

Pre-ICT and Nationals Open/Minnesota Open 2019 (PIANO/MO): “What about bad subject matter? Or a bad title drop, even? That could kill a tournament pretty good.”

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Packet 10 Tossups

1. *Description acceptable.* In one painting, a man holding a piece of Mozart sheet music does *this* action in front of an audience divided into black, red, and blue sections. A man defecates by a fence in the bottom left of a painting whose main subjects perform *this* action. In a painting, a bride is shown between a huge rooster and a man doing *this* in front of the Eiffel Tower, and a similar-looking couple does *this* in *The Three Candles*. Punning on the Yiddish phrase for “itinerancy,” a beggar in black does *this* action in a work titled for the artist’s hometown of (*) Vitebsk. A pink church and green houses appear in a painting where the artist holds hands with his wife Bella, who performs this action. In another work, Bella wears black and holds flowers while the artist contorts his neck to kiss her while doing this action. For 10 points, name this action performed by Marc Chagall in his paintings *The Birthday* and *Over The Town*.

ANSWER: **fly**ing [or **levitat**ing, or **float**ing, or any reasonable equivalent for **being mid-air**; prompt on **jump**ing] <DS>

2. Vigilante groups of this name in Illinois and Iowa formed to fight marauding “Banditti of the Prairie” in the 1830s. A New Mexico “range war” began when a posse of this name formed to avenge John Henry Tunstall’s murder by the Murphy–Dolan monopoly’s gunmen. Billy the Kid became infamous in a group with this name during the Lincoln County War. Cattle rustling in Texas led to a feud in Shelby County between a faction of this name and the (*) “Moderators.” Quaker speaker Herman Husband inspired rebels with this name who were defeated at Alamance Creek. That group of this name was angered by taxes going towards a new governor’s mansion in New Bern. Supporters of Shays’ Rebellion often used this name in reference to the pre-Revolution opponents of William Tryon. For 10 points, give this name of the anti-corruption rebels in a namesake 1771 “War” in North Carolina.

ANSWER: **Regulators** [accept **War** of the **Regulation**] <JG>

3. It’s not the B meson, but axiguons were proposed to explain the large forward-back asymmetry in pair production of this particle at the CDF. This particle’s mass occurs near the infrared fixed point of the Standard Model. Detection of this particle requires reconstructing secondary vertices by combining the trajectories from its all-jets decay mode. The LHC’s ATLAS experiment is called a factory for this particle, which has a branching ratio of almost 1 since its decay always produces a W boson. This particle has the (*) largest Yukawa coupling to the Higgs boson and its mixing is reported in the bottom row of the CKM matrix. This particle, which forms no hadrons, was discovered at Fermilab’s Tevatron in 1995 and weighs about the same as an atom of tungsten. CP violation can be explained by this heaviest quark and its counterpart. For 10 points, name this third-generation quark once called “truth”.

ANSWER: **top** quark [or **t**] <AS>

4. On the day of this deity's festival in 153 B.C., Quintus Fulvius Nobilior lost a battle to the Celtiberians, rendering it a *dies ater*. This deity's sanctuary near the Forum contained a lotus tree and cypress tree older than Rome itself, and is often associated with a pre-Republic *lapis niger*. This deity sent a sign to allow his son to populate the city of Praeneste. This father of Caeculus was the Roman equivalent to the Etruscan (*) Sethlans. In book 8 of the *Aeneid*, Evander describes how a son of this god inhabited the Aventine Hill before Hercules killed him over the theft of some cattle. This father of Cacus was also known to the Romans as Mulciber. Scenes from the battle of Actium adorn the shield that this god crafted for Aeneas at the behest of his wife Venus. For 10 points, name this Roman god of fire, the analogue to the Greek Hephaestus.

ANSWER: Vulcan [accept Mulciber before read; do not accept or prompt on "Hephaestus" at any point] <MK>

5. A poem from this country repeatedly tells the addressee "When you leave / weary of me" and promises to "scatter" the title objects "on your way." Translators of this country's poetry into English include Brother Anthony and David McCann. In a recent poem from this country, the speaker describes how she experienced sexual harassment after she "forgot K's advice and sat next to En," a pseudonym for a perennial Nobel Prize contender from this country who wrote the collection *Ten* (*) *Thousand Lives*. Translator Deborah Smith allegedly "improved" a novel from this country whose protagonist is sent to a mental hospital after shooting a pornographic film with her brother-in-law. That protagonist from this country has a "Mongolian Mark" and frustrates her husband after she stops eating meat. For 10 points, name this country home to Ko Un and the author of *The Vegetarian*, Han Kang.

ANSWER: South Korea [or Republic of Korea or ROK or Taehan-minguk or Hanguk; prompt on Korea] <JM>
(The first poem is "Azaleas" by Kim Sowol.)

