

**2022 Medium RaNge Academic, a Vanderbilt and Company
Collaboration vIa Network (MRNA VACCINE)**

Edited by: Eric Mukherjee (head), Erik Christensen, Chandler West, Conor Thompson, Ganon Evans, Henry Atkins, Jaimie Carlson, Sam Bailey, Chris Sims, Jacob O'Rourke, and William Grossman

Written by: The Editors, Gerhardt Hinkle, Vikshar Athreya, Andrew Hanna, David Bass, Owen Riley, Lia Rathburn, Beni Keown, Vishal Puppala, Aidan Fein, Jacob Augelli, Liam Thompson, Will Alston, Michael Borecki, Sharath Narayan, Zachary Beickman, Rebecca Thomas, Bryanna Shao, and Willie Chen

Packet 15: "I'm all out of #subtitle-suggetsions, someone good at the economy please help my set is dying"

1. Eisenberg and McLachlan give Gibbs free energy of transfer as a linear combination of potentials and this quantity. Lee and Richards sometimes name a type of this quantity that can be determined analytically with the L·C·P·O algorithm or numerically by counting mesh points with a "rolling ball" algorithm. That type of this quantity is its "accessible" form, which is determined by adding the radius of a (*) solvent to the radii of atoms. Creating a polygon mesh for a space-filling model can be used to reduce 3D calculations of this quantity to 2D ones. Biological developments to increase this quantity include cristae and microvilli, which maximize the ratio of this quantity to volume. For 10 points, name this quantity that, for a spherical atom, equals four pi r-squared. ANSWER: surface area [or Lee-Richards molecular surface area; or solvent-accessible surface area; prompt on Lee-Richards molecular surface, or SASA, or SAS, or SA]
<David Bass, Chemistry>

2. It's not French, but in a play in this language, the Jacobin Pancras besieges the Holy Trinity castle. A character delivers the "Great Improvisation" in this language in a verse drama whose title translates as a feast for the dead. This language was used to write *The Undivine Comedy*. In poems from this language, the name of a suicidal attack against an enemy derives from the character of Konrad Wallenrod. A member of this language's "Three (*) Bards" wrote an epic poem where Father Robak confesses he is related to the title character, who falls in love with Zosia - a member of the Horeszko family, which feuds with the Soplicas. In a novel written in this language, Marcus Vicinius converts to Christianity and falls in love with Lygia. For 10 points, name this language Adam Mickiewicz ["mish-key-vich"] used to write *Pan Tadeusz* and Henryk Sienkiewicz ["hen-ruk shin-kay-vuhch"] used to write *Quo Vadis*. ANSWER: Polish [or polski; or polszczyzna]
<Ganon Evans, European Literature>

3. A form of this practice meant to unravel avidya is an alternate way to achieve vijnana beyond reading religious text. Two forms of this practice which focus on renunciation and intelligence are sanyaya and buddhi, respectively. Patanjali wrote 196 sutras about this practice, in which he argues that through techniques like pratyahara, dhyana, and samadhi, one can achieve samadhi. Swami Vivekananda popularized Vedanta and this practice in the West. “Victorious (*) breaths” called ujjayi are part of breathing exercises called prana in this practice, which accompany the Lord of the Fishes and Lotus asanas, or postures. For 10 points, name this spiritual practice appropriated in the West as a form of body-stretching exercise.

ANSWER: yoga [accept specific forms of yoga such as Astanga yoga; or karma yoga; or jnana yoga; or bhakti yoga; or hatha yoga; or mantra yoga; or tantra yoga]

<Ganon Evans, Religion>

4. A welfare capitalist in this industry named George McMurtry hired Frederick Law Olmstead to design the worker-friendly town of Vandergrift. William Z. Foster attempted to recruit Black workers in this industry in Braddock and Monesson for a 1919 strike against the then-largest private employer in the U.S. The Siemens-Martins process surpassed a technology in this industry which used an egg shaped (*) converter. A “captain” of this industry described philanthropy among the rich in his article “The Gospel of Wealth.” The union buster Henry Clay Frick and the Pinkertons broke up the Homestead Strike in this industry, which saw greater efficiency through the Bessemer Process. For 10 points, name this industry dominated by Andrew Carnegie which creates a strong alloy of iron.

