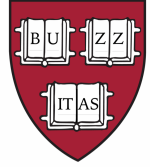


Harvard Fall Tournament IX

Edited by Will Holub-Moorman and Raynor Kuang

Questions by Will Holub-Moorman, Raynor Kuang, Sriram Pendyala, Robert Chu, Mark Arildsen, Catherine Wu, Roger Jin, and Vimal Konduri



Round 11

Tossups

1. **One king of this name introduced the notion of a jury of twelve men through his Assize of Clarendon. The third French king of this name was elected King of Poland, and in that role he established Poland as an elective monarchy. The fifth Holy Roman Emperor of this name ended the Investiture Controversy by signing the Concordat of (*) Worms, while his predecessor with this name knelt in the snow for three days at Canossa before meeting Pope Alexander II to reverse an excommunication. The fourth French king of this name gave protection to Protestants with the Edict of Nantes. For 10 points, give this name of an English king who established the Church of England and was married six times.**

ANSWER: Henry

2. **In *U.S. v. Lopez*, the Supreme Court ruled that Congress couldn't use its Commerce Clause powers to restrict these things from certain zones. These things were the subject of the cases *US v. Miller* and *McDonald v. Chicago*. While holding one of these things, a speaker noted that a potential Al Gore administration could pry it from his "cold, dead (*) hands." The permanently disabled Press Secretary James Brady names a 1993 law mandating background checks for the purchase of these things. For 10 points, name these things, which the NRA claims should be subject to few restrictions under the Second Amendment.**

ANSWER: guns [accept firearms; accept more specific answers like handguns or rifles, prompt on "arms"]

3. **This country's former intelligence chief Vladimiro Montesinos fled after the revelation of video evidence of his corruption in 2000. Chan Chan, a Chimor ruin, can be found near Trujillo in this country's northwest. Victor Raul Haya de la Torre founded this country's APRA party. Nevado Mismi in this country is the furthest source of the (*) Amazon River, which is formed at the junction of the Ucayali and Marañon Rivers in this country. In 2009, this country's former president Alberto Fujimori was convicted of aiding Grupo Colina death squads against Shining Path guerrillas. For 10 points, name this South American country with capital at Lima.**

ANSWER: Republic of Peru [accept República del Perú]

4. **In one work by this author, a character concludes that Chantilly the cobbler was not tall enough to play the role of Xerxes after running into a fruiterer. In another work by this author, a character leaves behind a snuff box in order to come back and replace an object owned by "Minister D--" with a duplicate. In another appearance, that character created by this author determines that an (*) orangutan was responsible for slitting a woman's throat and choking her daughter. For 10 points, name this author who wrote about the detective C. Auguste Dupin in his stories "The Purloined Letter" and "The Murders in the Rue Morgue," and also penned "The Tell-Tale Heart."**

ANSWER: Edgar Allen Poe

5. This letter indexed with either a 1, 2, or 3, is used to represent 2-by-2 complex matrices that have a determinant of -1 and that square to form the identity. Those matrices represented by this letter satisfy the commutation relations of spin and are the Pauli matrices. This letter denotes the proportionality constant in a law giving the intensity of a perfect blackbody; that law is the (*) Stefan-Boltzmann constant. This Greek letter is usually chosen to represent surface charge density and surface tension. Five-"this letter" represents the level of experimental significance at which a result is generally accepted, since this letter also denotes standard deviation. For 10 points, name this Greek letter whose upper case is the summation operator.

ANSWER: lowercase **sigma** [all the examples before "for 10 points" are lowercase, but accept uppercase as well]

6. In one encounter with reporters, this artist described Michelangelo's work as overly muscular and as "beefsteak run amok." A large oak sculpture called *The King of Kings* was intended for an Indian "Temple of Meditation" in India that this artist never completed. This artist created a work consisting of a stone table surrounded by twelve hourglass seats at (*) Targu Jiu that sits alongside a work consisting of seventeen iron rhomboids stacked on top of each other. This sculptor is best known for a series of marble and bronze sculptures that attempt to capture the flight of the title animal. For 10 points, name this Romanian sculptor of *Endless Column* and *Bird in Space*.

