



**ACADEMIC  
COMPETITION  
FEDERATION**

**ACF NATIONALS 2022**

**PACKET 14**

**Packet by**

**The Editors (5)**

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## TOSSUPS

1. A 15-year-old Ernest Lough's ("luff's") 1927 performance of a work by this composer was EMI's ("E-M-I's") first million-selling classical record. An excerpt from a cantata by this composer was adapted into one of the "Great Four Anglican Hymns." One of this composer's oratorios was performed every year at the Birmingham Triennial Music Festival, where it premiered, and his anthem *Hear My Prayer* includes the soprano solo "O for the Wings of a Dove." This composer wrote a melody that was adapted by William Cummings to fit a text by Charles Wesley. In 1829, he led the first full performance, outside of Leipzig, of Bach's *St. Matthew Passion*. A melody by him had the lyrics "Peace on Earth, and Mercy mild, / God and Sinners reconcil'd" added to it to become the carol "Hark! the Herald Angels Sing." For 10 points, name this 19<sup>th</sup>-century German composer of the biblical oratorios *St. Paul* and *Elijah*.

ANSWER: Felix Mendelssohn-Bartholdy [or Jakob Ludwig Felix Mendelssohn-Bartholdy]

<Classical Music>

2. The etymologist Yāska ("YAHSS-kuh") proposed that the name of these events reflects three components of worship, unity, and charity. A variety of these events named for using *soma* is commonly performed to cleanse an area of toxins. *Brahmanas* ("BRAH-muh-nuzz") and *mantras* originally written for these events are mixed together in the so-called "black" section, as opposed to the "white" section, of a text whose name indicates it was originally recited during these events. These events are usually accompanied by a brahmin reciting the shortest of the Vedas. Their name is a direct cognate of the name of a set of Zoroastrian scriptures recited during water offerings. During Hindu weddings, the central object of these Vedic rituals is circled during the *saptapadi* or seven steps. A sacrifice of *ghree* to Agni often begins, for 10 points, what rituals performed before a fire?

ANSWER: yajñas [or yagnas or yagyas; accept homa; accept somayajña; prompt on pujas; prompt on sacrifices; prompt on Hindu fire ceremonies or rituals; prompt on worship of Agni before "Agni"; prompt on Yasna by asking "What is the Sanskrit cognate?"] (The second clue refers to the *Yajurveda*.)

<Religion>

3. A problem in parameterized complexity theory can be reduced to a simpler problem with this name, if and only if it is fixed-parameter tractable. A scaled function with this name is evaluated at a set of data points in the Parzen-Rosenblatt window method for probability density estimation. A function with this name can be decomposed into eigenvalues ("EYE-gun-values") and eigenvectors ("EYE-gun-vectors") of an associated linear operator by applying Mercer's theorem. A Hilbert space for which point evaluation is a continuous linear functional has a "reproducing" function of this name. A similarity function with this name replaces a high-dimensional inner product in a namesake "trick" used by support-vector machines. For a transformation  $T$  on a vector space  $V$ , this single word names an object whose dimension equals " $\dim V$  minus  $\text{rank } T$ ." For 10 points, give this name for the null space of a linear map.

ANSWER: kernel [accept kernelization or kernel density estimation or kernel function or reproducing kernel Hilbert space or kernel trick; prompt on null space]

<Misc. Science>

4. A woman in this play rebuffs a suitor's proposal by claiming that she is a bimetalist, even though she doesn't know what bimetalism is. A different woman in this play appears at a party in a heliotrope dress and is referred to as "a genius in the daytime and a beauty at night." A character in this play complains that his buttonhole isn't trivial enough to his butler, Phipps. This play's antagonist steals a compromising letter saying "I want you. I trust you. I am coming to you" from a man who locked her arm in a brooch that can become a bracelet, to prove she's a thief. This play's protagonist, who is Under-Secretary for Foreign Affairs, is blackmailed into supporting an Argentine canal scheme by Mrs. Cheveley, who is foiled by the dandy Lord Goring. For 10 points, Sir Robert Chiltern's wife, Mabel, learns not to venerate him in what play by Oscar Wilde?

ANSWER: *An Ideal Husband*

<British Literature>

5. A protest march in this U.S. city ended with a man nailing a list of fourteen demands to the door of its city hall. This city's Blackstone Rangers street gang turned to nonviolent protest in the mid-1960s. A riot in this city began after two policemen chased William Young, a Black ex-convict who tried to open a fire hydrant. In this city, elusive civil rights leader Al Raby founded the Coordinating Council of Community Organizers. After he was hit by a rock here, Martin Luther King Jr. said he'd never seen "mobs" more "hateful" than those in this city, where he campaigned for fair housing from January to August 1966. A seminary student who ran this city's chapter of Operation Breadbasket later ran for president twice, touting a "Rainbow Coalition." For 10 points, name this city where Jesse Jackson lives, whose largely-black South Side contains Hyde Park.

