

ACF Regionals 2017

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Tossups by Maryland B (Justin Hawkins, Will Kunkel, Ani Perumalla, Emma Stevens) and Oxford A (Daoud Jackson, Joey Goldman, Chris Stern, Charles Clegg)

1. On the Krumbein phi scale, this material is graded between “negative one” and “positive four.” In the USCS system, this material corresponds both to more than 50% passing through a #4 sieve and more than 50% retained on a #200 sieve. Arenites and wackes (“wackies”) are types of a rock named for this material. This material is too heavy to be part of the suspended load in air, so it moves by a form of bed load aeolian (ay-OH-lee-an) transport elucidated by Ralph Bagnold and called “saltation.” Parabolic, barchan (BAR-kahn), and seif (“safe”) structures constituted of this material can be found in ergs. Clastic sedimentary rocks can be classified into mudrock, conglomerates, breccias (BREH-chee-uhz), and a type of “stone” made out of, for 10 points, what medium-grained material—coarser than gravel but finer than silt or clay—that forms dunes?

ANSWER: sand [accept sandstone]

2. In a hadith (hah-DEETH) recorded by Al-Nasa’i, Muhammad said that “heaven lies under the feet” of one of these people. In a hadith recorded by al-Bukhari, a man asks “who among the people is most worthy of my good companionship?” four times, and Muhammad’s first three answers are this type of person. The subject of Surah 19 became a person of this kind while holding onto a date palm. Soon after becoming a person of this type and being abandoned to God’s care in a valley, a woman ran between the hills of Safa and Marwah looking for water, which led to the opening of the Zamzam spring. Aminah’s relation to Muhammad was, for 10 points, what familial role, exemplified by Khadijah with respect to Fatimah and by Hagar with respect to Ishmael?

ANSWER: mothers [accept equivalents such as moms or answers mentioning mother such as “his mother” or “Muhammad’s mother”; prompt on gender-neutral answers such as “parents”; prompt on “woman” or equivalents before “became”; do not accept or prompt on “father(s)” or equivalents]

3. A Byzantine district of this name provided the epithet of a ruler who died after being dragged through a forest for 16 miles when his belt was caught on a deer’s antler. Most of Michael Psellus’s *Chronographia* records the rule of a dynasty with this name, including the reign of co-empresses Zoe and Theodora; that dynasty of this name was founded by Basil I after he had Michael III killed, and it ruled for much of the 9th, 10th, and 11th centuries. While fighting for a kingdom of this name, Cleitus the Black saved the life of his king from the satrap (sat-rap) Spithridates (spith-rih-DAH-teez) at the Battle of the Granicus; that Hellenistic kingdom of this name conquered the Achaemenid (uh-KEE-meh-nid) Empire after defeating Darius III (dah-"RYE"-us "the third") at Issus and Gaugamela (GOW-gah-meh-lah). For 10 points, what kingdom was ruled by Philip II and Alexander the Great?

ANSWER: Macedonia [accept Macedonian dynasty or Macedon]

4. In David Luke’s rhyming translation of this play, one character says “I’m not a lady and I’m not sweet / I can get home on my own two feet” in response to the protagonist asking to escort her from confession. Later in this play, the protagonist is guided by the sybil Manto while a companion disguises himself as one of the Graeae (GRY-ee). A woman in this play prays to an icon of the Mater Dolorosa shortly before her brother, the soldier Valentine, is slain by her beloved. In this play, a will-o’-the-wisp guides the protagonist through the Harz Mountains to a Walpurgis Night celebration, after which a voice from above proclaims “she is redeemed!” before Gretchen dies. The title academic makes a deal with Mephistopheles in, for 10 points, what play by Johann Wolfgang von Goethe?

ANSWER: Faust: A Tragedy [or Faust. Eine Tragödie; accept Faust, Part 1 or Faust. Der Tragödie / erster Teil before “Manto”]

5. The outer movements of this man's Sixth Symphony often draw comparisons to the outer movements of Brahms's Second Symphony because they share the same tempo, key, and structure. The finale of this man's Eighth Symphony opens with a trumpet fanfare that leads into a cello melody based on a children's song. The last of this man's symphonies contains a single note for cymbals in its "allegro con fuoco" finale and is written in the key of E minor. The first of this man's symphonies is nicknamed "The Bells of Zlonice" (ZLO-neets). In the last of his symphonies, the second movement has an English horn solo drawn from the spiritual "Goin' Home." For 10 points, name this Czech composer whose Ninth Symphony was called "From the New World."