ANSWER: steel [or word forms such as steelworking; prompt on metal]

<Erik Christensen, American History>

5. The bishop Richard Cumberland began a treatise on these concepts by claiming they can all be “reduced to one” and defined it as “immutably true propositions”. In two chapters of Leviathan, Thomas Hobbes enumerated 19 examples of these concepts, including “complaisance”. According to an American thinker, these concepts must be grounded in the rule of recognition. A Yale professor conceptualized an approach to these concepts (*) “as integrity” and wrote a book about their “*Empire*” which criticized the work of H.L.A. Hart. The “natural” form of these concepts are contrasted with the “positivist” approach based on social facts and Ronald Dworkin’s “interpretive” approach, which claims they are inseparable from morality. For 10 points, name these concepts, rules created by the state that governs society.

ANSWER: law [or laws of nature, prompt on nature until natural is read]

<Erik Christensen, Philosophy>

6. A character complains about how the author makes her leave London in this play’s rhyming epilogue, which was written by George Colman the Elder. A character in this play convinces his adopted father that a “little French milliner” is hiding behind a screen, not his adopted father’s wife. A character in this play refuses to sell a family portrait for 100 pounds to the supposed (*) moneylender Mr Premium, who in fact is his recently returned uncle in disguise. Sir Benjamin Backbite pursues the ward Maria in this play, who happily marries Charles Surface despite the meddling of his brother Joseph. For 10 points, Lady Sneerwell leads a group of gossipers in what comedy by Richard Sheridan?

ANSWER: *The School for Scandal*

<Henry Atkins, British Literature>

7. In this colony, the Black woman Rosa Egipcíaca ["ee-zhip-see-a-ca"] described harsh mining conditions in towns like one whose name changed from "Rich City" to "Black Gold." Mixed race *mamelucos* formed slave-hunter groups with "flag-carrying" explorers in this colony to kidnap natives. Enslaved Yoruba Muslims revolting in this colony wore emblems of Haitian Revolution leaders and were known as the Malê ["mah-lay"]. This colony's name derives from wood which was used to make a red dye and traded by the Potiguara and (*) Tupinambá. The dance-like martial art of capoeira ["kah-poh-AIR-ah"] was developed so maroons in this colony could hide their fighting skills before leaving for communities like mocambos ["moe-CAM-boos"] or quilombos ["kee-LOHM-boos"]. The single largest destination for African slaves was, for 10 points, what largest colony of Portugal?

ANSWER: Portuguese **Brazil**

<Erik Christensen, World History>

8. When given the impossible task of carrying water in a basket, one of these creatures retorts by requesting a strap of smoke to carry the basket with. The phrase "[this creature] said" begins many Igbo proverbs. One of these creatures, Mbeku, is taken by birds to a feast in the sky, but gains a certain trait when he falls. After a muskrat dives into the water to get some earth, this animal grows larger. Sky Woman lands on the back of one of these creatures. Nuwa uses the (*) legs of one of these creatures to prop up the sky, and four elephants stand on the backs of one of these creatures in Hindu cosmogony. In Lenape and Iroquois tales, mud on one of these creatures' backs makes up the world. For 10 points, name these animals, who carry the world on their shells in multiple myth systems.

ANSWER: **tortoise** [or **turtle**]

<Jaimie Carlson, Mythology>

9. *Description acceptable.* Attempts to do this task using diamagnetic levitation of a superconductor failed because of magnetic hysteresis. A device used for this task enables canceling the product of magnetic field strength and wire length with a calibration step. The achievement of this task enabled abandoning values denoted with a subscript 90 by determining exact ratios with other quantities; those were called "conventional electrical." An attempt to do this task involved the creation of a (*) sphere of monocrystalline silicon in the Avogadro Project. This task was done by a device that measures the current required to lift an object, a Kibble balance. For 10 points, name this metrological task done since 2019 by setting an exact value of the Planck constant, replacing an "international prototype" to derive the SI unit of mass.