ANSWER: **Chicago**, Illinois

<American History>

6. A book titled for this process asks what it would mean for a pressure gauge to determine what its own 14 psi ("P-S-I") reading means, in the book's analysis of introspection as "displaced perception." This process titles a book that sets out to prove that "All mental facts are representational facts," which are in turn about "informational functions." Fred Dretske's ("DRET-skee's") Jean Nicod ("zhahn nee-KOH") Lectures were titled for doing this process to "the Mind." A paper titled for this process contains the quip "the Humean ("h'YOOM-ian") predicament is the human predicament." That paper titled for this process suggests reorienting the study of knowledge into domains of conceptual reduction and doctrinal reduction and "sett[ling] for psychology." For 10 points, name this process of reducing a philosophy topic to scientific basics, which is done to "Epistemology" in a paper by Willard van Orman Quine.

ANSWER: **naturalizing** [or **naturalize**; accept *Naturalizing the Mind*; accept "Epistemology **Naturalized**"]

<Philosophy>

7. A postmodern architect from this country designed a red apartment building shaped like a set of jagged ovals, with a façade scattered with small cylindrical balconies. That architect from this country drew from North African *kasbahs* for a labyrinthine, fortress-like apartment complex with a plan based on the Greek cross. That seaside complex here has sections painted in pink, red, blue, or purple. An architect from this country designed Walden 7 and a complex whose name translates to "The Red Wall." Another architect from here designed a skyscraper with nine pentagonal sections whose top part is rotated 90 degrees from its base. That architect from this country, who designed Malmö's Turning Torso, included white-ribbed wings in his plan for the Milwaukee Art Museum's bird-like brise-soleil. For 10 points, name this home country of Ricardo Bofill and Santiago Calatrava.

ANSWER: **Spain** [or Kingdom of **Spain**; or Reino de **España**]

<Other Fine Arts>

8. When this ruler requested a pharaoh's daughter in marriage on the advice of an eye doctor, he was treacherously given Nitetis, the daughter of the previous pharaoh Apries ("ah-PREE-ess"). This ruler's people considered him the "despot" in a sequence of three rulers known as "the father," "the despot," and "the shopkeeper." By one account, he died of a gangrenous wound in the thigh caused by a horse-riding accident in Syria. After a judge accepted a bribe during a case, this ruler had a chair decorated with the flayed skin of the offending judge, Sisamnes ("sye-SAM-nee-z"). To exploit enemy superstition, this ruler ordered his soldiers to place cats on their shields at the Battle of Pelusium. That let him conquer Egypt, where he lost an army in the desert and killed the Apis bull, according to disputed accounts of his insanity. For 10 points, name this short-lived successor of Cyrus the Great.

ANSWER: **Cambyses II** ("kam-BYE-seez the-second") [or **Kabūjiya II**; prompt on Cambyses or Kabūjiya]

<Ancient History>

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9. In her paper “Escape from flatland”, Christine Humblet explicitly points out how this reaction’s popularity has driven down the Fsp (“F-S-P-three”) ratio. This reaction’s starting material can be prepared in the same pot by directed ortho metalation of basic hetero-cycles, or by adding two pina-colato groups. Multiple reports that this reaction can be run catalyst-free in a microwave have been retracted, because commercial sodium carbonate, added as a base to accelerate reductive elimination, contains trace amounts of its catalyst. In drug design, this reaction is the easiest way to link sp<sup>2</sup> (“S-P-2”) carbons, since it can be run in water and, unlike the similar Stille (“stilly”) reaction, does not require toxic heavy metals. Instead, in this reaction, palladium trans-metallates a metalloid. For 10 points, name this reaction that couples aryl (“AIR-ill”) halides with boronic acids.

ANSWER: **Suzuki**–Miyaura coupling [or **Suzuki** reaction; or **SM** coupling; or **SMC**]

<Chemistry>

10. This character has to be revived with three cheap brandies after collapsing from the realization that he and his companion aren’t true friends, when that companion of this character contemptuously rejects an old man’s plan to have them travel to Paris in coffins to smuggle dope. After surviving being buried alive, this man reappears to a painter, who mistakes him for a ghost and jumps off a cliff. This character tells a man “you’re a victim of your own dirty mind” after killing him with a glass ashtray in Rome. A companion walks in on this character imitating him in a mirror while wearing the companion’s suit. A series of five novels includes books titled for him “Under Ground” and for his “Game.” In his first appearance, he kills Dickie Greenleaf with an oar and adopts his identity. For 10 points, name this “talented” con artist created by Patricia Highsmith.

ANSWER: **Tom Ripley** [or **Thomas** Ripley; accept any underlined name; accept *The Talented Mr. Ripley* or *Ripley Under Ground* or *Ripley’s Game*]

<American Literature>

11. A theory of these concepts defines them as “potentiality [...] to respond in a certain way under certain given circumstances” and divides them into secondary psycho-genic and primary viscerogenic forms. Observing a management program in Shanghai led Edwin C. Nevis to criticize the most famous model of these concepts as inapplicable to collectivist cultures. The three main forms of these concepts are directed toward achievement, affiliation, and power in David McClelland’s theory of them. The “growth” type of these in Clayton Alderfer’s ERG theory corresponds to a type that causes people to seek “peak experiences” in a ranking of these concepts in the book *Motivation and Personality*; that ranking places “safety” and “physiological” forms at the bottom and “self-actualization” at the top. For 10 points, name these concepts arranged in a hierarchy by Abraham Maslow.