ANSWER: Antonín Dvorak [or Antonín Leopold Dvorak]

6. Morse and Feshbach determined the coordinate systems in which this man's equation is separable by imposing the Robertson condition on the Stackel determinant. In 3D, the Green's function for this man's equation is "minus ϵ " to the "plus or minus $i k r$ " all over "four pi r ." This man's equation is defined as the Laplacian of a scalar or vector function, F , plus " k -squared times F " equals zero, and it reduces to Laplace's equation when k equals zero. By this man's theorem, any finite, uniform, continuous, vanishing vector field can be expressed as the gradient of a scalar plus the curl of a vector with zero divergence. The useful work obtainable from a closed thermodynamic system is known as, for 10 points, what German scientist's namesake "free energy"?

ANSWER: Hermann von Helmholtz [or Hermann Ludwig Ferdinand Helmholtz; accept Helmholtz equation or Helmholtz theorem or Helmholtz free energy]

7. This album contains a song, inspired by Fleetwood Mac's "Albatross," that contains numerous nonsensical Spanish phrases and the local slang expression "chicka ferdy" in its multi-tracked vocal harmonies. The B side of this album contains a song in which a harpsichord and a synthesizer play the chords of Beethoven's *Moonlight Sonata* backward, which appears immediately before a song whose outro repeats the line "one, two, three, four, five, six, seven / all good children go to heaven." The songs "Sun King," "You Never Give Me Your Money," and "Carry That Weight" appear on the 16-minute medley that closes this 1969 album. "Come Together" opens, for 10 points, what album whose cover shows the members of the Beatles walking across the namesake street?

ANSWER: Abbey Road

8. A discovery led one member of this profession to declare that his old horse would be stuffed, placed in a glass case, and sent to the British Museum. For members of this profession, the dancer Lola Montez became an icon for performing the "spider dance." Acquittal of a hotel owner accused of murdering James Scobie led members of this profession to form the Ballarat Reform League and revolt under the leadership of Peter Lalor. After Edward Hargraves made a discovery at a location he called Ophir, this profession became popular, resulting in the depletion of convict laborers in Van Diemen's Land. Men in this profession fought the government of Victoria at the Eureka Stockade. For 10 points, what profession participated in an 1851 Australian "rush" for a precious metal?

ANSWER: gold miners [accept equivalents such as gold prospectors; prompt on "miners" or "prospectors" or equivalents]

9. The speaker of a poem by this author asks "whom dost thou worship in this lonely dark corner of a temple with doors all shut?" and says that God is "where the tiller is tilling the hard ground and where the pathmaker is breaking stones." Another poem by this author repeats "let me carry the pangs of this sorrow in my dreams and in my wakeful hours." The speaker in a poem by this author of "Let Me Not Forget" cannot board the title vehicle because it is too loaded with "gold paddy." This poet wrote of a place "where tireless striving stretches its arms towards perfection" and "where the mind is without fear." He wrote "thou hast made me endless, such is thy pleasure" at the beginning of a collection whose introduction was written by W. B. Yeats. For 10 points, name this Bengali author of *Gitanjali* (gee-TAHN-jah-lee).

ANSWER: Rabindranath Tagore (rah-BIN-dra-nath ta-"GORE")

10. The original version of this structure was “broken” during a war that was presaged by the coming of a witch who was thrice burned to death but who was reborn each time. Just after passing over this structure, an eagle in pursuit of a hawk carrying a valuable nut was burned to death when its feathers caught fire from a pile of plane shavings. Along with the sun and moon, the goddess of love was offered in exchange for this structure’s construction, under the condition that it be done within one winter. To prevent the timely completion of this structure, a trickster transformed into a mare to distract the stallion Svadilfari (SVAH-dil-far-ee) from hauling stones, resulting in the birth of Sleipnir. The unnamed giant who built these fortifications was killed by Thor. For 10 points, what structure defended the home of the Norse gods?

ANSWER: walls of Asgard [prompt on partial answers; accept answers indicating walls or fortifications for Asgard or walls or fortifications of the Aesir; prompt on answers mentioning “walls” or “fortifications” and “Norse gods” or equivalents]

11. The “forbidden Q branch” in a “P·Q·R” spectrum corresponds to this process. The “group” form of this process identifies irreducible representations that correspond to it by just looking at rows in the character table that transform as a linear or quadratic function of a coordinate. Centro-symmetric molecules cannot have overlapping peaks in spectroscopy that excites this process by causing a change in the polarizability tensor or dipole moment. The an-harmonic Morse potential models the energy required to excite this process, which is often reported in inverse centimeters. Nonlinear molecules have “three n minus six” degrees of freedom—or normal modes, such as wagging, scissoring, or bending—for this process. For 10 points, what process, detected by I-R spectroscopy, occurs when nuclei move back and forth?