ANSWER: Constantin **Brancusi**

7. A holocaust memorial in this city is shaped like a ship's prow and features 200,000 glass crystals in an underground passage. This city's tallest hill features a white-domed basilica finished at the outset of World War I and is dedicated to the Sacred Heart of Jesus. Renzo Piano designed a museum in this city with brightly colored (*) pipes on its outside. Another museum in this home of Montmartre is housed in an abandoned Beaux Arts railway station, while a third features a large glass pyramid at its entrance that was designed by I. M. Pei. For 10 points, name this location of the Musee d'Orsay, the Pompidou Center, and the Louvre.

ANSWER: **Paris**

8. One character in this work slices off a woman's nose and ears after she tries to seduce his brother. In a metafictional twist at the end of this work, the main character of this work recognizes his twin sons when they perform a version of this work for him at a festival. Most readings of this work begin with its fifth book, "The Beautiful Book," in which a character turns into a giant and leaps onto an (*) island in a rescue attempt. The protagonist of this work is exiled for fourteen years, and his wife is kidnapped by a figure disguised as a golden deer. For 10 points, name this epic centering on the eighth avatar of Vishnu and his wife, Sita, a work by Valmiki.

ANSWER: The **Ramayana**

9. This country's "Dark Ages" occurred between a sack by the Ayutthaya Kingdom and its becoming a protectorate in 1867. A political regime in this country killed many members of its population who owned glasses, as part of its anti-intellectual policies. The first king of this country's golden age empire was Jayavarman II, while its first constitutional monarch was (*) Norodom Sihanouk. One government of this country declared a "Year Zero" and was led by a man who called himself "brother number one"; that government of this country perpetrated a series of massacres in this country's "killing fields." For 10 points, name this country formerly led by Pol Pot and the Khmer Rouge.

ANSWER: Kingdom of **Cambodia** [accept Preăh Réachéanachâk **Kâmpŭchéa**; prompt on "Khmer Empire" or "Khmer Rouge"]

10. In one appearance, this character describes a trial in the afterlife in which both the judges and participants are naked. In another appearance, this character describes four types of divine madness and compares the soul to two winged horses and their charioteer. This character claims to have been taught “the philosophy of (*) love” by the priestess Diotima, and also convinces a friend that the laws of his city prevent him from escaping from his prison cell. For 10 points, name this character central to *Gorgias*, *Phaedrus*, and *Crito*, all of which are among his namesake “dialogues” written by his student Plato.

ANSWER: Socrates

11. These events are largely categorized by the presence or lack of hydrogen lines and silicon lines in their spectra. High-z examples of these events were used by Schmidt *et al* to show the acceleration of the universe’s expansion. At intermediate-to-late times, the luminosity of these events is dominated by the radioactive decay of nickel-56 into iron-56. The most common type of these events is caused by the accretion of matter (*) by a white dwarf until its mass surpasses the Chandrasekhar limit; that is the type Ia variety. The last directly observed one originating in the Milky Way was seen by Johannes Kepler in 1604, and these events can briefly outshine entire galaxies. For 10 points, name these stellar explosions.

ANSWER: supernovas [accept specific types]

12. This body’s OLAF office was created to combat corruption following the resignation of the Santer Committee. This body is governed by a set of laws known as the *acquis*, and can issue legal acts called “directives.” A predecessor to this body was first headed by Jean Monnet, was proposed by the (*) Schuman Declaration, and created a single market for coal and steel. The Schengen Agreement guaranteed free movement between members of this organization, which was created by the Treaty of Maastricht in 1992. For 10 points, name this group of 28 countries, many of whose members use the Euro.

