWER: soil (or regolith until mentioned; accept dirt until mentioned)

(Tossup 25) Duchenne and Becker name a dystrophy of this tissue which operates by sliding myosin and actin filaments. One form of this tissue has a structural unit known as sarcomeres. This tissue has smooth and cardiac types, while its skeletal type is connected to bone through tendons. Lactic acid is secreted in this tissue during a workout. For the point, name this tissue that makes up the deltoids, trapezius, and biceps.

ANSWER: muscle tissue (accept skeletal muscles)

(Tossup 26) The North American population of ferns spiked more than 70% following this event. The eruption of the Deccan Traps may have contributed to this event. A global layer of iridium and the Chicxulub crater in the Yucatan are both linked to this event, which the ancestors of birds survived. For the point, name this event from 65 million years ago that saw the end of species like Triceratops and Tyrannosaurus.

ANSWER: extinction of the dinosaurs (accept Cretaceous-Paleogene extinction, K-Pg extinction, Cretaceous-Tertiary extinction, K-T extinction)

(Tossup 27) This element is consumed in the CNO cycle of nuclear fusion in stars. Interactions named for this element hold together DNA strands. Isotopes of this element include tritium and deuterium. Interactions between this element and elements like nitrogen and oxygen cause this element's namesake "bonds." pH stands for the "power of this element". For the point, name this lightest element with atomic number 1 and symbol H.

ANSWER: hydrogen (accept H before it is read)

(Tossup 28) The behavior of these substances are governed by a set of relations called the Navier-Stokes equations. In these substances a change in speed is caused by an opposite change in pressure according to Bernoulli's law. When one of these substances has a high viscosity, it tends to resist motion. Oobleck and shampoo are two examples of the non-Newtonian form of this type of substance. For the point, name this type of substance with no fixed shape, exemplified by oil and water.

ANSWER: fluid

(Tossup 29) An enlarged sesamoid [sess-ah-moyd] bone gives this animal a pseudo-thumb which may help it feed. This animal's scientific name, *Ailuropoda melanoleuca* [ail-oo-roh-poh-da mel-an-oh-lu-kah] incorrectly identifies this animal as a black-and-white cat. This animal is a member of the order carnivora, but its diet is almost exclusively bamboo. For the point, identify this endangered animal, today considered a distant relative of bears which is native to the mountains of central China.

ANSWER: Giant panda

(Tossup 30) This process can occur chronically in Klein-Levin syndrome. Cataplexy is a common symptom associated with a disease in which this process occurs suddenly. Release of melatonin causes the onset of this process, and apnea occurs when breathing is disrupted during this process. This process can happen without warning in people suffering from narcolepsy. For the point, name this process during which dreams occur.

ANSWER: sleep (accept REM; prompt on dreaming)

Replacements

(Tossup 31) In 1979, Jimmy Carter installed 32 of these devices for the White House that were uninstalled in 1986 by Ronald Reagan. Recent dust storms on Mars have covered these devices on the Opportunity rover. These devices create electricity through the photovoltaic effect and account for 1.3% of global power. For the point, name these devices that convert light from the sun into usable energy.

ANSWER: photovoltaic solar panels (accept solar cells; accept photovoltaic cells; prompt on cells)

(Tossup 32) Urbain Le Verrier hypothesized that irregularities in the orbit of this planet were due to a yet undiscovered planet he called Vulcan. The MESSANGER probe orbited this planet for 4 years before entering the final phase of its mission and crashing to the surface. This planet completes an orbit around the sun every 88 days, less than half the time it takes Venus to do the same. For the point, name this closest planet to the sun.

ANSWER: Mercury