ANSWER: molecular vibration(s) [accept word forms such as vibrational; prompt on “molecular motion” or similar answers; prompt on “rovibration” or “libration”; do not accept or prompt on “translation(s)” or “rotation(s)”]

12. The first dancer to perform this role, Antonietta Dell’Era (an-“tone”-YET-ah dell-“EH”-rah), insisted on adding a gavotte by Alphonse Czibulka (chee-“BULL”-kah) to the score to pad her stage time. Maria Tallchief’s 1954 performance of this role helped repopularize the ballet in which this character appears. A theme representing this character begins with the notes “G-E-G, F sharp, D sharp, E.” In a four-movement pas de deux (pah day doo), this character dances to music meant to sound like “drops of water shooting out of a fountain” after a tarantella danced by Prince Coqueluche (koh-kay-loosh). Dancers representing chocolate, coffee, and tea are summoned by this character, who only appears in Act II. Her namesake “dance” features a prominent celesta solo. For 10 points, name this character from Tchaikovsky’s *The Nutcracker* who rules the “Land of Sweets.”

ANSWER: Sugar Plum Fairy [or Drazhe; or Fée Dragée]

13. This man’s rule was opposed by a “Liberal Party” centered in the lawless town of Corinne. This man used the idea of “blood atonement” to justify the execution of his adopted son John Lee. The so-called “Miracle of the Gulls” occurred under the leadership of this man when a settlement led by him was saved from famine by a flock of birds that ate up a plague of locusts. This man, who was pardoned by James Buchanan after a rebellion in the late 1850s, may have ordered his followers to join the Paiute (“PIE”-yoot) Indians in raiding the Baker–Fancher wagon train. After his predecessor was killed by a mob in Nauvoo, Illinois, this man led a mass migration to the Great Salt Lake. For 10 points, what man succeeded Joseph Smith as leader of the Mormon Church and names a university in Provo?

ANSWER: Brigham Young [accept Brigham Young University]

14. At an antique shop in this city, a literary protagonist is kissed by a young bedridden flautist named Pippa and tastes a hint of her morphine lollipop on his lips. Before the wealthy Barbours can adopt that character, he moves from this city to join his father in Las Vegas, where he befriends Boris Pavlikovsky. In a 2013 novel, a bombing at a museum in this city kills Theo Decker’s mother and leaves him in possession of the title painting of a bird. Another novel set in this city opens during “the summer they executed the Rosenbergs,” with the protagonist interning at *Ladies’ Day* magazine. Life in this city leads to depression and electroshock therapy for Esther Greenwood in *The Bell Jar*. For 10 points, what city, in Donna Tartt’s *The Goldfinch*, is the site of a bombing at the Metropolitan Museum of Art?

ANSWER: New York City [or NYC]

15. One character in this work dies in a ditch while waiting for a messenger to return from a diviner. Another character in this work argues that the art of the oxherd is the art of attending to oxen. One part of this text's argument awkwardly contrasts the active and passive aspects of carrying. This text comes to the aporetic (AP-oh-ret-ik) conclusion that the central topic and justice cannot be separated. The title person in this text is pursuing a case against his father over the accidental death of a servant and justifies the suit by showing that he understands the meaning of reverence. For 10 points, name this Platonic dialogue, set shortly before the trial of Socrates, in which Socrates discusses whether what is "pious" is so because it is dear to the gods or what is dear to the gods is so because it is pious.

ANSWER: Euthyphro ("YOUTH"-ih-fro)

16. Cell concentrations in this substance are often measured either "per high power field" or "per low power field." Tissues in contact with this substance are lined with a transitional epithelium. Insoluble "casts" form when the Tamm–Horsfall protein binds to blood cells present in this substance. Elevated protein in this substance can be caused by taking phen·azo·pyridine or by having rhabdo·myo·lysis. Gonad·o·tropins are normally extracted from this substance, which is enriched in h·C·G in pregnant women. The G·F·R and "creatinine (kree-AT-in-een) clearance" are found by assaying this material, which smells sweet in diabetics. Vaso·pressin stimulates the collecting ducts to concentrate this substance by withholding water. For 10 points, what liquid formed in the kidneys is used by mammals to excrete nitrogenous waste?

ANSWER: urine [accept word forms; accept equivalents such as pee]

17. Drawings by Jean-Étienne Dominique Esquirol (ES-kee-"roll") may have inspired a series done by this artist after he returned from a stay in England. One of this artist's works, painted after the end of an affair with his aunt, hangs in the Salle Mollien (sahl mohl-YAN) of the Louvre across from Eugene Delacroix's *The Massacre at Chios*. This artist may have met a patron in the Beaujon Hospital, from which had been taking dissected limbs. His first biographer, Charles Clément, wrote that the psychiatrist Étienne-Jean Georget (zhor-ZHAY) commissioned a series of paintings by this artist that includes *Portrait of a Kleptomaniac*. This artist depicted the *Argus* in the distance in the top left of a painting that shows a makeshift sea vessel with men stacked in a pyramidal arrangement. For 10 points, name this artist of *The Raft of the Medusa*.

