



Question #1: Science

10 points

<p>About 10% of deaths due to this disease cannot be assigned a specific cause and are called “sudden unexpected death in” this disease. This disease and bipolar disorder are sometimes treated with sodium valproate [val-PROH-“ate”]. This disease and depression can be treated by vagus [VAY-gus] nerve stimulation, and this disease is sometimes treated by removing part of the brain. People with this disease experience episodes that can be classified as absence, tonic, or clonic [KLAH-nik]. The myoclonic [“MY”-oh-KLAH-nik] episodes that people with this disorder experience are characterized by brief jerks or twitches of arms and legs. Name this set of disorders characterized by seizures.</p>	<p>epilepsy [prompt on seizure disorder or seizures]</p>
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Question #2: Literature

10 points

<p>In a novel by this author, the narrator opens a window to let in the protagonist from a fire escape. This author then has the protagonist say “If there’s one thing that I loathe, it’s men who bite”, and she asks the narrator if she can call him Fred. In that novel, this author wrote about a relationship between Mag Wildwood and José Ybarra-Jaegar [hoh-ZAY ee-BAR-ah YAY-gar]. A book by this writer is set in Holcomb, Kansas, and ended up being largely about Richard Hickock and Perry Smith. Name this author who wrote about the murder of the Clutter family in <i>In Cold Blood</i> and about Holly Golightly in <i>Breakfast at Tiffany’s</i>.</p>	<p>Truman (Garcia) Capote [or Truman Streckfus Persons]</p>
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Question #3: Social Studies

10 points

<p>Three months before this battle, a prisoner exchange freed John Sullivan, who during this battle prevented escapes by controlling a bridge over the Assunpink [ASS-un-“pink”] Creek. One side in this battle was led by Johann [YOH-hahn] Rall, who died the next day from his wounds. This battle changed the momentum of the war, reversing the results of the Battles of Fort Lee and Fort Washington a month earlier. This battle took place the day after Christmas. George Washington crossed the Delaware to get to this battle. Name this battle where forces under Washington defeated Hessians in New Jersey.</p>	<p>Battle of Trenton</p>
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Question #4: Fine Arts

10 points

<p>One piece by this composer quotes the funeral march of Beethoven’s <i>Eroica Symphony</i> and was written for 23 solo string instruments. That work was composed at the end of World War II after the destruction of opera houses that had performed this composer’s works. Another work by this composer begins with rising half notes that play C, then G, then C, then two chords followed by percussion. That passage is in the introduction, which is titled “Sunrise” and was used in the film <i>2001: A Space Odyssey</i>. Name this German composer of <i>Metamorphosen</i> and <i>Also sprach Zarathustra</i>.</p>	<p>Richard (Georg) Strauss [REEK-hart shtraoss]</p>
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Question #5: Science

10 points

Some of these substances, especially **hydro-philic** [“hide”-roh-FILL-ik] ones, are able to expand by *adsorbing* water through **imbibition** [im-buh-BISH-un]. When surfactant molecules are dispersed in one of these substances, **micelles** [“my-SELLS”] can form. **Nephelometers** [nef-uh-LAH-mih-turz] are used to measure these substances by taking advantage of an effect that is very similar to Rayleigh scattering. These substances contain particles that are between 1 and 1,000 nano-meters long. The scattering in these substances is the **Tyndall** [TIN-dahl] effect. Name this type of mixture that includes foams, sols, gels, and emulsions.

colloids [KAH-loydz]

Question #6: Literature

10 points

A kick from this creature caused the well **Hippocrene** [HIP-oh-kreen] to form on Mount Helicon, which inspired the Muses. This creature was captured while drinking at the well **Peirene** [pay-REE-nee]. A hero became hated after trying to use this creature to reach Mount Olympus. This creature had a human brother who was born at the same time as him and had a name meaning “he who bears a golden sword”. This offspring of Poseidon and brother of **Chrysaor** [“CRY-say-or”] was born when his mother Medusa was decapitated. This creature was captured by **Bellerophon** [bell-AIR-oh-fahn] and helped him defeat the **Chimera** [ky-MEER-uh]. Name this winged horse.

