Round 3

Bee Round 3

(1) Ralph von Frese suggests that an impact at Wilkes Land in Antarctica may have contributed to this event. The acanthodian, a spiny shark, was a type of jawed fish affected by this event. The percentage of seafloor-suspended marine life and the biodiversity of insects greatly decreased after this event, which occurred roughly 250 million years ago. For the point, name this event that wiped out over 90% of species on Earth, the largest extinction event in history, which defines the beginning of the Triassic Period.

ANSWER: Great **Permian Extinction** (accept the **Great Dying**; accept the **P-T**r extinction; prompt on **P** extinction; accept descriptions of the **extinction between the Permian and Triassic periods** and equivalents thereof)

(2) This method, which is optimized on the stack using its "tail" form, can be used to solve the Towers of Hanoi problem. Expressing n factorial using this method is done as "n times n minus 1 factorial," rather than the usual "listing all the multiplied numbers" method. The Fibonacci sequence can be described by this term, and in computer science, functions that call themselves are described by this term. For the point, give this term for a mathematical object defined in terms of itself.

ANSWER: **recursion** (accept word forms; accept descriptions of the **recursive** method)

(3) The anatomical snuffbox is a depression found in this structure. The median nerve is the only nerve that passes through a passage within this structure. The 8 bones of this structure, including the trapezium and the scaphoid, are located between the ulna and radius on one side and the metacarpals on the other. The thumb extends from this structure, which is the location of the carpal tunnel. For the point, name this joint between the arm and the hand.

ANSWER: **wrist** (accept **carpus** before "carpal" is said; prompt on arm before said)

(4) An example of this technique conducted on colloids is known as its "zeta potential" type. The redox type of this process sometimes looks for the presence of iodine to mark the endpoint, which is an approximation of the equivalence point. Phenolphthalein [fee-nol-thay-leen] is a common indicator in this process, which uses a buret to add drops of a solution to a flask. For the point, name this chemistry technique that finds the concentration of a solution.

ANSWER: **titration**

(5) John Wheeler's "delayed choice" experiment asks whether this experiment's apparatus was "noticed" by the light passing through it. This experiment refuted Newton's corpuscular theory by showing dark bands, formed by destructive interference that wouldn't be possible if light acted as a particle. For the point, name this 1801 experiment, named for the two-holed plate it used and its deviser, Thomas Young.

ANSWER: Young's **double slit** experiment (accept **Young**'s experiment before his name is read)

(6) One of these events is said to have caused an increased presence of microcystin in the seawater shellfish of California. The hydrological type of these events has affected the Aral Sea. Slash-and-burn agriculture can worsen the effects of these periods. Plants with waxy surfaces are able to tolerate these periods, which, in Australia, can lead to bushfires. For the point, name these periods marked by lack of precipitation.

ANSWER: **drought**s

(7) This quantity is equal to the sum of the hyperbolic sine of 1 and the hyperbolic cosine of 1. This number is the base of the exponent in the formula for continuously-compounded interest, and it is the base of the natural logarithm. The letter that represents this number was chosen to honor the man who showed it to be irrational, Leonhard Euler [oiler]. For the point, name this number approximately equal to 2.718.

ANSWER: **e** (accept **Euler's number** or **Euler's constant** before his name is said)

(8) A member of this phylum was used by Hodgkin and Huxley to come up with the formula for action potential. Odontophores and radulae are feeding organs unique to this phylum, which includes the purple dye-producing murex and the extinct ammonite. This phylum contains the gastropods and cephalopods, the latter of which are able to produce ink. For the point, name this animal phylum that includes mussels, squids, and snails.

ANSWER: **mollusc**a (or **mollusc**s)

(9) A species of this mammal named for James Weddell is the southernmost-ranging mammal on Earth. Members of this mammal's *Otariidae* family can walk on all fours and are contrasted with the earless, "true" type of these mammals. Penguins are hunted by the "leopard" type of these mammals, whose poor eyesight is partly compensated for by the sensitivity of their whiskers. Pinnipeds are, for the point, what marine mammals, including sea lions?

