

2018 Reinstein Set – Packet 4

Tossups

1. The theoretical perfect form of this state has heat capacities that are functions of temperature only. The average kinetic energy of particles in this state is found using the Boltzmann constant. This state is in the lower right on phase diagrams. This state's properties are described by kinetic theory. Elements in this state at standard temperature and pressure are in the upper right of the periodic table and in the rightmost column. This state of matter is the subject of Boyle's law and Charles's law. Name this state of matter that, "ideally", obeys the law " $P V$ equals $n R T$ ".

Answer: gases or gaseous state

2. This event started with criticism over the failure to repay a loan to **Onorato Caetani** ["oh-no"-RAH-toe kay-TAH-nee] and a meeting at his court in Fondi, at about the same time that the War of the Eight Saints ended. Meetings in Pisa that were intended to end this event ended up exacerbating it. This event was effectively ended when Martin V was selected by the Council of Constance in 1417, though some people continued to support Benedict **XIII** [13], who was labelled an antipope. Name this period when three people claimed to be the Pope.

Answer: Western Schism [or Papal Schism or Great Schism]

3. A research project started in 1968 determines which paintings are by this artist as opposed to his students such as Willem Drost. This artist made a painting of a scene from the Bible, showing a male attendant drying the foot of a naked woman: *Bathsheba at Her Bath*. This painter showed characters shocked by the appearance of Hebrew words on a wall in *Belshazzar's Feast*. In another work by this painter, a doctor shows his students muscles inside an arm. Name this artist of the Dutch Golden Age who painted *The Anatomy Lesson of Dr. Nicolaes Tulp*.

Answer: Rembrandt Harmenszoon van Rijn [accept either underlined portion]

4. This country's oldest shopping mall is in the Araneta Center and is named for Muhammad Ali. The Puerto Princesa subterranean river flows under a mountain range in this country's Palawan province. The **Zambales** [zam-BAH-"lace"] Mountains contain this country's Mount Pinatubo, a volcano that erupted powerfully in 1991. Magellan's Cross is displayed in a chapel in this country's **Cebu** [seh-BOO] City. The Bataan peninsula separates the South China Sea from a bay named for this country's capital. This country's most populous city is Quezon City on the island of Luzon. Name this Asian island country whose capital is Manila.

Answer: (Republic of the) Philippines or (Republika ng) Pilipinas

5. Beta oxidation gets its name because it affects the beta atom of this element in a fatty acid. Atoms of this element are double-bonded in **cumulene** [KYOOM-yoo-leen], and this element is double-bonded with oxygen in **ketones** [“KEY-tones”]. A molecule with one atom each of this element and oxygen binds to **hemoglobin** [HEE-moh-gloh-bin], preventing oxygen from reaching body tissue. An **autotroph** [AW-toh-troh-f] is an organism that does not need to take in this element in an organic form. Name this element that is central in methane molecules and is used throughout organic chemistry.

Answer: **carbon**

6. The value of this function gives the y-coordinate where a ray from the origin intersects the line $x = 1$. This function of theta over 2 always equals the cosecant of theta times the quantity 1 minus the cosine of theta. An antiderivative of this function is the opposite of the natural log of the absolute value of the cosine function, and the derivative of this function is the secant function squared. Name this trigonometric function equal to y divided by x on the unit circle, and equal to “opposite over adjacent” in a right triangle.

Answer: **tangent** [accept answers that additionally mention a variable]

7. This person was supported by Jean de Metz and Bertrand de **Poulengy** [poo-lan-zhee] and provided an escort by Robert de **Baudricourt** [boh-dree-kor] at **Vaucouleurs** [vaw-koo-lur] before traveling to **Chinon** [shee-noh] and being taken to **Poitiers** [pwah-tee-ay]. This person was later captured by the Burgundians near **Compiègne** [kom-pain] and sent to **Rouen** [roo-en]. This person helped Charles **VII** [7] get to **Reims** [reemz] for a proper coronation. In 1429, this person got the English to lift a siege, giving momentum to France in the Hundred Years’ War. Name this person who was burned at the stake by the English after leading the French to victory at Orléans.