ANSWER: Théodore Géricault [or Jean-Louis André Théodore Géricault]

18. After this kingdom became a princely state, its economy and law were reformed with the assistance of British commissioner Mark Cubbon. A ruler of this kingdom was accused of abducting 12,000 children from Tanjore (tahn-johr) with the intent of converting them to Islam. Its last independent ruler owned an automaton depicting a tiger devouring a European soldier's corpse. Sir William Congreve based his rocket design on the rockets produced by this kingdom. This kingdom, which agreed to the Treaty of Mangalore (man-gah-"lore"), was ruled by members of the Wadiyar (wah-dee-yar) dynasty, including Hyder Ali and Tipu Sultan. It ruled most of the Deccan plateau before losing the 1799 Battle of Seringapatam (seh-RIN-gah-pah-tahm) to a Maratha–British alliance. For 10 points, what South Indian kingdom fought four namesake wars against the British?

ANSWER: Kingdom of Mysore ("my-sore") [accept Mysore Wars]

19. In a job interview, one of this author's characters is asked to translate a note written in French but is too nervous to say that he cannot read the handwriting and insists that *doigts* (dwah) means "fingers." The speaker of a poem by this author sees his manhood "cast / down in the flood of remembrance" as he weeps "like a child for the past" while recalling his mother playing the piano. He created a mother who pays for her son, Arthur, to be discharged from the army, after which he marries Beatrice Wyld; that mother created by this man falls ill with a tumor and is euthanized by her son via an overdose of morphine in her milk. This man wrote about the son of a coal miner who romances Miriam Leivers and Clara Dawes. For 10 points, what English novelist wrote about Paul Morel in *Sons and Lovers*?

ANSWER: D. H. Lawrence [or David Herbert Lawrence]

20. This man's research assistant, Stephen Suomi, showed that it was possible to rehabilitate some of his test subjects. This man developed the concept of "learning sets" to test his theory of "learning to learn," and he studied the win-stay, lose-shift strategy in an experiment that presented its subjects with a choice between two stimuli. This man's paper "The Nature of Love" published the results of an experiment that involved the use of "surrogates" made from heavy wire mesh or wood to explore the importance of bonding between child and mother. This psychologist created a device, meant to produce an animal equivalent of clinical depression, that was dubbed the "pit of despair." For 10 points, name this psychologist at the University of Wisconsin whose experiments often involved rhesus monkeys.

ANSWER: Harry **Harlow** [or Harry Frederick **Harlow**; accept Harry Frederick Harlow **Israel**]

TB. A satirical cartoon depicted this battle as a "headdress" taking place atop a woman's massive hairdo. A man killed at this battle had insisted on fighting as an enlisted man, vowed to "die up to [his] knees in blood," and had his corpse identified when a dentist recognized his fake teeth. A geriatric militiaman who rode to this battle through gunfire is celebrated in a Katherine Shepherd-Smith poem called "Seth Pomeroy's Ride." This battle was initiated after one side tried to fortify the Dorchester Heights. Dr. Joseph Warren was killed at this battle by soldiers commanded by Thomas Gage. During this battle, Israel Putnam is said to have ordered his troops not to "fire until you see the whites of their eyes." For 10 points, what 1775 battle was, despite its name, actually fought on Breed's Hill?

ANSWER: Battle of **Bunker Hill**

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Bonuses by Maryland B (Justin Hawkins, Will Kunkel, Ani Perumalla, Emma Stevens) and Oxford A (Daoud Jackson, Joey Goldman, Chris Stern, Charles Clegg)

1. Despite playing virtuosically in the first and third movements, the solo violin provides the bass line when the ripieno (rip-YAY-no) is unaccompanied in the E-minor andante of this predominantly G-major work. For 10 points each:

[10] Name this concerto grosso whose concertino consists of two flauti d'echo and a solo violin, which play in its massive 82 bar ritornello.

ANSWER: **Brandenburg Concerto** no. 4 [prompt on "*Brandenburg Concertos*" or "*Brandenburg Concerti*" or "*Concerto* no. 4"]

[10] This composer of the *Brandenburg Concertos* also wrote a mass in B minor and the *St. Matthew Passion*.

ANSWER: Johann Sebastian **Bach**

[10] This kind of cadence leads into the fugal presto five-part finale of the Fourth Brandenburg Concerto. The modern musical "mode" of this type consists of the pattern "semitone, tone, tone, tone, semitone, tone, tone."

ANSWER: **Phrygian** cadence [or **Phrygian** mode]

2. This author described how, after arriving at Changi Airport, he was reminded of Laurie Anderson's claim that VR could not feel realistic until people worked out how to "put some dirt in it." For 10 points each:

[10] Name this author who was commissioned by *Wired* to write an essay about a trip to Singapore, which he titled "Disneyland with the Death Penalty." This author coined the term "cyberspace" in his story "Burning Chrome."