ANSWER: **seal**s (accept **pinniped**s before read)

(10) The discovery of this object, has recently been joined by a smaller but similar object to the southwest, is often credited to Robert Hooke in 1664. This object is located 22 degrees south of its host's equator, rotates counterclockwise about once every six Earth days, and is the size of two or three Earths. For the point, name this large, dark storm on Jupiter, named for its color.

ANSWER: Jupiter's **Great Red Spot**

(11) This law is sometimes co-named after the priest Edme Mariotte, and its usual namesake wrote a book arguing against the Aristotelian theory of the elements titled *The Skeptical Chymist* ["chemist"]. The number of moles and temperature are held constant in this law, which thus involves the other two variables in the ideal gas law. For the point, name this law of chemistry, named for an Anglo-Irishman, that describes the inverse relationship between pressure and volume.

ANSWER: **Boyle**'s Law (accept **Boyle**-Mariotte law)

(12) A transposition is one of these objects that is its own inverse, and a derangement is one of these with no fixed points. When drawing from a bag of n balls, one of these values counts the ways to draw k distinct balls. A formula for these values is n factorial divided by n minus k factorial, otherwise known as "n P k. For the point, name these rearrangements of elements in which order matters, contrasted with combinations.

ANSWER: **permutation**s

(13) A type of noise that affects materials with this property is named for Heinrich Barkhausen. The Ising model represents this phenomenon, which affects materials that can undergo hysteresis. Cobalt displays this "permanent" phenomenon, which is lost above the Curie temperature, at which point it becomes paramagnetic instead. For the point, name this form of magnetism commonly shown by the element it is named after, iron.

ANSWER: **ferromagnet**ism (prompt on magnetism before mentioned)

(14) Heron of Alexandria theorized an early version of this device that he named the *aeolipile* [ay-oh-li-pile]. Thomas Newcomen designed an early one of these devices to help prevent the flooding of mines. The man who developed horsepower designed one of these in 1782 that used a condenser and a piston. Boilers provided the central gas to these devices in early trains. James Watt developed an efficient version of, for the point, what type of engine that runs on gaseous water?

ANSWER: **steam engine** (accept **steam turbine**; prompt on engine until mentioned)

(15) Sydney Chapman names a cycle that regenerates this compound, which is measured in Dobson units. Polar stratospheric clouds have led to decreasing levels of this compound above Antarctica. Chlorofluorocarbons have also led to the depletion of this compound. The Sun's UV radiation is absorbed by, for the point, what compound with chemical formula O_3, found in a "layer" around the Earth?

ANSWER: **ozone** (layer) (accept O_3 before read; accept **trioxygen**)

(16) This class of compounds was named by Casimir Funk as a portmanteau involving an NH_2 group. One of these compounds with a cobalt center is needed to avoid pernicious anemia. Niacin, retinol, and thiamine are examples of these compounds; another example, ascorbic acid, is found in high quantities in citrus fruits and prevents scurvy. For the point, name these nutrients classified into A, C, and many B types.

ANSWER: **vitamin**s

(17) This constellation is home to the closest open star cluster to the Sun, the Hyades cluster. A remnant of a supernova that was observed in the year 1054 is found in this constellation. The brightest star in this constellation, Aldebaran, which is the Arabic for "follower," is so named because it appears to follow this constellation's Pleiades star cluster across the sky. For the point, name this constellation that resembles a bull.

ANSWER: **Taurus** (prompt on "bull" before mentioned)

(18)   While collaborating with Aaron Klug, this scientist found that all tobacco mosaic virus particles were of identical length. While working under this scientist, Raymond Gosling took the famous *Photo 51* using X-ray crystallography; that photo, visualizing the "B form" of a certain structure, was given by this scientist to Maurice Wilkins. For the point, name this woman, whose work was co-opted by James Watson and Francis Crick in the discovery of the double helix structure of DNA.