6. In February 2019, a team at Lawrence-Berkeley National Lab published a form of this technique in *Science* inspired by C-T scans, which they not-very-creatively abbreviated as CAL ["cal"]. Results in this technique are improved by specifying a brim, a raft, or a skirt and by limiting the infill fraction. "Standard triangle language" is a backronym for the ubiquitous file format in this technique which then gets processed by a Slicer into G-code. This technique often passes a UV laser through two mirror galvanometers into a (*) vat of resin. A mix of acrylonitrile, butadiene, and styrene is extruded as a filament in a form of this technique popularized by RepRap and the Fab@home projects. CAD files to enable proliferation of this technology are published on Thingiverse by MakerBot. For 10 points, name this technique of making objects with depth.

ANSWER: 3D printing [or word forms; or three-dimensional printing; or additive manufacturing; prompt on printing or word forms; prompt on manufacturing or word forms; prompt on rapid prototyping; do not accept or prompt on "machining"] <AS>

7. A 2006 book argues that the standardization of *these things* was set in motion by the US military's high demand for them in Vietnam. The Seventh-Kilometer Market in Ukraine is mainly built from these things, and other structures composed of them include Peter DeMaria's Redondo Beach House. A 2018 paper by Kerem Cosar and Banu Demir measures how much these things lowered costs in their industry by examining the margin at which firms choose between using them and (*) breakbulk. The first commercially successful use of these things was on the *Ideal X*, which was owned by Malcom McLean. These things are often used by companies like APL or Evergreen. The "High Cube" is a taller variant of these things, which typically have lengths of twenty or forty feet. Marc Levinson's *The Box* is a history of—for 10 points—what standardized metal crates that can go on trucks, trains, or ships?

ANSWER: intermodal shipping containers [or intermodal shipping containers; or intermodal freight containers; prompt on just containers by asking "For what purpose?"; accept just containers after "ships"; prompt on shipping crates or boxes until mentioned] <SB>

8. In an authorial preface, this character is called a “hero” despite being “a figure of an indefinite, indeterminate sort” and an “odd man.” This character is said to be the only person who’d safely be fed and sheltered if put in a new city of a million people with just a penny. His thoughts drift to “one little onion” upon hearing Paissy read the Wedding of Cana aloud. After a eulogy called the “Speech at the Stone,” a 14-year-old socialist named Kolya cheers “Hurrah for” this man, ending the novel he appears in. He’s not from Ursula Le Guin’s *Omelas*, but he rejects the idea of securing (*) utopia by torturing even one child in a chapter titled “Rebellion.” He gets his finger bitten after saving a boy from being pelted with stones. A monastic novitiate is abandoned by—for 10 points—what young man who *listens to* the tale of the Grand Inquisitor from his older brother Ivan [ee-VAHN] in a novel by Fyodor Dostoevsky?

ANSWER: Alyosha Karamazov [or Alexei Karamazov; accept A. Karamazov; prompt on Karamazov] <MJ>

9. A man in this city commissioned watercolors of himself wearing 137 outfits across the decades, then bound them into a *Book of Clothes*; Matthäus Schwarz of this city is thus a key source on 16th-century fashion. A powerful family from this non-Constantinople city implausibly claimed descent from the Byzantine general Belisarius. Seven articles about “abuses” of belief end a set of 28 articles written in this city. A walled enclave of yellow houses in this city, where rent has not gone up for 500 years, is the oldest social housing in the world. Colonial rights to (*) Venezuela were briefly held by this city’s Bartholomew Welser, whose rival Jakob Fugger was also a banker in it. The Schmalkaldic League laid down arms per a document named for this city creating the principle of *cuius regio, eius religio*. Lutherans wrote a 1530 “confession” in—for 10 points—what namesake of a 1555 “peace”?

ANSWER: Augsburg (The housing enclave is called the *Fuggerei*.) <MJ>

10. In a piece in this genre, two string instruments are tuned to natural harmonics of the bass player, and the oboist and clarinetists double on ocarinas. That piece in this genre adapts a melody from its composer’s own *Musica ricercata* in its second movement, “Aria, Hoquetus, Chorale.” The movements “Rings,” “Paths,” and “Rounds” appear in a Thomas Adès piece in this genre titled *Concentric Paths*. Jennifer Koh commissioned a (*) cadenza from John Zorn for one of these pieces by György Ligeti. Another of these pieces uses a tone row that starts with a chain of ascending thirds and begins with the clarinet and harp going up and down the stacked fifths “B-flat, F, C, G,” which are echoed by the soloist as “G, D, A, E.” Jennifer Higdon wrote one of these pieces for Hilary Hahn, and Alban Berg dedicated his “to the memory of an angel.” For 10 points, what orchestral genre features the highest string instrument?