ANSWER: human **needs** (The first clue is Henry A. Murray’s need-press theory.)

<Social Science>

12. This document and several Spanish documents were the source material for a “digest” drafted by Edward Livingston and James Brown, which created the only instance of “forced heirship” in the U.S. Similarly, this document was largely copied by the *Burgerlijk Wetboek* (“BURGER-lake VET-book”) introduced during the reign of Louis I (“the-first”). This document’s first section, named for “persons,” forbids women from entering into contracts and divorce by mutual consent. It was created to replace the decentralized system of *coutumes* (“koo-T’YOOM”) from the feudal era. An assembly called the Tribunate, which was purged for opposing this document, included Benjamin Constant (“kon-STAHN”). Its namesake said it would be remembered better than his victories in “40 battles,” such as Ulm and Jena (“YAY-nuh”). For 10 points, name this basis of modern French civil law, named for the emperor who introduced it.

ANSWER: **Napoleonic Code** [or **Code Napoléon**, or **Civil Code of the French**, or **Civil Code of 1804**; prompt on **Civil Code**] (The first clue refers to Louisiana’s code of laws.)

<European History>

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13. In this novel, the male protagonist's father watches men play soccer with what he believes to be a goat's head, before he realizes in horror that it's a human head. This novel depicts the House of the Children orphanage in Tijuana ("tee-HWAH-nah") and a man who goes to Namibia instead of slitting his wrists with a box cutter in two of its short interludes involving one-off characters. In this novel, the central couple does shrooms on the woman's terrace, where she keeps a lemon tree, in a building that the male protagonist visits by dressing in black robes like a woman. This novel's central couple first meet at a night class and later flee from a migrant camp in Mykonos ("MEE-ko-noss") to London, after their unnamed Muslim country is taken over by militants. For 10 points, Nadia and Saeed travel from country to country via mysterious doors in what 2017 novel by Mohsin Hamid ("MO-sin HAH-mid")?

ANSWER: Exit West

<World Literature>

14. Note to players: The answer is not "humans." Tendrils of ivy sprawl across a painting that shows one of these animals and omits the sheet of paper from the corner of the Velázquez work on which it is based. In a Rubens-inspired painting that centers on one of these animals, a pair of cherubs float above Michael Jackson as a battle rages in the background. One of these animals appears in a work whose red background shows sperm cells swimming around gold motifs. These animals appear in the series *Rumors of War*, which includes a sculpture of a dreadlocked man in a hoodie and ripped jeans. That work was made for the Virginia Museum of Fine Arts in response to statues depicting these animals nearby on Monument Avenue. A man with Timberland boots appears with one of these animals in a painting based on David's ("dah-VEED's") *Napoleon Crossing the Alps*. For 10 points, name these animals that appear in Kehinde ("keh-HIN-day") Wiley's equestrian portraits.

ANSWER: horses [accept more specific answers such as stallions or mares]

<Painting/Sculpture>

15. Cells within these structures were the first profiled using the LM22 signature matrix in the FARDEEP ("far-deep") and CIBERSORT ("cyber-sort") methods. In these structures, CD39 and CD73 catalyze the degradation of ATP to adenosine ("uh-DEN-oh-seen"), which acts on the A2A receptor. Maeda ("muh-AY-duh") discovered that the environment surrounding these structures makes them susceptible to the EPR effect. Within these structures, arginase-1 ("AR-jin-ace-one") is up-regulated by MDSC. Because these structures express PD-L1, their namesake "infiltrating lymphocytes ("LIM-foh-sytes")" are unable to target their neo-antigens unless a checkpoint inhibitor is administered. Thanks to HIF1-alpha ("hiff-one-alpha"), these structures secrete VEGF to grow leaky blood vessels. These structures' surrounding micro-environment is often hypoxic ("hye-POX-ic") due to the Warburg effect. For 10 points, name these structures which can spread to lymph nodes and distant organs through metastasis ("muh-TASS-tuh-siss").

ANSWER: tumors [accept cancer or neoplasms; accept specific tumors like gliomas or melanomas or carcinomas or sarcomas]

<Biology>

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16. *Description acceptable.* Zurab Tsereteli designed a fairy-tale themed sculpture park around one of these features called the Neglinnaya (“neg-LEEN-nuh-yuh”) as part of a revitalization project in Moscow. Visitors to Palawan in the Philippines flock to one of these features that lends its name to Puerto Princesa Park. Chay and Son are examples of these features which create the attractions of Vietnam’s Phong Nha-Kẻ Bàng (“PONG n’yah-kay BAHNG”) Park, while the largest example of them in the world creates the Sistema Sac Actun in the Yucatán. These features are not roads, but [emphasize] *before* an urban renewal project ending in 2005, Cheonggyecheon (“chung-gay-chun”) in Seoul was an artificial example of these features. They aren’t streets, but the Fleet is London’s largest example of these features, which are often created by culverting. For 10 points, what waterways naturally occur in karst topography, where they are created by flow into sinkholes?