ANSWER: William **Gibson** [or William Ford **Gibson**]

[10] In the author's note that this man wrote for his *The Singapore Grip*, he admitted that it is perhaps odd to include an extensive bibliography in a work of fiction; that book completed a trilogy by this author that also includes *The Siege of Krishnapur* and *Troubles*.

ANSWER: J. G. **Farrell** [or James Gordon **Farrell**]

[10] Singaporean novelists Kelvin and Adrian have this surname, which they share with the Chinese-American author Amy who wrote *The Joy Luck Club*.

ANSWER: **Tan** [accept Kelvin **Tan** or Adrian **Tan** or Amy **Tan**]

3. One attempt to accomplish this action would have used thallium salts to poison the target's beard. For 10 points each:

[10] Describe this action repeatedly attempted by the CIA as part of Operation Mongoose. The Church Committee's investigation of these attempted actions revealed that they involved the participation of the Giancana crime family.

ANSWER: trying to **assassinate** Fidel **Castro** [accept answers mentioning attempting to **kill** or **murder** Fidel (Alejandro) **Castro** (Ruz); prompt on answers such as "*trying to overthrow Castro*" that do not explicitly mention some form of killing]

[10] The U.S.'s clandestine campaign against Castro intensified after this 1961 incident, a failed invasion of Cuba by anti-Castro exiles that was sponsored by the American government.

ANSWER: **Bay of Pigs** invasion [or invasión de **Playa Girón** (hee-ROHN); or invasión de **Bahía de Cochinos**]

[10] American anti-Castro plots were detailed in this set of documents given a colloquial name, which were released in 2007 and reveal a number of CIA misdeeds. These documents also disclosed American involvement in attempted assassinations targeting Patrice Lumumba and Rafael Trujillo ("true"-HEE-yo).

ANSWER: **Family Jewels**

4. Ailerons on the edge of these structures can be raised and lowered to allow a plane to execute a bank or roll. For 10 points each:

[10] Name these structures that can be swept back inside the shock wave cone to decrease drag. The shape of these structures is called the planform, and their cross section is an airfoil.

ANSWER: wings [accept swept wings]

[10] The half angle of a shock wave cone is equal to the arcsine of the inverse of this quantity. This quantity can be defined as the “fluid flow velocity” times the “square root of fluid density” over “bulk modulus elasticity.”

ANSWER: Mach number [or M; or Ma]

[10] A Mach number greater than one can correspond to supersonic or hypersonic flow, while this flow regime is characterized by a Mach number very close to one.

ANSWER: transonic flow

5. For 10 points each, answer the following about the career of Carol Myers-Scotton.

[10] Myers-Scotton developed the “markedness model” of this phenomenon, in which speakers move between languages or registers in the course of a conversation.

ANSWER: code-switching [accept code-mixing; accept answers mentioning forms of the word code and switch or mix; prompt on “switching” or “mixing”]

[10] Myers-Scotton’s model posits alternation between the “embedded language,” or EL, and this sort of language, denoted ML, which is the unmarked or default choice. More generally, this word can describe a sentence into which constituents are embedded.

ANSWER: matrix [accept matrix language]

[10] One of Myers-Scotton’s projects focused on people from this country who were code-switching between Xhosa (KAW-sah) and English. The majority of Afrikaans speakers live in this country.

ANSWER: South Africa [or Republic of South Africa; or Republiek van Suid-Afrika; prompt on “RSA”]

6. This state is the site of a “Mystery House” built by gun industry–heiress Sarah Winchester. For 10 points each:

[10] Name this state whose other mysterious phenomena include the Santa Cruz Mystery Spot.

ANSWER: California

[10] The design for the Santa Cruz Mystery Spot was ripped off from a “vortex” located in this state’s town of Gold Hill. The decline of this state’s logging industry has been blamed on environmental laws protecting the northern spotted owl.

ANSWER: Oregon

[10] Visitors to this town in West Texas often claim to see a mysterious glowing mirage, this town’s namesake “lights.” Donald Judd converted an abandoned fort in this town into an installation art museum.

ANSWER: Marfa [accept Marfa lights or Marfa ghost lights]

7. The Earl of Derby’s first ministry came to be known as the “Who? Who? Ministry” because this politician, who was by then partly deaf, did not recognize the relatively unknown cabinet members. For 10 points each:

[10] Name this Anglo-Irish politician who served twice as prime minister and led the Tory party. As a general, he had earlier defeated Napoleon at the Battle of Waterloo.