Answer: **Joan** of Arc [or **Jeanne** d’Arc]

8. This measure was first developed by Fair, Isaac, and Company in the 1980s. This measure may be lowered by “hard pulls” of a related report, but is unaffected by “soft pulls”. This measure is also affected by how long accounts have been open and by people’s debt ratios. This measure is always between 300 and 850 and is included on reports offered by TransUnion, Experian, and Equifax. Name this measure of how likely a person is to pay debts.

Answer: **credit score** [accept **FICO** credit score]

9. Ethel Smyth wrote a concerto for horn and this instrument. A **basso continuo** [BAH-soh kohn-TIN-oo-oh] and this instrument perform a set of pieces by **Heinrich Biber** [HYN-rik BEE-bur] called the *Rosary Sonatas* or *Mystery Sonatas*. Anne-Sophie Mutter and Hilary Hahn were famous for playing this instrument. Twenty-four **caprices** [kuh-PREES-us] for this instrument were written by Niccolò **Paganini** [pah-gah-NEE-nee]. The lead player of this instrument in an orchestra is the concertmaster, and there are two of these instruments in a string quartet. Name this string instrument pitched higher than a viola.

Answer: **violin**

10. This person and his wife Harriet were assisted financially by the sons of Peter Blow. This person moved with Dr. John Emerson to Illinois and Wisconsin, and he later ended up with Emerson's widow in Missouri. This person was supported by Benjamin Curtis and John McLean, the latter of whom wrote that this person was a citizen in dissents to an opinion by Roger **Taney** [TAU-nee], who used this person's case to declare the Missouri Compromise unconstitutional. Name this person who remained a slave even though he was taken to free states and who lost his Supreme Court case against John Sanford.

Answer: Dred **Scott**

11. In this town, there is a tree commemorating the capture of Major Andre by three **yeomen** [YOH-men]. In this town, old Brouwer is thrown into a brook by a skeleton figure. This town's schoolteacher is obsessed with Cotton Mather's book on the history of witchcraft in New England. That teacher is attacked while riding his horse, Gunpowder, after leaving a "quilting frolic" at the farm of the girl he is wooing. This town's prankster Brom Bones wins the hand of Katrina van Tassel after the disappearance of **Ichabod** [IK-uh-bahd] Crane. Name this town haunted by the Headless Horseman in a "Legend" written by Washington Irving.

Answer: **Sleepy Hollow**

12. A recent controversy surrounds whether a photograph of this person in the Marshall Islands was taken in 1935 or a few years later. This charter member of the Ninety-Nines wrote the books *The Fun of It* and *20 Hours 40 Minutes: Our Flight In The Friendship*, whose name refers to this person's trip with Wilmer Stultz from **Newfoundland** [NOO-fun-lund] to Wales in 1928. This person's trip with Fred Noonan from Papua New Guinea to Howland Island in 1937 was not completed, and she was never found. Name the first female aviator to fly solo across the Atlantic Ocean.

Answer: Amelia **Earhart**

13. In one work by this poet, a character advises “Charms strike the sight, but merit wins the soul.” Another work by this poet is the first use of the line “Fools rush in where angels fear to tread,” and that work also contains the aphorisms “To err is human, to forgive divine” and “A little learning is a dangerous thing.” This author of *An Essay on Criticism* wrote a work about the Baron’s “dire offense” against Belinda, which consists of cutting and stealing some of her hair. Name this 18th-century Englishman who wrote *The Rape of the Lock*.

Answer: Alexander **Pope**

14. Some followers of this religion commemorate the Battle of **Karbala** [KAR-buh-luh] on the Day of **Ashura** [ASH-oo-rah], and some of the events following the battle are remembered during the month of **Safar** [suh-FAR]. It is common for adherents of this religion to memorize and display the Throne Verse, and adherents often refer to charitable giving as *zakat* [zah-KAHT] and fasting as *sawm*. This religion’s declaration of faith names its messenger of god, is called the *shahada* [shah-HAH-duh], and is the first of its five “pillars”. Name this religion whose followers cleansed the **Kaaba** [KAH-bah] after going from **Medina** [meh-DEE-nah] to Mecca when they were led by Muhammad.