Pegasus



Question #7: Mathematics

10 points per part

This quantity is often used to quantify exponential decay.		
1	Name this quantity equal to the amount of time it takes for an amount to decrease by 50%.	<u>half-life</u>
2	If the half-life of a substance is one day, how many grams of a 32-gram sample are left after two days?	<u>8</u> grams
3	Rounded to the nearest gram, if the half-life of a substance is 10 days, what will be the final mass of a 100-gram sample after five days?	<u>71</u> grams

Question #8: Mathematics

10 points per part

Completing the square on a quadratic function makes it easy to identify the coordinates of this point.		
1	Give this term for the point on a parabola that the axis of symmetry passes through.	<u>vertex</u>
2	Find the x -coordinate of the vertex of the parabola “ y equals x squared minus $6x$ plus 10 ”. Give only the x -coordinate.	$x = $ <u>3</u> (The y -coordinate is 1.)
3	Find <i>both</i> coordinates of the vertex of a parabola if its focus is the point “3 comma 8” and its directrix is the line “ x equals 7”.	<u>(5, 8)</u> [order matters; accept <u>$x = 5$</u> and <u>$y = 8$</u>]



Question #9: Social Studies

10 points per part

This quantity equals the amount of a good that consumers are willing and able to purchase.		
1	Name this quantity often contrasted with supply.	<u>demand</u>
2	The y -axis on a demand curve typically represents this quantity. The x -axis represents the quantity of a good.	<u>price</u> [do not accept “cost”]
3	Consumer demand curves are sometimes generated using these curves that link combinations of quantities that consumers consider to have equal values.	<u>indifference</u> curves

Question #10: Social Studies

10 points per part

This type of payment is contrasted with principal.		
1	Name this type of payment made from a borrower to a lender, including payments from banks to people with certain savings accounts.	<u>interest</u>
2	This interest rate is the lowest available rate at a particular time to the most credit-worthy customers. It is usually 3% more than the federal funds rate.	<u>prime</u> rate
3	According to this equation, the rate of inflation equals the difference between the real interest rate and the nominal interest rate.	<u>Fisher</u> equation



Question #11: Literature

10 points per part

This poem states “But at my back I always hear time’s winged chariot hurrying near.”		
1	Name this poem that begins “Had we but world enough and time.”	<u>“To His Coy Mistress”</u>
2	This English poet wrote “To His Coy Mistress” and “Flecknoe”.	Andrew <u>Marvell</u>
3	The poem “To His Coy Mistress” states that this location is “a fine and private place”. The poem adds “But none, I think, do there embrace.” Use the same term that the poem uses.	the <u>grave</u>

Question #12: Literature

10 points per part

This poem mentions “A gown made of the finest wool” and “Fair lined slippers for the cold”.		
1	Name this poem that begins “Come live with me, and be my love.”	“The <u>Passionate Shepherd to His Love</u> ”
2	“The Passionate Shepherd to His Love” was written by this 16th-century English poet and playwright.	Christopher <u>Marlowe</u>
3	After Christopher Marlowe died, this man—who translated Homer’s works into English—finished Marlowe’s poem <i>Hero and Leander</i> [<i>lee-AN-dur</i>].	George <u>Chapman</u>



Question #13: Science

10 points per part

This person devised a thought experiment about a cat that can be treated as both alive and dead.		
1	Name this Austrian physicist whose equation using wave functions is a fundamental part of quantum mechanics.	Erwin Schrödinger [SHRAY-ding-ur]
2	Most forms of the Schrödinger equation use this operator that combines kinetic and potential energies.	Hamiltonian
3	Though the Schrödinger equation is often very difficult to solve, this problem—sometimes called the “infinite potential well” or “infinite square well”—does have relatively straightforward solutions.	particle in a box problem

Question #14: Science

10 points per part

This particle has the same mass as an electron but a positive charge.		
1	Name this antimatter particle.	positron [PAH-zih-trahn] [prompt on anti-electron or positive electron]
2	In the most common example of this process, a photon turns into an electron and a positron.	pair production
3	The positron was predicted from this person’s equation, developed in 1928, that used both quantum mechanics and relativity.	Paul (Adrien Maurice) Dirac [DEER-ak]



Question #15: Social Studies

10 points

This battle is described in detail in the *Mozarabic [moh-ZAR-uh-bik] Chronicle*, but some of the details might not be accurate. The historical importance assigned to this battle has decreased in recent years as historians have pointed out that Uqba [UK-bah] and Yusuf [YOO-suf] made major incursions in the years after this battle. Both sides in this battle had been rivals with Odo [OH-doh] the Great, who warned his rival to the northeast after being defeated from the south. Abdul Rahman was killed during this battle, which led to an Umayyad [oo-“MY”-ad] withdrawal in Europe. Name this victory by Charles Martel in 732 in what is now France.

