

Saturnalia: Packet 7

Edited by Justine French, Avinash Iyer, Laurence Li, Robert Condron, Connor Mayers, Eric Yin, Karan Gurazada, Nick Dai, Ethan Ashbrook, Dylan Bowman, Jeffrey Ma, Daniel Ma, Benjamin McAvoy-Bickford, and Lalit Maharjan. Written by the editors and Vikshar Athreya, Maxwell Ye, Felix Wang, Danny Kim, William Orr, Jason Lewis, Tiffany Zhou, Gabe Forrest, Ariel Faeder, Josh Rollin, Louis Li, Advait Modali, Raymond Wang, Auden Young, Aadi Karthik, Ned Tagtmeier, Rohan Venkateswaran, Victor Li, and Richard Lin

THESE TOSSUPS ARE PAIRED WITH BONUSSES. IF A TOSSUP IS NOT CONVERTED, SKIP THE PAIRED BONUS AND MOVE ON TO THE NEXT TOSSUP. DO **NOT** COME BACK TO THE SKIPPED BONUS.

1. **This quantity for water is measured by reacting it with iodine in a technique abbreviated KFT (“K-F-T”). This quantity is on the x-axis of a graph whose slope is equal to the extinction coefficient. It’s not path length, but for a given substance, this quantity is directly proportional to absorbance, according to (*) Beer’s Law.** Recrystallization uses a seed crystal to decrease this quantity for an impurity. Colligative properties only depend on this quantity. For an analyte, this quantity can be determined by finding the equivalence point of a titration. For 10 points, name this quantity which can be measured with molarity or parts per million.

ANSWER: **concentration** [accept **molarity** before “molarity” is read”; accept **parts per million** or **parts per** other numbers until “parts” is read; accept **molality** or **normality**] (The lead-in refers to Karl Fischer titration.)
<Chemistry — Condron> [Ed. Iyer, French]

1. Signetics designed one of these devices called the 555 (“five-five-five”) timer, which is used for pulse generation and oscillators. For 10 points each:

[M] Name these devices, which combine large numbers of tiny circuit elements into a single piece of semiconductor material. Moore’s law predicts that the number of transistors in these devices will double approximately every two years.

ANSWER: **integrated circuits** [or **ICs** or monolithic **integrated circuits** or **chip** or **microchip**]

[H] The transistors in modern integrated circuits are nearly always this type of transistor. These transistors have three terminals called “gate,” “source,” and “drain.”

ANSWER: **field-effect** transistors [or **FETs** or **MOSFETs** or metal-oxide-semiconductor **field-effect** transistors or metal-oxide-silicon **field-effect** transistors]

[E] Along with transistors, integrated circuits also contain these other semiconductor devices, which only allow current to flow in one direction. Some of these devices are “light-emitting.”

ANSWER: **diodes** [accept light-emitting **diodes**; prompt on **LEDs**]

<Physics — French> [Edited]

2. **Ludwig Wittgenstein spent over a year designing unpainted radiators for one of these buildings he designed with Paul Engelmann. A long, horizontal window wraps all the way around a white one of these buildings whose free façade is supported by concrete pillars called pilotis. Gerrit Rietveld (“REET-felt”) designed one of these buildings for (*) Truus Schröder (“SHROH-der”). Frank Lloyd Wright named one of these buildings after the Welsh bard Taliesin (“tah-lee-AY-sin”). Le Corbusier analogized these buildings to machines and designed one for Pierre and Eugenie Savoye (“sah-V’WAH”).** For 10 points, Frank Lloyd Wright pioneered the Usonian style of what buildings in which people live?

ANSWER: **houses** [or **haus** or **villa**; accept **residence**; accept Usonian **House** or **Villa** Savoye or Schröder **House** or **Haus** Wittgenstein; accept any answer referring to a place where **people live**; prompt on **studio** with “for what other purpose was that building used?”]

<Architecture — French> [Edited]

2. Following this event, a bilingual national anthem and a coat of arms featuring both a two-tailed lion and a double cross were split among two successor states. For 10 points each:

[H] Name this event that saw the division of a multi-ethnic country into two states, one of which was led by Vladimír Mečiar (“VLA-dee-meer MET-see-ahr”).

ANSWER: Velvet Divorce [or Rozdělení Československa or descriptive answers like dissolution of Czechoslovakia or break-up of Czechoslovakia; do NOT accept or prompt on “Velvet Revolution”]

[M] This playwright was the last president of Czechoslovakia before the Velvet Divorce. He had earlier led members of Charter 77 in creating the Civic Forum party, which helped lead Czechoslovakia’s exit from the Warsaw Pact.