ANSWER: Rosalind Elsie **Franklin**

(19)   For a monatomic ideal gas, this quantity can be calculated by the Sackur-Tetrode equation. Two chambers separated by a door are central to a thought experiment showing that this quantity would decrease over time; that aforementioned "Maxwell's demon" concept violated the Second Law of Thermodynamics, which states that this quantity increases over time. For the point, name this quantity, symbolized S, the measure of the disorder of a system.

ANSWER: **entropy** (accept **S** before mentioned)

(20) "Wildcat" types of these structures are built where little is known geologically about the surrounding area, as was done in Titusville, Pennsylvania. High levels of reservoir pressure in these constructs can lead to "blowout." Offshore platforms provide a space for building these structures, which may be hydraulically fractured, or "fracked," to increase their production of hydrocarbons. For the point, name these structures where a deep hole is drilled in the Earth to find oil or natural gas.

ANSWER: gas and/or oil **well**s

(21)   Dividing Planck's constant by this quantity for a particle gives the de Broglie wavelength. If this quantity for a particle is exactly known, its position can not be known, according to Heisenberg's uncertainty principle. The change in this quantity is symbolized J and is known as impulse. For the point, name this quantity, found for an object by multiplying mass and velocity, that is conserved in all collisions.

ANSWER: linear **momentum**

(22)   The coat of these objects contains the tegmen and the testa. These objects can contain a triploid endosperm and usually one or two cotyledons. The ovule develops into these objects. Gymnosperms and angiosperms are named for having a "naked" or "enclosed" variety of these things. Nuts are hard shells surrounding, for the point, what objects that contain plant embryos and are thus sown by farmers?

ANSWER: **seed**s

(23)   This figure can be constructed through de la Hire's method, by the trammel of Archimedes, or - because this closed shape is defined as the locus of points where the sum of the distances to two points is constant - by pinning the two ends of a piece of string and drawing the string taut with a pen. This conic section has eccentricity less than one, and its two focal points are contained within it. For the point, name this shape that, like an oval, is more elongated than a circle.

ANSWER: **ellipse** (prompt on oval before mentioned)

(24) A ghost town near Beatty, Nevada is named for the abundance of one example of this rocktype called rhyolite. This type of rock is classified as intrusive if it forms below the Earth's surface. Magnesium and iron are heavily concentrated in mafic examples of this rock, such as basalt, while felsic examples include granite. For the point, name this type of rock formed by cooling magma or lava, unlike sedimentary and metamorphic rocks.

ANSWER: **igneous** rocks

(25) The presence of this activity marks the difference between black holes characterized by the Kerr metric and those characterized by the Schwarzschild metric. Galaxies performing this activity differently than what was predicted through mathematics led to the concept of dark matter. Pulsars are neutron stars that perform this activity incredibly fast. The Earth does this action at around a 23.5 degree tilt from the solar plane. For the point, name this action that, for the Earth, has a period of about 24 hours.

ANSWER: **rotation** (accept **spin** or word forms thereof; do not accept or prompt on revolve, revolution, or word forms thereof)

(26) This element and copper are found alongside other functional groups in Gilman's reagent. This element is commonly used as a treatment for sufferers of bipolar disorder. Ions of this element move between electrodes during discharge and charging of a namesake type of battery that, in 2016, caused numerous Samsung Galaxy phones to be recalled due to fire hazard. For the point, name this lightest alkali metal and third-lightest element on the periodic table, whose chemical symbol is Li.

ANSWER: **lithium** (or **Li** before mentioned)

(27) Geological features on this body include five dark spots referred to as the "Brass Knuckles" and a dark region that resembles a whale. Trying to discover this object was the goal of a series of mid-1910s observations by Percival Lowell, but this object was not officially discovered until Clyde Tombaugh did so in 1930. In 2006, this object was controversially reclassified as a dwarf planet. For the point, name this former ninth planet from the sun.