ANSWER: underground rivers [or underground stream, or lost river, or lost stream; accept answers indicating a river or stream or brook that is subterranean or covered or beneath the ground; accept rivers in caves or rivers in caverns; prompt on rivers or streams or brooks by asking “What is uncommon about their surroundings?”; prompt on tunnels; reject “aquifers”]

<Geography>

17. Writing this equation in terms of a commutator acting on a third-order operator  $P$ , and then changing the order of  $P$ , generates its namesake hierarchy of equations. Applying the Miura (“mee-OO-ruh”) transform to this equation produces a “modified” form that facilitates deriving its infinite number of conservation laws. The fact that integrals of this equation are eigenvalues (“EYE-gun-values”) of a nonlinear one-dimensional Schrödinger operator was used in a 1968 paper that introduced Lax pairs to solve this equation. Zabusky and Kruskal noted that this equation, which reads “ $u$ -sub- $t$ , plus  $u$ -sub- $xxx$ , minus  $6u$  times  $u$ -sub- $x$ , equals zero,” describes the continuum limit of the Fermi–Pasta–Ulam–Tsingou (“t’SEEN-goo”) model. Like the sine-Gordon equation, this integrable (“in-TEG-ruh-bull”) equation admits soliton solutions. For 10 points, name this doubly-eponymous partial differential equation that models shallow-water waves.

ANSWER: Korteweg–de Vries (“KOR-tuh-weck-duh v’REESS”) equation [or KdV equation]

<Physics>

18. This poet’s brief time in Paris is fictionalized in the novel *What’s Left of the Night*. In Rae Dalven’s translation, this poet compares unfulfilled desires to “beautiful bodies of the dead who had not grown old” shut “in a magnificent mausoleum” in the first of several poems that use the phrase “sensual delight.” This poet’s poems titled for an emperor “at the Mysteries” and “Seeing Indifference” are about Julian the Apostate. A poem by this author repeats, “Hope your road is a long one.” People wear “rings sparkling with magnificent emeralds” in a poem by him that notes “how serious people’s faces have become” and asks “Why this sudden bewilderment, this confusion?” In that poem by him, the title people, who are called “a kind of solution,” fail to arrive in the forum. For 10 points, name this Greek-language poet of “Waiting for the Barbarians.”

ANSWER: C(onstantine) P(eter) Cavafy (“kuh-VAH-fee”) [or Konstantinos Petrou Kavafis]

(The poems whose titles are not dropped are “Desires” and “Ithaca”)

<European Literature>

19. In a dialogue set at a barrow, a woman says that she is not afraid of the flames engulfing this object as she demands it from her father’s ghost. By lying about using this object to pick an apple for his foster-son, a man wins the hand of Gardar’s daughter. The *Skáldskapar-mál* states that Högni owned an object called Dáinsleif (“DYNE-slay’P”) with similar properties to this object. In anger over a riddle, a king attacks Odin with this object and ends up clipping a hawk’s tail feathers. In a battle against twelve berserkers, Örvar-Oddr’s (“OR-var-OH-dur’s”) companion Hjálmar is slain by this object, which is central to *The Waking of Angantyr*. This object, which was wielded by the shieldmaiden Hervör and her son Heidrek, was made for Svafhlami (“s’VAH-vur-LAH-may”) by the dwarves Durin and Dvalin, who cursed it so it could not be sheathed without killing. For 10 points, name this sword possibly named after a Norse war god.

ANSWER: Tyrfing [or Tyrving; accept Tyr’s finger]

<Mythology/Legends>

20. This ideology left its populace “uncaptured” because it failed to address huge droughts, per a book about looking “Beyond” it by Göran Hydén (“YURR-un hew-DEN”). Officials beholden to this ideology swore not to be landlords or own shares of businesses under a strict Leadership Code. A document about this ideology claims, “A poor man does not use money as a weapon,” and urges, “Do not let us depend on money for development.” In James C. Scott’s *Seeing Like a State*, the embrace of this ideology by the TANU party is tied to the relocation of over nine million people in “villagization” (“village-ization”) efforts. Rice production along the Rufiji river collapsed because of a collectivization of agriculture motivated by this ideology, which was laid out in the Arusha declaration. For 10 points, name this socialist doctrine with a Swahili name, advanced by Tanzania's leader Julius Nyerere (“n’yuh-RAY-ray”).

ANSWER: ujamaa (“oo-juh-MAH”) [or ujamaa villages; prompt on socialism or Tanzanian socialism or African socialism; prompt on familyhood; prompt on villagization or agricultural collectivization before “villagization” by asking “What specific ideology motivated that?”]

<World History>

## BONUSES

1. A book formally titled for the *The Art of Thinking*, which distinguished types of meaning that it called “comprehension” and “extension,” is usually known by the name of this building. For 10 points each:

[10m] Name this abbey southwest of Paris, whose chief nun was Antoine Arnauld’s (“ar-NOH’s”) sister. This center of Jansenist thought names the logic textbook that was standard in western Europe for almost two centuries.

ANSWER: **Port-Royal**-des-Champs (“PORT-roh-YAL-day-SHAHN”) [accept **Port-Royal Logic**]

[10e] The *Port-Royal Logic* states that a perception must be “clear and distinct” to be reliable, a phrase found earlier in this Frenchman’s *Meditations on First Philosophy*.

ANSWER: René **Descartes** (“day-KART”) [or Renatus **Cartesius**]

[10h] A chapter in Part III (“three”) of the *Port-Royal Logic* discusses these incomplete syllogisms, which require some implied or unstated premise to reach their conclusion. Aristotle’s *Rhetoric* coined the term for them.