ANSWER: Václav Havel

[E] Charter 77 was signed in this city nine years after the suppression of a namesake “Spring” in 1968. Tomas Masaryk chose this city as the capital of Czechoslovakia in the aftermath of World War I.

ANSWER: Prague [or Praha; accept Prague Spring]

<European History — Laurence Li> [Ed. Iyer]

3. **An author from this country addressed a poem to a group who “pays to sin” and “lay / the guilt on women.” That author from this country concluded a poem with the line, “the world illuminated and I awake.” Another poem from this country describes a river that “advances and retreats, goes roundabout, / arriving forever.” The poems “You Men” and “First Dream” were written by a nun from this country, (*) Sor Juana Inés de la Cruz. A poem from this country is based on the synodic period of Venus and begins, “a willow of crystal, a poplar of water.” That 584-line poem is based on a solar calendar. For 10 points, name this home country of the author of “Sunstone,” Octavio Paz.**

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

<Poetry — Orr> [Ed. Condrón, French]

3. A text praising this deity states “I am in ecstasy when I experience the Indescribable Wisdom.” For 10 points each:

[H] Name this deity who is the dedicatee of the Gurmantra and Mul Mantar.

ANSWER: God [or Waheguru or Akaor Thakur or Prabhu or Swami or Shah or Paatshah or Sahib or Sain; accept BUT DO NOT REVEAL any answers referring to the deity worshipped in Sikhism]

[E] The Mul Mantar and Gurmantra are dedicated to the God of this monotheist Indian religion originating in Punjab. Male adherents of this religion wear turbans and generally adopt the surname “Singh.”

ANSWER: Sikhism

[M] The Mul Mantar opens this text, which was accepted as the final, eternal guru of Sikhism after the death of Guru Gobind Singh.

ANSWER: Guru Granth Sahib [or Adi Granth]

<Religion — Dai> [Edited]

4. **This ruler caused a period of massive displacement and migration known as the “Crushing.” Legendarily, this leader was conceived by his parents during a form of sexual foreplay called the “fun of the roads.” This leader ordered that no crops be planted for a year and banned the consumption of milk after the death of his mother. This half-brother of Mpande and (*) Dingane introduced the shorter “iklwa” spear as an alternative to the longer “assegai.” This ruler created a standing army divided into units called “impi” and pioneered the “bull horn” formation to encircle enemies in battle. For 10 points, name this militaristic ruler who expanded the Zulu Kingdom.**

ANSWER: Shaka Zulu [or Shaka kaSenzangakhona]

<World History — Athreya> [Ed. Iyer]

4. According to the IAU (“I-A-U”), these objects’ ability to fuse deuterium distinguishes them from planets. For 10 points each:

[M] Name these substellar objects. Although they form in the same manner as stars, these “failed stars” are not massive enough to fuse ordinary hydrogen into helium.

ANSWER: **brown dwarfs**

[E] The masses of brown dwarfs are typically expressed in terms of this planet’s mass. Ganymede and Callisto are moons of this largest planet in the solar system.

ANSWER: **Jupiter** [accept **Jupiter** masses]

[H] Along with neutron stars and rogue planets, brown dwarfs are examples of these dark matter candidates. These objects are made of ordinary matter but emit radiation too faint to be detected.

ANSWER: **MACHOs** (“machos”) [or **massive compact halo objects**]

<Astronomy — Yin> [Edited]

5. **One character on this TV show recalls learning to play chess by shooting chess pieces off a porch with an airgun. That character on this show is forced to invest in a pyramid scheme called NutriBoom to get freed from captivity by the prostitute Bill. Another character on this show wishes people would be “kind, sober, and fully dressed,” eliciting the response “Title of your (*) sex tape!”** In this show, the title of “Amazing Human slash Genius” has been won in the Halloween Heist by characters like Gina Linetti and Rosa Diaz. For 10 points, name this show about characters like Jake Peralta and Amy Santiago set at a New York City police precinct.

ANSWER: ***Brooklyn Nine-Nine***

<Popular Culture — Tagtmeier> [Edited]

5. The lever rule is used to calculate the proportion of ferrite and cementite in a form of this material known as pearlite. For 10 points each:

[M] Name this material, which is called austenite at high temperatures and low carbon concentration. Martensite is created from austenite by rapidly cooling this material in quenching.