ANSWER: Arthur Wellesley, 1st Duke of Wellington [accept either underlined portion]

[10] Under Wellington’s first ministry, an 1829 act was passed in furtherance of this political goal, for which Daniel O’Connell had fiercely advocated. The new law repealed the Test Act and other discriminatory religious laws.

ANSWER: Catholic emancipation [or Catholic relief; prompt on answers indicating improvement in conditions for Catholics in the United Kingdom]

[10] Wellington’s brother Richard served as foreign secretary in the wake of this scandalous event. This event, which took place at Putney Heath in 1809, resulted in the incumbent foreign secretary being wounded in the thigh.

ANSWER: duel between George Canning and Lord Castlereagh [accept Robert Stewart, Viscount Castlereagh, or 2nd Marquess of Londonderry in place of “Lord Castlereagh”; prompt on partial answers]

8. In a work by this author, the emperor Domitian uses a real blade, and not a play sword, to stab Paris while performing in a play-within-a-play called *The False Servant*. For 10 points each:

[10] Name this English playwright who wrote *The Roman Actor*. In his best-known play, the servant Marrall alters some legal documents to help Frank Wellborn bring down Sir Giles Overreach.

ANSWER: Philip **Massinger**

[10] Massinger collaborated with John Fletcher on a number of plays, including *The Sea Voyage* and *The False One*, for this acting company. William Shakespeare worked with this company for much of his life.

ANSWER: **King's Men** [accept **Lord Chamberlain's Men**]

[10] Massinger's other collaborations include *Rollo Duke of Normandy*, which he coauthored with Fletcher, George Chapman, and this playwright behind *Bartholomew Fair* and *The Alchemist*.

ANSWER: Ben **Jonson** [or Benjamin **Jonson**]

9. This process is done inside a calorimeter to determine the binding constant of a protein to a ligand. For 10 points each:

[10] Name this analytical technique. Its acid-base format usually involves dripping a stock of sodium hydroxide from a buret (byoo-RET) into a solution of weak acid to determine the concentration of the solution.

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

[10] In iso-thermal titration calorimetry, the binding constant can be calculated solely based on the slope at this point on the graph. In an acid-base titration, the equivalence point occurs at this point. A mathematical description is fine.

ANSWER: point of **inflection** [or **inflection** point; or the point where the **slope** is **maximized**; accept equivalents]

[10] The setup for I·T·C uses a reference cell and a sample cell and measures the heat required to keep them at the same temperature, just like this other experimental technique, which slowly ramps up temperature to figure out how the heat capacity of the sample varies with temperature.

ANSWER: **differential scanning calorimetry** [or word forms; or **DSC**; prompt on "**calorimetry**"]

10. Although this king sent his sons to search for their missing sister, the sons eventually gave up their quest and founded a number of kingdoms, including Cilicia (sih-LISH-ah). For 10 points each:

[10] Name this king of Tyre, a son of Libya and Poseidon who left his native Egypt to live in Phoenicia. He was the father of Cilix, Phoenix, and a man who became the ruler of the Spartoi after killing the Ismenian dragon.

ANSWER: **Agenor**

[10] Agenor and his wife Telephassa were the parents of this Phoenician princess, who was gathering flowers by the seashore when she was abducted by Zeus in the form of a bull.

ANSWER: **Europa**

[10] The union between Zeus and Europa produced three sons: Sarpedon, Minos, and this man, whose wisdom and integrity in life led to his appointment, along with Aeacus (EE-ah-kus) and Minos, as a judge of the dead.

ANSWER: **Rhadamanthus** [or **Rhadamanthys**]

11. This architect described her design for Rome's contemporary art museum, MAXXI, as moving away from the idea of "the museum as an object" and toward the idea of a "field of buildings." For 10 points each:

[10] Name this late Iraqi-born British architect whose design for the Guangzhou (gwahng-joh) Opera House resembles two pebbles on the shore of the Pearl River. In 2004, she became the first woman to receive the Pritzker Prize.

ANSWER: Zaha **Hadid** [or Dame Zaha Mohammad **Hadid**]

[10] With Ben van Berkel, Hadid designed a pair of color-changing pavilions to commemorate the centennial of Daniel Burnham's plan for this city. Fazlur Khan designed this city's Sears Tower, now known as Willis Tower.

ANSWER: **Chicago**

[10] Hadid designed the "nerve-center" of a factory complex meant to bring together blue-collar and white-collar employees of this company. This company's headquarters resembles four vertical cylinders arranged in a tight square.

ANSWER: **BMW** [or **Bavarian Motor Works**; or **Bayerische Motoren Werke** AG]

12. This sect was developed in the 11th century by the scholar Ramanuja. For 10 points each:

[10] Name this sect whose members view the Alvars as exemplary saints. Chaitanya founded the Gaudiya (gow-DEE-yah) branch of this sect.