ANSWER: **enthymemes** (“EN-thuh-meem”) [or **enthymematic** arguments]

<Philosophy>

2. An indigenous guide that this explorer called “The Turk” may have been sent by the Keres Pueblo to distract him and lead his company astray into the Staked Plains. For 10 points each:

[10e] Name this Spanish explorer who, in 1540, set out north from Mexico to find the Seven Cities of Gold.

ANSWER: Francisco **Coronado** [or Francisco Vázquez de **Coronado**]

[10h] Coronado was led by this friar, who claimed to have visited Cíbola (“SEE-boh-lah”) and said it was as big as Tenochtitlan (“TEH-notch-TEET-lan”). This friar and the African-born explorer Estevanico (“ess-TAY-bah-NEE-koh”) had previously undertaken an evangelizing mission to the Southwest.

ANSWER: Marcos de **Niza** (“NEE-sah”) [or Marco da **Nizza**]

[10m] Coronado was not amused when Niza’s “Cíbola” turned out to be Hawikuh (“hah-WEE-koo”), a major site of this still-extant people. An archaeological complex of several of their sites, including Great Kivas, is partly named for Cíbola.

ANSWER: **Zuni** people [accept **Zuni**-Cibola Complex; prompt on **Pueblo** peoples; reject “Ancestral Pueblo” or “Anasazi”]

<American History>

3. A work titled for this literary form begins with *The Jewel in the Crown*, in which a mob beats Hari Kumar and rapes Daphne Manners after catching them having sex in a public park. For 10 points each:

[10m] Name this literary form. In one work titled for this form, the novelist Pursewarden serves as a confidant to Ambassador David Mountolive. A Paul Scott work is titled *The Raj* [this].

ANSWER: **quartet**

[10h] The year after Scott finished his *The Raj Quartet*, fellow British author M. M. Kaye published this epic novel. This novel charts Ashton Pelham-Martyn’s life as a soldier and love for Princess Anjuli from the Sepoy Mutiny through the Second Anglo-Afghan War.

ANSWER: *The **Far Pavilions***

[10e] Ashton is a British orphan raised by an Indian woman to be an Indian, much like the title character of *Kim*, by this author of “Gunga Din.”

ANSWER: Rudyard **Kipling** [or Joseph Rudyard **Kipling**]

<British Literature>



4. In behavioral genetics, three studies of this type, labeled EA1 through EA3, tried to find variants linked to educational attainment. For 10 points each:

[10m] Name this type of study that tries to determine the relationship between particular single nucleotide poly-morphisms and a trait. In these studies,  $p$ -values are commonly shown on a Manhattan plot.

ANSWER: **GWAS** (“G-wass”) [or **genome-wide association studies**; accept **whole-genome association studies** or **GWA** studies or **WGA** studies]

[10e] Genome-wide association studies try to build associations between SNPs (“snips”) and these things, which are the outward expression of a genotype.

ANSWER: **phenotypes**

[10h] GWAS studies also attempt to build these formulas, which are a weighted sum of the influence of each risk allele. These formulas are usually validated on a separate set from the one on which the GWAS was conducted.

ANSWER: **polygenic risk score** [or **PRS**; accept **polygenic score** or **PS**; accept genome-wide **polygenic score** or **GPS** or **genetic risk score** or **GRS** or **genome-wide score** or **GWS**; prompt on **risk score**]

<Biology>

5. The Suardi Chapel near Bergamo contains this painter’s fresco *Christ the Vine*, in which Christ’s fingers grow long branches that sprout grapes and eventually form circles around depictions of saints. For 10 points each:

[10h] Name this Venetian artist, whose *Recanati Annunciation* shows a cat leaping away from an angel holding a lily and God floating in a cloud that is visible through an archway.

ANSWER: Lorenzo **Lotto**

[10e] In another work by Lotto, this mythological figure urinates through a laurel wreath onto Venus. This figure is shown kissing Venus in an allegorical painting by Bronzino.

ANSWER: **Cupid**

[10m] Lotto’s portrait of the goldsmith Bartolomeo Carpan has this unusual property. That painting likely influenced a portrait of Charles I by Anthony van Dyck (“dike”) that has this property.

ANSWER: **triple** portrait [accept any answers involving **three** views of the same person; prompt on **multiple** views of the same person; reject “triptych”]

<Painting/Sculpture>

6. Answer the following about using the Internet to learn about physics, for 10 points each.

[10m] Googling almost any physics topic returns hits from this website created by Georgia State University’s Rod Nave. Its extensively cross-referenced text is presented in bare HTML tables on a pale peach-colored background.

ANSWER: **HyperPhysics** [accept <http://hyperphysics.phy-astr.gsu.edu/>]

[10h] This physicist maintains a list of online resources entitled “How to become a GOOD theoretical physicist.” He shared a Nobel Prize with his thesis advisor for showing how to renormalize Yang–Mills theories.

ANSWER: Gerard **’t Hooft** (“utt-HOHFT”) [or Gerardus **’t Hooft**]

[10e] This university’s introductory classical mechanics class was one of the first courses to reach a million views on its OpenCourseWare website. This university co-founded the edX (“ed-X”) platform with Harvard.

