Question #1: Science – Astronomy

10 points

Before this astronaut was allowed to return to space, he needed surgery for Ménière's [mayn-YAIR'Z] disease, which affects the inner ear. He became the only one of the original Mercury Seven astronauts to walk on the Moon. After landing there as part of the Apollo 14 mission, he hit two golf shots. This person flew in the *Freedom 7* craft in May 1961. That flight only lasted about fifteen minutes, landing near the Bahamas. Because of a delay, that flight took place after a *Vostok 1* flight by Yuri Gagarin. Name this astronaut who, before John Glenn's orbital mission, became the first American in space.	Alan **Shepard**

Question #2: Social Studies – U.S. History

10 points

This person changed his last name to Johnson to hide his identity, then changed it again to match characters in "The Lady of the Lake". In the 1872 presidential election, he was Victoria Woodhull's running mate for the Equal Rights Party. He was the only African-American present at the Seneca Falls convention, and the story of his life was told in *My Bondage and My Freedom*. This person worked closely with William Lloyd Garrison until Garrison burned copies of the Constitution. Name this publisher of the *North Star*, an escaped slave who became an abolitionist.	Frederick **Douglass** [or Frederick Augustus Washington **Bailey**]

Question #3: Literature – British Literature

10 points

This author wrote of a gate with gold and black inscriptions, one side of which states, "Through me men go into that blessed place." A debate which results in the "formel eagle" not choosing a mate occurs at the title meeting of birds in this writer's *A Parliament of Fowls*. One of his characters, Madam Eglantine [EH-glun-tine], was a prioress; another of his characters, who talks about a woman who became beautiful after marrying a knight, was the Wife of Bath. He wrote about pilgrims on a journey to the grave of Thomas á Becket. Name this author of *The Canterbury Tales.*	Geoffrey **Chaucer**

Question #4: Miscellaneous – Popular Culture

10 points

One album by this band featured a cover designed by Peter Blake and Jann Haworth [HAH-wurth] showing them in front of dozens of celebrities. Another of their album covers shows them crossing the street, with the person in front wearing white. One song by this band features "a sermon that no one will hear" written by Father McKenzie. That song by this band was paired with another that describes a "sky of blue and sea of green." Those songs are "Eleanor Rigby" and "Yellow Submarine". Name this British band that featured Ringo Starr on drums and Paul McCartney on bass guitar.	The **Beatles**

Question #5: Science – Biology

10 points

A model for the development of these structures claims that the A, B, and C transcription factors affect development of different parts of these structures. Double fertilization takes place inside of these structures. The corollas [kuh-ROH-luhz] that form these structures tend to have four or five parts in dicots ["DIE-cots"], but three or six parts in monocots [MAH-noh-"cots"]. The sepal [SEE-pul] is found under these structures. They often attract pollinators with their nectar. Name these reproductive structures in plants, composed of petals.	**flower**s [prompt on **petal**s or **angiosperm**s]

Question #6: Literature – Mythology

10 points

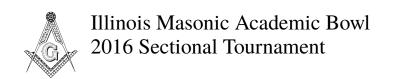| In China, one of the gods of this phenomenon was Hui Lu [wee loo], who kept birds in his gourd. In Norse mythology, the realm devoted to this phenomenon is populated by the Eldjötnar [ELD-yoht-nar]. That realm, Muspelheim [MOOS-pul-hyme], is ruled by Sinmara and Surt. Like Loki in Norse mythology, in Native American mythology Coyote steals this phenomenon for humans. In Greek mythology, Zeus hid this from humans after being tricked by Prometheus, but Prometheus took it back. Name this hot, light phenomenon that several mythologies predict will be used to end the world.	**fire** [or **flame**s]

Question #7: Mathematics – Probability

10 points per part

	This operation gives the number of ways that items can be selected from a group if order matters.	
1	Name this operation often contrasted with combination.	**permutation** [prompt on n**P**r]
2	In how many ways can 3 items be chosen from a pool of 5 items, if order matters?	**60**
3	Divide 7 factorial by the quantity 7 permutation 5.	**2**

Question #8: Mathematics – Probability

10 points per part

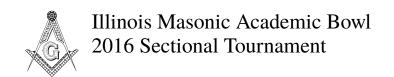|	These diagrams are Euler [OY-lur] diagrams in which every possible combination is shown.	
1	Name these diagrams in which sets are often represented as overlapping circles.	**Venn** diagrams
2	If there are a total of 7 elements in set A, a total of 9 elements in set B, and 3 elements common to both sets, then how many elements are in set A but not in set B?	**4** elements
3	In the same situation, find the probability that an item in set B chosen at random is also in set A. Again, the situation is that there are 7 elements in set A, 9 elements in set B, and 3 elements in both sets.	**1/3** [or 0.**3 repeating**]