ANSWER: European Union

13. This scientist names waves that balance the Coriolis force against a topographic boundary or waveguide. The coefficient for a process named by this scientist is equal to the partial derivative of temperature with respect to pressure at constant enthalpy. Along with Planck, this man names a statement of the second law of thermodynamics implying that it is impossible to build a (*) heat engine with one hundred percent thermodynamic efficiency. A process for cooling nonideal gases initially below their inversion temperature is named for this man and Joule. This scientist names a temperature scale where ice melts at 273.15. For 10 points, give the scientist who names the absolute temperature scale.

ANSWER: William Thomson, 1st Baron Lord Kelvin [Accept either underlined part]

14. This character watches on as one of his companions has a lengthy argument with an Englishman conveyed only through elaborate hand signals. This character is attacked by an army of Chitterlings who mistake him for Lent, and also defeats the Dispodians. This grandson of Lord Grandgousier gives money to Friar John to found an institution with the motto (*) “Do What Thou Wilt,” and urinates from the top of Notre Dame cathedral, causing a flood. This companion of Panurge helps to found the Abbey of Theleme. For 10 points, name this giant, a creation of Francois Rabelais, who wrote five books about him and his father, Gargantua.

ANSWER: Pantagruel

15. The Xhosa originated a violent form of this practice called *ukuthwalwa*, and the Mosuo, or Na, practice a “walking” form of it. Claude Levi-Strauss described this practice using the structural models of “restricted exchange” and “generalized exchange” in his “alliance theory.” The Nuer people of Sudan allow deceased individuals to take part in this practice in the (*) “ghost” form of it, and a document that ends one of them in Judaism is called a *get*. For 10 points, name this practice, which often involves the exchange of dowries and bridewealth.

ANSWER: marriages [accept equivalents, including weddings]

16. One subset of this faith performs a foot-washing ceremony set to text from John 13 called the pedalavium, and contains a subset founded by Daniel Parker which adheres to the “Two-Seed-in-the-Spirit” doctrine. That is this faith’s “Primitive” movement. This faith’s lack of creeds stems from its adherence to the doctrine of “soul liberty,” and a historic text in the development of this faith is the (*) Philadelphia Confession. The largest Protestant church in the United States is a “Southern Convention” of this denomination. For 10 points, name this denomination of Protestantism named after an act in which a person is “purified” with water.

ANSWER: Baptists [prompt on “Protestantism” before read; prompt on “Christianity.” Do not accept “Anabaptists.”]

17. This city sent no contingent to the Trojan War because its king Thersander was killed by Telephus before reaching Troy. Various curses on this city have supposedly been inflicted due to the murder of Chrysippus, who was raped by one of its kings, and the necklace of Harmonia, its first queen. This city’s founder enlisted the aid of the Spartoi, who grew out of the ground when he (*) sowed the teeth of a dragon. Polynices led a group of seven warriors against this city, whose most famous king was a son of Laius and stabbed his eyes out after discovering he had slept with his mother and murdered his father. For 10 points, name this Greek city ruled by Oedipus.

ANSWER: Thebes

18. This author created a psychotherapist whose wife takes photos of decaying churches and who preaches a mantra of “proportion” to a character whose last words are “I’ll give it you!” This author included a philosopher named Charles Tansley who argues that women can’t paint or write in a novel whose second section spans a period of ten years and is bookended by (*) two sections describing single days. The title character of one of this author’s novels recalls being kissed by Sally Seton and learns about the suicide of Septimus Smith while throwing a party. For 10 points, name this author of *To the Lighthouse* and *Mrs. Dalloway*.

ANSWER: Virginia Woolf

19. When intracellular levels of this molecule fall, SREBP upregulates the transcription of an enzyme that catalyzes the rate-determining step of this compound’s biosynthesis; that enzyme is HMG-CoA reductase. In the skin, the 7-dehydro variant of this compound is converted to vitamin D when exposed to UV light. Statins block this compound’s biosynthesis, and thus can be used to treat (*) atherosclerosis. Bile salts are synthesized by oxidation of this water-insoluble molecule. Lipitor can be used to lower LDL, the “bad” variant of this compound and raise HDL, its “good” type. For 10 points, name this sterol lipid whose high levels have been linked to heart disease.