ANSWER: **Pluto**

(28) Trouton's rule predicts that, regardless of this value, a substance's entropy of vaporization will fall in a narrow set of ranges. An ebulliometer can be used to find this value, whose elevation is an important colligative property. On the periodic table, this value is lowest for helium, at roughly 4 Kelvin, while for water, this value is roughly 100 degrees Celsius. For the point, name this temperature at which a liquid becomes a gas.

ANSWER: **boiling point** (accept **vaporization point**; accept temperature for point)

(29) The length of a line segment is equal to the square root of one plus the square of this quantity all times the change in x. This quantity can be computed with a derivative, and is equal to the tangent of the angle between a line and the x-axis. Decreasing functions have a negative value of this quantity, which is symbolized as m in the equation of a line. For the point, name this quantity that measures the steepness that is equal to rise over run.

ANSWER: **slope**

(30) One mole of this molecule can undergo steam reforming to produce one mole of carbon monoxide and pure hydrogen gas. This compound is "trapped" within clathrates in permafrost and the seafloor; climate change thus threatens the release of this gas, which, like carbon dioxide, is a significant greenhouse gas. This compound is the simplest alkane and has chemical formula CH_4. For the point, name this compound, the central component of natural gas, which has one fewer carbon than ethane.

ANSWER: **methane** (accept **CH$_4$** before read)

(31) The sturzstrom type of these events undergoes a particularly large horizontal displacement. This type of mass wasting occurs at very high speeds. Ice can trigger a type of these known as a topple, while heavy rain can trigger mudflows as part of these events. Liquefaction can weaken slope stability, triggering these events on hillsides. For the point, name these events in which the unstable ground falls away.

ANSWER: **landslide**s (accept **landslip**s; prompt on mass wasting before it is said)

(32) These objects can be multiplied if the width of the first matches the height of the second. A square example of these objects with ones along the main diagonal and zeroes everywhere else is called the identity. These objects can be added by taking the sums of their corresponding entries. The formula a d minus b c computes the determinant of one of these objects that has two rows and two columns. For the point, name these rectangular arrays of numbers.

ANSWER: **matrix** (or **matrices**)

(33) A large group of these objects contains the Kirkwood gaps. Jupiter's L4 and L5 Lagrangian points are the home of the Trojan and Greek groups of these objects. NASA's Dawn spacecraft is studying two of these objects: Vesta and the largest one of these objects, Ceres, which is also a dwarf planet. For the point, name these small rocky objects that, between the orbits of Mars and Jupiter, are found in a namesake "belt."

ANSWER: **asteroid**s

(34) Bruce Cork discovered this particle's antiparticle. This particle was discovered using paraffin wax in a 1932 experiment at the Cavendish Laboratory conducted by James Chadwick. This particle consists of one up quark and two down quarks. Carbon-13 is an isotope that contains 7 of these particles. For the point, name these particles with no charge found in the nucleus of the atom with protons.

ANSWER: **neutron**s

(35) The fact a large proportion of patients who have this class of disease have a mutation in the TP53 gene has resulted in that gene being referred to as the "guardian of the genome." Types of this disease include melanoma and leukemia. Metastasis is the "spread" of this disease, which is studied by oncologists. For the point, name this class of disease that involves uncontrolled cell growth, usually starting as a tumor.

ANSWER: **cancer**

Extra Question

Only read if moderator botches a question.

(36) Western blots use antibodies to determine the presence of these compounds. These compounds were shown not to be the molecule for inheritance in the Hershey-Chase experiment. The major classes of these molecules include signaling, enzymatic, and structural. These molecules' structures include beta sheets and alpha helices. The process of translation, which occurs in the ribosomes, produces, for the point, what large biological macromolecules?

ANSWER: **protein**s (prompt on polypeptides)