(Battle of) **Tours [toor]**
or **Poitiers [pwaht-ee-ay]**
[accept the **Highway of the Martyrs**]

Question #16: Mathematics

10 points

The centers of all circles that are tangent to a fixed circle and pass through a fixed point outside the fixed circle form this shape. An object launched at an angle and at greater than the escape velocity will follow a path that is part of this shape. The axes of this shape are called “transverse” and “conjugate”. The difference between the distances of any point on this shape to two fixed points is constant. This shape has an eccentricity greater than 1. Part of this shape is created by slicing a cone perpendicular to its base. Name this conic section with two branches.

hyperbola [prompt on **conic** section before “conic”]



Question #17: Literature

10 points

<p>A character in this novel kisses Fenechka [feh-NECH-kuh], leading to a duel and the same character leaving Marino. This novel begins with Nikolai and his servant Peter waiting for Nikolai's son. Two of the main characters in this novel were recently students at St. Petersburg University. Characters in this novel debate whether a certain point of view consists of either thinking critically or not respecting anything. In this novel, Arkady [ar-KAH-dee] states that Bazarov [bah-ZAHR-awff] is a nihilist [NY-uh-list]. Name this Russian novel written by Ivan Turgenev [tur-"GAIN"-yeff].</p>	<p><u><i>Fathers and Sons</i></u> [or <u><i>Otsy i Deti</i></u>]</p>
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Question #18: Science

10 points

<p>This di-saccharide ["die-SACK-uh-ride"] consists of glucose and a mono-saccharide that is created from glucose by hexo-neo-genesis ["HEX-oh-KNEE-oh-genesis"]. Eosin methylene [EE-uh-sin METH-uh-leen] blue is used to identify organisms that ferment this sugar. A genus of bacteria named for being able to digest this sugar includes the subspecies <i>bulgaricus</i> [buhl-GAR-ih-kuss] and the species acidophilus ["acid"-AH-fuh-liss]. This sugar is the only common sugar of animal origin. This di-saccharide is found in high concentrations in milk. Name this sugar that most of the world's population, though not most people of European descent, have an intolerance for.</p>	<p><u>lactose</u></p>
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Question #19: Social Studies

10 points

<p>The constitutional clause granting Congress the power to initiate these actions also gives Congress the power to grant letters of marque ["mark"] and reprisal. A 1973 joint resolution allows these actions to begin on an emergency basis if Congress is given notice within 48 hours and passes an A.U.M.F. within 60 days. The Supreme Court case <i>Schenck v. U.S.</i> found that First Amendment protections could be curbed by the Espionage Act during these events. Congress has used its power to declare these actions in 1812, 1846, 1898, 1917, 1941, and 1942. Name this type of major conflict.</p>	<p><u>wars</u></p>
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Question #20: Miscellaneous

10 points

<p>This person helped start the Sasakawa [sah-sah-KAW-uh] Africa Association, whose website quotes him saying "Take it to the farmer!". This person hypothesized that improving agricultural productivity leads to other benefits, such as stopping deforestation. While accepting his Nobel Peace Prize, this person stated "The first essential component of social justice is adequate food for all mankind." Early in his career, this person worked in Mexico to develop a semi-dwarf wheat plant that was disease-resistant, and his work was later applied to India and Pakistan. Name this leader of the Green Revolution.</p>	<p>Norman (Ernst) <u>Borlaug</u></p>
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Question #21: Science