ANSWER: **steel**

[E] Martensite is known for its high value of this quantity, around seven hundred Brinell, making it useful in blades and center punches. Steel files generally have a value of around six on the Mohs scale for this quantity.

ANSWER: **hardness** [accept relative **hardness** or indentation **hardness** or Mohs scale of mineral **hardness**]

[H] Martensite’s hardness comes from its body-centered tetragonal crystal structure, which forms from a diffusionless transformation from this crystal structure of austenite. This crystal structure has a coordination number of twelve.

ANSWER: **face-centered cubic** [or **cubic close-packed** or **fcc** or **cF** or **ccp**; do NOT accept or prompt on “body-centered cubic” or “hexagonal close-packed”]

<Chemistry — Iyer> [Edited]

6. **Doug Adams wrote a book documenting the score of this film franchise. Johan de Meij’s (“YO-han de MAY’s”) first symphony has the same title as this film franchise. A boy soprano sings, “When the cold of winter comes / Starless night will cover day,” in a song from this franchise, “In Dreams.” A bouncing low string arpeggio leads to a tin whistle melody in a track “Concerning” a race of characters from this franchise. The composer of this film franchise, (*) Howard Shore, quoted the 5/4 (“five-four”) march from “A Knife in the Dark” in the track “The Fighting Uruk-Hai.”** For 10 points, the “Shire” theme is referenced throughout what franchise based on a series of books by J.R.R. Tolkien?

ANSWER: *The **Lord of the Rings*** [accept *The **Hobbit***; accept answers mentioning J.R.R. **Tolkien** before “Tolkien”]

<Classical Music — Bowman> [Edited]

6. Giovanni Bellini, a painter from this city, showed an astounded friar emerging from a cave in *St. Francis in Ecstasy*. For 10 points each:

[M] Name this city, whose Renaissance art was dominated by the Bellini family. The artist of *The Tempest*, Giorgione, was also from this city.

ANSWER: **Venice** [or *Venezia*]

[E] Giovanni Bellini's student Titian showed this Roman god rescuing Ariadne in a painting for the Camerini d'alabastro. Bellini's *The Feast of the Gods* depicts this Roman god of wine filling up his jug.

ANSWER: **Bacchus** [do NOT accept or prompt on "Dionysus"]

[H] This 18th-century painter is known for his *vedute* of London, Rome, and Venice. This painter's *Stonemason's Yard* depicts a group of masons across the Grand Canal from the church Santa Maria della Carita.

ANSWER: **Canaletto** [or Giovanni Antonio **Canal**]

<Painting and Sculpture — Bowman> [Edited]

7. **These characters plant two plants in their grandmother's house that shrivel up but become green again when these characters are ground up, thrown into a river, and come back to life. To punish an opponent for "self-magnifying," these characters get help from their grandparents to replace that enemy's teeth with (*) corn.** As part of one quest, these characters survive dangers in the Dark House and the Razor House. One of these characters has his head replaced with a squash after he is decapitated in the Bat House. These characters use that head to play a ball game in the underworld, Xibalba ("shee-BALL-buh"). For 10 points, name these brothers from Mayan mythology.

ANSWER: Mayan **Hero Twins** [or **Hunahpu** ("hoo-NAH-poo") AND **Xbalanque** ("sh'bah-LON-kay")]

<Mythology — Condron> [Edited]

7. New theories suggest that the thundering herds of bison we associate with the western US only became present after the fall of complex Indian societies. For 10 points each:

[E] American bison have lived primarily in this large, mostly flat grassland region east of the Rocky Mountains that stretches across much of the central United States.

ANSWER: **Great Plains** [accept the **Plains**]

[H] This South Dakota national park known for its boxwork contains a herd of bison descended from the Yellowstone herd. It was the first cave to become a national park.

ANSWER: **Wind Cave** National Park

[M] The Henry Mountains in this state are home to another herd of bison descended from the Yellowstone herd, and its Antelope Island has a distinct, native herd of bison. Bryce Canyon National Park is also in this state.

ANSWER: **Utah**

<Geography — McAvoy-Bickford> [Ed. Daniel Ma]

8. **In this play, a character calls his mother a slave "of convention" after he tears a bandage from his head. Another character in this play recites a monologue about a "universal soul" during a performance that is interrupted by a woman who complains about the smell of sulfur. The Moscow Art Theater adopted its emblem from this play after an 1898 staging of it by Konstantin Stanislavsky. In this play, Dr. Dorn dismisses a (*) gunshot as the sound of a medicine bottle exploding after the suicide of a character who had been rejected by Nina.** For 10 points, name this Anton Chekhov play in which Treplev shoots the title bird.

