



1. 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 10 points, name this experiment conducted at Case Western that disproved the existence of the luminiferous aether.

ANSWER: Michelson-Morley experiment

187-13-96-04101

2. This author wrote a play about a Dutch national hero executed under Philip II, *Egmont*. He wrote another play in which the master of Wagner seduces Gretchen, who is executed for drowning her baby. In a novel, this author created a youth who shoots himself over his unrequited love for Albert's wife, Lotte (LAH-tuh). This author of *The Sorrows of Young Werther* wrote a two-part tragedy about a German scholar who makes a deal with the demon Mephistopheles. For 10 points, name this German poet of *Faust*.

ANSWER: Johann Wolfgang von Goethe

080-13-96-04102

3. William Duer was invited to write some of these texts, but his work was found lacking. John Marshall supported using them for interpreting the laws in *McCulloch v. Maryland*. George Clinton attacked these essays under the pen name "Cato." The tenth of them argues against the belief that republics cannot be large, explaining that rival factions will counteract each other. For 10 points, name this series of essays defending the Constitution, written by John Jay, James Madison, and Alexander Hamilton.

ANSWER: the Federalist Papers

121-13-96-04103

4. In one of this man's plays, Roebuck Ramsden and Jack Tanner are made guardians of Ann Whitefield. In another play by this author of *Man and Superman*, the arms manufacturer Andrew Undershaft makes a donation to the Salvation Army. A play by this man was adapted into the musical *My Fair Lady* and centers on Henry Higgins attempting to teach the flower girl Eliza Doolittle to be a proper lady. For 10 points, name this Irish playwright of *Major Barbara* and *Pygmalion*.

ANSWER: George Bernard Shaw

186-13-96-04104

5. Channels that are selective for this substance have an aromatic-arginine filter and were discovered by Peter Agre. Bdelloid (DEH-lloyd) rotifers and tardigrades can enter a cryptobiotic state when this substance is unavailable. A molecule of this substance is released during the formation of a peptide bond, and this substance promotes the formation of lipid bilayers because the tails of phospholipids avoid it but the heads interact with it. For 10 points, name this substance which makes up 53% of the human body and has formula H₂O.

ANSWER: water [or H₂O until it is read]

048-13-96-04105

6. This city's Old Deaf School Park contains a topiary rendering of the painting *Sunday Afternoon on the Island of La Grand Jatte*. The Batelle Memorial Institute is headquartered in this city, whose historic monuments include the Camp Chase Confederate Cemetery and James Thurber's house. Found at the confluence of the Olentangy and Scioto (sai-OH-tuh) Rivers, it is the seat of Franklin County. It is the capital of a state whose other large cities include Dayton and Toledo. For 10 points, name this capital of Ohio.

ANSWER: **Columbus**, Ohio

080-13-96-04106

7. The Tempo program is used to find and model these objects, which are sometimes surrounded by a plerion. An example of these objects in Virgo is surrounded by the first discovered extrasolar planets. A binary example of them was used to indirectly prove the existence of gravitational waves by Hulse and Taylor. Burnell and Hewish named the first discovered one LGM-1 and noted that its emissions were periodic. For 10 points, name these highly magnetized rotating stars that periodically emit radiation.

ANSWER: **pulsars** [or **pulsating stars**; prompt on neutron **stars**]

048-13-96-04107

8. Every entire function can be written as a power series with this property on the complex plane. A complete metric space is one where Cauchy sequences have this property. The Weierstrass M-test can show whether something has the uniform type of this property. Geometric series will always have this property if the common ratio has absolute value between zero and one, and the harmonic series does not possess it. For 10 points, name this opposite of divergence.

ANSWER: **convergence** [or **has a limit**]

121-13-96-04108

9. When given the task of censoring letters, this character signs the names "Washington Irving" or "Irving Washington." He has a brief affair with Nurse Duckett that ends soon after Kid Sampson's death. This character is stalked by "Nately's whore" near the end of the novel, who nearly stabs him to death. After witnessing the death of Snowden, he refuses to go on flying missions and decides to escape Pianosa at the end of the novel in which he appears. For 10 points, name the protagonist of Joseph Heller's *Catch-22*.