10 points per part

In the late 19th century, the Harvard astronomy department hired women who became known as “computers”.		
1	Harvard computers determined the link between luminosity and period in Cepheid [SEH-fee-id] variables, allowing Cepheid variables to be used to find this quantity by comparing the absolute value of luminosity to observed brightness.	distance from Earth [accept descriptive answers such as how far away they are]
2	The computers organized this star catalogue, named for an amateur astronomer and funded by his widow, who became a computer.	Henry Draper Catalogue [accept Henry Draper Extension Charts]
3	Cecilia Payne- Gaposchkin [guh-POHSH-kin], who later became the Harvard astronomy department chair, discovered that stars’ atmospheres consisted primarily of helium and this other element.	hydrogen [accept H]

Question #22: Science

10 points per part

Extra-solar planets are planets that orbit a star other than our Sun.		
1	The first extrasolar planets discovered were in a category combining the word “super” and the name of this largest planet in our Solar System.	Jupiter [accept super- Jupiter planets]
2	Scientists are focusing on planets in the circum-stellar habitable [“habit-uh-bull”] zone, which is given this fairy tale-based nickname.	Goldilocks zone (because their conditions are “just right” for life)
3	Many extrasolar planets approximately the size of Earth were found using this space telescope from 2009 to 2018.	Kepler space telescope



Question #23: Literature

10 points per part

This poem is about an object that “did not give of bird or bush, like nothing else in Tennessee”.		
1	Name this poem about an object that “was round upon the ground”.	“ <u>Anecdote of the Jar</u> ”
2	“Anecdote of the Jar” first appeared in this poet’s collection <i>Harmonium</i> along with “The Emperor of Ice-Cream” and “Disillusionment of Ten O’Clock”.	Wallace <u>Stevens</u>
3	Another Wallace Stevens poem has this many sections, each of which includes the word “blackbird”.	<u>13</u> sections [accept “ <u>Thirteen</u> Ways of Looking at a Blackbird”]

Question #24: Literature

10 points per part

Hennessey plays a major role in the first part of this novel, but he is killed by a mortar shell.		
1	Name this novel set on the Pacific island of Anopopei [an-oh-POH-“pie”] during World War II.	<i>The <u>Naked and the Dead</u></i>
2	This author of <i>The Naked and the Dead</i> wrote about capital punishment in <i>The Executioner’s Song</i> .	Norman (Kingsley) <u>Mailer</u>
3	Norman Mailer’s essay <i>The White Negro</i> was heavily criticized by this person who wrote the essay <i>The Fire Next Time</i> .	James (Arthur) <u>Baldwin</u>



Question #25: Social Studies

10 points per part

This empire was interrupted when Humayun [hoo-MAH-yoon] was defeated by the Sur Empire from Afghanistan in 1540.		
1	Name this empire on the Indian subcontinent that started with Babur [BAH-ber].	Mughal Empire [accept the Mughals]
2	Babur defeated Ibrahim Lodi at this location. Thirty years later, Akbar defeated Hemu [HAY-moo] at the same place.	(Battle of) Panipat
3	This empire lost the Third Battle of Panipat, but they gained power after the Mughals and controlled much of the subcontinent during the 18th century.	Maratha Empire [or Maratha Confederacy or Marathas]

Question #26: Social Studies

10 points per part

The Houses of Lancaster and York were both branches of this royal house, which came from the house of Anjou [AN-joo].		
1	Name this royal house that ruled England from 1154 to 1485.	House of Plantagenet [plan-TAJ-ih-nut] or Plantagenet dynasty or Plantagenets
2	The last Plantagenet monarch is generally considered to be this member of the House of York who died at the Battle of Bosworth Field.	Richard III [prompt on Richard]
3	The House of Lancaster descended from this son of Edward III and father of Henry IV.	John of Gaunt [prompt on John]



Question #27: Fine Arts

10 points per part

This painting shows people from different classes fighting together in a revolution.		
1	Name this painting, set during the July Revolution of 1830, in which the title woman holds up a French flag.	<i>Liberty Leading the People</i> [or <i>La Liberté guidant le peuple</i>]
2	This French artist painted <i>Liberty Leading the People</i> .	Eugène Delacroix [del-uh-krwah]
3	This Delacroix painting shows three people sitting on the floor as a servant walks away from them.	<i>Women of Algiers in their Apartment</i> [or <i>Femmes d'Alger dans leur appartement</i>]