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

<Drama — Orr> [Edited]

8. In Pindar's First Olympian Ode, this hero marries Hippodamia after defeating her father Oenomaus ("ee-noh-MAY-us") in a chariot race with the help of Poseidon. For 10 points each:

[M] Name this hero, who bribes Myrtilus to replace Oenomaus' bronze linchpins with wax in another version of the chariot race myth. In another myth, this hero's shoulder is replaced with one made of ivory.

ANSWER: **Pelops**

[E] This goddess mindlessly eats Pelops' shoulder after his father, Tantalus, cooks him and serves him at a banquet for the gods. This goddess of agriculture is the mother of Persephone.

ANSWER: **Demeter**

[H] Pelops and Tantalus are both members of the cursed house named for this son of Pelops and father of Agamemnon. Aegisthus ("ee-JISS-thus") murders this man for revenge after this man feeds Thyestes ("thigh-ESS-teez") the bodies of his sons.

ANSWER: **Atreus**

<Mythology — McAvoy-Bickford> [Ed. French]

9. **One algorithm that finds these things relaxes the entire input V minus one times and is named for Bellman and Ford. An algorithm that finds these things given an admissible heuristic ("hyoo-RISS-tick") called A^* ("A-star") builds on an algorithm that finds these things by adding every vertex to a priority queue or heap and successively relaxing them. In (*) graphs without negative edge weights, Dijkstra's ("dyke-struh's") algorithm can be used to find these things. Finding one of these things that visits every city in a list precisely once is an NP-hard problem. For 10 points, name these things, solutions to the travelling salesman problem which minimize the distance the travelling salesman needs to travel.**

ANSWER: **shortest path** [or **minimum weight path** or **minimum cost path** or **minimum distance path**;
prompt on **path**]

<Computer Science — Gurazada> [Edited]

9. When designing a concert venue for this city in 1960, Hans Scharoun ("shah-ROON") arranged rows of seats to rise up like a terrace surrounding the stage in a pentagon in what became known as a "vineyard style" concert hall. For 10 points each:

[M] Name this city home to an orchestra previously conducted by Wilhelm Furtwängler ("FOORT-veng-ler") and Herbert von Karajan ("KAR-ah-yahn").

ANSWER: **Berlin** [accept **Berlin** Philharmoniker]

[H] Between 2002 and 2018, the Berlin Philharmonic was led by this British conductor, who led a reorganization of the orchestra into a foundation. He rose to fame as the conductor of the City of Birmingham Symphony Orchestra.

ANSWER: Simon **Rattle**

[E] Despite criticism that Rattle neglected German classics, one of the most celebrated recordings made during his tenure is a 2007 recording of this composer's *A German Requiem*. This composer's Opus 49 contains a Wiegenlied ("VEE-guhn-LEET") better known as his "Lullaby."

ANSWER: Johannes **Brahms**

<Classical Music — Ashbrook> [Ed. Jeffrey Ma]

10. **Leo Strauss argued that the main character in this text acts as "the most magnificent cure" for political ambition in his book *The City and Man*. This text uses a metaphor from Sophocles likening a population to a shipowner who can't pilot a ship despite the presence of a stargazer on board. This text claims that the worst-off person is a tyrant, because he is a slave to his passions, after arguing that (*) democracy is only a bit better than tyranny. A man in this text argues that an ideal ruler would know the Form of the Good, leading to the notion of a philosopher-king. For 10 points, name this Platonic dialogue in which Socrates asks about the nature of justice and proposes an ideal city.**

ANSWER: *The* **Republic** [or **Politeia**]

<Philosophy — Ashbrook> [Edited]

10. In one ballet by this choreographer, dancers perform a *khorovod* (“huh-rah-VOTE”) after jumping in a circle over a series of irregularly-accented bitonal chords. For 10 points each:

[H] Name this choreographer. In that ballet by this choreographer, a girl becomes the “Chosen One” after twice entering the mystical circle.

ANSWER: Vaslav **Nijinsky** [do NOT accept or prompt on “Nijinska”]

[E] Nijinsky’s choreography for this Igor Stravinsky ballet supposedly caused a riot at its Parisian premiere. A young virgin dances herself to death in a fertility ritual in this “picture of pagan Russia.”