ANSWER: John **Yossarian**

140-13-96-04109

10. A crystalline target made of this element was used in the Davisson-Germer experiment. An oxide of this element is reacted with syngas in the first step of the Mond process, which is used to purify this metal. This element is used with cadmium in rechargeable batteries. Like cobalt and iron, this element is ferromagnetic at room temperature. For 10 points, name this element with atomic number 28 and atomic symbol Ni.

ANSWER: **nickel** [or **Ni** until it is read]

189-13-96-04110

11. A roguish hero from this country's literature bores a hole in a wine jug to steal from his abusive blind master. A playwright from this country described the deaths of Leonardo and the Bridegroom in *Blood Wedding*. An iconic character from this country decides to become a knight errant after reading too many books of chivalry, subsequently getting into an unfortunate joust with some windmills. For 10 points, name this setting of *Lazarillo de Tormes* (lah-zah-REE-yoh day TOR-mace) where Miguel de Cervantes penned *Don Quixote*.

ANSWER: **Spain**

080-13-96-04111

12. A city from this modern-day country names a major chord built on the lowered second scale degree. The NBC Symphony Orchestra was established for a conductor from this country. A composer from this country supposedly saved polyphony with a performance of the *Pope Marcellus Mass*. A Baroque composer from this country wrote a set of four violin concerti that depict events such as a thunderstorm and hunting in his *The Four Seasons*. For 10 points, name this country, the setting of Ottorino Respighi's *Pines of Rome*.

ANSWER: **Italy** [or **Italian** Republic; or Repubblica **Italiana**]

140-13-96-04112

13. This river contains a seventy-five-mile stretch of rough rapids dubbed "The Gates of Hell." The central portion of this river's basin is known as the "cuvette" and contains the second-largest rainforest in the world. This river splits off at a point, creating a lake-like area now known as the Malebo Pool. The Lualaba is this river's largest tributary. The cities of Kinshasa and Brazzaville lie on the banks of this river, which lends its name to the countries both of those cities are located in. For 10 points, name this major river of central Africa, the second longest on the continent.

ANSWER: **Congo** River

230-13-96-04113

14. This poem's third section declares that this poem's dedicatee "will split the heavens of Long Island and resurrect your living human Jesus from the superhuman tomb." The second part of this poem describes a character who is "the crossbone soulless jailhouse and Congress of sorrows" named Moloch. This poem declares "Carl Solomon! I'm with you in Rockland" and starts by declaring that "I saw the best minds of my generation destroyed by madness." For 10 points, name this poem by Allen Ginsberg.

ANSWER: **Howl**

186-13-96-04114

15. This man's secretary of state James Byrnes was the recipient of George Kennan's "Long Telegram." He fired Secretary of Commerce Henry Wallace for Wallace's pro-Soviet beliefs on foreign policy. This man ran against Wallace for President when Wallace was with the Progressive Party, in the same year that dissidents from his party nominated Strom Thurmond for the "Dixiecrat" ticket. As President, he sent troops to Korea and approved dropping the atomic bomb. For 10 points, name this successor of Franklin Roosevelt.

ANSWER: Harry S. **Truman**

121-13-96-04115



1A. What nineteenth-century American poet wrote "To a Waterfowl" and "Thanatopsis?"

ANSWER: William Cullen **Bryant**

1B. In what German board game do players try to get ten Victory Points by acquiring sheep, wheat, wood, brick, and ore?

ANSWER: *The **Settlers of Catan***

2A. What type of star, which is composed of electron-degenerate matter, has an upper mass bound described by the Chandrasekhar (chohn-druh-shay-KAR) limit?

ANSWER: **white dwarfs**

2B. What Naiad was turned into a laurel tree while being pursued by Apollo?

ANSWER: **Daphne**

3A. This is a 20-second calculation question. A school brings six players to a quizbowl tournament. How many different ways are there to pick four players to play in a given round?

ANSWER: **15**

3B. This is a 20-second calculation question. You invest 10 dollars at one percent interest, compounded continuously. Rounded to the nearest dollar, how much money will you have after one hundred years?

ANSWER: **\$27**

4A. What Cavalier poet instructed, "Gather ye rosebuds, while ye may," in his "To the Virgins, to Make Much of Time"?

ANSWER: Robert **Herrick**

4B. What French architect built the Villa Savoye and laid out the Five Points of Architecture in a famous treatise?

ANSWER: Le **Corbusier**

5A. What Showtime network TV show follows a Miami serial killer who abides by the Code of Harry?