ANSWER: **defining** the **kilogram** [or equivalent descriptions; prompt on answers that describe defining, standardizing, etc. units, measurements, or mass; before mentioned, prompt on answers that describe measuring the Planck constant]

<Gerhardt Hinkle, Other Science>

10. A 20th-century concerto for this instrument opens with the cellos playing soft "D-E-D-E" twice in a thematic fragment that repeats throughout the piece. A "Romance" and "Humoresque" are the two movements of Carl Nielsen's two *Fantasy Pieces* for this instrument and piano. The American soldier John de Lancie inspired a late concerto for this instrument based on the short-short-short-long motif, written by (*) Richard Strauss. In the first movement of Beethoven's fifth symphony, a brief cadenza for this instrument leads into the recapitulation. In Prokofiev's *Peter and the Wolf*, this instrument represents the duck. For 10 points, the English horn is the lower "cousin" of what double reed instrument that the orchestra tunes to?

ANSWER: **oboe**

<Gerhardt Hinkle, Classical Music>

11. **A character in this novel mistakenly believes that children are staring at his watch but later realizes that they were staring at his food. In this novel, a character uses his birthday money and a watch to frame his father's servants as thieves. After attempting suicide in a bathtub, a former orphan in this novel stops speaking. A character in this novel has plastic surgery to fix his (*) cleft lip and saves the protagonist from a character with brass knuckles by using a slingshot. This novel ends with a character telling his adopted son "for you, a thousand times over." Assef rapes a Hazara boy in this novel. For 10 points, name this novel set in Afghanistan which is about the friendship of Hassan and Amir, written by Khaled Hosseini.**

ANSWER: The *Kite Runner*

<Chandler West, World Literature>

12. **One film from this country opens with a woman and her child moving to the hometown of her recently deceased husband, and is based on the short story "The Story of a Bug." In another film from this country, a woman uses a thimble to grate a noblewoman's tooth and destroys erotic manuscripts in a library after learning about that noblewoman's reading sessions. In another film from this home country of the director of *The Handmaiden*, a maid repeatedly rings a (*) doorbell in the rain while the house's owners are camping. In that film from this country, that maid has an allergic reaction to peach fuzz as part of a plot to get her fired so another woman can replace her. For 10 points, name this country, the home of the director of *Parasite*, Bong Joon-ho.**

ANSWER: South Korea [or Republic of Korea or ROK; prompt on Korea; reject "Democratic People's Republic of Korea" or "DPRK" or "North Korea"]

<Liam Thompson, Other Visual Arts>

13. **When simulating plasmas using the particle-in-cell method, these interactions are evaluated using Monte Carlo methods like the "binary" *these interactions* "model". The Coulomb logarithm describes a form of these interactions, also named for Coulomb, that occur in plasmas. Solving these interactions is the prototypical use of the center of momentum frame. The average distance between instances of these interactions is the (*) mean free path. A specific type of these interactions are the only interactions between particles in an ideal gas. These interactions are described by the coefficient of restitution, with a value less than 1 indicating the loss of energy to phenomena such as heat or sound. For 10 points, name these interactions between objects that when total kinetic energy is conserved are termed elastic.**

ANSWER: collisions [accept scattering]

<Gerhardt Hinkle, Physics>

14. **The North-South company competed with this city's urban rail system, which was built with an unusual 1,300mm gauge to prevent a national takeover. 19th century apartments in this city, built with its namesake limestone mined in underground quarries, replaced middle class occupants in upper stories with servants. A white neo-Byzantine basilica was built on this city's high point as a reaction to an uprising destroyed during a (*) "Bloody Week." An 1895 photograph taken in this city shows a crashed train hanging out of the second story of a station now used as an art museum. Wide streets that allowed for the use of cannons replaced many of this city's medieval neighborhoods during a mid-19th century renovation overseen by Baron Haussmann. For 10 points, name this city that hosted an 1871 "commune" after its country lost a war to the Prussians.**

ANSWER: Paris, France [or Paris Commune]

<Henry Atkins, European History>

15. Melissa Kearney and Philip Levine looked at Google Trends to argue this product could have a negative effect on teenage pregnancy. Tannis MacBeth Williams studied the introduction of this product in three small Canadian towns and found children who used it had lower cognitive skills and more traditional views on gender roles. In *Bowling Alone*, Robert Putnam attributes around one-fourth of the decline in social capital to the (*) increased use of this product and others like it. A 1985 book opens by comparing the predictions of Orwell and Huxley and goes on to implicate this product in America's "vast descent into triviality." In a speech on this product "and the Public Interest," one of its regulators infamously called it "a vast wasteland." Neil Postman criticized it in *Amusing Ourselves to Death*. For 10 points, name this device with which one can watch sitcoms or the nightly news.