ANSWER: *The **Rite of Spring*** [or *Le **Sacre du printemps***]

[M] Nijinsky also played this character in an earlier Stravinsky ballet. In Michel Fokine’s (“foh-KEEN’s”) choreography, this character is kicked onto stage by a foot as the clarinets play arpeggiated C major and F-sharp major chords.

ANSWER: **Petrushka**

<Misc. Art — Victor Li> [Ed. Jeffrey Ma]

11. **A character in this story tells another character to retrieve a key hidden under a plantain leaf. In this story, the strength of a set of bars prevents the “admirable exercise” of jumping out of a window. This story’s narrator is unable to tell whether she receives phosphates or phosphites as a part of her treatment via Weir Mitchell’s (*) Rest Cure method. The “smoldering” and “unclean” title object of this story decorates the nursery of a colonial mansion where a doctor brings his wife to treat her “nervous depression.”** For 10 points, name this story whose main character goes crazy and peels off the title decoration, written by Charlotte Perkins Gilman.

ANSWER: “The **Yellow Wallpaper**”

<Short Fiction — Iyer> [Ed. Condrion, Mayers]

11. Antonin Artaud (“ar-TOE”) advocated for a version of this medium in which “violent physical images crush and hypnotize the sensibility of the spectator” in his book [*this medium*] and its *Double*. For 10 points each:

[H] Name this medium, which was influenced by a movement led by Artaud called “[this medium] of Cruelty.”

Artaud himself was influenced by *Ubu Roi* (“wah”), a work in this medium by Alfred Jarry.

ANSWER: the **theater** [or **drama** or **stage** or **plays**; accept **Theater** of Cruelty or **Théâtre** de la Cruauté; prompt on **performance**]

[M] The Theater of Cruelty was an inspiration for this absurdist playwright. In a play by this author, two characters contemplate hanging themselves from the lone stage decoration, a tree.

ANSWER: Samuel **Beckett** [or Samuel Barclay **Beckett**]

[E] That play, *Waiting for Godot*, was originally written in this language. Artaud and Jarry wrote in this language, as did other absurdist, such as Jean Genet and Jean-Paul Sartre.

ANSWER: **French** [or *langue française*]

<Drama — Faeder> [Edited]

12. **According to legend, this saint created a spring of water that could heal the sick after visiting Bernadette Soubirous (“soo-bee-ROO”). During an appearance of this saint, the Sun danced in the sky, and this saint visited Lucia Santos and her two cousins and described three secrets to those three children. The most visited Catholic pilgrimage site was built following the appearance of an image of this saint on the *tilma* (“TEEL-mah”) of Juan Diego. This saint’s titles include (*) Our Lady of Lourdes (“LOO-erd”), Our Lady of Fátima (“FAH-tee-mah”) and Our Lady of Guadalupe (“gwah-dah-LOO-pay”).** This saint is the subject of the doctrine of the Immaculate Conception. For 10 points, name this Biblical wife of Joseph and virgin mother of Jesus.

ANSWER: **Mary** [or **Maryam**; accept **Our Lady of Lourdes** or **Our Lady of Fatima** or **Our Lady of Guadalupe** before “Our Lady”]

<Religion — McAvoy-Bickford> [Ed. Dai]

12. Carsten Niebuhr (“NEE-boor”) copied a document commissioned by this ruler that shows him looking up at a *farvabar*. For 10 points each:

[M] Name this ruler who seized power in a civil war following the assassination of the impostor Gaumata. This commissioner of the Behistun Inscription established the Royal Road to connect his empire from Susa to Sardis.

ANSWER: **Darius I** (“the first”) [or **Darius the Great**; prompt on **Darius**]

[E] Darius I and his grandfather, Cyrus the Great, were both rulers of this empire. Herodotus described a series of wars fought between this empire and Greece.

ANSWER: **Persia** [or **Persian** Empire or **Achaemenid** Empire; prompt on **Iran**]

[H] The Behistun inscription also describes Darius’s defeat of a rebellion of these provincial governors of Persia. Cyrus the Great established this class of viceroys to govern the Achaemenid empire.