ANSWER: **Dexter**

5B. What Indian novelist earned a *fatwa* from Ayatollah Khomeini for writing *The Satanic Verses*?

ANSWER: Salman **Rushdie**

6A. At what 480 BCE battle did three hundred Spartans led by King Leonidas hold off a larger Persian army?

ANSWER: Battle of **Thermopylae**

6B. What name is given to the heterogeneous sediment deposited by glaciers that covers structures like moraines?

ANSWER: **till**

7A. What theorem states that for any integer n greater than 2, no three integers can satisfy the equation $a^n + b^n = c^n$?

ANSWER: **Fermat's last** theorem

7B. What American painter painted *Automat* and *Nighthawks*?

ANSWER: Edward **Hopper**

8A. What German-American anthropologist taught Edward Sapir and Margaret Mead at Columbia University?

ANSWER: Franz **Boas**

8B. What Mesoamerican civilization led by Montezuma was crushed by the conquistador Hernan Cortes?

ANSWER: **Aztecs**

9A. This is a 30-second calculation question. A dartboard has radius 8 inches, and the inner bullseye has radius of one-half an inch. If a dart strikes the dartboard, what is the probability that it hits the bullseye?

ANSWER: **1/256**

9B. This is a 30-second calculation question. If angle theta is in quadrant II and sine theta is two over the square root of 29, what is sine of two theta?

ANSWER: **-20/29**

10A. What composer's forty-first and final symphony in C major is nicknamed the "Jupiter?"

ANSWER: Wolfgang Amadeus **Mozart**

10B. 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**



1. These entities do not perform any work on an isolated charge, and the divergence of its strength is always zero. Maxwell found that changing electric fields can generate one of these, and the force on a particle moving through one of these entities is proportional to the cross product of its velocity and this entity's strength. They can also be generated by electric currents, and their strength is measured in Gausses or Teslas. For 10 points, identify this type of field that deflects compass needles.

ANSWER: **magnetic** field [or **B**-field or **H**-field]

226-13-96-04117

2. In one of this man's novels, Gordon Comstock returns to his old job at an ad agency after willingly reducing himself to poverty. In an essay by this man, he wrote that modern political literature is "largely the defense of the indefensible." In addition to penning *Keep the Aspidistra Flying* and "Politics and the English Language," this man wrote a novel in which O'Brien betrays Winston Smith in a country dominated by Big Brother. For 10 points, name this British author of *Nineteen Eighty-Four* and *Animal Farm*.

ANSWER: George **Orwell** [or Eric **Blair**]

030-13-96-04118

3. This element's sulfide can build up on the inside of electronics in a phenomenon called "whiskering". Electrum is an alloy of gold and this element. A test that distinguishes aldehydes from ketones uses a nitrate of this element dissolved in ammonia, called Tollens's reagent. This transition metal, which has the lowest electrical resistivity of any element, is below copper and above gold on the periodic table. For 10 points, name this precious metal which forms an alloy with copper named sterling, an element with atomic symbol Ag.

ANSWER: **silver** [or **Ag** until it is read]

239-13-96-04119

4. In February 2010, this man declared his state was in fiscal emergency and on the same day eliminated the Department of the Public Advocate. On election day 2013, this man won re-election over Democratic challenger Barbara Buono. In 2012, he drew criticism from his own party after visiting areas affected by Hurricane Sandy with Barack Obama. In January 2014, he was accused of conspiring to create traffic jams on the George Washington Bridge as retribution against Fort Lee Mayor Mark Sokolich. For 10 points, name this current governor of New Jersey.

ANSWER: Chris **Christie**

225-13-96-04120

5. Invariants named for these constructs are true after every time they are executed. A type of them whose name is prefixed with "do" checks the termination condition at the end, rather than the beginning. One can go to the beginning of one of them with the "continue" command, or leave one entirely with the "break" command. These constructs come in "while" and "for" types. For 10 points, name these repeating pieces of code, an "infinite" one of which will cause a program to run forever.

ANSWER: **loops** [or specific answers, such as **for loops** or **while loops**]

132-13-96-04121

6. Many angiosperms arose as a result of a polyploidy-based type of this process. Niles Eldredge and Stephen Jay Gould proposed that this process happens over brief time periods in punctuated equilibrium. The most common form of this process occurs when a group of organisms becomes geographically isolated and undergoes genetic divergence compared to a parent population; that is its allopatric type. For 10 points, identify this term for the process by which new species arise.