ANSWER: television [or "TV"; accept *16 and Pregnant* before "this product" in the sentence beginning "Tannis MacBeth Williams studied the introduction of this product"]

<Sam Bailey, Social Science>

16. In a play by this author, a character sings "De moon she shine. She looks [just] like you" after receiving a letter. In the first act of a play by this author, a character finds out that his daughter, who he hasn't seen in fifteen years, is coming to visit. A play by this author ends with a character decrying "capitalist svine" and "bourgeois monkeys" before proclaiming "The days grow hot, O Babylon!" A character created by this author claims to hate all men while telling her lover Burke and her father Chris Christopherson that she is a (*) prostitute. In a play by this author, a fire escape is used by Don Parritt to commit suicide. A character created by this author of *Anna Christie* advises regulars at Harry Hope's saloon to give up their "pipe dreams." For 10 points, name this author of *The Iceman Cometh*.

ANSWER: Eugene O'Neill [or Eugene Gladstone O'Neill]

<Chandler West, American Literature>

17. An abandoned resort district on this island whose high-rises had sat vacant since the 1970s was reopened to tourism in October 2020, prompting the People's Party to withdraw from a coalition with Ersin Tatar's government. Another city on this non-Italian island is known for the eleven-sided polygon formed by its Venetian Walls, which enclose the historic center of that city, including landmarks like (*) Ledra Street. The beach town of Varosha was closed to the public following a 1974 invasion of this island by a country to its north. The British military bases of Akrotiri and Dhekelia are found on, for 10 points, what island on which a "Turkish Republic" controls the northern half of the city of Nicosia?

ANSWER: Cyprus [or Kypros or Kıbrıs]

<Conor Thompson, Other>

18. The late stages of this process are marked by phosphorylation of serine-139 on H-2-A-X. One assay used to detect this process uses digoxigenin-labeled d-N-T-Ps to "tail" certain molecules. This process can be triggered by TRAIL binding to D-R-4. Cleavage of PARP-1 marks a form of this process that can be triggered by granzyme B. A signaling complex that induces this process can be activated through the binding of the (*) Fas ligand to its receptor. The TUNEL assay is used to detect this process. The D-I-S-C forms during this process, during which caspases are activated. Cytochrome c is released from the mitochondria in one form of this process, during which membranes bleb and DNA is cut into a ladder. For 10 points, what is this process of programmed cell death?

ANSWER: apoptosis [accept programmed cell death before mentioned; prompt on death, do NOT accept "necrosis"]

<Vikshar Athreya, Biology>

19. **This emperor's ashes were deposited in his ancestral house on the Pincian Hill by his freedwoman mistress Acte ["AHK-tay"]. This emperor had an affair with the Vestal Virgin Rubria and retained a Gallic master of the use of poisonous mushrooms named Locusta. Acerronia was killed by soldiers sent by this emperor after claiming to be the target of a plot involving a self-destructing ship at Baiae ["BYE-eye"]. After this emperor sent soldiers to kill another woman, she demanded that the troops smite her in the (*) womb.** This emperor's mistress, Poppaea Sabina, encouraged him to assassinate his mother Agrippina the Younger. He also forced Seneca to commit suicide after surviving the Pisonian Conspiracy. For 10 points, name this successor of Claudius who reigned during the Great Fire of Rome.

ANSWER: Nero [or Nero Claudius Caesar Augustus Germanicus, or Lucius Domitius Ahenobarbus]
<Owen Riley, OtherHistory>

20. **In 1976, an artist with this surname and Andy Warhol exchanged portraits of each other which were exhibited at the Coe Kerr gallery. In 2014, the Boston MFA acquired that artist with this surname's realistic posthumous portrait of JFK, which became immensely popular despite the Kennedys' dislike of it. Another artist with this surname illustrated many classic novels for Scribner's, including *Treasure Island*. Leonard Andrews purchased a collection of paintings by an artist with this surname which depicted a woman who stayed at the (*) Kuerner farm that included the paintings *Braids* and *Lovers*. Secret paintings of Helga Testorf were created by an artist with this surname who depicted a woman in a pink dress lying on the grass and facing the Olson House.** For 10 points, give the surname of the artist of *Christina's World*.