Question #28: Fine Arts

10 points per part

Answer the following about the Japanese woodblock commonly called <i>The Great Wave off Kanagawa</i> .		
1	This artist made the print.	(Katsushika) Hokusai
2	<i>The Great Wave</i> is the first of 36 Hokusai prints showing this mountain.	Mount Fuji [or Fuji -san]
3	This many fishing boats can be seen in <i>The Great Wave</i> .	three fishing boats



Question #29: Science

10 points

This quantity and charge are the reason that an electron has a magnetic **dipole** [“DIE-pole”] moment. The **Landé** [lawn-day] *g*-factor for this quantity is about 2 because it is about twice as effective at producing a magnetic dipole moment as orbital motion is. When this property of a particle is an integer, the particle obeys Bose-Einstein statistics; when it is not an integer, the particle follows the Pauli exclusion principle. This quantity is an integer for **bosons** [BOH-zahnz] but it is a half-integer for fermions. The quantum number representing this quantity can take on two values for any electron in an atom. Name this intrinsic form of angular momentum represented by the fourth quantum number.

(magnetic) **spin** [accept **spin angular momentum**; prompt on **angular momentum**; do not prompt on “momentum”]

Question #30: Literature

10 points

One of the characters in this novel summons his servant **Hassan** [hah-sahn] and points to flies, then helps Hassan figure out that he should kill the flies. Soon after that, Dr. Panna Lal arrives and helps this novel’s protagonist avoid going back to work for Major Callendar. In this novel, a bridge party that does not involve any card playing is hosted by Mr. Turton, and a tea party is hosted by Cyril Fielding. This novel also features a broken engagement between Ronny Heaslop and Adela Quested, the latter of whom makes a sexual assault allegation against Dr. **Aziz** [ah-ZEEZ]. Name this novel by E. M. Forster.

*A **Passage to India***



Question #31: Mathematics

10 points

The **Minkowski–Bouligand** [min-KAWFF-skee boo-luh-gawn] version of this quantity is also known as the box-counting version and is calculated by dividing the log of a quantity analogous to area by the log of a quantity analogous to radius. Another version of this quantity is found by dividing the log of the number of copies of a figure by the log of a scaling factor. That version of this quantity equals the log base 3 of 2 for the Cantor set and the log base 2 of 3 for the **Sierpinski** [sir-PIN-skee] triangle. This quantity is irrational for many fractals. Name this quantity that is 1 for lines, 2 for planes, and 3 for space.

(fractal) dimension

Question #32: Social Studies

10 points

When Timothy Pickering was dismissed as Secretary of State, this person replaced him. Later, as a Supreme Court justice, this person wrote “The very essence of civil liberty certainly consists in the right of every individual to claim the protection of the laws whenever he receives an injury.” In another decision, this person wrote “The power to tax is the power to destroy.” Those quotations are in this person’s decisions for *Marbury v. Madison* and *McCulloch v. Maryland*. Name this longest-serving Chief Justice who held the position from 1801 to 1835.

John Marshall



Extra Question #1: Science

10 points

Indirect evidence for the existence of this phenomenon was provided in a 2019 experiment using **phonons** [FOH-nahnz] in supersonic gases at the **Technion** [“TECH-knee-on”]. This phenomenon is sometimes named for Yakov Zeldovich in addition to the scientist it is usually named for. Echoes of gravitational waves are being studied to determine whether they provide evidence of the quantum fuzz that would cause this phenomenon. If this phenomenon exists, then so does black hole evaporation. A discovery of white holes would support the existence of this phenomenon. Name this energy from black holes named after a scientist who suffered from ALS.

Hawking radiation [or **superradiation** or **superradiance**; prompt on **black hole radiation**; do not accept or prompt on “black hole(s)”]

Extra Question #2: Literature

10 points

In a novel by this writer, Thomas Greggs is cleaning part of the London Zoo and is shocked to hear some of the animals talk. This author goes on to satirically describe fighting between those animals and humans that destroys much of the Earth’s landmass. In a play by this writer, Radius tries to kill all humans. In that play, Helena burns a formula that was used by her husband Harry **Domin** [doe-MEEN] to become very powerful. Domin manages a company that was started by the Rossum family in this author’s play that introduced the word “robot”. Name this author of *War with the Newts* and *R.U.R.*

Karel **Čapek** [CHAH-pek]



Extra Question #3: Fine Arts

10 points

One sculpture by this artist was originally on display at the **Salon des Indépendants** [sal-awn dez an-deh-pen-dawnt] in Paris, but it was removed because some viewers found it obscene. This artist complained that the sculpture was an abstract depiction of Princess Marie Bonaparte. This sculptor of *Princess X* made a series of abstract sculptures that the United States insisted should be taxed because they did not qualify as art. In those sculptures, this artist depicted the flight of an animal while giving minimal attention to the animal itself. Name this Romanian sculptor who created *Bird in Space*.

