Question #1: Science

10 points

Chemical hardness is proportional to the derivative of this property with respect to the number of electrons. One method of calculating this property makes it the opposite of chemical potential. In another definition of this property, it nearly varies directly with effective nuclear charge and inversely with the square of covalent [koh-VAY-lint] radius. The central atom in a Lewis dot structure is almost always the one with the smallest value for this property. Atoms with large differences in this quantity are able to form ionic bonds. Name this measure of an atom's ability to attract electrons.	**electronegativity**

Question #2: Social Studies

10 points

One of the holiest locations in this religion contains 125 shrines that are each rebuilt every 20 years. An incantation, a wand, and salt water are used in this religion's purification ceremonies, which generally precede all rituals. Practitioners of this religion sometimes use just water to cleanse their hands and mouth when entering a shrine after passing through a gate called a torii [tor-ee]. Many of this religion's shrines are dedicated to spirits called kami [kah-mee]. Name this religion that is often practiced alongside Buddhism and that became the state religion during the Meiji [may-jee] era in Japan.	**Shinto**ism [or **kami-no-michi**]

Question #3: Literature

10 points

One character with this occupation is captured by the Forest Brotherhood while returning from Yuriatin [YUR-ee-ah-tin]. Another character of this profession meets his second wife while still married to Heloise Dubuc. One character is assisted in this job by Lara Antipova, with whom he later has an affair. The wife of one member of this profession has an affair with his client, Rodolphe Boulanger [boo-lawn-zheh]. This is the occupation of Charles, the husband of the title character in Gustave Flaubert's [goo-stahv floh-"bear's"] Madame Bovary. Name this profession of Boris Pasternak's character Yuri Zhivago.	**doctor** [or **physician**]

Question #4: Miscellaneous

10 points

The company On-Line PLC more than tripled in value when it changed its name to mention this technology. Ethereum [eh-THEER-ee-um] is an app platform for this type of technology. Changes in this technology that require all users to upgrade their protocol software are called hard forks. This technology uses distributed ledgers rather than centralized ledgers, which makes it more difficult for hackers to manipulate data. Name this technology that creates verifiable, permanent records that are useful when using cryptocurrencies like Bitcoin.	**blockchain** [prompt on **bitcoin** or **cryptocurrency**/ies]

Question #5: Science

10 points

This condition is also known as "E6V" because valine [VAL-een] replaces another amino acid, causing a molecule to collapse in on itself. The combination of being a carrier of this disease along with a gene for beta thalassemia [thal-uh-SEE-mee-uh] can result in people having the full symptoms of this disease. Carriers of this disease can also have symptoms when they are dehydrated or are oxygen depleted. People who carry this disease have some resistance to *Plasmodium* because their red blood cells rupture more often; that is, they are resistant to malaria. Name this condition in which red blood cells adopt a namesake curved shape.	**sickle-cell** disease [accept **sickle-cell** anemia]

Question #6: Social Studies

10 points

As a young lawyer, this person successfully defended Aaron Burr when Burr was indicted for treason, but Jefferson then convinced this person of Burr's guilt. During his career, this person resigned as Speaker of the House three times: to negotiate a peace treaty, to pay off debts, and to become secretary of state. This person worked with John Calhoun [kal-HOON] to pass the Tariff of 1833, which ended the Nullification Crisis. Very late in his career, this person worked with Stephen Douglas to pass the Compromise of 1850. Name this Whig leader who got the Missouri Compromise through the House and was nicknamed "the Great Compromiser".	Henry **Clay** (Sr.)

Question #7: Literature

10 points per part

	The protagonist of this work saves a book of paintings by Paul Gauguin [goh-gan] for a boy who visits every day.	
1	Identify this novella in which Neil Klugman works at the Newark Public Library and carries on a summertime affair with the Radcliffe student Brenda Patimkin.	**"Goodbye, Columbus"**
2	This American author wrote "Goodbye, Columbus" as well as *Portnoy's Complaint.*	Philip (Milton) **Roth**
3	In 2001, Philip Roth became the first winner of a literary prize named for this Czech author. This author wrote a novella about Gregor Samsa turning into a bug, "The Metamorphosis".	Franz **Kafka**