ANSWER: **Massachusetts Institute of Technology** [or **MIT**]

<Physics>

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7. The Biden administration lifted sanctions against this project's executive Matthias Warnig ("VAR-nick") in May 2021, but imposed new sanctions in November 2021 targeting affiliate companies. For 10 points each:

[10m] Name this now-cancelled project. It was intended to extend an existing network which shuttles billions of cubic feet of natural gas from Vyborg ("VEE-borg") to Germany.

ANSWER: **Nord Stream 2** Pipeline [prompt on Nord Stream Pipeline, or North Transgas, or North European Gas Pipeline]

[10e] This Chancellor of Germany canceled Nord Stream 2 in response to the Russian invasion of Ukraine. This Chancellor replaced Angela Merkel.

ANSWER: Olaf **Scholz** ("sholts")

[10h] Poland, which opposes Nord Stream 2, receives much natural gas from another Gazprom ("gas-PROM") line which runs from this peninsula to Europe. In 2014, several giant methane-filled pingoes were found in this peninsula, where a Gazprom "megaproject" seeks to find more reserves.

ANSWER: **Yamal** ("yuh-MAL") peninsula [accept Yamal-Europe Pipeline]

<Current Events>

8. The city and region of Ayacucho ("EYE-uh-KOO-cho") have a Quechua ("KETCH-wah") name meaning "corner of the dead." Identify these people who are reasons why that name is appropriate, for 10 points each.

[10e] At the Battle of Ayacucho, this general won independence for Peru by defeating Spanish royal forces. He lends his name to one of Bolivia's two capitals.

ANSWER: Antonio Jose de **Sucre** ("SOO-kray") Alcala

[10m] While teaching philosophy at the University of Ayacucho, this professor organized the Shining Path rebel group, which executed unpopular officials in Ayacucho's streets.

ANSWER: Abimael **Guzmán** ("goose-MAHN")

[10h] This ruler initiated a bloody conquest of Ayacucho to begin the first major Inca expansion. He sought revenge on the Chankas for their siege of Cusco, in which this Inca bravely ran away, leaving the city's defense to his son Pachacuti ("pah-chah-KOO-tee").

ANSWER: **Viracocha** ("vee-ruh-KOH-chuh") Inca [or Wiracocha Inca or Wiraqucha Inka; accept Hatun Tupac Inca; prompt on Tupac; reject "Tupac Amaru"] (Yes, he's named after the god.)

<World History>

9. This melody provided the subject for the most popular fugue by Vincent Lo, his Opus 31, which became a surprise hit on YouTube in 2008. For 10 points each:

[10m] Name this melody that also inspired Marc-André Hamelin's *Valse Irritation*. This melody is adapted from a phrase in a Francisco Tárrega piece.

ANSWER: **Nokia** ringtone [prompt on Gran Vals by asking "What melody did it become?"]

[10e] Tárrega's original "Gran Vals" was for this instrument, the primary non-voice instrument in *flamenco* music.

ANSWER: acoustic **guitar**

[10h] Ringtones provide the primary musical material of *Archeologia del telefono* by this Italian contemporary classical composer of the opera *Luci mie traditrici* ("LOO-chee MEE-ay trah-dee-TREE-chee"), who set the mystical visions of Maria Maddalena de Pazzi to music in his *Infinito nero*.

ANSWER: Salvatore **Sciarrino** ("shah-REE-no")

<Classical Music>

Editors: Will Alston, Stephen Eltinge, John Lawrence, Stephen Liu, Eric Mukherjee, and Adam Silverman

10. This author's character János (“YAH-nosh”) Batky goes to visit a decrepit Welsh castle in his novel *The Pendragon Legend*. For 10 points each:

[10h] Name this author, who was beaten to death in the Balf concentration camp in 1945. He wrote of Mihály (“MEE-high”), who abandons a honeymoon with his wife Erzsi (“ERR-zhee”) to wander Europe, in *Journey by Moonlight*.

ANSWER: Antal **Szerb** (“sairb”) [or **Szerb** Antal]

[10e] The honeymoon in Szerb’s *Journey by Moonlight* begins in this Italian city, where Gustav Aschenbach (“ASHEN-bock”) succumbs to cholera in a 1912 novella.

ANSWER: **Venice** [or **Venezia**; accept *Death in Venice*; accept *Tod in Venedig*]

[10m] Szerb’s travel diary about journeying through Italy is titled for one of these structures. Hugo von Hofmannsthal’s adaptation of *Life is a Dream* is titled for one of these structures, where Segismundo lives.

ANSWER: **tower** [or **torony**; or **turm**; accept *The Third Tower*; accept *A Harmadik Torony*; accept *Der turm*]

<European Literature>

11. Celebrations introduced by this movement include the *tish*, in which devotees gather for ecstatic singing around the table of their *rebbe* (“REH-beh”). For 10 points each:

[10e] Name this Jewish revivalist movement which arose in Eastern Europe in the 18th century. Its practitioners include the leaders of Chabad (“hah-BAD”) Lubavitch.