ANSWER: violin concertos [or violin concerti; prompt on partial answer] <SK>

11. In electrolytes, this quantity is scaled by a factor of one plus the derivative of the log of permittivity with respect to log temperature. L·C·S·Ts and U·C·S·Ts only exist on phase diagrams if this quantity is nonzero. A simple mean field theory calculates this quantity as $R T$ times the product of volume fractions, the number of lattice sites, and a dimensionless parameter χ . A van’t Hoff plot with the log of infinite-dilution activity coefficient on the y -axis has a slope of this quantity over R . Making N·a·O·H stocks can be (*) dangerous because this quantity is very negative for sodium hydroxide and water. Flory–Huggins theory borrows the definition for this quantity, also known as the excess molar enthalpy, from regular solution theory. By contrast, it is assumed to be zero for all ideal solutions. For 10 points, name this quantity, the energy released when two compounds combine.

ANSWER: heat of mixing [or enthalpy of mixing; or heat of solvation; or enthalpy of solvation; or heat of solution; or enthalpy of solution; or heat of dissolution; or enthalpy of dissolution; or excess molar enthalpy until it is read; prompt on enthalpy; prompt on heat; prompt on H] <AS>

12. An anonymous group of theologians in *this* country rejected State and Church Theology in favor of Prophetic Theology in the Kairos Document. Missionaries to *this* country from Zion, Illinois spawned a movement of independent churches examined in a chapter of *Body of Power, Spirit of Resistance* by Jean Comaroff. In many indigenous belief systems from this country, an initiatory illness called *intwaso* begins the *ukuth-wasa* rites, through which a person becomes a traditional healer. This is the southernmost country in which medicines generically called (*) *muti* are doled out by traditional healers called *inyangas* or *sangomas*. This country's largest ethnic group venerates the supreme god Unkulunkulu. An Anglican theologian from this country developed Ubuntu theology and chaired the Truth and Reconciliation Commission. For 10 points, name this home of Archbishop Desmond Tutu.

ANSWER: Republic of South Africa [or Republiek van Suid-Afrika; or iRiphabhuliki yaseNingizimu Afrika; or iRiphabliki yomZantsi Afrika; accept equivalents] <SK>

13. It's not Cambodia, but an ex-farmer legendarily became this country's "Cucumber King" after he killed the old king for stealing his cucumbers. A ruler in this country used texts seized in his conquest of Thaton to back Shin Araham's suppression of marauding, *pramae noctis*-practicing "Ari Buddhist" monks. A kingdom in this country was ruled by an ex-monk named Dhammazedī, who had a giant bell built for a gilded (*) *stupa* in its current capital. The Myinsaing kingdom took over part of this country after Mongol victories at Bhamo and Ngasaunggyan ended a kingdom once led by Anawrahta. This country's dominant culture places its origin in the overtaking of Pyu city-states by Pagan. The Taungoo and Konbaung dynasties ruled this country from cities like Mandalay. For 10 points name this country whose kingdoms competed over the Irrawaddy valley.

ANSWER: Republic of the Union of Myanmar [or Burma; or Pyidaunzu Thanmada Myama Nainngandaw] <JG>

14. The NimStim dataset consists of 646 images of *these things*, which the Dartmouth lab of John Lanzetta and Robert Kleck studied in relation to electric shock. Randy Larsen's laboratory method for eliciting these things attached golf tees to subjects' skin. A study among Papua New Guinea's South Fore people gave them flashcards showing six Western examples of these. Carroll Izard studied a hypothesis that these physical things induce "feedback" in one's emotional state. "Human ethologist" Irenäus Eibl-Eibesfeldt argued that these things are universal, and a "coding system" for them with the acronym (*) FACS ["fax"] was co-developed by Wallace Friesen. Studies found a small set of people who can detect these on a time-scale of under half a second, called "Truth Wizards." Paul Ekman assessed lie detection using the "micro-" form of—for 10 points—what responses, which include furrowed brows and smiles?

ANSWER: facial expressions [or emotional expressions; or microexpressions; prompt on faces or emotions or non-verbal communications or body language or facial feedback] <MJ>

15. One of this author's characters makes up an excuse involving a cat, and then has to claim that cats are "superstitious" to explain why there are none in the house. That character created by this author says "I know what stillness is" after commenting how the protagonist used to sing and now lives in an empty house. Two of this author's characters are mocked for paying attention to (*) "kitchen stuff" like broken preserves jars, and for wondering if the protagonist was going to knot or quilt some pieces of fabric. In that play by this author, Mrs. Hale and Mrs. Peters hide the canary that John Wright strangled, which had in turn prompted Minnie to strangle him. For 10 points, name this co-founder of the Provincetown Players who fictionalized the life of Emily Dickinson in *Alison's House* and also wrote *Trifles*.