Question #8: Literature

10 points per part

	This poem declares "I made a model of you / A man in black with a Meinkampf ["MINE"-kahmpf] look."	
1	Identify this poem that opens "You do not do" and states that "every woman adores a Fascist." Its German-speaking title figure is described as having an "Aryan ["AIR"-yun] eye" and "one gray toe / Big as a Frisco seal."	"**Daddy**"
2	This author included "Daddy" in her collection *Ariel.* She also wrote the novel *The Bell Jar.*	Sylvia **Plath**
3	In "Daddy", Plath says she has a picture of her father standing at one of these objects.	black**board** [accept chalk**board**]

Question #9: Mathematics

10 points per part

	This property holds for multiplication over addition and subtraction, and it also holds for exponentiation over multiplication and division.	
1	Name this type of property. For multiplication over addition, this property means that x times the quantity y plus z [pause] equals xy plus xz.	**distributive** property or **distributivity**
2	Using the distributive property if you prefer, find the value of 7 times 18, plus 7 times 2.	**140**
3	Find the value of $5i$ times the quantity 2 plus $3i$. In this problem, i is a square root of -1, and you should give your answer in "a plus bi" form.	$-15 + 10i$

Question #10: Mathematics

10 points per part

	The internal angles of this polygon each measure $135°$.	
1	Name this polygon whose central angles each measure $45°$.	regular **octagon** [prompt on regular **8-gon**]
2	Find the number of diagonals of a convex octagon.	**20** diagonals
3	The diagonals of a given regular octagon have three different lengths. How many of the twenty diagonals are the longest of those three lengths?	**four** of the diagonals

Question #11: Social Studies

10 points per part

	East Timor became an independent country in 2002, but this country still controls the western half of Timor [tee-MOR].	
1	Name this country between the Pacific and Indian Oceans.	(Republic of) **Indonesia**
2	This Indonesian volcano erupted in 1883, killing tens of thousands of people and making a noise that was heard thousands of miles away.	**Krakatoa** ["CRACK"-ah-TOH-ah] [or **Krakatau**]
3	This person declared Indonesia's independence just after World War II and served as its president until 1967.	**Sukarno** [do not accept "Suharto"]

Question #12: Social Studies

10 points per part

	This country now consists of 26 cantons, though it has previously had eight or 13 cantons.	
1	Name this European country that has maintained its neutrality since 1815.	**Switzerland** [or **Swiss Confederation** or **Schweiz**erische Eidgenossenschaft or Confederation **Suisse** or Confederazione **Svizzera** or Confederaziun **Svizra**]
2	Swiss neutrality was informally established at this 1815 meeting of European powers before being formalized in the 1815 Treaty of Paris.	**Congress of Vienna** [or **Wiener Kongress**]
3	This Swiss businessman shared the first Nobel Peace Prize with Frédéric Passy [fred-eh-rik pah-see] for starting the International Committee of the Red Cross.	(Jean-)Henri **Dunant** [awn-ree doo-nawn]

Question #13: Science

10 points per part

	This quantity is the opposite of the common log of a concentration.	
1	Name this quantity that, by definition, is 7 for neutral solutions and less than 7 for acids.	**pH** [accept **power of hydrogen** or **potential of hydrogen**]
2	The pH of a solution can be calculated using this equation which gives the electromotive force, or cell potential, in terms of the reaction quotient.	**Nernst** equation
3	Ocean acidification [uh-SID-ih-fih-KAY-shun] occurs when carbon dioxide combines with water to form this acid, which then dissociates into hydrogen ions, bicarbonate, and carbonate.	**carbonic** acid [accept **H_2CO_3**]

Question #14: Science

10 points per part

	This adjective describes acids such as acetic [uh-SEE-tik] acid and bases such as ammonia.	
1	Give this adjective for acids and bases that only partially ionize ["ION-eyes"] in water.	**weak** acids or **weak** bases
2	This quantity measures the strength of an acid. For water, this property is 10 to the −14 power.	acid **dissociation constant** [prompt on **dissociation** or **Ka** ["K-A"] or **acidity constant** or **acid-ionization constant**]
3	Some acids have more than one acid dissociation constant. How many does phosphoric acid have?	**3**

Question #15: Mathematics

10 points

Setting powers of x equal to this number gives the cyclotomic ["sigh"-kloh-"TOM"-ik] equation, whose solutions are the de Moivre [duh mwahv] numbers and have the same magnitude as this number. The Von Neumann [NOY-mun] definition of ordinals associates this number with a set containing only zero. This is the only positive number that cannot be the base of a logarithm. This is the larger digit in Boolean algebra. "Zero point nine repeating" equals this number. Name this number that is neither prime nor composite, and is the smallest positive integer.	**1**

