



1. During embryonic development, these cells undergo axophilic migration. Camillo Golgi created a method for staining these cells. Saltatory conduction occurs between these cells. These cells undergo a depolarization, repolarization, and hyperpolarization of their membrane potential during an action potential. Glia support these cells, which come in "sensory" and "motor" types. For 15 points, name these cells that have axons and dendrites and make up the nervous system.

ANSWER: **neurons** [or motor **neurons**; or sensory **neurons**; or interne**urons**]

190-13-104-05101

BONUS: This is a calculation question. A cookie jar has 10 oatmeal raisin and 10 chocolate chip cookies. If you randomly pick three cookies, what is the probability they are all chocolate chip? Express your answer as a reduced fraction.

ANSWER: **2/19**

003-13-104-0510-11

2. In this novel, Arina, a member of the aristocracy, devotedly believes in superstitions, while the feminist Kukshina plays host to Sitnikov and his two friends. The former lover of Princess X, Paul, questions the upcoming liberation of the serfs, and his brother Nikolai marries Fenechka (fuh-NESH-kuh) at this novel's end. This novel's protagonists are a young student from St. Petersburg and his friend, the first literary nihilist. For 15 points, name this novel about Arkady Kirsanov and Bazarov, written by Ivan Turgenev (tur-GAIN-ev).

ANSWER: ***Fathers and Sons*** [or ***Otcy i Deti***]

192-13-104-05102

BONUS: What kind of blackbody radiation, named for a British physicist, is produced by black holes?

ANSWER: **Hawking** radiation

014-13-104-0510-11

3. A character in this novel tries to make a patchwork violin from a ukelele. That character in this novel, Mick, gets a job at Woolworth's and vows to save up for a piano. In this novel, Mick's little brother, Bubber, shoots Baby Wilson with a BB gun and is found trying to run away to Atlanta. The deaf-mute John Singer's suicide following the death of his friend Antonapoulos shocks the townspeople depicted in this novel. For 15 points, name this novel by Carson McCullers.

ANSWER: ***The Heart Is a Lonely Hunter***

194-13-104-05103

BONUS: This is a 30-second calculation question. A cubic container with side length six feet is partially filled with water. When a cone with height three feet is placed into this cube, the water level rises by pi over four feet. What is the radius of the cone's base?

ANSWER: **three** feet

080-13-104-0510-11

4. A poet from this country wrote a group of poems called *Cradlesongs* in her book *Tenderness: Songs for Children*. Another writer from this country wrote of Clara, who vows to never again speak to her husband Esteban Trueba (troo-EY-buh) after being slapped by him. The authors of *Sonnets of Death* and *House of the Spirits* were from this country. For 15 points, name this South American nation, the home country of the writers Gabriela Mistral, Isabel Allende (eye-EN-day), and Pablo Neruda.

ANSWER: **Chile**

030-13-104-05104

BONUS: Name the contest won in 2013 by Denmark's Emmelie de Forest, in 2009 by Norway's Alexander Ryback, and in 1974 by Sweden's ABBA, who sang "Waterloo".

ANSWER: **Eurovision** Song Contest [or Concours **Eurovision** de la chanson]

153-13-104-0510-11

5. The system described by this set of statements has a conserved quantity called the Laplace-Runge-Lenz vector. One of these statements holds that a body's areal velocity is constant, while another relates the square of the sidereal period to the cube of an ellipse's semimajor axis. Isaac Newton used calculus to rigorously prove these laws, which were based on examinations of data taken by Tycho Brahe. For 15 points, identify this set of three laws, named for a German astronomer, that describe how planets move.

ANSWER: **Kepler's** laws of planetary motion

132-13-104-05105

BONUS: This is a 30-second calculation question. Given the equation cosine squared of x minus one-fourth equals zero, give all possible values for x, in radians, between negative pi over two and three pi over two.