ANSWER: **speciation** [or obvious equivalents, such as the creation of **new species**, until "new species arise" is read; prompt on **anagenesis**; prompt on **cladogenesis**; prompt on **genetic drift**; prompt on **natural selection**; prompt on **evolution**]

066-13-96-04122

7. This man founded the all-female music group called the Moranbong Band. He is the dedicatee of the song "Onwards Toward the Final Victory." This man has attempted to erase the past of his wife, a former singer in the Unhasu Orchestra, and his former bodyguard revealed the existence of more than a dozen of this man's private homes, including Ryongsong Residence. This world leader notoriously purged his own uncle, Jang Sung-taek, and the first American he ever met may have been Dennis Rodman. For 10 points, name this Supreme Leader of North Korea.

ANSWER: **Kim Jong-un** [prompt on **Kim**]

052-13-96-04123

8. In January 2011, Harvey Updike called in to a radio show to claim he poisoned this university's Toomer's Corner Oaks. Chris Davis returned a kick more than a hundred yards to give this university a win in the 2013 Iron Bowl. This university got a late lead on a Tre Mason run during a 2014 bowl game, but gave up a touchdown with thirteen seconds left to a team led by Jameis (JAY-mis) Winston. This university won the 2011 BCS title with Cam Newton. For 10 points, name this university that lost in the 2014 title game to Florida State and has an in-state rivalry with Alabama.

ANSWER: **Auburn** University [prompt on **Tigers**]

023-13-96-04124

9. This god disguises himself as Gagnrathr (GAG-in-roth-er) to engage in a riddling contest with Vafthruthnir (vaf-THROOF-neer). While pretending to be Bolverk (BUL-verk), he stole the mead of poetry from Baugi (BOW-gee). In the *Voluspa*, (vuh-LUSS-puh) a seer tells him that at Ragnarok, he will be swallowed by the wolf Fenrir (FEN-reer). This god hanged himself from Yggdrasil (IG-druh-sil) for nine days to learn the runes, and put one of his eyes in Mimir's (MIM-eerz) well in exchange for wisdom. For 10 points, name this husband of Frigg, father of Thor, and chief Norse god.

ANSWER: **Odin**

121-13-96-04125

10. In a play by this author, a dramatic cold snap freezes Excelsior, New Jersey, where the Antrobus family owns a mammoth. This author's play *The Matchmaker* provides the basis for the musical *Hello, Dolly!* At the end of his best-known play, Emily relives her twelfth birthday after addressing her fellow ghosts in a cemetery. In that play, the Stage Manager comments on the marriage of George Gibbs and Emily Webb in Grover's Corners. For 10 points, name this American playwright of *Our Town*.

ANSWER: Thornton **Wilder**

080-13-96-04126

11. A character in this opera tells of how he was asked to play violin to a pet parrot until the parrot died. Another character tells of her love for flowers following the aria "che gelida manina" (kay JAH-lee-duh mah-NEE-nuh). Two characters in this opera sing of their love for each other in "O soave fanciulla" (oh soo-AH-vay fohn-CHOO-luh). The aria "quando me'n v'o" is sung while Musetta dances a waltz to Marcello in this opera, which ends with Rodolfo weeping as Mimi dies of consumption. For 10 points, name this opera by Giacomo Puccini set in the poor quarters of Paris.

ANSWER: *La **boheme***

140-13-96-04127

12. The Zulu words "ummese" (oo-MEH-seh) and "igotshwa" (ee-GOT-shwuh) can both be translated as this object in English. A French idiom for a confused person literally translates as "a hen that has found" this item. Though Dutch and Danish have a similar word for this object as English, derived from Proto-Germanic, the High German languages call it a "messer." This item is a "couteau" in French and a "cuchillo" (coo-CHEE-yoh) in Spanish. In prison slang, this item may be called a "shank" or a "shiv." For 10 points, identify this object used to eat food or stab someone.

ANSWER: a **knife**

019-13-96-04128

13. A Glu-104-Asp mutation in one enzyme in this pathway causes a rare chronic hemolytic anemia and cardiomyopathy. An isomerase in this pathway is one of the few catalytically perfect enzymes. The first enzyme in this pathway is hexokinase. This process begins with an investment phase and ends with a payoff phase, which uses substrate-level phosphorylation to generate a net of two ATP. For 10 points, name this process that generates a pair of pyruvate molecules by splitting a monosaccharide.