ANSWER: **Vaishnavism** (VYESH-nuh-vizm) [or **Vaishnavites**; prompt on “**Vishnubhakta**” or “**Vishishtadvaita**”]

[10] Chaitanya was said to be a reincarnation of this avatar of Vishnu. ISKCON promotes the “consciousness” of this deity by chanting “hare” (hah-ray) to worship him.

ANSWER: **Krishna** [or **Krsna**; accept Hare **Krishna**]

[10] Vaishnava devotees commonly worship Vishnu through the *kirtana* (keer-tah-nah) type of this action, which is different from its *bhajana* (b'ha-jah-nah) form. The Samaveda (sah-mah-VAY-dah) is meant to be understood through this action.

ANSWER: **singing** [or **song**; or **gana**; or **sangita**; accept **chanting** or equivalents; prompt on “**music**” or equivalents]

13. This man's guerrilla campaign faltered when Winston Churchill convinced the British Army to stop engaging him directly, harassing him with air raids instead. For 10 points each:

[10] Name this Sunni cleric who established the theocratic Dervish State in Somaliland. He is popularly known by the alliterative nickname bestowed on him by the British press.

ANSWER: **Mad Mullah** [or Mohammed Abdullah **Hassan**; or Muhammad Abd Allah al-**Hasan**; or Maxamed Cabdille **Xasan**]

[10] The Mad Mullah is often compared to the “Mad Mahdi,” a cleric who led a similar anticolonial movement in this modern-day African country. In this modern-day country, the Mahdi's forces captured Khartoum from “Chinese” Gordon.

ANSWER: **Sudan**

[10] Future prime minister Winston Churchill described the Mahdi's campaign in this 1899 best seller. It contains an Islamophobic passage about the “curses which Mohammedanism lays on its votaries.”

ANSWER: *The **River War**: An Historical Account of the Reconquest of the Soudan*

14. The interaction of grid cells and place cells enables the brain to perform spatial recognition. For 10 points each:

[10] Grid cells, found in the entorhinal cortex fire periodically, and then place cells, found in this part of the brain's temporal lobe, decompose the sinusoidal signals to encode a path. This structure, a key component of the limbic system, governs memory formation and is shaped like a seahorse.

ANSWER: **hippocampus**

[10] The signal to a place cell is turned off by one of these parvalbumin-expressing (parv-al-BYOO-min-"expressing") cells in the hippocampus. Generally, this term refers to any neuron that relays information in the C·N·S between a motor neuron and a sensory neuron.

ANSWER: **interneurons** [or **association** neurons; or **intermediate** neurons; or **connector** neurons]

[10] Mapping how place cells interact with head direction cells and grid cells is crucial to this specific “-omics” field that aims to characterize all the neural interactions in the human brain.

ANSWER: **connectomics** [accept **connectome** or Human **Connectome** Project]

15. In a novel set in one of these locations, Sylvia Moomaw writes a story “about a bug that turns into a man” and admits that “it’s influenced by Kafka” before asking the narrator to show it to Gertrude Johnson. For 10 points each:

[10] Name these places that include Benton, the setting of Randall Jarrell’s *Pictures from an Institution*. In *The Sound and the Fury*, Quentin Compson wanders through one of these places in Cambridge, Massachusetts, before committing suicide.

ANSWER: college campuses [accept either underlined portion; or universities; accept other answers indicating institutions of higher learning]

[10] This Englishman wrote about Philip Swallow and Morris Zapp’s participation in an academic exchange program in the novel *Changing Places*, part of his “Campus Trilogy” with *Small World* and *Nice Work*.

ANSWER: David Lodge [or David John Lodge]

[10] This campus novel by John Williams enjoyed a resurgence in popularity after it was republished by the *New York Review of Books*. It follows the title Missouri native, who becomes a literature professor and rival of Hollis Lomax.

ANSWER: Stoner

16. For 10 points each, answer the following about about paintings of George IV.

[10] George IV’s attendance of service at the High Kirk of Edinburgh was painted by this artist, who also painted *Rain, Steam, and Speed* and *The Fighting Temeraire*.

ANSWER: J. M. W. Turner [or Joseph Mallord William Turner]

[10] Turner was accompanied in Edinburgh by this Scottish artist of *Pitlessie Fair* and *The Letter of Introduction*, who painted George IV in full Highland regalia during George’s visit.

ANSWER: David Wilkie

[10] This artist of a “grand manner” portrait of George IV also painted *Pinkie*, a portrait of Sarah Barrett Moulton that hangs in the Huntington Library across from Thomas Gainsborough’s *The Blue Boy*.