ANSWER: cholesterol

20. This composer used a repeated progression that chromatically descends through a fourth in the bass line of a passacaglia “Crucifixus” movement that sits in the middle of the Credo section of a larger work. A work for keyboard by this composer opens and closes with a G major sarabande *aria* in 3/4 time. This composer used sustained strings in all but the last of a certain figure’s recitatives to give them a (*) “halo.” This composer wrote two books of preludes and fugues in all the major and minor keys. For 10 points, name this German organist and composer of the *Mass in B Minor*, the *St Matthew Passion*, the *Goldberg Variations*, and *The Well-Tempered Clavier*.

ANSWER: Johann Sebastian Bach

21. The government of this country used a process termed “negotiated nationalization” to claim three mines owned by the Anaconda Copper Company, later claiming them on the Day of National Dignity. One president of this country was plotted against in two plans named Track I and Track II, and defeated Jorge Alessandri in an election with the support of his Unidad Popular coalition. That president died in a bombing of (*) La Moneda palace in a 1973 coup ordered by a later president of this country, who presided over its economic “miracle” with the help of the Chicago Boys. For 10 points, name this country which was ruled in the 20th century by Salvador Allende and Augusto Pinochet.

ANSWER: Republic of Chile [accept República de Chile]

Bonuses

1. This premiere of this composer's *Six Pieces for Orchestra*, Opus 6, was conducted by his teacher, Arnold Schoenberg. For 10 points each:

[10] Name this Second Viennese School composer and likely Nazi sympathizer, notable for producing very short works at a very slow pace.

ANSWER: Anton **Webern** [VAY-burn]

[10] Midway through his composing career, Webern adopted this technique invented by Schoenberg, which attempts to give equal weight to every note in the chromatic scale and uses tone rows.

ANSWER: **twelve-tone** technique or composition [or **dodecaphony**, also accept **twelve-tone** serialism]

[10] Webern's compositions were influential on the early works of this *avant-garde* American composer, who utilized the *I Ching* for his *Music of Changes* and also wrote 4' 33" [four minutes and thirty-three seconds].

ANSWER: John Milton **Cage**, Jr.

2. The U.S. Public Health Service and Tuskegee Institute infamously collaborated on an experiment that led to hundreds of deaths by this disease among black sharecroppers. For 10 points each:

[10] Name this sexually-transmitted disease, the untreated progression of which was the subject of the Tuskegee experiments.

ANSWER: **syphilis**

[10] Another unethical syphilis study was conducted by the US government in this country under the administration of Juan José Arévalo. This country would later see a coup orchestrated by the CIA with the codename PBSUCCESS.

ANSWER: Republic of **Guatemala**

[10] This American banana producer was Guatemala's largest land owner and employer at the time of the 1954 coup. It was the only company to have a CIA cryptonym.

ANSWER: **United Fruit Company**

3. A playwright in this play commits suicide offstage as a group of characters play bingo. For 10 points each:

[10] Name this play which features a love triangle between the story-writer Trigorin, the actress Arkadina, and the aspiring actress Nina.

ANSWER: *The **Seagull*** [or ***Chayka***]

[10] *The Seagull* is a work by this Russian playwright of *Uncle Vanya* and *The Cherry Orchard*.

ANSWER: Anton **Chkhov**

[10] *The Seagull* has been the subject of many controversial English translations. This English playwright of *Copenhagen* and the farce *Noises Off* produced one in 1988 that changes Nina's line "I am a seagull" to "I am the seagull."

ANSWER: Michael **Frayn**

4. The accumulation of these types of goods is a driver of economic growth along with labor in the Solow-Swan model. For 10 points each:

[10] Name these types of goods used in the production of other goods and services.

ANSWER: **capital** goods [accept **capital accumulation**]

[10] This French economist argued that a high rate of return on capital has, over time, led to massive wealth inequality in modern society in his recent bestseller *Capital in the Twenty-First Century*.

ANSWER: Thomas **Piketty**

[10] Another thinker well-known for writing about capital is this German, who introduced the concepts of "use-value" and the "commodity fetish" in his enormous *Das Kapital*.