ANSWER: Wyeth [or Wyeth family; or Jamie Wyeth; or N(ewell) C(onvers) Wyeth; or Andrew (Newell) Wyeth]
<Chandler West, Painting/Sculpture>

1. This statement is usually applied to canonically conjugate variables. For 10 points each:

[10e] Name this fundamental principle of quantum mechanics, which in one formulation states that it's impossible to know both the position and momentum of a particle to arbitrary precision.

ANSWER: **Heisenberg uncertainty** principle [prompt on partial answer]

[10h] These states achieve the bound of the Heisenberg uncertainty principle. In general, these states are right eigenstates of the annihilation operator

ANSWER: **coherent** states

[10m] Another formulation of the principle is stated in terms of the uncertainty in time and this other quantity. This quantity corresponds to an eigenvalue of the Hamiltonian operator.

ANSWER: total **energy**

<Eric Mukherjee, Physics>

2. An author from this country wrote about Sepha Stephanos, an immigrant from here who runs a failing Washington, D.C. grocery store. For 10 points each:

[10h] Name this country, the birthplace of the author of *The Beautiful Things That Heaven Bears*. The first stanza of a poem titled for this country claims "I know the pangs which thou didst feel, / When slavery crushed thee with its heel."

ANSWER: **Ethiopia** [accept but DO NOT REVEAL "Ode to **Ethiopia**"] (Dinaw Mengestu wrote *The Beautiful Things That Heaven Bears*.)

[10e] The aforementioned poem is Paul Laurence Dunbar's poem of this type "to Ethiopia." Four books of these lyrical stanzas were written by the Roman poet Horace.

ANSWER: **odes** [or "**Ode** to Ethiopia"]

[10m] This text describes how the Queen of Sheba gave birth to Menelik, who brought the Ark of the Covenant to Ethiopia. This national epic of Ethiopia was written in Ge'ez in the fourteenth century.

ANSWER: ***Kebra Nagast*** [or ***Kebra Negast***; or ***The Glory of the Kings***]

<Chandler West, World Literature>

3. An empire centered on this city was founded by the Laskaris family in 1204 alongside successor states in Trebizond and Epirus. For ten points each:

[10m] Name this city, which names the state which restored the Byzantine Empire after the Fourth Crusade shattered it.

ANSWER: **Nicaea**

[10e] Almost a millennia before, the First Council of Nicaea was convened by an emperor of this name, which also belonged to the last Byzantine Emperor.

ANSWER: **Constantine**

[10h] The first Laskaris emperor of the Nicene Empire had this first name. A member of the Komnenos Doukas family who ruled the rival state of Epirus and founded the brief Thessalonica Empire also had this first name.

ANSWER: **Theodore**

<Owen Riley + Erik Christensen, European History>

4. Various mythical theories of this instrument's origins include being invented by Mani or by the Devil exchanging it for all the "People of David's" instruments. For 10 points each:

[10h] Name this fretless stringed instrument common throughout the Middle East. Ziryab, an Andalusian player of this instrument, was said to have been the first to add a fifth string to early versions of this instrument.

ANSWER: **oud** [or **ūd**]

[10e] The oud is this type of stringed instrument, which is bigger than a mandolin. This type of instrument is the origin of a word for someone who repairs string instruments.

ANSWER: **lutes** (That word is luthier.)

[10m] The literal meaning of the Arabic word "oud" denotes a thin straw-shaped piece of wood, possibly referencing this type of implement used to pluck it. When used for a guitar, this implement is often called a pick.

ANSWER: **plectrum**

<Andrew Hanna, Other Fine Arts>

5. Answer the following about food-related gaffes, for 10 points each:

[10m] In February 2022, the QAnon-supporting Representative Marjorie Taylor Greene accidentally discussed Nancy Pelosi's possession of this soup rather than her purported authoritarian police forces in an unhinged rant.

ANSWER: **gazpacho**

[10e] A widespread, but false, urban legend purports that this US president's famous line "Ich bin ein Berliner" accidentally called himself a jelly donut.

ANSWER: John F. **Kennedy** [or **JFK**]

[10h] In 2020, this politician and brief candidate for the Democratic presidential nomination horrified the internet by proclaiming his favorite bagel order to be whole wheat with extra cream cheese.