ANSWER: Sir Thomas Lawrence

17. Despite having pushed for the executions of 45 Algerian prisoners as minister of justice, this man joined with Robert Badinter (roh-BAIR bah-dawn-TAIR) in abolishing the death penalty shortly after becoming president. For 10 points each:

[10] Name this socialist politician who succeeded Valéry Giscard d’Estaing (vah-LAY-ree zhis-CAR deh-STAHNG) as president of France. While in office, he was forced into cohabitation governments with Jacques Chirac and Édouard Balladur.

ANSWER: François Mitterrand [or François Maurice Adrien Marie Mitterrand]

[10] In 1985, Mitterrand sanctioned the bombing of this Greenpeace ship, which was docked in New Zealand. This ship had been on its way to protest the French nuclear program.

ANSWER: Rainbow Warrior

[10] The “Mitterrand doctrine” was a policy under which the French government promised *not* to perform this action in response to violence, especially that carried out by the Red Brigades, during Italy’s Years of Lead.

ANSWER: extradition of terrorists to Italy [accept word forms and reasonable equivalents; accept revoking asylum for Italian terrorists or reasonable equivalents thereof]

18. This essay opens with a quote in which Paul Valéry argues that our understanding of the title subject must change over time. For 10 points each:

[10] Name this essay by Walter Benjamin (VAHL-ter BEN-yah-meen) that claims that the uniqueness of the title subject is embedded in tradition and that examines how film has influenced the decline of “aura.”

ANSWER: *The **Work of Art in the Age of Mechanical Reproduction*** [accept *Das **Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit***]

[10] This German thinker examined Vincent van Gogh’s *A Pair of Shoes* in a work that seeks to distinguish works of art from other “things” titled *The Origin of the Work of Art*. He also wrote *Being and Time*.

ANSWER: Martin **Heidegger**

[10] This German philosopher claimed that art was the “eternal organ and document of philosophy” and that aesthetic activity unified the conscious and unconscious. This mentee of J. G. Fichte was a proponent of *Naturphilosophie* (nah-"TOUR"-philosophy).

ANSWER: Friedrich Wilhelm Joseph (von) **Schelling**

19. *Note: the third bonus part uses a multiline answer format for clarity. Each line is required, although answers may be given in any order.* Using the Laplace expansion or expansion by cofactors allows one to find this value for large matrices by using smaller minor matrices. For 10 points each:

[10] Name this value that is defined as “*a* times *d*” minus “*b* times *c*” for a two-by-two matrix.

ANSWER: **determinant**

[10] According to this rule, solving a system of linear equations can be done using ratios of matrix determinants.

ANSWER: **Cramer’s** rule

[10] Name all three of the elementary row operations that one can perform on a matrix.

ANSWER: **switching** two rows [or **interchanging** rows; accept equivalents]

ANSWER: **multiplying** a row by a non-zero scalar [accept equivalents]

ANSWER: **adding** a scalar multiple of **one row to another row** [accept equivalents]

20. Answer the following about Siberian prisons in Russian literature, for 10 points each.

[10] Katyusha Maslova is sentenced to prison in Siberia for allegedly poisoning one of her clients in this novel, which follows her former employer Dmitri Nekhlyudov (nek-L'YOO-doff) and his encounters with other inmates.

ANSWER: **Resurrection** [or **Voskreseniye**] [by Leo Tolstoy]

[10] Boris Viktorovich Savinkov’s supposed suicide after being spared a death sentence is one of the stories told in this book, which is based on 227 different testimonies.

ANSWER: *The **Gulag Archipelago*** [or **Arkhipelag GULAG**] [by Alexander Solzhenitsyn]

[10] Several of this author’s novels involve characters being sentenced to hard labor in Siberia, such as Rogozhin in *The Idiot* and Raskolnikov in *Crime and Punishment*.

ANSWER: Fyodor **Dostoyevsky** [or Fyodor Mikhailovich **Dostoyevsky**]

Extra. This protein’s variants include “superfolder,” which folds when fused to anything; the synthetic proteins m-Cherry and m-Wasabi; and the RNA aptamer analogues Spinach and Broccoli. For 10 points each:

[10] Name this natural protein whose concentration can easily be measured on a plate reader absorbing at 510 nanometers by using a laser tuned to 485 nanometers.

ANSWER: **green fluorescent protein** [or **G·F·P**]

[10] If you don’t have a handy reporter like G·F·P, you may have to measure your protein’s concentration the old-fashioned way: measuring the absorbance at 280 nanometers, which relies on the concentration of these *three* amino acids with aromatic side chains. You must name all three.

ANSWER: **tryptophan**, **phenylalanine**, and **tyrosine** [or **W**, **E**, and **Y**; or **Trp**, **Phe**, and **Tyr**; accept in any order; must give all three]

[10] GFP was first isolated from an animal in this phylum called *Aequorea victoria* ("eye"-QUO-ree-ah "victoria"). This invertebrate phylum includes jellyfish and corals.

ANSWER: **Cnidaria** [or **cnidarians**]