ANSWER: Karl **Marx**

5. The American author Nicholas Delbanco observed that “all writing is travel writing.” Answer the following about works that are unambiguously travel writing, for 10 points each:

[10] This early Italian author employed lots of allegory in his famed account of climbing Mount Ventoux. He also penned a 366-poem collection of “scattered rhymes.”

ANSWER: **Petrarch** [or Francesco **Petrarca**]

[10] This author penned his *The Journal of a Tour to the Hebrides*, but may be better known for his biography of Samuel Johnson.

ANSWER: James **Boswell**

[10] This historical figure wrote the memoir and travel journal *The Motorcycle Diaries* about his travels across South America with his friend Alberto Granado.

ANSWER: Ernesto “**Che**” **Guevara** [accept either]

6. According to American short story writers, only bad things can happen when you go to Florida. For 10 points each:

[10] Seymour Glass commits suicide in a Florida hotel while on vacation with his wife Muriel in this author’s “A Perfect Day for Bananafish.” He also wrote *The Catcher in the Rye*.

ANSWER: Jerome David **Salinger**

[10] In this Flannery O’Connor short story, the Grandmother has a bad feeling about going to Florida, which turns out to be justified when her entire family is murdered after their car breaks down on the way there.

ANSWER: “A **Good Man Is Hard to Find**”

[10] In this short story by Stephen Crane, Billie drowns off the Florida coast after trying to swim ashore from the title entity. The Cook, the Captain, and the Correspondent all survive.

ANSWER: “The **Open Boat**”

7. A tsukubai is used for this process at Buddhist temples. For 10 points each:

[10] Name this process that was frequently carried out by Pharisees. A certain form of it in Judaism is called *netilat yadayim* and it is also called ritual ablution.

ANSWER: ritual **washing** [accept equivalents and more specific answers, such as **washing** of hands]

[10] These sauna-like structures are frequently used in Native American cultures for purification ceremonies. The entrances of these structures generally face toward the east, in reference to the sun’s position at the beginning of the day.

ANSWER: **sweat lodge** [or **sweat** house]

[10] This term refers to “partial ablution” in Islam. It is contrasted with ghusl, which is full ablution, and tayammum, which is a dry type of ablution.

ANSWER: **wudu**

8. This man produced a music video for a song he wrote entitled “Black Flower in the White House” as part of his weird fascination with Condoleezza Rice. For 10 points each:

[10] Name this former world leader who allegedly ordered the Lockerbie bombing.

ANSWER: Muammar al-**Gaddafi**

[10] Gaddafi was the former leader of this North African nation.

ANSWER: State of **Libya** [accept **Libyan** Arab Jamahiriya]

[10] In a one-and-a-half hour speech in front of the UN in 2009, Gaddafi famously voiced his doubts about this phenomenon, claiming that it was invented for the benefit of “capitalist companies” and wondering if a “fish” version would be next.

ANSWER: **Influenza** A virus subtype **H1N1** [Accept **swine flu**; prompt on “flu” or “influenza”]

9. One president of this country successfully ran on a “no re-election” platform, stepped aside for four years, and then ran again. For 10 points each:

[10] Name this country ruled by Porfirio Diaz, who was toppled in a 1910 revolution led by Francisco Madero with the help of Pancho Villa.

ANSWER: **Mexico** [accept **United Mexican States**; accept **Estados Unidos Mexicanos**]

[10] The Mexican Revolution led to the creation of this political party, which controlled Mexico for most of the 20th century and used a process known as the “dedazo” to pick successors.

ANSWER: **Partido Revolucionario Institucional** [pronounced “pree,” but accept spelled pronunciations. Also accept **Institutional Revolutionary Party**]

[10] Although the PRI was pretty much always accused of election fraud, the charges were especially well-evidenced in an election in this year, which saw Carlos Salinas gain victory. In a US vice presidential debate during this year, Lloyd Bentsen annihilated Dan Quayle by telling him, “Senator, you’re no Jack Kennedy.”