ANSWER: **negative pi over three, pi over three, two pi over three, and four pi over three**

080-13-104-0510-11

6. The third chapter of this novel devolves into three simultaneous conversations, presented completely as dialogue, including a lecture given by the D.H.C. This novel ends by describing the protagonist's feet rotating counterclockwise. Characters in this book are programmed to say "Mending is better than ending" and "Everyone belongs to everybody else." Linda and her Shakespeare-obsessed son encounter Bernard Marx in this novel. For 15 points, name this dystopian novel about John the Savage, written by Aldous Huxley.

ANSWER: **Brave New World**

190-13-104-05106

BONUS: This is a 30-second calculation question. The quadrilateral ABCD is inscribed in a circle. Points B and D are not directly connected by a line segment. If Angle B is twice Angle D, what is the measure of Angle D, in degrees?

ANSWER: **60** degrees

080-13-104-0510-11

7. Brenda Patimkin features in a collection by this author that includes the short stories "Defender of the Faith" and "Esptein." In a novel by this author, Amy Willette is confused with Anne Frank. This author of *Goodbye, Columbus* and *The Ghost Writer* wrote a novel in which Coleman Silk is black but pretends to be white and Jewish. Another of his novels is a monologue by a sex-obsessed neurotic. For 15 points, name this author of *The Human Stain* and *Portnoy's Complaint*.

ANSWER: Philip **Roth**

127-13-104-05107

BONUS: What law states that the pressure of a gas is inversely proportional to the gas's volume?

ANSWER: **Boyle's** law

014-13-104-0510-11

8. This artist's *The Milkmaid of Bordeaux* is one of several works that may be of his companion Leocadia Weiss. This court painter to Charles IV decorated one wall of La Quinta del Sordo, or the Villa of the Deaf, with *Saturn Devouring His Son*, one of the *Black Paintings*. In a painting of the brutality of Napoleon's occupying army, he showed a man in a white shirt with outstretched arms being shot by French troops. For 15 points, name this Spanish artist of *The Third of May, 1808*.

ANSWER: Francisco José de **Goya** y Lucientes

131-13-104-05108

BONUS: Maine and Louisiana are the two U.S. states where some counties feature over 20% of the population as primary speakers of what language?

ANSWER: **French**

019-13-104-0510-11

9. Objects that undergo this process under similar conditions are grouped into "facies" (FAH-sheez). George Barrow defined the chlorite and sillimanite zones at opposite ends of a grading system for this process. Black smokers trigger the hydrothermal variety of this process on the ocean floor. Contact and regional are more common types of this process, which results in gneiss (NICE), schist (SHIST), and slate, when shale, clays, and muds are subject to high temperature and pressure. For 15 points, name this process that transforms limestone, a sedimentary rock, into marble.

ANSWER: **metamorphism** [or word forms]

020-13-104-05109

BONUS: This is a calculation question. Tony and Maria each have exactly 60 coins, each of which is either a quarter or a dime. If Tony has three dollars more than Maria, how many more quarters does he have than she does?

ANSWER: **20**

190-13-104-0510-11

10. The severity of this disease is measured on the EDSS scale. A classic symptom of this disease is Lhermitte's (LARE-meet's) sign. Its treatments includes a random polymer of four amino acids called glatiramer acetate, which shifts the Th1 response to a Th2 response. Oligodendrocytes are lost in this disease, which can be diagnosed by looking for white matter plaques on MRI. For 15 points, name this autoimmune disease which destroys the myelin sheaths surrounding neurons.

ANSWER: **multiple sclerosis** [or **MS**]

048-13-104-05110

BONUS: What layer of the atmosphere lies above the troposphere?

ANSWER: **stratosphere**

014-13-104-0510-11

11. This king's general Sagmandia captured Gao, the capital of a neighboring empire. He employed an architect from Granada named as-Sahili and had the Sankore (sahn-CORE-eh) and Djinguereber (JING-uh-ray-bare) mosques built. Writing twelve years after this man traveled through, al-Umari claimed that his visit was still being talked about in Cairo. He allegedly flooded Cairo's gold market during his extremely lavish hajj. For 15 points, name this fourteenth century ruler who served as the mansa of Mali.

ANSWER: Kankan **Musa** I [or Mansa **Musa**]

023-13-104-05111

BONUS: What term is used to describe the relative liquidity and mobility of the constituents of the lipid bilayer of the plasma membrane?