ANSWER: Bill **de Blasio**

<Conor Thompson, Other>

6. Robert K. Merton contrasted this theoretical approach with both minor hypotheses from day-to-day research and systematic, all-inclusive unified theories. For 10 points each:

[10h] Name this approach to sociology, the predominant approach in American sociology which seeks to make abstractions that are close to observed data that can be empirically tested.

ANSWER: **middle-range** theory

[10e] Merton said the social form of this phenomenon can be analyzed like gas laws in physics. Many sociologists believe that this phenomenon of changing one's status in a class structure has declined since the 1970s in the U.S.

ANSWER: social **mobility** [or upward **mobility**; or downward **mobility**]

[10m] Merton argued that failing to achieve the American dream of upward mobility will lead to this behavior. Per Merton, this behavior varies based on whether one accepts society's goals and society's means to achieve them.

ANSWER: **deviance** [or **crime**; accept word forms of either term]

<Erik Christensen, Social Science>

7. In one painting, this man is depicted wearing a straw hat and holding a portfolio while talking to William Cullen Bryant on a ledge overlooking Kaaterskill Falls. For 10 points each:

[10m] Name this man who is depicted at an easel between two rocks overlooking the Connecticut River near Mount Holyoke, Massachusetts in another painting.

ANSWER: Thomas **Cole**

[10e] Asher Durand depicted Kaaterskill Falls, near the Catskill Mountain House in New York state, in *Kindred Spirits*, a painting from this art movement, whose other members included Cole and Frederic Church.

ANSWER: **Hudson River** School

[10h] This other artist depicted the cave behind Kaaterskill Falls in the engraving *Under the Falls*. His seascapes include *West Point*, *Prout's Neck*, and a depiction of a fisherman looking at a foggy sky as he rows back to his ship.

ANSWER: Winslow **Homer**

<Michael Borecki, Painting/Sculpture>

8. Mughal Prince Shah Shuja fled to this region after losing a succession conflict. For 10 points each:

[10h] Name this region once ruled by the Kingdom of Mrauk U [myow oo]. The Mughal Empire recaptured the city of Chittagong from an alliance of the Portuguese and pirates from this region.

ANSWER: **Arakan** [or **Rakhine**]

[10e] Despite intermittent invasions from Bengal, the Kingdom of Mrauk U survived until it was conquered by the ruling Konbaung dynasty in this modern-day country. The Rohingya have been persecuted in this country.

ANSWER: **Burma** [or **Myanmar**]

[10m] Shaista Khan eventually conquered Chittagong from the Portuguese and Arakanese pirates while serving this emperor. This son of Shah Jahan expanded the Mughal Empire to its greatest extent.

ANSWER: **Aurangzeb**

<Vikshar Athreya, World History>

9. A character in this novel refers to himself as “a man without a cross”, referencing either his lack of Christianity or his European descent. For 10 points each:

[10m] Name this novel which ends in a double funeral following a knife fight on the edge of a cliff. Heyward disguises himself as a French medicine man to rescue Alice in this novel.

ANSWER: *The **Last of the Mohicans***

[10e] Uncas and Cora Munro die at the climax of *The Last of the Mohicans*, one of five novels by this author about the frontiersman Natty Bumppo.

ANSWER: James Fenimore **Cooper**

[10h] Colonel Munro is forced to surrender this location to General Montcalm in return for safe passage for his troops, but Magua attacks them as they are retreating from this place.

ANSWER: Fort **William Henry** [do NOT accept or prompt on “Fort Henry” alone]

<Lia Rathburn, American Literature>

10. The Fitzhugh-Nagumo model reduces this model from four to just two differential equations. For 10 points each:
[10m] Name this set of equations derived in 1952 from voltage clamp experiments on squid giant axons that models the cell membrane as a capacitor and ion channels as resistors.

ANSWER: **Hodgkin-Huxley** Model

[10e] The Hodgkin-Huxley equations model the propagation of these “all-or-nothing” events that occur once the membrane potential reaches threshold. They consist of depolarization, repolarization, and hyperpolarization.

ANSWER: **action potentials**

[10h] The flux of an ion that has an equilibrium potential close to the resting potential, like chloride, causes this kind of inhibition by preventing the propagation of an action potential to the soma.