ANSWER: **Hasidic** Judaism [or **Hasidism**, or **Chassidism**, or **Chasidut**]

[10h] The Hasidic movement popularized these worship songs as a means of attaining *devekut*, or closeness to God. The lyrics of these songs are typically repetitive syllables, such as “Yai-Lai-Lai.”

ANSWER: **nigun** (“nee-GOON”) [or **niguns** or **niggunim**]

[10m] A Hasidic *nigun* was adapted into this Hebrew song whose title, meaning “Let us rejoice,” is followed by the words “ve nismecha” (“VEH neess-meck-HAH”) in its lyrics.

ANSWER: “**Hava Nagila**”

<Religion>

12. Answer the following about the planetary boundary layer, or PBL, the turbulent part of the troposphere in direct contact with the Earth, for 10 points each.

[10m] The PBL typically contains one of these layers during the day, and two of them at night. These layers block atmospheric convection, so they may harm air quality if they form over a city and trap smog.

ANSWER: thermal **inversions** [or **inversion** layers]

[10e] This quantity increases logarithmically within the lowest 100 meters of the PBL. This quantity is estimated via visual observation of one’s surroundings using the Beaufort (“BOH-fort”) scale.

ANSWER: **wind speed** [or **wind velocity**; prompt on **speed** or **velocity** by asking “Of what?”]

[10h] During the day, the PBL is capped by a layer named for this process. In this physical process, non-turbulent air from the upper troposphere is captured and mixed into the turbulent boundary layer.

ANSWER: **entrainment** [accept **entrainment** layer or **entrainment** zone]

<Misc. Science>

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13. Answer the following about Richard Kayne's 1994 book *The Antisymmetry of Syntax*, for 10 points each.

[10e] The word "antisymmetry" refers to this typological property of languages. For example, English and Mandarin clauses are subject–verb–object, whilst Hindi and Japanese clauses are subject–object–verb.

ANSWER: word **order** [or **linearity**; or **precedence**; or **directionality**; prompt on **branching**]

[10m] Kayne's *Antisymmetry* works within this formal theory of generative syntax named for an English letter. It is taught in many introductory courses, but has largely been outmoded by the Minimalist Program.

ANSWER: **X-bar** theory

[10h] In X-bar theory, all phrases have an underlying order in which this constituent is to the left of the head. In the determiner phrase "the team's bonus", the phrase "the team" is this kind of constituent.

ANSWER: **specifier** [or **Spec** ("speck"); prompt on **Adj** ("adge") or **Adjunct**; reject "Comp" or "complement"]

<Social Science>

14. The name of this forest may show a Celtic reflex of the Proto-Indo-European root word for "oak," reflecting this forest's massive oak trees. For 10 points each:

[10h] Name this vast, no-longer-extant forest in Central Europe. Pliny the Elder describes it as "surpassing all marvels" and remarks on its large bison and aurochs populations.

ANSWER: **Hercynian** ("her-KIN-ian") Forest [or **Hercynia** Silva, or **Arkýnia**, or **Orkýnios**; reject "Black Forest" or "Teutoburg Forest" as those places are still around today] (The root PIE \*perkʷ- > Proto-Celtic \*φerk- ("h'werk").)

[10m] Julius Caesar writes that the Hercynian forest stretched from Dacia ("DAY-shuh") to these people's homeland. During the Gallic Wars, Orgetorix ("or-GET-oh-reeks") initiated the migration of these Celtic people, who provide the Latin name of a present-day country.

ANSWER: **Helvetii** ("hell-VET-ee-eye") [or **Helvetians**; accept **Helveticum** or Confoederatio **Helvetica**; reject "Swiss"]

[10e] Surviving tracts of Hercynia include this forest, which was renamed from Osning in the 19th century to honor a battle fought here at which Arminius ("ar-MIN-ius") defeated three Roman legions.

ANSWER: **Teutoburg** ("t'YOO-tuh-burg") Forest [or **Teutoburger** Wald]

<Ancient History>

15. The original version of one of this author's plays urged the audience to resist the Kuomintang, but it was soon altered to spread anti-Japanese sentiment. For 10 points each:

[10h] Name this author and filmmaker whose 1931 play, *Put Down Your Whip*, featured future Madame Mao, Jiāng Qīng ("j'yang ching"), in its cast.

ANSWER: **Chén** Lǐtíng

[10m] In the 1960s, Jiāng Qīng commissioned the creation of this new theatrical genre, which sought to tell stories of common people, unlike traditional Peking Opera. Its eight initial examples included *The White-Haired Girl* and *Taking Tiger Mountain by Strategy*.

ANSWER: **revolutionary operas** [or **model operas**; or *yangban xi*; accept Eight **Model Plays**; prompt on **opera**]

[10e] This adjective describes a lantern in the title of one of the Eight Model Plays and a "Detachment of Women" in the title of another.

ANSWER: **red** [or **hóng**]

<World Literature>

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16. Although the theremin (“THAIR-uh-min”) started out as a concert instrument, it gained greater fame for its use in film scores. For 10 points each:

[10h] The theremin’s earliest prominent Hollywood appearances were in 1945, when this composer used it to depict amnesiac dreams in his score for *Spellbound* and alcoholism in his score for *The Lost Weekend*.