ANSWER: **1988** [prompt on “88”]

10. Answer the following about the history of Malta, for 10 points each:

[10] This Christian military order ruled Malta for over two and a half centuries, until Ferdinand von Hompesch zu Bolheim surrendered it to Napoleon in 1798.

ANSWER: Knights **Hospitaller** [or **Knights of Saint John**, accept **Order** in place of “Knights” in either]

[10] The opening of this waterway in 1869 significantly benefited Malta’s economy. It was nationalized in 1956 by Gamal Nasser, leading the UK, France, and Israel to invade Egypt in this waterway’s namesake “crisis.”

ANSWER: **Suez** Canal

[10] Malta was also used as a base during WWII to strike at the supply lines of this Nazi general, who led forces at the First Battle of El Alamein, and defeated American forces at the Battle of the Kasserine Pass.

ANSWER: Erwin **Rommel**

11. Answer the following about the more godly aspects of political leaders, for 10 points each:

[10] This Italian neoclassical sculptor of *Psyche Revived by Cupid’s Kiss* also created the sculpture *Napoleon as Mars the Peacemaker*, which ironically ended up being owned by the Duke of Wellington.

ANSWER: Antonio **Canova**

[10] When this longtime “Dear Leader” of North Korea was born, a new star and a double rainbow appeared in the sky, and who are you to dispute that? He was succeeded by his son Kim Jong-Un.

ANSWER: **Kim Jong-Il**

[10] The nobleman Paul Atreides represents the messianic “Muad’Dib” to the Fremen, whom he leads into battle against the Harkonnen dynasty in this 1965 novel by Frank Herbert.

ANSWER: **Dune**

12. The roots of a mountain and the breath of a fish are among the ingredients used to create a device with which this creature is captured. For 10 points each:

[10] Name this monstrous creature captured using Gleipnir, but only with the use of the god Tyr’s hand as bait.

ANSWER: **Fenrir**

[10] Fenrir is an example of one of these animals. Romulus and Remus were suckled by a female one of these animals.

ANSWER: **wolf**

[10] In the founding story of this modern day country, an injured boy was saved by the Grey Wolf Ashina. Though it is not Mongolia, the Ergenekon legend tells how a wolf safely led this country’s early people out of a valley.

ANSWER: Republic of **Turkey** [accept **Türkiye** Cumhuriyeti]

13. This body consolidated its power in the Law of 14 Frimaire. For 10 points each:

[10] Name this governmental body that put down a peasant revolt in the Vendée region during the French Revolution. It held its greatest power during the Reign of Terror.

ANSWER: Committee of Public Safety [accept Comité de salut public]

[10] The Committee of Public Safety was led by this former lawyer from Artois. He created the state religion known as the Cult of the Supreme Being before being deposed in the Thermidorian Reaction.

ANSWER: Maximilien François Marie Isidore Robespierre

[10] Robespierre's right-hand man was this fellow member of the Committee of Public Safety who was the youngest deputy elected to the National Convention. Nicknamed the "Angel of Death," he was executed along with Robespierre.

ANSWER: Louis Antoine León de Saint-Just [sahn-ZHOOST]

14. At the end of this play, Demogorgon declares "This is alone Life, Joy, Empire, and Victory." For 10 points each:

[10] Name this 1820 closet drama whose title character loves the oceanid Asia and suffers at the hands of Jupiter.

ANSWER: Prometheus Unbound [do not accept "Prometheus Bound"]

[10] *Prometheus Unbound* is a work by this English Romantic poet of "Ozymandias" and "Ode to the West Wind."

ANSWER: Percy Bysshe Shelley

[10] A year after penning *Prometheus Unbound*, Shelley wrote the long poem *Adonais* as an elegy for this other poet, who wrote works such as "To Autumn" and "The Eve of St. Agnes."

ANSWER: John Keats

15. In a painting depicting this artist's armchair, a lit candle and two books sit on a green cushion. For 10 points each:

[10] Name this artist who depicted a nude girl lying face down in his *Spirit of the Dead Watching*. Five women sit on a bench in this artist's *We Shall Not Go to Market Today*.