Answer: **Islam** or **Muslim** religion [accept **Shi’a** Islam or **Sunni** Islam]

15. These geographic things can have layers called the **hypolimnion** [“hi”-poh-LIM-nee-ahn] and **epilimnion** [EP-ih-LIM-nee-ahn] which sometimes mix, allowing oxygen to spread. Gases such as carbon dioxide may suddenly release from solution in these things, a phenomenon called limnic eruption. Some of these things are named for resembling fingers and often have moraine sediment at one end. A meandering river diverting into a new riverbed creates a ‘U’-shaped type of this feature called an oxbow. Name these bodies of water which are surrounded by land and larger than ponds.

Answer: **lakes**

16. One poem by this author tells the title concept “You are the best friend / I ever had” and is titled “Good Morning Revolution”. Another work by this poet includes the parenthetical remark “America never was America to me.” This author of “Let America Be America Again” wrote of bathing in the **Euphrates** [“you-FRAY-tees”] and building a hut on the Congo in a work that states “My soul has grown deep”: “The Negro Speaks of Rivers”. This poet considers festering, crusting over, exploding, and drying up “like a raisin in the sun” as possible fates for a “dream deferred”. Name this Harlem Renaissance poet.

Answer: (James Mercer) Langston **Hughes**

17. There are specific formulations of the Heisenberg uncertainty principle named after Howard Robertson and this person. This person's version of quantum mechanics uses constant operators and changing state vectors. In the equation named for this person, the Hamiltonian operator acts on the wavefunction. The result of that operation equals the energy times the wavefunction in the time-independent version. Name this Austrian physicist who developed a thought experiment in which radioactivity may release poison, leading one to conclude that, in a sense, a cat is simultaneously dead and alive.

Answer: Erwin (Rudolf Josef Alexander) **Schrödinger** [SHRAY-din-gur]

18. When later emperors were inaugurated, they were told to be more fortunate than Augustus and better than this emperor. A disagreement over who should rule Armenia led this emperor to fight Osroes I of Parthia. This emperor was honored by works of **Apollodorus** [uh-PAH-loh-DOR-uss] of Damascus, including a forum, a bridge, and a column named for him; the column is the oldest victory column in Rome, and the bridge crossed the Danube River to help this emperor conquer **Dacia** [DAY-shuh]. Name this adopted son of his predecessor Nerva and adoptive father of his cousin and successor Hadrian, the second of the Five Good Emperors.

Answer: **Trajan** [or Marcus Ulpius **Traianus**]

19. Oskar Minkowski performed experiments that removed this organ from dogs. This organ develops in embryos from dorsal and ventral buds. A lung transplant or the replacement of enzymes from this organ are used to treat cystic fibrosis. The duct in this organ is called the duct of **Wirsung** [VEER-soonk], whose opening is the major **duodenal papilla** [doo-AH-dih-nul PAP-ih-luh]. The ampulla of Vater combines this organ's duct with the common bile duct. This organ's islets of Langerhans produce **glucagon** ["GLUE"-kuh-gahn] and insulin. Name this organ behind the stomach that is part of both the digestive and endocrine systems.

Answer: **pancreas**

20. A character in this work finds a paper knife on the mantelpiece only to be told there are no books. Later, that character bangs on a door when the bell doesn't work, but can't go through it when it opens. Another character in this play admits to spending five months in Switzerland with her lover Roger before throwing their child into a lake to drown. Joseph, who was executed while running a pacifist newspaper in Rio, is seduced by Estelle during this play under the gaze of Inez. Identify this play by **Jean-Paul Sartre** [zhahn "Paul" sar-treh] in which **Garcin** [gar-san] concludes that "Hell is other people."

Answer: **No Exit** [or **Huis Clos** [wee kloh]; accept **In Camera** or **No Way Out** or **Dead End**]

21. The statement of this type named for William Henry Young deals with products of non-negative numbers and can be used to prove a related statement for sums of products named for Otto Hölder. A specific case of Hölder's statement of this type relates the square of an inner product to a product of inner products and is named for **Augustin-Louis Cauchy** [oh-goo-stan loo-ee koh-shee] and **Hermann Schwarz** ["HAIR"-mahn shvarts]. That relationship is used to prove another relationship of this type relating the size of one side of a triangle to the sum of the other two sides. Name these statements involving the relations "less than" or "greater than".

Answer: **inequality**/ies

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Bonuses

1. According to one science fiction author, these beings must follow three laws, the first of which is not harming humans.