ANSWER: **satraps**

<World History — Modali> [Ed. Iyer]

13. **One member from this dynasty defeated the Habsburg Albert VII (“the seventh”) at the Battle of Nieuwpoort (“NEW-port”) before signing the Twelve Years’ Truce with him. Following a French Invasion during the “disaster years,” rioters loyal to this dynasty hanged Johan de Witt (“YO-han deh VITT”). A group supported by this dynasty that adopted crescent-shaped symbols for Ottoman support was the (*) Sea Beggars. A male head of this dynasty was invited by “The Seven” to invade Great Britain, instigating the Glorious Revolution, which placed this house’s William III (“the third”) on the throne. For 10 points, William the Silent established what royal house as the ruling house of the Netherlands?**

ANSWER: House of **Orange**-Nassau [or *Huis van **Oranje**-Nassau*; accept William of **Orange**; prompt on **Nassau**]

<European History — Rollin> [Edited]

For 10 points each, answer the following about the Igbo poem “Akuko Kpulu Uwa Iru” (“ah-koo-koh boo-loo oo-wah ee-roo”):

[M] At the beginning of the poem, White Ant tells a fib that his mother’s house has some of these crops “as big as his fists.” In a novel, the Week of Peace occurs before a feast celebrating the harvest of these crops.

ANSWER: **yams** [or **ji** (“jee”)]

[H] While laughing at White Ant’s fib, Cockerel burns Housefly, who then flies up this character’s nose. In *Things Fall Apart*, this character borrows feathers from birds so that he can attend a great feast in the sky.

ANSWER: **Tortoise** [or **Mbe** (“em-BAY”) or **Mbeku** (“em-BAY-koo”); do NOT accept or prompt on “Turtle”]

[E] “Akuko Kpulu Uwa Iru” is a poem by this Igbo author of *Things Fall Apart*.

ANSWER: Chinua **Achebe**

<Long Fiction — French> [Edited]

14. **One city in this country is home to the Menara Gardens and Kutubiyya Mosque near the Jemaa el-Fna Square. After this country’s Jews moved to Israel in Operation Yachin, their former neighborhoods became known as “Mellahs.” The Draa River flows south of this country’s highest point, Jebel Toubkal. This country is the northwesternmost in Tamazgha and in the (*) Maghrib. The Rif and the western end of the Atlas Mountains lie in this country. For 10 points, Tangier lies opposite Spain on the Strait of Gibraltar in what country whose capital of Rabat lies just north of its city of Casablanca?**

ANSWER: **Morocco** [or Kingdom of **Morocco**; accept *al-mamlakah al-maghribiyah* before “Maghrib”]

<Geography — Rollin> [Edited]

14. For 10 points each, answer the following about the British force H during World War II:

[H] Force H was tasked with sinking the Vichy French Fleet docked in this port as part of Operation Catapult. Ships from Algiers and Alexandria were ordered to relieve Marcel-Bruno Gensoul's fleet at this port, but they were unable to arrive in time.

ANSWER: **Mers-el-Kébir**

[E] The attack at Mers-el-Kébir was planned to prevent the Axis powers from using the French fleet to gain superiority in this body of water. Britain controlled access to this body of water from the Atlantic through the strait of Gibraltar.

ANSWER: **Mediterranean** Sea

[M] Force H's most famous engagement took place outside the Mediterranean Sea, in which Swordfish planes from the carrier HMS Ark Royal heavily damaged this German battleship. Earlier, this battleship sunk the *HMS Hood*.

ANSWER: **Bismarck**

<European History — Rollin> [Ed. Iyer]

15. In one print, this artist depicted a group of fleeing civilians with the caption "I saw it." This artist showed a man bound to a wooden pole awaiting execution by firing squad in "And there's nothing to be done," the fifteenth of a set of eighty-two aquatint prints. A cavalry regiment of Egyptian slave soldiers are attacked by the residents of a city in this artist's painting (*) *The Charge of the Mamelukes*. This artist depicted the devastation of the Peninsular War in his series *The Disasters of War*. A painting by this artist depicts a white-clad man with his arms outstretched in a Christ-like pose as he faces a firing squad. For 10 points, name this Spanish artist of *The Third of May, 1808*.

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

<Painting and Sculpture — Athreya> [Ed. Bowman]

15. A riot in this city saw the complete destruction of a neighborhood dubbed the "Black Wall Street." For 10 points each:

[H] Name this city where a black shoeshine boy named Dick Rowland was accused of assaulting Sarah Page, a white elevator operator. The accusation led to a massive race riot in this city.

ANSWER: **Tulsa**

[M] Many residents of Tulsa's Greenwood District, which was burned during the massacre, participated in this exodus of African-Americans out of the deep South.