Question #9: Social Studies – Psychology

10 points per part

	The Bobo doll experiment tested observational learning in this type of person.	
1	Name this group of people who experience the first three of Jean Piaget's [jeen pee-ah-jay's] four stages and the first four of Erik Erikson's eight stages.	**child**ren [accept equivalents such as **young people** or **kid**s; prompt on **student**s or **babies** or **infant**s]
2	In the Little Albert experiment, John Watson affected a child's reactions to other objects by making loud noises to coincide with interactions with this kind of animal.	(white or brown) **rat** [or **R**attus **norvegicus**]
3	In that experiment, Watson's actions were an example of this form of conditioning, in which the subject eventually pairs an unconditioned stimulus with a conditioned response.	**classic**al conditioning

Question #10: Social Studies – Psychology

10 points per part

	The tobacco industry was alleged to have influenced the science behind the formulation of the "type A" theory of this concept.	
1	Name this concept that incorporates the way a person thinks, feels, and behaves. The Myers-Briggs test for it gives results such as INTJ and ESFP.	**personality**
2	The Myers-Briggs test is grounded in the work of this psychotherapist, who introduced the concepts of anima and animus.	Carl (Gustav) **Jung** [yoong]
3	Participants in this personality test are shown a series of inkblots and asked to interpret what they see.	**Rorschach** inkblot test

Question #11: Science – Physics

10 points per part

	This quantity is equal to the cross product of the lever arm with the applied force.	
1	Name this quantity, the rotational analogue of force.	**torque**
2	If moment of inertia is constant, torque divided by moment of inertia equals this quantity — a fact analogous to Newton's second law.	**angular acceleration** or **rotational acceleration** [do not prompt on "acceleration"]
3	For a solid sphere with uniform density, the moment of inertia about an axis through the center is equal to this value times the sphere's mass times its radius squared.	**2/5** [or 0**.4**]

Question #12: Science – Physics

10 points per part

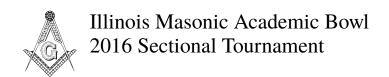|	The conservation law for this quantity can be used to derive the equation of motion for an ideal rocket.	
1	Name this quantity equal to mass times velocity.	linear **momentum** [do not accept "angular momentum" or "rotational momentum"]
2	This term refers to a change in momentum. It is equal to the integral of force with respect to time.	**impulse**
3	The Heisenberg uncertainty principle applies to position and momentum because the commutator of the two variables does *not* have this value.	**zero**

Question #13: Literature – World Literature

10 points per part

	This character attempted to distract a scholar by taking him to a witches' sabbath on Walpurgis [VAHL-pur-gis] Night.	
1	Name this incarnation of the devil who first appears in the form of a poodle. His attempt to claim one man's soul was thwarted by angels using rose petals.	**Mephistopheles** [or **Mephisto**; do not accept "Satan", "Lucifer", or other putative synonyms]
2	Mephistopheles made a bet with God about the soul of this German scholar.	Dr. Heinrich **Faust** [accept Doctor **Faustus**]
3	This German author of *The Sorrows of Young Werther [VAIR-tair]* wrote of the seduction and redemption of Gretchen in *Faust*.	Johann Wolfgang von **Goethe** [GRR-tuh]

Question #14: Literature – World Literature

10 points per part

	Algerian author Kamel Daoud [kah-mel dah-ood] re-worked this text, telling it from a different perspective.	
1	Name this novel in which the narrator, who does not cry at his mother's funeral, shoots an Arab.	*The **Stranger*** [or ***L'Etranger***]
2	*The Stranger* is by this French author.	Albert **Camus** [al-"bear" kam-oo]
3	Daoud's novel, *The Meursault [mair-sawl] Investigation*, is told from the perspective of Harun [hah-ROON], who had this relationship with the Arab whom Meursault shot.	younger **brother** [accept **sibling**]

Question #15: Fine Arts – Art History

10 points

This city is the home of the Archbasilica of St. John Lateran, which is behind the largest of this city's thirteen major obelisks. For many years, this city's largest building was a round structure designed as a mausoleum, Castel Sant'Angelo. This city's Trinita dei Monti Church is at the top end of a set of 135 steps leading from its Spanish Embassy. Nicola Salvi designed its Trevi Fountain. The world's largest unreinforced concrete dome, which contains an enormous oculus [AHK-yoo-lus], is in this city's Pantheon. Name this city featuring the Flavian Amphitheatre, or Colosseum, which surrounds Vatican City.	**Rome**, Italy [or **Roma**; do not accept "Vatican (City)"]

Question #16: Mathematics – Math Concepts

10 points

The gradient of a function is a "field" in which every point is one of these objects. A space consisting of these objects can be defined using a set called a basis. These objects are often represented as a matrix with one row or one column. Projecting one of these objects onto the coordinate axes gives its components. The dot product takes two of these mathematical things and produces a scalar. Name this mathematical concept that consists of a magnitude and a direction.	**vector**(s)

Question #17: Social Studies – World History

10 points

This person disputed the claims of his brother-in-law Charles II of Spain, sparking the War of Devolution. Following the arrest of Nicolas Fouquet [nee-koh-law foo-kay], this person appointed Jean-Baptiste Colbert [zhahn bap-teest "coal-bear"] as finance minister. This ruler revoked the Edict of Nantes [nahnt] by issuing the Edict of Fontainebleau [fawn-ten-bloh]. His grandson Philip V gained power in the War of Spanish Succession. This leader described his absolute power with the phrase "l'etat c'est moi [lay-tah say mwah]", meaning "I am the state." Name this French "Sun King" who ruled for 72 years.	**Louis XIV** [14]