Question #16: Literature

10 points

In Chinese mythology, Gong Gong has a minister with nine of these body parts, whom Yu the Great kills. After drinking a potion from Circe [SUR-see], Scylla [SIL-uh] had six of these objects grow from the middle of her body that were used to attack sailors. Chimera had three of these body parts, including one that resembled a goat's. Orthrus had two of these body parts, and his brother who guarded the gates of the Underworld had three. That brother was Cerberus. Name these body parts of which the Hydra's regenerated after being cut off.	**head**s or **face**s [prompt on **neck**s]

Question #17: Science

10 points

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

Question #18: Social Studies

10 points

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.	**Trajan** [or Marcus Ulpius **Traianus**]

Question #19: Fine Arts

10 points

This key signature is used in Cécile Chaminade's [seh-seel shah-mih-nahd'z] Flute Concertino ["con-chair-TEE-no"]. This key signature used to be considered the "key of glory", which may explain why George Frideric Handel's *Zadok the Priest* and "Hallelujah" chorus are in this key. This is the key signature of the only Violin Concerto by Pyotr Tchaikovsky, and of Pachelbel's Canon. The tonic chord in this key is the root, F sharp, and A. Name this major key signature that has the same notes as B minor, with its two sharps at F-sharp and C-sharp.	**D major** [accept just **D** after "major"; prompt on **D** before that]

Question #20: Literature

10 points

This character hates it when people have cheap suitcases, including two nuns and Dick Slagle. This character chats with the falsie-wearing Selma Thurmer on a bus and gives an alias to Ernest Morrow's mother while on a train. This character is beaten up over five dollars by Maurice the elevator man. This character wonders where the Central Park ducks went in the winter, and he repeatedly derides things and people he calls "phony". He leaves for New York City after dropping out of Pencey Prep. Name this protagonist of J. D. Salinger's *The Catcher in the Rye*.	**Holden** Caulfield [prompt on **Caulfield**]

Question #21: Social Studies

10 points per part

	The expenditure form of this concept incorporates consumption, investment, government spending, and net exports.	
1	Name this concept used to measure national economies. Its name has three words, none of which is "national".	**gross domestic product** or **GDP**
2	There are often two published versions of GDP growth. Those versions are real GDP growth, which is adjusted for inflation, and this type of GDP growth that is not adjusted for inflation.	**nominal** GDP growth
3	This quantity equals 100 times nominal GDP divided by real GDP. Like the consumer price index, this quantity is a measure of inflation.	GDP **deflator**

Question #22: Social Studies

10 points per part

	David Ricardo stated that commodities gain value from this concept and from labor.	
1	Name this basic economic condition that arises because the desire for resources is seemingly limitless, while the amount of resources available is limited.	**scarcity** [or **paucity**]
2	Some critics have said that this writer's *Grundrisse* [GROON-dree-seh] described a post-scarcity society. This writer later contradicted some of those ideas in *Das Kapital* [dahss kah-pee-TAHL].	Karl **Marx**
3	In capitalism, scarcity is controlled by setting prices on commodities. What term means the price at which the demand for a commodity drops to zero?	**choke** price

Question #23: Fine Arts

10 points per part

	The Society of Independent Artists set up an exhibit in 1917 that allowed any artist to display any work of art, but this work was hidden during the show against those guidelines.	
1	Give this name that was applied to a urinal signed "R. Mutt".	***Fountain***
2	This French-American artist submitted *Fountain*.	(Henri-Robert-)Marcel **Duchamp**
3	*Prelude to a Broken Arm*, another readymade by Duchamp, was originally one of these objects.	snow **shovel**

Question #24: Fine Arts

10 points per part

	There are several paintings called *The Bath*.	
1	This American painter, who moved to France, often painted women with children—including the painting *The Bath*, which is also called *The Child's Bath*.	Mary **Cassatt**
2	This French artist painted dressed men and nude women in *The Luncheon on the Grass*, which was originally called *The Bath*.	Édouard **Manet** [ayd-war man-ay]
3	This 19th-century French painter set many of his works in Islamic bathhouses, including one most commonly called *The Bath* that shows a seated woman being sponged.	Jean-Léon **Gérôme** [zhahn leh-ohn zhair-ohm]