A. Give this term for human-like machines. The grandmother in Ray Bradbury’s “I Sing the Body Electric” is one of these machines.

Answer: **robots** [prompt on **androids**]

B. This Russian-American science fiction writer stated the three laws of robotics in his story “Runaround”, part of his *I, Robot* collection. This author also wrote the *Foundation* series.

Answer: Isaac **Asimov** [or Isaak Yudovich **Ozimov**]

C. This Czech author of *The War with the Newts* introduced the word “robot” in his play *R.U.R.*

Answer: **Karel Čapek** [“Carol” CHAH-pek]

2. The Native Americans at this battle were led by **Tenskwatawa** [ten-SKWAH-tuh-wuh], and this battle was followed by the burning of Prophetstown.

A. Name this 1811 victory in the Indiana Territory, in which the U.S. Army defeated followers of **Tecumseh** [tuh-KUM-suh].

Answer: Battle of **Tippecanoe**

B. This then-governor of the Indiana Territory gained national popularity for leading forces at Tippecanoe, and was later elected U.S. president.

Answer: **William Henry Harrison** [prompt on **Harrison**]

C. At this 1813 battle, forces under Harrison killed Tecumseh and his war chief Roundhead.

Answer: Battle of the **Thames** [temz] or Battle of **Moraviantown**

3. This boy’s birth was celebrated with pistol shots after the suggestion of exploding a barrel of gunpowder was deemed insensitive to the mother.

A. Identify this orphan son of Cherokee Sal who was cared for by Stumpy. Kentuck, who started bathing and washing his clothes to spend time with this boy, died with him in a flood.

Answer: **Thomas Luck** [accept either]

B. In this other short story by the same author, John Oakhurst uses a two of clubs to mark his body after suicide. He had encountered a “streak of bad luck” in being snowed in with Mother Shipton, Piney Woods, and The Innocent.

Answer: “The **Outcasts of Poker Flat**”

C. Who wrote “The Outcasts of Poker Flat” and the story from part 1, “The Luck of Roaring Camp”?

Answer: Bret **Harte**

4. Much of book 18 of the *Iliad* is spent describing this object belonging to Achilles [uh-KIL-eez].

A. Name these protective objects that are often round and held by warriors.

Answer: **shields**

B. This loud shield belonged to Zeus and was often used by Athena.

Answer: **Aegis** [EE-jiss]

C. This Greek hero used his shield to protect his half-brother Teucer [TYOO-sur], who was a skilled archer.

Answer: **Ajax**

5. Robert FitzRoy named a mountain near the Beagle Channel after this person, and there are also frogs and finches named after this person.

A. Name this author of *On the Origin of Species*.

Answer: Charles (Robert) **Darwin**

B. Darwin applied his ideas to humans in this 1871 book.

Answer: *The **Descent of Man**, and Selection in Relation to Sex*

C. This cousin of Darwin influenced and interpreted Darwin's thinking. Primarily famous as a statistician, this author of *Hereditary Genius* coined the term "eugenics" [yoo-JEN-iks].

Answer: Francis **Galton**

6. This person's orchestra performed the song "Hooray for Hollywood" in the 1937 movie *Hollywood Hotel*.

A. Identify this musician nicknamed the "King of Swing" who grew up in the Maxwell Street neighborhood, a Jewish area of Chicago.

Answer: (Benjamin David) "Benny" **Goodman**

B. Benny Goodman primarily played this instrument. Wolfgang Mozart wrote pieces for Anton Stadler to play on this instrument.

Answer: **clarinet**

C. One of the earliest integrated jazz acts was the Benny Goodman Quartet, which featured this percussionist known for his performances on the vibraphone.

Answer: Lionel (Leo) **Hampton**

7. This diagram of numbers gives all the possible values of binomial combinations.

A. Name this diagram that has diagonal lines of ones on both sides. In the interior, each number equals the sum of the two numbers above it.

Answer: **Pascal's triangle**

B. This fractal can be formed by shading in the odd numbers in an infinite version of Pascal's triangle.

Answer: **Sierpiński('s) [ser-PIN-skee]** or **Sierpiński('s) gasket** or **Sierpiński('s) sieve**

C. One of the rows of Pascal's triangle begins 1, 6, 15. Find the next number in that row, which is in the middle of the row.