ANSWER: **glycolysis** [or **Embden-Meyerhof**-Parnas pathway]

048-13-96-04129

14. Dennis Macdonald holds that the story of this man is an imitation of the episode in which Odysseus defeats the suitors. In John 18, this character is called by the word "lestes," (LESS-teez) meaning "bandit" or "revolutionary." In Mark and Luke, he is said to have been involved in the riot against the plan to plant Roman standards on the Temple Mount, and in Matthew, he is simply called a "notorious prisoner." The chant of a crowd to "give us" this man is the origin of the "Jewish deicide" (DAY-uh-side) belief. For 10 points, name this criminal released instead of Jesus.

ANSWER: **Barabbas**

019-13-96-04130

15. This city's Augarten park contains two half-finished anti-aircraft towers too solid to be safely demolished. For many years, the world's tallest Ferris wheel was in the park called the Prater in its district of Leopoldstadt. When this city's second through ninth districts were added, the old city walls were replaced by the road called the Ringstrasse. The Schönbrunn Palace was the summer residence for this city's Habsburg monarchs. For 10 points, name this capital of Austria.

ANSWER: **Vienna**, Austria [or **Wien**, Österreich]

121-13-96-04131



1. Howard Jarvis successfully advocated for an amendment to this state's constitution that limited the maximum level of property taxes. Over sixty percent of voters supported that ballot initiative here, which was known as Proposition 13. A man who promised to make the "welfare bums" work defeated Pat Brown for the governorship here in 1966. Brown won its 1962 election running against Richard Nixon, and his son Jerry is the current governor of this state. For 10 points, name this state, where Ronald Reagan was governor in the 1960s.

ANSWER: California

121-13-96-04132

2. One example of this genre addressed to "Vera" was written by Vladimir Nabokov and originally referred to the mother of the Muses. Another book in this genre describes how the main character was sexually abused by her mother's boyfriend Mr. Freeman and then helped out of a period of silence by Bertha Flowers after moving back to Stamps, Arkansas. For 10 points, name this genre that includes *Speak*, *Memory* and Maya Angelou's *I Know Why the Caged Bird Sings*, which both describe the authors's lives.

ANSWER: autobiography [or autobiographies; or memoirs]

023-13-96-04133

3. In the Debye (DEH-buy) model, specific heat is proportional to temperature raised to this power. A compound containing this many oxygen atoms is broken down via a radical mechanism by CFCs. Bent molecules have one electron lone pair and this many atoms. This type of s p hybridization is exhibited by methane. It is the number of valence electrons for aluminum and boron. This many hydrogens are bonded with a phosphate ion to form phosphoric acid. For 10 points, identify this number of oxygen atoms in ozone.

ANSWER: three

189-13-96-04134

4. During this battle, the Ninth Corps took three hours to get across the Lower Bridge, which was subsequently called the Burnside Bridge. This battle was shortly preceded by both the Battle of South Mountain and Stonewall Jackson's capture of Harpers Ferry. The outcome of this battle allowed for the issuing of the Emancipation Proclamation and stopped the advance of the Confederate army into Maryland. For 10 points, name this 1862 Civil War battle that was a Union victory and the single bloodiest day of the war.

ANSWER: Battle of Antietam [or Battle of Sharpsburg]

023-13-96-04135

5. The removal of these proteins by apheresis is the treatment for Guillain–Barré (GHEE-yahn BAR-ay) syndrome. These proteins are the subject of the Kabat numbering scheme, and their function mostly depends on their CDR3 regions. These proteins are separated into isotypes by their constant regions, consist of two heavy and two light chains, and get their variable regions from VDJ recombination. These proteins are secreted by plasma cells. For 10 points, name these Y-shaped proteins that are secreted by B-cells and which bind to antigens.

ANSWER: antibodies [or immunoglobulins]

048-13-96-04136

This is a calculation question. The cosine of an angle equals three-fourths. If the angle lies in Quadrant IV, what is the angle's sine?

ANSWER: **negative square root of 7 over 4** [or **negative root 7 divided by 4**; or **negative one-fourth times the square root of 7**]

What British monarch presided over the British presence in the Crimean War during her sixty-three year reign?

ANSWER: Queen **Victoria**