Question #25: Science

10 points per part

	In this type of wave, the wave oscillates in a direction perpendicular to the direction it travels in.	
1	Name this type of wave contrasted with longitudinal [lawn-jih-TOOD-in-ul] waves.	**transverse** waves [prompt on **T**-waves]
2	In this phenomenon, transverse waves vibrate in a single plane. Photographers often use filters that force light to behave this way.	**polarization** or **polarize**d or **polarizing**
3	Polarization can be specified using parameters named for this person. A theorem named for this person is a generalization of the fundamental theorem of calculus that equates the curl of a field over a surface to the work done by the field along the boundary.	(Sir) George (Gabriel) **Stokes**

Question #26: Science

10 points per part

	This quantity is the rate at which work is done.	
1	Name this quantity measured in watts.	**power**
2	The watt per square meter is the unit used for this vector representing the flux of an electric field. This vector equals the cross product of the electric field with the magnetic H-field.	**Poynting** vector
3	The log of the ratio of two sound intensities, each measured in watts per square meter, is used to calculate this unit of sound intensity.	deci**bel**

Question #27: Literature

10 points per part

	This character's murder was proclaimed with the headline "Well-known city engineer shot dead. Assailants thought to be natives."	
1	Name this man who was shot when three young men broke into his home. This author of "The Truth About Native Crime" had an entire bookshelf in his study dedicated to Abraham Lincoln.	**Arthur** (Trevelyan) Jarvis [prompt on **Jarvis**]
2	Arthur Jarvis was shot by a man whose first name was Absalom; what was his last name? Absalom's father, Stephen, traveled to Johannesburg but was unable to save his son from execution.	**Kumalo**
3	Arthur Jarvis and Stephen Kumalo appear in this novel by the South African author Alan Paton.	***Cry, the Beloved Country***

Question #28: Literature

10 points per part

	This character stands still all night to earn his father's permission to leave.	
1	Identify this character who claims his skills are thinking, waiting, and fasting. He learns business from his boss Kamaswami and learns about the river from the ferryman Vasudeva.	**Siddhartha**
2	This German author wrote *Siddhartha*, *Steppenwolf*, and *The Glass Bead Game*.	Hermann (Karl) **Hesse** [HESS-uh]
3	This courtesan kisses Siddhartha after he improvises a poem for her. This woman is the mother of Siddhartha's son and dies of a snakebite near the river.	**Kamala**

Question #29: Social Studies

10 points

One of these events is commemorated by a Lorado Taft bas-relief [BAH "relief"] that hangs in Chicago's City Hall. That event took place on Randolph Street in Chicago in 1903 at the Iroquois Theatre. A very large one of these events took place in northeast Wisconsin in October 1871 and is named after the town of Peshtigo [PESH-ti-go]. Another major one occurred at the Asch Building in Manhattan in 1911, and led to more support for the International Ladies' Garment Workers' Union and the creation of the American Society of Safety Engineers. Name this type of event, one of which in Chicago occurred the same day as the Peshtigo one and was blamed on Mrs. O'Leary's cow.	**fire**s

Question #30: Mathematics

10 points

The calculation of this quantity is the most straightforward result of a triple integral of just a Jacobian [YAH-koh-bee-un]. For a parallelepiped ["parallel-uh-PIE"-ped], this quantity is found using a triple product. The derivative of this quantity with respect to radius gives the surface area of a sphere. The factor this value changes by during a transformation can be calculated by taking the determinant of a 3-by-3 matrix. For a cone or pyramid, this quantity equals one-third times height times base area. Name this measurement of the space taken up by a three-dimensional object.	**volume**

Question #31: Science

10 points

This type of tissue is attacked by the *Cryphonectria parasitica* ["CRY-foe-NECK-tree-uh" pair-uh-SIT-ih-kuh] fungus, which releases oxalic ["oak"-SA-lik] acid and causes cankers. Some lycophytes ["LIKE-oh-fights"] exhibit only the unifacial type of this tissue, which works only toward the interior. The cells in this tissue are ray initials and fusiform ["FUSE"-ih-form] initials. Dicots ["DIE-cots"] and gymnosperms [JIM-noh-"sperms"] have the vascular type of this tissue. Phellogen [FEL-oh-jen], which is located in the periderm ["PAIR"-ih-durm], is called the "cork" type of this tissue. Name this tissue that is theoretically a single layer of dividing cells responsible for the growth of phloem ["FLOW-um"] and xylem [ZY-lum] in trees.	(vascular) **cambium**