ANSWER: **fluid mosaic**

014-13-104-0510-11

12. One of these two divine characters sent a giant crab named Carcinus (car-KEEN-us) to attack the feet of the other. The Milky Way originated from the breast of one of these two characters after she angrily stopped suckling the other. One of these mythical beings tried to prevent the other's birth by tying up Alcmena's (alk-MEE-nee-z) legs. When that failed, she dispatched two snakes to kill the other of these characters. For 15 points, name both the cow-eyed Greek goddess and the strongman she forced to perform twelve labors.

ANSWER: **Hera** and **Heracles** [or **Juno** and **Hercules**; or **Hera** and **Hercules**; or **Juno** and **Heracles**; any combination of acceptable answers may be given in either order, but do not accept or prompt if only one answer is given]

079-13-104-05112

BONUS: What play written by Edward Albee sees George and Martha treat Nick and Honey to bizarre games like "Humiliate the Host" and "Get the Guests"?

ANSWER: **Who's Afraid of Virginia Woolf?**

227-13-104-0510-11

13. A king of this name attempted to divide his kingdom through the Ordinatio Imperii (or-din-AH-tee-oh imp-AIR-ee-ee). Three sons of that king with this name later split up the kingdom by the Treaty of Verdun. This name was held by a king who was captured in the Battle of Fariskur (FAH-riss-kor) and died in Tunisia after starting a second expedition towards the Holy Land. This name belonged to a monarch who led the Seventh and Eighth Crusades and was the only French king to be canonized. For 15 points, identify this name belonging to a French saint and seventeen other French kings.

ANSWER: **Louis** [or **Louis I**; or **Louis IX**]

023-13-104-05113

BONUS: What ancient civilization's history is divided into an Old Kingdom, Middle Kingdom, and New Kingdom?

ANSWER: **Egypt**

015-13-104-0510-11

14. A method of root-finding named for this word is identical to Newton's method, but is used when no analytical derivative exists for the function. When two of these lines are drawn from a single point to a circle, then the length of the segment times the length of the external segment is constant. The derivative of this function of x equals this function of x times the tangent of x . This word refers to any line that passes through a curve twice, and in a right triangle, this function of an angle equals the hypotenuse divided by the side adjacent to the angle. For 15 points, name this reciprocal of the cosine.

ANSWER: **secant**

190-13-104-05114

BONUS: What Roman emperor created the tetrarchy (TETCH-rahr-kee) by appointing Maximian, Galerius, and Constantius co-emperors?

ANSWER: **Diocletian**

015-13-104-0510-11

15. At constant temperature, this process occurs in a direction that minimizes chemical potential by maximizing entropy. An equation governing this process sets its rate inversely proportional to the square root of molar mass. This process is governed by Fick's Laws and Graham's Law. When it occurs through a semipermeable membrane, it is called osmosis. For 15 points, name this random movement of particles from areas of high concentration to areas of low concentration.

ANSWER: **diffusion** [prompt on **effusion**; prompt on **osmosis** until it is read]

190-13-104-05115

BONUS: What Egyptian goddess sent a serpent to Ra in order to learn about his secret name?

ANSWER: **Isis**

227-13-104-0510-11

16. This character was disowned by his father, but was allowed to return home thanks to the intervention of his beloved younger sister Fan. This man sees two children called Ignorance and Want, and has his possessions sold to Old Joe by his charwoman and laundress. He once had a fiancée named Belle and was employed by the jovial Mr. Fezziwig. After being warned by Jacob Marley, this character begins to treat Bob Cratchit better. For 15 points, name this protagonist of Charles Dickens's novel *A Christmas Carol*.

ANSWER: Ebenezer **Scrooge** [or **Ebenezer** Scrooge]

052-13-104-05116

BONUS: What man, who held power in the Soviet Union from 1985 to 1991, instituted the reform programs of "perestroika" (peh-ress-TROY-kuh) and "glasnost" (GLAZ-nahst)?