ANSWER: Susan (Keating) Glaspell <JR>

16. This non-literary activity titles a book in which Gohar Homayounpour criticizes her own internalized orientalism for having expected anything to be different about *Doing* this activity *In Tehran*. British experts on this activity like Susan Isaacs and Kate Friedlander split into two groups following major practitioners and one “middle” or “independent” group after a series of “Controversial Discussions.” Wilfred Bion studied groups under this paradigm, and was one of the first to work under the (*) “object relations” paradigm of this practice. Aspirants studying to do this activity must undergo it themselves in a “training” example of this practice, which typically seeks to achieve a “transference” of desires from some problematic object to practitioners like Melanie Klein. For 10 points, name this therapeutic practice originated by Sigmund Freud.

ANSWER: psychoanalysis [accept word forms like psychoanalyzing; prompt on psychology or psychotherapy] <JM>

17. This is the more precious of two materials used to make a collection of items assembled by the Ephrussi family, which was described in the 2010 book *The Hare with Amber Eyes* by Edmund de Waal. Around 1800, this material was used as the substrate for paintings like Sarah Goodridge’s *Beauty Revealed*. This was the typical material of objects used to keep the cords of *inrō* boxes from slipping off the sash of an *obi*. Coral, wood, and lacquer were inlaid in this material to make the vast majority of (*) *netsuke*. This material was carved to make many Anglo-Saxon crosses, as well as most of the Lewis chessmen. Most Inuit art is carved from a variety of this material, in a form of scrimshaw. This material was used for Zeus’s body in the statue at Olympia. This material was combined with gold in chryselephantine sculptures. Piano keys were once made from—for 10 points—what material derived from animal tusks?

ANSWER: ivory [accept more specific answers like walrus ivory; prompt on dentine] <JR>

18. In a play by this author, a character urges, “Hang the malicious world—There’s charms in wealth and honour, but none half so powerful as love” to persuade her sister Marcella to escape a “dull virtuous life” with Octavio by pretending to be a prostitute. Mr. Jevern states that the “industrious Stage / Has strove to please a dull ungrateful Age” in the prologue of another play by this author, in which Elaria and Bellemante are forbidden to marry human suitors by their father, Doctor Baliardo, who wants to marry his daughters to (*) alien suitors instead. This author of *The Feign’d Curtizans* wrote a play in which the vengeful Angellica Bianca falls in love with and later attempts to murder Willmore. In *A Room of One’s Own*, Virginia Woolf urged women to drop flowers on the grave of this playwright of *The Emperor of the Moon*. For 10 points, name this Restoration author of *The Rover* and *Oroonoko*.

ANSWER: Aphra Behn <WJ>

19. This protein is fused to tetanus or diphtheria toxin in a controversial vaccine named for its C-terminal peptide. In the triple test, high levels of this protein and low levels of A·F·P and U·E·3 are diagnostic of Down’s Syndrome. Edwards and Steptoe won a Nobel Prize effectively for showing that this protein works better than clomiphene to induce final maturation. This protein, which is only made in syncytiotrophoblast cells, is the most common one detected in an assay that combines an ELISA [“eliza”] sandwich with lateral (*) flow. The “trigger shot” directly injects this protein or a G·n·R·H agonist into follicles to stimulate release during an IVF treatment. Like its analogs FSH and LH, this hormone prevents degradation of the corpus luteum, but is secreted instead by the placenta. For 10 points, name this hormone detected in the urine by dipstick pregnancy tests.

ANSWER: beta-hCG [or beta-human chorionic gonadotropin] <AS>

20. **Mary Boyce demonstrated how bards named “gōsāns” achieved popularity in *this* empire before spreading to several of its smaller neighbors. The historian Homer H. Dubs argued that troops originally captured by this empire settled in the Chinese village of Liqian. The first ruler of this empire was a member of the Parni tribe. Capitals of this empire included the royal necropolis Nisa and the “hundred-gated” Hecatompylos. At one battle, a general of this empire ordered his soldiers to cover their (*) horses with cloth, thereby disguising the gleam of their armor. That general also used camels to resupply his horse archers. This empire ended the First Triumvirate by supposedly pouring molten gold down the throat of Crassus. The battle of Carrhae was won by—for 10 points—what pre-Sassanid Persian empire, whose archers fired while retreating in its namesake “shot”?**

ANSWER: **Parthian** Empire [accept **Arsacid** Empire] <MK>

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Packet 10 Bonuses

1. In this musical, the Jewish fruit shop owner Herr Schultz gifts a pineapple to his lover Fräulein Schneider in the song “It Couldn’t Please Me More.” For 10 points each:

[10] Name this musical set at the Kit Kat Klub. Alan Cumming reprised his Tony Award-winning role as the Emcee in its 2014 Broadway revival, which starred actresses such as Emma Stone and Michelle Williams as Sally Bowles.