Question #32: Literature

10 points

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.*	Alexander **Pope**

Extra Question #1: Mathematics

10 points

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".	**inequality**/ies

Extra Question #2: Fine Arts

10 points

This artist showed a person in front reaching his hand forward while looking back at this artist in *Self-Portrait with a Friend*. Another possible self-portrait by this artist is *Portrait of a Young Man*, which has been missing since World War II. Two little winged angels look up from the bottom of this artist's *Sistine Madonna*. Several paintings by this painter are in the Stanza della Segnatura [sen-yah-TOO-rah] in the Vatican, including *La Disputa* [lah dees-POO-tah]. Name this High Renaissance Italian artist who portrayed Plato and Aristotle at the top of steps, surrounded by many famous thinkers, in *The School of Athens*.	**Raphael** [or Raffaello **Sanzio** da Urbino]

Extra Question #3: Literature

10 points

The narrator of this work returned to his father his "inheritance" of a knife and spoon. The narrator of this work tells Stein of Antwerp that his wife Reizel ["RYE"-zel] was good despite not having heard from her in years. In this work, the people of Sighet ignore the warnings of Moshe the Beadle. The narrator of this book works counting things for Franek after passing selection by Dr. Mengele [MEN-guh-luh]. The narrator's father dies after a mass march to Gleiwitz [GLY-vits] and being shipped by train to Buchenwald [BOO-ken-vahlt]. Name this memoir about time in Auschwitz ["OW"-shvits], written by Elie Wiesel [EL-ee vee-SEL].	***Night*** [or *La* ***Nuit*** or ***And the World Remained Silent*** or ***Un di velt hot geshvign***]

Extra Question #4: Social Studies

10 points

This person pledged to build 300,000 houses per year and made Harold Macmillan his Minister of Housing. After being slowed down by a stroke, this person resigned his leadership, making way for Anthony Eden. This leader of the Conservative Party had a rivalry with Labour Party leader Clement Attlee, and he first came to power after Neville Chamberlain resigned in 1940. Name this British Prime Minister who worked closely with Franklin Roosevelt and Joseph Stalin during World War II.	Winston (Leonard Spencer) **Churchill**

Extra Question #5: Science

10 points

An illusion named for this effect impacts pilots who turn their heads while their plane is turning, giving the pilot vertigo [VUR-tih-goh] and a false sense of additional motion. The magnitude of this effect is found by multiplying -2 times the cross product of angular velocity with linear velocity. This effect explains why the westerlies come from the southwest in some locations and from the northwest in others. This effect pushes projectiles to the right in the Northern Hemisphere. Name this fictitious force that affects objects in a rotating reference frame.	**Coriolis** effect or **Coriolis** force

Extra Question #6: Literature

10 points per part

	Much of this novel is told through the journals of Jonathan Harker and Mina Murray.	
1	Name this novel in which Lucy Westenra becomes the victim of a Transylvanian count.	***Dracula***
2	This author wrote the 1897 novel *Dracula*.	(Abraham) "Bram" **Stoker**
3	In *Dracula*, John Seward calls in this Dutch doctor to figure out what is wrong with Lucy.	**Abraham** **Van Helsing** [accept either underlined portion]

Extra Question #7: Literature

10 points per part

	This character poses the riddle "Why is a raven like a writing desk?", but he doesn't know the answer.	
1	Name this character who testifies at a trial "with a teacup in one hand and a piece of bread-and-butter in the other".	the Mad **Hatter**
2	When the Mad Hatter is done testifying, this character states "Just take his head off outside."	the **Queen of Hearts** [prompt on the **Queen**]
3	This author wrote about the Mad Hatter in *Alice's Adventures in Wonderland*.	Lewis **Carroll** [or Charles Lutwidge **Dodgson**]

Extra Question #8: Mathematics

10 points per part

	Bézout's [beh-zoh's] identity states that this number is a linear combination of the two numbers from which it is determined.	
1	Name this quantity that can be calculated by multiplying two numbers and then dividing by their least common multiple.	**greatest common divisor** or **greatest common factor** or **gcd** or **gcf** [accept **largest** or **highest** in place of **greatest**]
2	Find the greatest common factor of 72 and 78.	**6**
3	A common algorithm for finding greatest common factors is named for this person, who described it in his book *Elements*.	**Euclid**'s algorithm or **Euclidean** algorithm

Extra Question #9: Mathematics

10 points per part

	The length of one of these segments is the height of a triangle.	
1	Name this type of segment that connects a vertex in a triangle to the opposite side, and is perpendicular to that side.	**altitude**
2	The altitudes of a triangle meet at this point.	**orthocenter**
3	If the area of a triangle is 10 square units, find the length of the altitude to a side that is 5 units long.	**4** units