Answer: **20**

8. This character poses the riddle "Why is a raven like a writing desk?", but he doesn't know the answer.

A. Name this character who testifies at a trial "with a teacup in one hand and a piece of bread-and-butter in the other".

Answer: the Mad **Hatter**

B. When the Mad Hatter is done testifying, this character states "Just take his head off outside."

Answer: the **Queen of Hearts** [prompt on the **Queen**]

C. This author wrote about the Mad Hatter in *Alice's Adventures in Wonderland*.

Answer: Lewis **Carroll** [or Charles Lutwidge **Dodgson**]

9. This property of a polygon is analogous to the circumference of a circle.

A. Give this term for the sum of the lengths of a polygon's edges.

Answer: **perimeter**

B. Find the perimeter of the triangle whose vertices are the origin, the point "10 comma 0", and the point "5 comma 12".

Answer: **36** units

C. Find the area of a regular polygon whose perimeter measures $4\sqrt{3}$ units and whose apothem measures 1 unit.

Answer: **2** times the square **root** of **3** square units [or **2** times **radical 3** units]

10. This element is an **anode** [“AN-ode”] in many batteries, and its compounds are used to treat depression.

A. Name this lightest metal. Its atomic number is 3.

Answer: **lithium**

B. Lithium is often combined with this ion commercially, including in medications. This ion’s chemical formula is **CO₃²⁻** [“C O three, two minus”].

Answer: **carbonate**

C. Many lithium-ion batteries also use this element. This element is at the center of a molecule of vitamin B12.

Answer: **cobalt**

11. This person was the namesake of a successful but very unpopular treaty between the U.S. and Great Britain signed in 1794.

A. Name this first Chief Justice of the United States.

Answer: John **Jay**

B. While he was chief justice, the Supreme Court decided in this case that residents of one state could sue another state. This case was overturned by the 11th Amendment.

Answer: **Chisholm** v. *Georgia* [prompt on **Georgia**]

C. John Jay resigned from his position as chief justice when he was elected to this position. George Clinton held this position before and after Jay.

Answer: **governor** of **New York** (State) [prompt on **governor**]

12. Many of these elements are semiconductors.

A. Give the common name for **antimony** [AN-tih-moh-nee], arsenic, boron, **germanium** [jur-MAY-nee-um], and **tellurium** [teh-LUR-ee-um]. These elements tend to be both lustrous and brittle.

Answer: **metalloids** [“METAL”-oydz] [do not accept or prompt on “metal(s)”]

B. Metalloids have many properties intermediate between those of metals and nonmetals. This example of such a property is the amount of energy required to remove an electron from a neutral atom.

Answer: first **ionization** energy

C. This heaviest halogen is so rare and radioactive, scientists can’t get enough of it to determine whether it’s a metalloid.

Answer: **astatine** [ASS-tuh-teen] [prompt on **At**]

13. The top of this painting shows an advertisement for five-cent Phillies cigars.

A. Name this painting that shows a man in white working at a diner counter with three people sitting around it.

Answer: *Nighthawks*

B. This artist painted *Nighthawks*.

Answer: Edward **Hopper**

C. This artist made an alternative version of *Nighthawks* in which the diner has a broken window, and there is a man outside the diner with British flag underpants.

Answer: **Banksy**

14. Bézout's [beh-zoh's] identity states that this number is a linear combination of the two numbers from which it is determined.

A. Name this quantity that can be calculated by multiplying two numbers and then dividing by their least common multiple.

Answer: **greatest common divisor** or **greatest common factor** or **gcd** or **gcf** [accept **largest** or **highest** in place of **greatest**]

B. Find the greatest common factor of 72 and 78.

Answer: **6**

C. A common algorithm for finding greatest common factors is named for this person, who described it in his book *Elements*.

Answer: **Euclid's** algorithm or **Euclidean** algorithm

15. Answer the following about several stage-based models of psychological development:

A. Name the Swiss psychologist who developed a four-stage theory of cognitive development, including the **sensorimotor** ["sensory-motor"] and concrete operational stages.