ANSWER: Mikhail **Gorbachev**

015-13-104-0510-11

17. This experiment partially contradicted the earlier Hoek (WHO-K) experiment, the results of which had been explained by a dragging coefficient. An early version of this experiment observed a shift of 0.018 fringes. This experiment was modified with an asymmetrical apparatus in the Kennedy-Thorndike experiment. This experiment's apparatus was designed around a half-silvered mirror and perpendicular arms, and rested upon a pool of mercury which rotated. For 15 points, name this experiment conducted at Case Western that disproved the existence of the luminiferous aether.

ANSWER: **Michelson-Morley** experiment

187-13-104-05117

BONUS: What civilization developed a seismograph involving dragons dropping balls in jars and also invented paper?

ANSWER: **China** [or **Chinese** civilization; accept the **Han** dynasty specifically, which is when both of those were made]

020-13-104-0510-11

18. The US Office of Naval Research funded a study at this site, many of whose participants wore mirrored sunglasses to prevent eye contact. In 1916, this institution's employee Lewis Terman released a revision of Alfred Binet's intelligence test. The book *The Lucifer Effect* reflects on a study here, which had to be terminated after "John Wayne" and other guards abused their power. For 15 points, name this university where Philip Zimbardo conducted his infamous "prison experiment."

ANSWER: **Stanford** University

020-13-104-05118

BONUS: This is a 20-second calculation question. What is the angle supplementary to a 125 degree angle?

ANSWER: **55 degrees**

080-13-104-0510-11

19. This instrument was used in jazz by Stephane Grapelli and Stuff Smith. Gustav Holst wrote a double concerto for this instrument for Jelly d'Aranyi and her sister Adila Fachiri. In the nineteenth century, leading players of this instrument included Johannes Brahms's collaborator Joseph Joachim and the virtuoso Niccolò Paganini. For 15 points, name this instrument which Yehudi Menuhin and Itzhak Perlman also play using a shoulder rest and a bow, which is higher pitched than the cello and viola.

ANSWER: **violin**

019-13-104-05119

BONUS: Kitty Genovese's murder was an example of what psychological phenomenon studied by Darley and Latane, in which multiple onlookers tend to do nothing to help someone in trouble?

ANSWER: **bystander** effect

226-13-104-0510-11

20. Several members of this party were implicated in scandals during the "Back to Basics" campaign. A leader of this political party was in power during Black Wednesday, when this party's country was kicked out of the Exchange Rate Mechanism. Michael Haseltine challenged another member of this party for leadership, eight years after that member of this party ordered an intervention in the Falkland Islands. For 15 points, name this British political party headed at different times by David Cameron and Margaret Thatcher, which opposes the Lib Dems and Labour.

ANSWER: **Conservative** party [or **Tories**]

048-13-104-05120

BONUS: What 1813 battle, also known as the Battle of the Nations, pitted Napoleon Bonaparte's alliance against Russia, Austria, Prussia, and Sweden?

ANSWER: Battle of **Leipzig**

015-13-104-0510-11

21. This building was broken into several times by a youth known as "the boy Jones." Unlike similar locations such as Sandringham and Balmoral, it is not owned by an individual but rather the state. The Golden State Coach is located adjacent to this building at the John Nash-designed Royal Mews. During a war, a queen said she was glad this location was bombed because she could "look the East End in the face." The ceremony of "changing the Queen's Life Guard" occurs here. For 15 points, name this palace in London, the residence of the British monarch.

ANSWER: **Buckingham** Palace

052-13-104-05121

BONUS: What early English novelist wrote *Captain Singleton* and *Moll Flanders*?

ANSWER: Daniel **Defoe**

014-13-104-0510-11

22. A cathedral in this city was designed by Konstantin Thon and was started on this city's Sparrow Hills. Dmitry Donskoy led this city when it defeated the Tatars at the Battle of Kulikovo (koo-lee-KOH-voh). This city is home to the largest Orthodox cathedral in the world, the Cathedral of Christ the Savior. Ivan the Terrible allegedly blinded the architect of this city's eight-domed cathedral, built to honor Ivan's conquest of Kazan (kuh-ZON). This city was burned after Napoleon won the Battle of Borodino. For 15 points, name this Russian city, home to St. Basil's Cathedral and the Kremlin.