ANSWER: **Cabaret**

[10] This composer-lyricist duo collaborated on *Cabaret*, as well as *Chicago*. They also wrote the jazz standard “New York, New York,” which was popularized by Frank Sinatra; name both members.

ANSWER: John (Harold) **Kander** AND Fred **Ebb** [accept in either order]

[10] In the song “If You Could See Her,” the Emcee sings about his love of a woman dressed in *this* fashion. He concludes the song by singing, “If you could see her through my eyes, she wouldn’t look Jewish at all.”

ANSWER: dressed in a **gorilla** suit [do not accept being dressed as a monkey or any other primate] <WJ>

2. Part 2 of this man’s long poem *Madoc* is composed of sections with headings like “[Thales],” “[Diderot],” and “[Kristeva].” For 10 points each:

[10] Name this contemporary Irish poet known for his use of the pluperfect tense in difficult poems like “Moy Sand and Gravel.” His other collections include *Annals of Chile* and *Quoof*.

ANSWER: Paul **Muldoon**

[10] Muldoon’s *Madoc* was inspired by an epic of the same name by *this* Lake Poet, whose other epics include *Roderick the Last of the Goths* and *Thalaba the Destroyer*. The opening line of Byron’s *Don Juan* mocks this man.

ANSWER: Robert **Southey**

[10] Muldoon is also known for his intensely creative use of *this* poetic technique, often in its imperfect or “slant” variety. Near the end of Canto I, the narrator of *Don Juan* remarks “Prose poets like blank verse,” while *he*’s “fond” of *this* technique.

ANSWER: slant **rhyme** <JR>

3. This variable’s usefulness has been put into doubt by evidence that it is directly chosen by women with high socioeconomic status. For 10 points each:

[10] Name this variable, which Angrist and Krueger used in 1991 as an instrument for educational attainment.

ANSWER: **quarter** of **birth** [or **season** of **birth**; or things like **time of the year** of **birth**; prompt on **date of birth** with “What part of the date?”]

[10] Another criticism of using quarter of birth is that it is *this* type of instrument, which only explains a small fraction of the variation in the variable being instrumented.

ANSWER: **weak**

[10] Weak instruments aggravate *this* already existing problem for two-stage least squares regressions in finite samples. Estimators display this problem if their expectation is different from the population parameter.

ANSWER: **bias** [or small sample **bias**] <SB>

4. In a book noted for its extensive use of statistical tables, this historian failed to notice that a decrease in the proportion of farmers in Overijssel [oh-fur-eye-sul] was readily explained by an overall increase in population. For 10 points each:

[10] Identify this historian who wrote *The Dutch Republic: Its Rise, Greatness and Fall 1477–1806*. He has since written a massive trilogy contrasting “moderate” and “radical” camps during the Enlightenment.

ANSWER: Jonathan (Irvine) **Israel**

[10] Israel’s book identifies *this* decade as the starting point of the peculiar Dutch trend for *de*-urbanization, rejecting the alternative view that places it a decade earlier. In this decade, William of Orange took the British throne in the Glorious Revolution.

ANSWER: **1680s**

[10] In addition to being Prince of Orange, William held *this* title from 1672. This title was abolished in 1795 with the foundation of the short-lived Batavian Republic.

ANSWER: ***stadtholder*** <DJG>

5. These basis functions are derived by scaling and translating a “mother” function. For 10 points each:

[10] Name these functions that oscillate only within a relatively narrow interval. Transforms based on these functions are used in compression schemes like JPEG [“jay-peg”] 2000.

ANSWER: **wavelets** [accept continuous **wavelet** transform]

[10] Wavelet transforms are often used as an alternative to the sinusoid-based “transform” named for *this* French mathematician. His transform takes a function plotted over time and shows peaks at its component frequencies.

ANSWER: (Jean-Baptiste) Joseph **Fourier** [or **Fourier** transform]

[10] For instance, wavelet transforms can be used to avoid *this* man’s namesake phenomenon, in which a function’s Fourier series always overshoots near sudden jumps. This American popularized the use of vectors, and he invented the dot and cross products.

ANSWER: Josiah Willard **Gibbs** [or **Gibbs** phenomenon] <JR>

6. For 10 points each—answer the following about controversial author attributions in literature.

[10] In 2016, the New Oxford Shakespeare made headlines for using “big data” to attribute the Henry VI plays to *this* playwright in collaboration with Shakespeare. This man wrote *The Jew of Malta* and *Doctor Faustus*.