ANSWER: First **Great Migration**

[E] This organization's member W. Tate Brady served as a night watchman during the Tulsa massacre. This white supremacist organization was founded in the wake of the Civil War by Nathan Bedford Forrest.

ANSWER: **Ku Klux Klan** [or **KKK**]

<U.S. History — Athreya> [Ed. Iyer]

16. The quality factor is the ratio between a value of this quantity and the full width at half maximum of this quantity's lineshape function. When this quantity is represented as a complex number, its imaginary part represents damping. This quantity is the same for all components of a system when the system is at a normal mode. The maximum speed of a simple (*) harmonic oscillator equals its maximum displacement times this quantity. For a pendulum, this quantity equals "root g over l ," while for a mass on a spring, it equals "root k over m ." Resonance occurs at particular values of this quantity. For 10 points, give this number of times that a system oscillates in a given unit of time.

ANSWER: **frequency** [accept angular **frequency** or oscillation **frequency** or normal mode **frequency** or resonant **frequency** or temporal **frequency**; prompt on **omega** or **nu** or **f**; do NOT accept or prompt on "spatial frequency"]

<Physics — French> [Edited]

16. Kinases, enzymes which phosphorylate other molecules, play important roles in intracellular signalling. For 10 points each:

[H] These cytoplasmic tyrosine kinases transduce signals from type I and type II cytokine (“SYE-toh-kyne”) receptors. These kinases phosphorylate STAT (“stat”) transcription factors in a namesake signalling pathway.

ANSWER: **Janus** kinases [or **JAKs** or **just another** kinases; accept **JAK-STAT** signalling pathway]

[M] Another important signalling kinase is protein kinase A, which initiates a phosphorylation cascade when it is activated by this second messenger. Adenylyl cyclase produces this signalling molecule from ATP (“A-T-P”).

ANSWER: **cAMP** (“camp”) [or **cyclic AMP** or **cyclic adenosine monophosphate**; do NOT accept or prompt on “AMP” or “adenosine monophosphate”]

[E] Signals are often transmitted across this structure by receptor tyrosine kinases. This structure is composed of a phospholipid bilayer and separates a cell’s interior from its environment.

ANSWER: **cell membrane** [or **plasma membrane**]

<Biology — Yin> [Edited]

17. **The Revolution of 1930 overthrew this country’s Old Republic. A leader of this country committed suicide following the Rua (“ROOH-ah”) Tonelero incident. That leader of this country introduced a new Polish-inspired constitution nicknamed “Polaca” (“poh-LAH-kah”) after overthrowing Washington Luis. This country’s period of “coffee with milk” politics was ended by the rule of (*) Getúlio Vargas, who established the Estado Novo regime. Vargas nationalized this country’s petroleum industry by creating the Petrobras corporation. For 10 points, name this South American country whose major cities include São Paulo and Rio de Janeiro.**

ANSWER: **Brazil** [or Federative Republic of **Brazil** or *República Federativa do **Brasil***]

<World History — Athreya> [Edited]

17. The inverse of a matrix A can be computed by combining A and the identity into a block matrix and then applying this process. For 10 points each:

[M] Name this process, which converts a matrix into row echelon form by scaling rows and adding them to each other. Linear systems of equations can be solved by performing this process on an augmented matrix.

ANSWER: **row reduction** [or **Gaussian elimination** or **Gauss-Jordan elimination**; prompt on **elimination**]

[H] For a matrix in row echelon form, these values are the first non-zero value in each row. An n by n matrix is invertible if it has n of these values.

ANSWER: **pivots**

[E] A matrix in row echelon form can be further reduced by scaling each pivot to equal this number. Any non-zero number divided by itself equals this number.

ANSWER: **one** [or **1**]

<Math — Ye> [Ed. French]

18. **A character created by this author claims that “the far and the near must be relative” during a discussion of whether a character who has moved fifty miles is near or far from her family. In another novel by this author, the protagonist breaks off her engagement after Sir Walter and Lady Russell warn her not to marry below her status. Captain (*) Wentworth marries Anne Elliot at the end of that novel. In a novel by this author, the heroine endures two “dances of mortification” with Mr. Collins during a ball at Netherfield, where her sister Jane awaits a proposal from Mr. Bingley. For 10 points, name this author of *Persuasion*, who wrote about Mr. Darcy and Elizabeth Bennet in *Pride and Prejudice*.**

ANSWER: Jane **Austen**

<Long Fiction — French> [Edited]

18. In the first published edition of this author's poems, Mabel Loomis Todd and Thomas Wentworth Higginson controversially changed words and added titles to poems that were originally untitled. For 10 points each:

[H] Name this author. In a letter to Todd, Higginson said the only poem "I dread a little to print" was a poem by this author whose final stanza reads, "Rowing in Eden – / Ah, the sea! / Might I but moor – Tonight – / In thee!"