ANSWER: **Moscow** [or **Moskva**]

186-13-104-05122

BONUS: What rule states that the limit of the ratio of two functions is equal to the ratio of the derivatives of those functions?

ANSWER: **L'Hopital's** (LOW-pea-tahl's) rule

014-13-104-0510-11

23. Reactive oxygen species formed in this organelle can be disproportionated by superoxide dismutase. The malate-aspartate shuttle moves electrons around this organelle. FAD+ (F A D plus) is reduced to FADH₂ (F A D H 2) in this organelle. Bcl-2 controls the release of cytochrome c from this organelle at the start of apoptosis (EY-pop-TOH-siss). This organelle's DNA is inherited maternally. Its matrix is formed by folds of the inner membrane called cristae. For 15 points, name this organelle in which the Krebs cycle and the electron transport chain occur as part of cellular respiration.

ANSWER: **mitochondria** [or **mitochondrion**]

190-13-104-05123

BONUS: This is a calculation question. A point is expressed in polar coordinates as (3, pi), meaning that it is 3 units away from the origin and at an angle of pi radians. What are the Cartesian coordinates of this point?

ANSWER: **(-3,0)**

003-13-104-0510-11

24. This poet asserted, "death is the mother of beauty," in a poem that describes the "green freedom of the cockatoo upon a rug." That poem by this man describes a "casual flock of pigeons" and the "complacencies of the peignoir." In another poem, he wrote of a woman who sings "beyond the genius of the sea." This author of "Sunday Morning" and "The Idea of Order at Key West" wrote the collection *Harmonium*. For 15 points, name this modernist American poet of "The Emperor of Ice-Cream."

ANSWER: Wallace **Stevens**

079-13-104-05124

BONUS: The friction force for an object is proportional to what force that is perpendicular to the surface?

ANSWER: **normal** force

014-13-104-0510-11

25. A large, dark surface on this satellite is called Galileo Regio. The bright regions on this satellite contain grooved terrain thought to be caused by tidal heating, since it consists about equally of ice and rock. This satellite has an iron core that generates a magnetic field, making it the only moon with a magnetosphere. This satellite is in a 1:2:4 orbital resonance with Europa and Io. For 15 points, identify this largest moon in the Solar System and of Jupiter.

ANSWER: **Ganymede**

066-13-104-05125

00--20-0510-11

26. An opera by this composer combines poetry by Muriel Rukeyser, traditional Tewa songs sung by the housemaid Pasqualita, and an aria based on the poem "Batter my heart, three person'd god." A character nicknamed "Rambo" is one of the antagonists in another of his operas, in which Marilyn's husband sings the "Aria of the falling body" after being killed by hijackers. This composer of *Doctor Atomic* included the number "I am the wife of Mao tse-tung" in another opera. For 15 points, name this American composer of *The Death of Klinghoffer* and *Nixon in China*.

ANSWER: John Coolidge **Adams**

025-13-104-05126

00--20-0510-11



27. This building is currently part of a historic site with the nearby Petersen House. Major Henry Rathbone was stabbed in this building by a knife-wielding assailant. Audience members laughed in this building after a line about a "sockdologizing old man-trap" was delivered. During a performance of the comedy *Our American Cousin* in this building, a man shouted "Sic semper tyrannis!" after jumping onto the stage. For 15 points, name this theater in Washington D.C. where John Wilkes Booth assassinated Abraham Lincoln.
ANSWER: **Ford's** Theatre

052-13-104-05127

00--20-0510-11

28. This statement can be derived by applying Gauss's law to a spherical surface. One constant in this law is often rewritten as one over four pi times the permittivity of free space, and dividing it by charge gives the electric field of a point charge. The constant of proportionality for this statement is symbolized k, and its value is equal to nine times ten to the nine. It states that force is proportional to the inverse-square of distance. For 15 points, name this statement that gives the electrostatic force between two charges.
ANSWER: **Coulomb's** law

226-13-104-05128