ANSWER: Christopher **Marlowe**

[10] Donald Foster, who is best-known for his work on Shakespeare authorship, also used stylometry to identify *this* anonymous bestseller as the work of Joe Klein. This roman à clef is about Bill Clinton’s first presidential campaign.

ANSWER: ***Primary Colors***

[10] Textual analysis programs have recently re-attributed the novels of *this* author to Domenico Starnone, whose novels *Ties* and *Trick* were translated into English by Jhumpa Lahiri. Others believe that this author’s works were written by Starnone’s wife, Anita Raja.

ANSWER: Elena **Ferrante** <DS>

7. In the tenth or eleventh century, an anonymous scribe in this empire produced a 30,000-plus entry alphabetical encyclopedia of religious, historical, and everyday terms known as the *Suda*. For 10 points each:

[10] Name this empire whose history was popularized among Renaissance scholars by Hieronymus Wolf. Historical sources on it include Procopius's *Secret History*, which calls its emperor Justinian I a "demon."

ANSWER: **Byzantine** Empire [or **Eastern Roman** Empire; prompt on **Roman** empire or **Romaioi**]

[10] This twelfth-century Byzantine princess became one of the first known women historians by penning the *Alexiad*, which narrates the dynasty-establishing reign of her father Alexios I.

ANSWER: **Anna Comnena** [or **Anna Komnene**; or **Anna Comnenos**; prompt on just her first or last name]

[10] This bishop of a Lombard city described a hydraulically-elevated throne and fanciful automaton lions in a report to Otto the Great about his trip to Constantinople, which is a key outsider source on the Byzantine empire.

ANSWER: **Liutprand** of Cremona [or **Liudprand** of Cremona] <MJ>

8. This form of spectroscopy has energy on the scale of a single electron-volt, which is suitable for detecting pi-pi star transitions to determine if a molecule is conjugated. For 10 points each:

[10] Name this form of spectroscopy that generally probes electronic transitions.

ANSWER: **UV-vis** spectroscopy [or **ultraviolet-visible** light spectroscopy; or **spectrophotometry**; prompt on partial answer]

[10] IR and Raman spectroscopy, on the other hand, consider the much lower-energy transitions caused by this type of molecular motion, in which a chemical bond contracts or lengthens, leading the nuclei move slightly.

ANSWER: **vibration**

[10] At low atomic numbers, pi orbitals are lower in energy than sigma orbitals due to low *s-p* mixing. However, the order of the energy for pi and sigma molecular orbitals inverts between *which two* adjacent elements on the periodic table?

ANSWER: **nitrogen** AND **oxygen** [or **N** and **O**] <AS>

9. Signs reading "Tweet your feet!" encouraged visitors to photograph themselves and *this* object, whose original design by SRG Partnership was removed to great outcry in 2015. For 10 points each:

[10] Name this teal object. It was patterned with dark blue T-shapes intended to resemble airport runways viewed from overhead.

ANSWER: **Portland** International Airport **carpet** [or **PDX carpet**; prompt on **Portland International Airport** or **PDX**; prompt on answers such as "PDX floor"]

[10] The PDX carpet bedecked an airport south of the Columbia River in *this* state, whose tourist attractions include Mount Hood and the rainwater-filled ex-volcano Crater Lake.

ANSWER: **Oregon**

[10] Oregon's Malheur National Forest is home to the largest known example of *these* things, covering over three square miles of land.

ANSWER: **fungi** [or **funguses**; or **mycelium**s; or **mycelia**; or honey **fungus**; or fungal **rhizome** network; or **Armillaria mellea**; or **Armillaria solidipes**; anti-prompt on **mushrooms**] <MJ>

10. Verse six of *Sūrat al-Mā'idah* [MEH-ih-duh] provides the instructions for this practice, and notes that “Allāh does not intend to make things hard for you” when explaining the *tayammum* type of this practice. For 10 points each:

[10] Describe this practice, which comes in *wuḍū'* and the more intensive *ghusl* forms. Muslims must do a type of this practice before praying and entering mosques, and may use “clean earth” for it in tough circumstances.

ANSWER: **ablution** [accept descriptive answers describing **washing** or ritual **purification**]

[10] A full *ghusl* is required after *this* practice, which *fiqh* literature calls *istimnā'*. *Shāfi'ī* jurists find this practice categorically *ḥarām*, while other *madhabs* allow it only for travelers and prisoners or to prevent *zīnah*.

ANSWER: **masturbation** [accept word forms and equivalents]

[10] Muslims must achieve *this* specific heightened state of ritual purity before crossing ceremonial boundaries called the *mīqāt* [mee-KAHT]. Unusually, this purity state is explicitly *broken* for women by wearing a *niqāb* or *burqa*.