ANSWER: **shunting** inhibition [or **divisive** inhibition]

<Vishal Puppala, Biology>

11. These features often have a high concentration of reduced species, causing them to be home to large numbers of algae, bacteria, and archaea that oxidize those substances for energy. For 10 points each:

[10e] Name these sources of mineral-rich water that often occur near volcanoes. A subtype of these features periodically emits jets of water and steam; those are called geysers.

ANSWER: **hot springs** [or **hydrothermal springs**; or **geothermal springs**; or **thermal springs**; prompt on **springs**]

[10h] Hot springs are often surrounded by terraces of this material formed by the precipitation of carbonates from supersaturated water. This form of limestone is rather porous, but generally less so than tufa.

ANSWER: **travertine** [prompt on **alabaster**]

[10m] Travertine and tufa are made by water that has this property because of a high concentration of dissolved calcium. White smokers differ from black smokers by having this property.

ANSWER: **alkaline** [or **basic**; or **high pH**]

<Gerhardt Hinkle, Other Science>

12. During this event, the Declaration of the People condemned the corruption and excessive taxation of governor William Berkeley. For 10 points each:

[10m] Name this event, in which poor white people and enslaved Africans participated. Historians argue that a racial hierarchy was encouraged by colonial authorities in America after this event, including a Slave Code in 1706.

ANSWER: **Bacon's** Rebellion

[10e] Many of the white people who participated in Bacon's rebellion came to the United States as this kind of laborer, who work for a certain period of time to pay for their transportation across the Atlantic.

ANSWER: **indentured** servant

[10h] Along with John Frederick Whitehead, a man of this ethnicity wrote the only account of being a “redemptioner”. Soldiers of this ethnicity fled to Assunpink Creek after losing a battle in which they were ambushed while drunk in an orchard.

ANSWER: **German**-Americans [or **Deutschamerikaner**; accept **Hessians**]

<Erik Christensen, American History>

13. A goddess of these places alternately appears as a white dog, old woman, or young woman, and participates in a sled race with Poli'ahu. For 10 points each:

[10m] Name these places, the domain of Pele. Pele creates these locations as she is chased from place to place by her sister Namaka.

ANSWER: **volcanoes**

[10e] Pele is the creator of this island chain, whose traditional religion includes the gods Ku and Kane and the goddess Hina.

ANSWER: **Hawai'i**

[10h] The creation of the Hawaiian islands is described in this epic chant, translated by Queen Liliuokalani. It includes 16 sections called *wa*, which describe the creation of land, fish, birds, taro, and humans.

ANSWER: **Kumulipo**

<Jaimie Carlson, Mythology>

14. At the beginning of this play's second act, a group of men light cigars after lunch, but one goes out early. For 10 points each:

[10h] Identify this play, which ends with the female protagonist saying "kiss me." After two characters in this play go upstairs but don't have sex, one character asks another if he's satisfied without "going the whole hog."

ANSWER: *The* **Homecoming**

[10e] *The Homecoming* is one of the "comedies of menace" by this British playwright. This author also wrote *The Birthday Party* and *The Dumb Waiter*.

ANSWER: Harold **Pinter**

[10m] In *The Homecoming*, Teddy's brother Sam has this profession. Hoke Coleburn performs this job for a woman named Daisy in an Alfred Uhry ["yer-ee"] play.

ANSWER: **driver** [or **chauffeur**; accept similar answers of a personal/professional **driver**; accept **Driving Miss Daisy**]

<Chandler West, British Literature>

15. The philosophical zombie argument is used to criticize the physicalist variety of this position, which is contrasted with its idealism variety. For 10 points each:

[10m] Name this position, expounded by Bertrand Russell in a "neutral form" that rejects dichotomies. Donald Davidson has argued for an "anomalous" form of this position.

ANSWER: **monism**

[10e] Monism is the belief that this concept is inseparable from the body. Property dualists believe this concept cannot be reduced to the physical brain.

ANSWER: **mind**

[10h] With Ernst Haeckel and Ewald Hering, this scientist made up a group of neutral monists who nonetheless believed that nature had internal direction. This thinker created a series of gray bands that create an optical illusion.