ANSWER: Emily **Dickinson**

[E] In a poem whose first line mentions this concept, Dickinson noted that she "could not stop" for this concept, but "He kindly stopped for me."

ANSWER: **Death** [accept "Because I could not stop for **death**"]

[M] A Dickinson poem whose first line mentions one of these events describes hearing a group "lift a Box / And creak across my Soul." During one of these events, that group "Kept treading - treading - till it seemed / That Sense was breaking through."

ANSWER: **funeral** [accept "I felt a **funeral**, in my brain"]

<Poetry — Laurence Li> [Ed. Condrón]

19. **It's not urea, but the first artificial synthesis of this compound was performed by Joan Oró ("joo-AHN oo-ROH") by heating a solution of ammonium cyanide. APRTase ("A-P-R-T-ase") catalyzes this compound's namesake salvage pathway. Lactate dehydrogenase uses a cofactor named for nicotinamide and this compound to reduce pyruvate during fermentation. Up to 250 monomers of this purine derivative are attached to the 3-prime end of most (*) mRNA ("M-R-N-A"). Many eukaryotic ("yew-kair-ee-OT-ik") transcription factors bind to a "box" composed of thymine and this compound. This compound pairs with uracil in RNA and with thymine in DNA. For 10 points, name this nitrogenous base symbolized "A."**

ANSWER: **adenine** [prompt on A until it is read; do NOT accept or prompt on "adenosine"] (APRTase stands for adenine phosphoribosyltransferase.)

<Biology — Maharjan> [Ed. Yin]

19. This author wrote that "the conceited villager believes the entire world to be his village" in his essay "Our America." For 10 points each:

[M] Name this author, who founded the newspaper *Patria* ("PAH-tree-uh") to advocate for his country's independence. This author wrote "I am a sincere man" in a poem from his collection *Versos sencillos* ("sen-SEE-yos").

ANSWER: José **Martí** ("mar-TEE") [or José Julián **Martí** Pérez]

[E] José Martí was from this country. Martí wrote the lyrics to a patriotic song from this country, "Guantanamera," which is titled for a woman from Guantanamo.

ANSWER: **Cuba** [or Republic of **Cuba** or *República de Cuba*]

[H] An essay in *Patria* suggests that these things "should be mixed" to prevent conflict between them. Mexican writer José Vasconcelos proposed a "cosmic" one of these things that will unite and subsume the other four.

ANSWER: **races** [or *razas*]

<Other Literature — French> [Edited]

20. **The Workingmen's party under Dennis Kearney sought the deportation of this ethnic group. Paper Daughters and Paper Sons were invented by this ethnic group to bypass a law targeting them; that law was repealed by the Magnuson act. A case involving an individual of this ethnic group extended the *jus soli* doctrine of (*) citizenship to children of immigrants. This ethnic group was targeted by members of the Knights of Labor in the Rock Springs massacre. Most of the workers hired to build the Central Pacific railroad were from this ethnic group. For 10 points, name this ethnic group that was targeted by an 1882 Exclusion Act.**

ANSWER: **Chinese**-Americans (The Supreme Court case was *Wong Kim Ark v. U.S.*)

<U.S. History — Laurence Li, Iyer> [Edited]

20. This plane set the record for longest flight by a crewed solar powered aircraft when it flew for 26 hours. For 10 points each:

[H] Name this airplane flown by André Borschberg and Bertrand Piccard. It became the first solar powered airplane to circumnavigate the entire globe, which it did in seventeen legs.

ANSWER: **Solar Impulse**

[E] This American aircraft manufacturer's subsidiary company, Aurora, is working on an unmanned solar plane design called Odysseus. This aircraft manufacturer had to ground its fleet of 737 Max planes after a problem with the MCAS system.

ANSWER: The **Boeing** Company

[M] Like most solar cells, the solar cells on Solar Impulse use this effect to generate power. Solar cells are sometimes named for this effect, which generates electric potential upon exposure to light.

ANSWER: **photovoltaic** effect [do NOT accept or prompt on "photoelectric effect"]

<Other — McAvoy-Bickford> [Edited]