ANSWER: Paul Gauguin

[10] This Post-Impressionist painted that depiction of Gauguin's armchair, and also showed a waiter in a white suit standing next to a billiard table with an oversized shadow in the center of his *The Night Cafe*.

ANSWER: Vincent van Gogh

[10] Another key Post-Impressionist art style was pointillism, developed along with Paul Signac by this artist of *A Sunday Afternoon On the Island of La Grande Jatte*.

ANSWER: George Seurat

16. This value for a medium is equal to the speed of light over the speed of light for that medium. For 10 points each:

[10] Name this value for a substance, often written lowercase n , that measures how much light "bends" when passing through it.

ANSWER: index of refraction

[10] For materials with a relative permeability close to 1, the index of refraction is approximately equal to the square root of this constant. If a substance is placed between the plates of a capacitor, its value for this constant multiplies the capacitance.

ANSWER: dielectric constant [accept relative permittivity]

[10] This doubly-eponymous equation predicts the dielectric constant of a material as a function of its density and molecular polarizability. The Lorenz-Lorentz equation can be derived from this relation.

ANSWER: Clausius-Mossotti equation

17. This structure is located beneath the lateral fissure. For 10 points each:

[10] Name this lobe of the cerebral cortex involved in the processing of auditory input, as well as the retention of visual memory.

ANSWER: **temporal** lobe

[10] The cerebral cortex is a region of this organ, located in the cranium. This organ and the spinal cord together compose the Central Nervous System.

ANSWER: **brain**

[10] This is the term for a ridge in the cerebral cortex. It is often contrasted with a sulcus, or a groove in the cerebral cortex.

ANSWER: **gyrus**

18. The central limit theorem states that the distribution of the arithmetic mean of a sequence of random variables, under certain conditions, will converge toward this distribution. For 10 points each:

[10] Name this distribution also named after Gauss, which is described by a bell curve shape.

ANSWER: **normal** distribution

[10] The central limit theorem only applies when the sequence of random variables is identically distributed and also has this property. If two events have this property, then the probability of both events happening is the product of the probabilities of each.

ANSWER: **independent** [accept word forms]

[10] The central limit theorem can be proven by the application of Taylor's theorem to these functions of each of the random variables in the sequence. For real random variables, this function is the inverse Fourier transform of its probability distribution.

ANSWER: **characteristic** function

19. These mixtures can have either positive or negative deviations from Raoult's law. For 10 points each:

[10] Name these mixtures of two or more liquids whose composition is unchanged through distillation. A solution of 95% ethanol and 5% water by volume forms a "positive" one of these.

ANSWER: **azeotrope**

[10] This simple rule, which is derived from Euler's polyhedron theorem, gives the number of degrees of freedom that can be possessed by multicomponent mixture with a fixed number of phases. This rule predicts that for a one-component mixture, an coexistence point for four phases is not possible.

ANSWER: **Gibbs phase** rule

[10] This gas's triple point is at a pressure above atmospheric pressure, and thus the phase diagram for this gas predicts that sublimation will occur directly at atmospheric pressure. Along with water, it is a main byproduct of combustion and is a potent greenhouse gas.

ANSWER: **carbon dioxide** [accept **CO2**]

20. A torch song in this musical begins with the line "The sun comes up, I think about you" and is sung by the middle-aged Sally Durant Plummer. For 10 points each:

[10] That song, "Losing My Mind," appears in this musical set in the crumbling Weismann Theatre which centers on the reunited performers of a musical revue.

ANSWER: **Follies**

[10] The music and lyrics for *Follies* were written by this American composer, also famous for his musicals *Company*, *A Little Night Music*, and *Into the Woods*.

ANSWER: Stephen **Sondheim**

[10] This Sondheim musical centers on the title "Demon Barber of Fleet Street," who slits his customers' throats and bakes them into pies with the help of Mrs. Lovett.

ANSWER: **Sweeney Todd**