ANSWER: Ernst **Mach**

<Erik Christensen, Philosophy>

16. This segment disappeared in later forms of comedy, along with most of the chorus's roles. For 10 points each:
[10h] Name this fourth section of many comedic plays, in which the chorus 'steps forward' to speak to the audience and the actors depart. It follows the Agon, or debate.

ANSWER: **Parabasis**

[10e] This Athenian playwright was the most famous writer of Old Comedy. His plays include *The Frogs*, *The Clouds*, and *The Wasps*.

ANSWER: **Aristophanes**

[10m] This treatise defines comedy as being focused on weak and less virtuous people. It outlines the structure of a related genre using six concepts including *mythos*, *ethos*, and *opsis*.

ANSWER: **Poetics** [or *Peri poietikes*, or *De Poetica*] (by Aristotle)

<Lia Rathburn, European Literature>

17. This composer composed a fugue entirely in Lydian mode in his motet *Os Justi*, which he wrote for the choirmaster of St. Florian Abbey, where he worked as an organist for many years. For 10 points each:

[10m] Name this Austrian composer, whose choral *Te Deum* has also been proposed as a finale for his unfinished ninth symphony in D minor.

ANSWER: Anton **Bruckner**

[10h] Anton Bruckner's *Romantic* fourth symphony is likely best-known for its third movement, which is typically given this nickname. This movement, which replaced an earlier one that imitated an Alhorn, contains numerous triadic horn calls.

ANSWER: **"Hunting Scherzo"** [or **"Jagdscherzo"**]

[10e] Bruckner idolized this composer, and included a cymbal crash representing his death in his seventh symphony. Bruckner's third symphony, named for this composer, originally included quotations from *Tristan und Isolde*.

ANSWER: Richard **Wagner**

<Chris Sims, Classical Music>

18. Some scholars have hypothesized that a reference in the Talmud to "a star which rises once in seventy years and misleads sailors at sea" is a reference to this object. For 10 points each:

[10m] Name this celestial object. The Roman historian Cassius Dio claimed that this object's appearance foretold the death of Marcus Vipsanius Agrippa.

ANSWER: **Halley's comet** [prompt on just a comet]

[10e] An appearance of Halley's Comet in AD 12 is also potentially responsible for the story of the Star of Bethlehem, which appeared in the sky and led the Magi to the site of this event.

ANSWER: **Jesus's birth** [or the **Nativity** or the **First Christmas**]

[10h] In response to a later appearance of Halley's Comet, this pope issued a bull calling for special prayer. He originated the custom of ringing the Angelus bell at noon and oversaw the vindication of Joan of Arc.

ANSWER: **Callixtus III** [prompt on Callixtus]

<Conor Thompson, Religion>

19. During the Gulf War, tanks kitted out with bulldozing equipment buried Iraqi forces defending a line named for this leader. For 10 points each:

[10e] Name this leader, the dictator of Iraq who had started the Gulf War by invading Kuwait.

ANSWER: Saddam **Hussein** [or Saddam **Hussein** Abd al-Majid al-Tikriti]

[10m] The IDF used modified Caterpillar bulldozers nicknamed “Doobi,” or “Teddy Bear,” during the second conflict of this name between 2000 and 2005. The first conflict of this name ended with the Oslo Accords.

ANSWER: **Intifada**

[10h] In this city, a man nicknamed Joe rammed into a telecom building in this city during the “Bulldozer Revolution.” After a contested election in 2000, thousands of protestors gathered in this city in support of the D-O-S.

ANSWER: **Belgrade**

<Jacob Augelli + Erik Christensen, Other History>

20. Whether constructive or destructive interference occurs between two wavefunctions determines whether these entities are bonding or antibonding. For 10 points each:

[10e] Name these orbitals that describe the probability of finding an electron in a system of multiple atoms. They can be constructed from a linear combination of atomic orbitals.

ANSWER: **molecular** orbitals [or **MO**]

[10m] Antibonding orbitals are notated by a sigma or pi followed by this symbol.

ANSWER: **star** or **asterisk**

[10h] In this method, the energies of MOs are calculated using a secular determinant to form an eigenvalue problem. The extended version of this method, developed by Hoffman, also takes sigma orbitals into account.

ANSWER: **Hückel** method

<Vishal Puppala, Chemistry>