Answer: **Jean Piaget** [zhahn pee-ah-zhay]

B. Lawrence Kohlberg illustrated his stages of moral development with the example of Heinz, who does this action to save his dying wife.

Answer: **stealing** drugs or medicine [accept **theft** or **robbery** or other synonyms]

C. Sigmund Freud's theory of psychosexual development proceeds from the oral stage to this second stage.

Answer: **anal** stage

16. Much of this play takes place while Lovewit is in the country to get away from the plague.

A. Name this play in which Face and Subtle run a series of scams when they are not fighting with each other. Face is actually Lovewit's butler Jeremy.

Answer: *The **Alchemist***

B. *The Alchemist* was completed in 1610 by this playwright who also wrote *Volpone* [vohl-POH-nay].

Answer: Ben **Jonson**

C. *Volpone* is set in this city, which is also the setting for Act I of William Shakespeare's *Othello*.

Answer: **Venice** [or **Venezia**]

17. This dimensionless measure of speed is named after an Austrian scientist.

A. Name this number calculated by dividing the speed of an object by the speed of sound in the medium the object is traveling through.

Answer: **Mach** number

B. This noise that sounds like an explosion is created by objects traveling faster than the speed of sound.

Answer: **sonic boom**

C. This type of radiation is created when a particle travels faster than the speed of light in a medium, which is impossible in a vacuum.

Answer: (Vavilov-)**Cherenkov** radiation

18. In one story in this collection, Isabella buries her lover's head in a pot of basil.

A. Name this collection of 100 stories told over 10 days by 10 travelers waiting out the plague. This collection was written by **Giovanni Boccaccio** [joh-VAHN-nee bohk-KAHT-choh].

Answer: *The **Decameron***

B. This character in *The Decameron* generally tells the last tale each day. His stories about putting the Devil back in hell and turning **Gemmata** [jem-MAH-tah] into a mare were omitted from early translations for being too sexual.

Answer: **Dioneo** [dee-oh-NAY-oh]

C. In the third story, Filomena tells a parable about a father bequeathing one of these objects to his sons. Gottfried Lessing retold that story as "Nathan the Wise".

Answer: **rings**

19. This country was united in 1932, and all of its kings since the first one have been sons of that first king.

A. Name this Middle Eastern country whose King Abdullah died in 2015 and was replaced by King Salman.

Answer: (Kingdom of) **Saudi Arabia** [or al-Mamlakah al-**Arabiyah** as-**Suudiyah**]

B. In 1973, the price of oil shot up because Saudi Arabia used **OPEC** [OH-pek] to organize an embargo against selling oil to countries that supported Israel in this war.

Answer: **Yom Kippur** War [or **milkhemet yom** ha-**kipurim**; accept **Ramadan** War or **October** War]

C. For most of the 1980s, Saudi Arabia refused to have diplomatic relations with this country because of its peace deal with Israel.

Answer: (Arab Republic of) **Egypt** [or Gumhuriyat **Misr** al-Arabiyah]

20. This phenomenon occurs when the driving frequency of a system matches its natural frequency.

A. Name this phenomenon in which oscillation occurs at particularly large amplitudes.

Answer: **resonance** [or **resonating**]

B. Impure notes on musical instruments often have a fundamental resonant frequency and these other resonant frequencies that are greater than the fundamental frequency.

Answer: **overtones** [prompt on **harmonics**]

C. If a musical instrument made from a pipe with one open end and one closed end has a fundamental frequency of 100 **hertz** [“hurts”], what is the frequency of the first overtone?

Answer: **300** Hz

21. Mark Twain wrote an essay claiming that this man “scored 114 offenses against literary art out of a possible 115”.

A. Name this author who included the novel *The Last of the Mohicans* in his series *The Leatherstocking Tales*.

Answer: James Fenimore **Cooper** [prompt on **Fenimore**]

B. Twain criticized this first novel of *The Leatherstocking Tales* for “accomplish[ing] nothing and arriv[ing] in air.” In this novel, “Floating Tom” Hutter dies.

Answer: *The **Deerslayer***(, or *The First War-path*)

C. Twain also critiqued Cooper for breaking “the eternal laws of Nature” because this companion of Natty Bumppo follows moccasin tracks along a streambed and the tracks aren’t washed away.

Answer: **Chingachgook** [chene-GACH-gook]