ANSWER: Miklós **Rózsa** (“MEE-klosh RO-sah”)

[10e] The theremin’s association with extraterrestrial life was popularized by the score for *The Day the Earth Stood Still*, by this composer of the scores for *Vertigo* and *Psycho*.

ANSWER: Bernard **Herrmann** [or Maximillian **Herman**]

[10m] The theremin-like sounds in Maurice Jarre’s (“ZHAR’s”) score for *Lawrence of Arabia* actually come from this electronic instrument, beloved by Messiaen (“mess-YANN”), whose wavering pitch is controlled by a keyboard or a metal ring, rather than by the player’s bare hands.

ANSWER: **ondes martenot** (“awnd mart-NO”) [or **ondes musicales**]

<Other Fine Arts>

17. Name these American authors of translations titled *Selected Poems of Gabriela Mistral* (“miss-TRAHL”), for 10 points each.

[10m] Directly after Mistral’s death in 1957, this man produced the first such volume. Six years earlier, this author of *Fields of Wonder* translated a Roma-inspired Federico Garcia Lorca collection that includes a poem beginning “Green, how I want you green.”

ANSWER: Langston **Hughes** [or James Mercer Langston **Hughes**]

[10h] Also in 1957, this woman produced and translated another book of selected poems. This woman was Mistral’s partner in her final years, and remained Mistral’s literary executor for half a century.

ANSWER: Doris **Dana**

[10e] A far more substantial array of poems appeared in this American author’s 2003 collection of *Selected Poems of Gabriela Mistral*. She is better known for writing *The Left Hand of Darkness* and the *Earthsea* novels.

ANSWER: Ursula K(roeber) **Le Guin** (“luh GWINN”)

<American Literature>

18. The radial component of these functions scales as the following: “rho to the  $n$ -minus-one,” times the exponential of “negative-rho over  $n$ ”. For 10 points each:

[10m] Name these functions proportional to a Laguerre (“lah-GAIR”) polynomial times a spherical harmonic. They are the solutions to the wave equation for a radial Coulombic (“koo-LOM-bick”) potential.

ANSWER: atomic **orbitals** of a hydrogen-like atom [or hydrogen **orbitals**; or **AOs**; or **s orbitals**, **p orbitals**, **d orbitals**, or **f orbitals**; prompt on **wavefunctions**; reject “molecular orbitals”]

[10e] In the formula, rho is a normalized radius times this quantity. A variational method estimates helium’s “effective” value for this quantity to be 1.6875—a bit less than the actual value—due to shielding.

ANSWER: effective nuclear **charge** [or nuclear **charge**; or **atomic number**; or the **number of protons**]

[10h] [read slowly] For an electron with principal quantum number  $n$  and azimuthal (“AZ-ih-MUTH-el”) quantum number  $\ell$  (“L”), the wavefunction depends on a Laguerre polynomial subscripted with what strictly non-negative function of  $n$  and  $\ell$ ?

ANSWER:  **$n - \ell - 1$**  (“N-minus-L-minus-one”) [or  **$n - 1 - \ell$**  (“N-minus-one-minus-L”)]

<Chemistry>

19. A Latin maxim beginning with the phrase “sit tibi copia” is inscribed in Rayonnant (“RYE-yoh-NAHN”) Gothic style on the portico of this structure’s great Gothic hall. For 10 points each:

[10h] Name this structure originally built for the Mirdasid dynasty. T.E. Lawrence wrote that it was the “the best preserved and most wholly admirable” structure of its kind in the world.

ANSWER: **Krak des Chevaliers** (“krahk day shev-ah-L’YAY”) [or **Crac de l’Hospital** or **Hisn al-Akrād**; prompt on **Krak**; reject “Kerak”]

[10e] Krak des Chevaliers was taken from the Hospitallers in 1271 by Baybars (“BYE-barz”), one of the sultans from this medieval state’s Bahri dynasty. This state ruled Egypt after the collapse of Saladin’s Ayyubid (“EYE-yoo-bid”) dynasty.

ANSWER: **Mamluk** Sultanate [or Salṭanat al-**Mamālīk**; or **Mamluk** dynasty]

[10m] Baybars re-fortified Krak des Chevaliers to guard the Beqaa (“beh-KAH”) valley from attacks by this Crusader state. Its rulers included Raymond III (“the-third”), one of the two losing commanders at the Battle of Hattin.

ANSWER: County of **Tripoli** [accept Raymond of **Tripoli**]

<European History>

20. For 10 points each, answer the following about writings that discuss ways to get nothing done.

[10e] During this war, the U.S.’s Office of Strategic Services gave tips for ruining meetings in a “Simple Sabotage Field Manual.” U.S. soldiers used the word “lollapalooza” as a shibboleth during this war.

ANSWER: **World War II** [or **Second World War**]

[10m] This political scientist calls the U.S. a “vetocracy” defined by interest groups blocking action at many points. His forthcoming book *Liberalism and its Discontents* walks back triumphalist claims about liberal democracy.

ANSWER: Francis **Fukuyama** (He made that claim in *The End of History and the Last Man*.)

[10h] This essay by radical feminist Jo Freeman, also known as Joreen, claims that groups without formal organization tend toward “political impotence” and a “star” system where informal elites dominate.

ANSWER: “The **Tyranny of Structurelessness**”

<Other Academic>