ANSWER: **ihrām** [prompt on descriptive answers indicating the purity state required for pilgrimages, i.e. for hāj or umrah, or for entering Mecca and/or Medina; prompt on tahārah] <JG>

11. This piece switches styles midway through for a slow, G-minor “Air” marked “Andante religioso.” For 10 points each:

[10] Name this 1884 piece that ends with a “Rigaudon.” It was written around the same time as its composer’s A-minor cello sonata and his two “Waltz-Caprices.”

ANSWER: **Holberg Suite** [or **From Holberg’s Time** or **Fra Holbergs tid** or **Aus Holbergs Zeit**]

[10] The *Holberg Suite* was written by *this* Norwegian composer of many *Lyric Pieces*.

ANSWER: Edvard (Hagerup) **Grieg**

[10] The third movement of the *Holberg Suite* is *this* kind of dance, which begins with a two-quarter-note upbeat and, like a bourrée, is in cut time. Prokofiev included one of these dances in his *Classical Symphony*.

ANSWER: **gavottes** <JR>

12. This equation, which is frequently used in seismology, can also be used to calculate the height of a fata morgana mirage, in which case it is derived directly from Fermat’s principle of least time. For 10 points each:

[10] Name this nonlinear partial differential equation which sets the norm of the gradient of a function equal to some arbitrary scalar function. It can be solved numerically using the fast marching approach.

ANSWER: **eikonal** equation

[10] The eikonal equation is key to ray tracing in this field of optics, which considers light to act as a ray, not as a particle. The paraxial approximation is made in the Gaussian subfield of it.

ANSWER: **geometrical** optics [or **geometric** optics]

[10] The eikonal equation can be derived from this second-order P·D·E under a W·K·B approximation. This equation, which sets the second time partial of a scalar function to be proportional to its Laplacian, is named for the fact that its solutions are oscillatory.

ANSWER: **wave** equation <AS>

13. For 10 points each—answer the following about the word “fuck”... in poetry.

[10] The first line of this Philip Larkin poem, which takes its title from Robert Louis Stevenson’s “Requiem,” states, “They fuck you up, your mum and dad.”

ANSWER: “**This Be The Verse**”

[10] In the first edition of *this* poem, the publisher replaced the f-word with dots in the line “let themselves be f..... in the a.. by saintly motorcyclists.”

ANSWER: “**Howl**” (by Allen Ginsberg)

[10] *This* author’s poem “On the Death of Robert Lowell” begins, “O, I don’t give a shit” and concludes, “Fucking dead.” Robert Mapplethorpe shot a portrait that graces the cover of the novel *Chelsea Girls* by this author, who included “An American Poem” in the collection *Not Me*.

ANSWER: Eileen **Myles** <DS>

14. Shortly after MIT philosopher George Boolos died, many of his essays were collected in the anthology *Logic, Logic, and Logic*. For 10 points each:

[10] Many essays in *Logic, Logic, and Logic* are about this German logician. This author of the *Begriffsschrift* analyzed two forms of meaning in the sentence “Hesperus is Phosphorus” in the essay “Sense and Reference.”

ANSWER: Gottlob **Frege**

[10] A Boolos essay on *this* kind of logic defends it from Quine’s claim that it’s merely a form of set theory. By Frege’s Theorem, Hume’s principle is enough to derive all of Peano arithmetic within this form of logic.

ANSWER: **second-order** logic [prompt on higher-order logic]

[10] A trollish essay near the end of *Logic, Logic, and Logic* purports to prove *this* mathematical result using only words of one syllable in length. The Lucas–Penrose argument attempts to conclude from this result that minds are not entirely mechanistic.

ANSWER: Gödel’s Second **Incompleteness** Theorem <MJ>

15. This dynasty’s Xiàowén [SHYOW-wun] Emperor and Dowager Empress Féng [fung] devised a system in which all land would be owned by the government and given out based on family size for the length of a farmer’s life. For 10 points each:

[10] Name this dynasty that unified the “Sixteen Kingdoms” of the Five Barbarians to found the first of the Northern Dynasties. This dynasty enacted mandatory Sinicization policies for its own elite under Xiànwén [SHYEHN-wun].

ANSWER: Northern **Wèi** [or **Tuòbá** Wei or Later **Wèi** or Yuán **Wèi**; accept **Xiānbēi** [shyehn bay]]

[10] *This* land distribution system created under Northern Wei had heritable options for long-term cultivation as needed, as well as its normal lifetime tenured plots. It formed the basis of the post-Taika Reform *ritsuryō* system.

ANSWER: **equal fields** system [or **Jūntián Zhidù**]

[10] The equal field system’s reliable tax revenue led it to be adopted under the Suí and this dynasty after the Suí. The system collapsed along with this dynasty with the rise of *fānzhèn* [fahn-JUHN] warlords and the Ān Lùshān rebellion.