Constantin **Brâncuși**
[kohn-stahn-TEEN
brin-KOOSH]

Extra Question #4: Mathematics

10 points

A sphere inscribed in this solid has a radius equal to this solid's edge length times the golden ratio squared divided by the quantity 2 root 3. A combination of two of these solids can be formed using vertices that have one coordinate of 0, one coordinate of plus or minus 1, and another coordinate of plus or minus the golden ratio. This solid has 12 vertices, each of which is the vertex of five of its triangular faces. Name this Platonic solid whose name indicates that it has 20 faces, which is even more faces than a **dodecahedron** [doh-DEK-uh-HEE-drun].

icosahedron
["eye"-KAH-suh-hee-drun]



Extra Question #5: Social Studies

10 points

A description of the design of these objects is in chapter 25 of Exodus, ending with the verse, “See that you make them according to the pattern shown you on the mountain.” A depiction of this object was originally painted yellow on the Arch of Titus, which shows it as the largest object taken from the Temple in Jerusalem. This object is surrounded by olive branches on the coat of arms of the State of Israel. Two extra branches are on the **hanukiah** [hah-NOO-kee-AH], which is a version of this object that has one branch raised to be used for the **shamash** [shah-MAHSH] and which is used during Chanukah. Name this object whose branches hold lamps or candles.

menorah(s) [or **menorot**;
prompt on **candlesticks**
before “branches”]



Extra Question #6: Mathematics

10 points per part

James Gleick [rhymes with “bike”] wrote a book about the development of this branch of mathematics.		
1	Name this study of dynamical systems that are very sensitive to initial conditions.	<u>chaos</u> theory
2	Chaos theory is often explained using this “effect” in which an insect flaps its wings, eventually leading to a tornado.	<u>butterfly</u> effect
3	Chaos theory and the butterfly effect are based on the work of this mathematician and meteorologist, whose namesake system has a solution called his namesake “attractor”.	Edward (Norton) <u>Lorenz</u>

Extra Question #7: Mathematics

10 points per part

Numbers named after this person are 1 less than a power of 2.		
1	Identify this 17th-century French mathematician whose namesake numbers are used to find large primes.	Marin <u>Mersenne</u> [or Marinus <u>Mersennus</u>]
2	Mersenne primes are also used to find these numbers that are equal to the sum of their proper divisors.	<u>perfect</u> numbers
3	Find the perfect number that corresponds to the fact that 7 is a Mersenne prime, according to the Euclid-Euler [YOOK-lid OY-lur] theorem.	<u>28</u>



Extra Question #8: Social Studies

10 points per part

This person is the only person to be named General of the Armies of the United States while he was still alive.		
1	Name this commander of the American Expeditionary Forces during World War I.	John J(oseph) Pershing [prompt on Black Jack]
2	Pershing mentored and served as the best man for this person, who was Army Chief of Staff during World War II and served as President Truman’s Secretary of State and Secretary of Defense.	George C(atlett) Marshall (Jr.)
3	Pershing led American troops during this offensive from September 26 to November 11, 1918 that ended the war.	Meuse (River) – Argonne (Forest) offensive [prompt on Meuse or Argonne]

Extra Question #9: Social Studies

10 points per part

This person has the fourth-most time served in the U.S. Cabinet, which she belonged to from 1933 to 1945.		
1	Name the first female cabinet member.	Frances Perkins [or Fannie Coralie Perkins]
2	Frances Perkins held this position, which recently has been held by Eugene Scalia [skuh-LEE-uh] and Marty Walsh.	Secretary of Labor
3	After the National Industrial Recovery Act was declared unconstitutional, Perkins oversaw the implementation of this 1938 law that established a federal minimum wage.	Fair Labor Standards Act of 1938 or FLSA