ANSWER: **Táng** Dynasty <JG>

16. The proposed influence of this variable on diversification rates has led to a debate about whether certain values of this quantity produce “cradles” or “museums” of biodiversity. For 10 points each:

[10] Identify this independent variable in a ubiquitous biogeographic pattern relating it to species diversity. The mid-domain effect is often incorporated into null models of its influence.

ANSWER: **latitude** [accept answers that describe proximity to the Equator or to the tropics; do not accept climate variables such as “temperature” or “precipitation”]

[10] The influence of latitude on diversification may occur via either of these *two* component processes whose difference equals the diversification rate. These processes often explain the emergence and disappearance, respectively, of taxa in the fossil record. Name *both*.

ANSWER: **speciation** AND **extinction** [accept in either order]

[10] Rapoport’s rule describes the decline in the size of these things as latitude increases. Niche modeling techniques like MaxEnt are used to model these things, the geographic extents through which a species can be found.

ANSWER: geographic **range** [or geographic **distribution**; prompt on **habitat**] <SK>

17. This play’s author enacted a “posthumous literary emigration” by dying a few months after its first production and forbidding the staging or publishing of any of his works in Austria in his will. For 10 points each:

[10] Name this controversial play that begins after the funeral of a Jewish professor who committed suicide by jumping out a window onto the title Vienna street.

ANSWER: **Heldenplatz** [accept **Heroes’ Square**]

[10] *Heldenplatz* was written by *this* author, who included bitter monologues attacking his native Austria as a “Nazi nest” in plays like *Elizabeth II*. His novel *The Loser* follows an obsessive rival of Glenn Gould.

ANSWER: (Nicolaas) Thomas **Bernhard**

[10] Bernhard’s fellow Austrian playwright Elfriede Jelinek [yeh-lih-neck] wrote a postmodern riff on *this* Ibsen play showing “what happened after” Nora Helmer climatically slams the door on her married life.

ANSWER: *A Doll’s House* [or *Et Dukkehjem*; accept *A Doll House*] <JG>

18. In computational linguistics, these words require “reference resolution” through the analysis of linguistic and situational context. For 10 points each:

[10] Name these words, exemplified by demonstratives and adverbs of time and place, which depend upon the context of their speaker. These words index positional attributes like “I am here.”

ANSWER: **deictics** [accept **deixis**]

[10] Deictics are exemplified by *these* parts of speech, which substitute for a noun.

ANSWER: **pronouns**

[10] Deictics are studied in *this* subfield of linguistics, whose other key concepts include H. Paul Grice’s notion implicature.

ANSWER: **pragmatics** <JR>

19. This man is shown next to his namesake, Saint Stephen, on the left-hand panel of the *Melun* [meh-LUH] *Diptych*. For 10 points each:

[10] Name this royal secretary and patron of the arts who commissioned an influential book of hours from Jean Fouquet [foo-KAY].

ANSWER: Étienne **Chevalier** [ay-TYEN shu-vahl-YAY]

[10] Jean Fouquet's other manuscript illuminations include a "Grand" one of *these* books for the royal court. Many 15th-century illuminators produced deluxe editions of Jean Froissart's [frwah-SAR] book of this kind; we need the precise term.

ANSWER: **chronicles** [or **chroniques**]

[10] Fouquet's *Hours of Étienne Chevalier* have unfortunately been dismembered; for instance, Robert Lehman acquired a single page and donated it as part of his namesake "collection" in *this* large New York art museum.

ANSWER: **Metropolitan Museum of Art** <JR>

20. During this event, Simon Metcalfe lured locals onto the beach to trade with his ship, the *Eleanora*, but then fired on them with cannons instead. For 10 points each:

[10] Name this massacre, which is often compared to Wounded Knee. After this event, Chief Kame'eia'amoku exacted revenge on Metcalfe by capturing the ship *Fair American* and killing Metcalfe's son.

ANSWER: **Olowalu Massacre**

[10] The Olowalu Massacre occurred under the rule of Kamehameha [kah-MAY-uh-MAY-uh] I, the founder and first monarch of *this* kingdom. This kingdom was last ruled by queen Lili'uokalani.

ANSWER: (Kingdom of) **Hawai'i**

[10] Kamehameha I promulgated *this* humanitarian law, which decreed "everyone, from the old men and women to the children, be free to go forth and lie in the road without fear of harm." It was inspired by Kamehameha's encounter with a merciful fisherman during a military campaign in Puna.

ANSWER: Law of the **Splintered Paddle** [or Law of the **Splintered Oar**; or **Kānāwai Māmalahoe**] <WJ>