Question #18: Science – Chemistry

10 points

Two of these things are emitted in the Auger [oh-zhay] effect. When sodium is placed into ammonia, a deep blue color occurs due to the formation of a salt with these as the anion ["AN-ion"]. In organic chemistry, the transfer of these things is represented by arrows. These things occupy the HOMO but not the LUMO. These particles are transferred in a redox reaction. J.J. Thomson discovered these particles while working with a cathode ray tube. The octet rule says that atoms try to have eight of these particles in their valence shells. Name these negatively charged particles which surround the nucleus of an atom.	**electron**s

Question #19: Literature – U.S. Literature

10 points

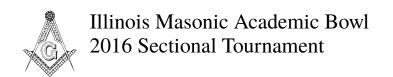|	
In one play by this writer, a bride and window dummy appear to argue. In that same play by this author, a conception is signaled when the title mark burns on Serafina's [sair-uh-FEE-nuh'z] chest. This writer of *The Rose Tattoo* wrote about a character who feels a click in his head that makes him peaceful. That character, Brick, describes the experience to Big Daddy. This author also wrote about a woman who loses her home, Belle Reve [bel reev], and goes to stay with her sister Stella Kowalski in New Orleans. Name this playwright of *The Glass Menagerie* and *A Streetcar Named Desire*.	Tennessee **Williams** [or Thomas Lanier **Williams** III]

Question #20: Social Studies – Economics

10 points

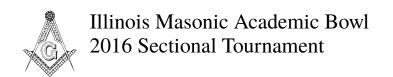|	
The rate of this condition is measured using the current population survey, which was revised in 1994. Okun's [OH-kun's] law describes a conditional relationship between the rate of this condition and GDP. Its rate is represented on the *x*-axis in graphing the Phillips curve. The efficiency wage hypothesis argues that this condition results from managers not paying the market-clearing wage. John Maynard Keynes ["canes"] wrote about the cyclic nature of this problem. The frictional form of this condition applies to someone "between jobs". Name this status held by people who are looking for work but who do not currently have a job.	**unemployment** [accept being **unemployed**; accept **employment** or being **employed** before "Phillips curve"]

Question #21: Mathematics – Algebra

10 points per part

	Several theorems in mathematics are described by this word; one of them states that every non-constant polynomial has at least one root in the complex numbers.	
1	Give the name common to these theorems. The example "of calculus" states that integrals can be evaluated using anti-derivatives.	**fundamental** theorems
2	Credit for the fundamental theorem of calculus is usually given to either Isaac Newton of England or this German mathematician.	Gottfried Wilhelm **Leibniz**
3	Find both solutions to the equation x squared plus 9 equals 0.	$3i$ and $-3i$ [either order; "or" may be substituted for "and"; accept $\pm 3i$; accept the square **root** of -1 in place of i]

Question #22: Mathematics – Algebra

10 points per part

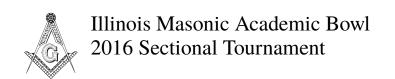|	On the complex plane, these numbers form the vertical axis.	
1	Name this set of numbers, each of which equals i times some real number.	(purely) **imaginary** numbers [do not accept "complex (number(s))"]
2	This French mathematician developed a formula for raising complex numbers to powers, relying on the expression of complex numbers in polar form.	Abraham **de Moivre** [duh mwahv]
3	Find the value of i raised to the tenth power.	-1 [do not accept "1"]

Question #23: Literature – British Literature

10 points per part

	One short story collection by this author opens with "The Sisters".	
1	Name this Irish novelist who wrote about Stephen Daedalus in *A Portrait of the Artist as a Young Man* and *Ulysses.*	James (Augustine Aloysius) **Joyce**
2	"The Dead" is the last story in this James Joyce collection.	***Dubliners***
3	In "The Dead", this is the profession of Gabriel Conroy. The enemy of Sherlock Holmes, James Moriarty, also held this type of job.	university **professor** [prompt on **teacher** or **researcher**]

Question #24: Literature – British Literature

10 points per part

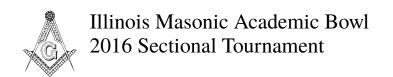|	Linda died from overdosing on this drug, which she had gotten from Dr. Shaw.	
1	Name this fictional drug that causes its user to go on a "holiday". Its effects were described as "all the advantages of Christianity and alcohol, and none of the defects."	**soma** [SOH-muh]
2	Soma is the drug of choice for the civilized characters in this dystopian [dis-TOH-pee-un] novel in which people are classified as Alpha through Epsilon unless they live on a Savage Reservation.	***Brave New World***
3	*Brave New World* is by this author of *Point Counterpoint* and *Crome Yellow*.	Aldous (Leonard) **Huxley**

Question #25: Social Studies – World History

10 points per part

	This leader wrote a *Defense of the Seven Sacraments* that led to Pope Leo X granting him the title "Defender of the Faith".	
1	Name this king who was later excommunicated following his break with the Catholic Church, as he sought to divorce Catherine of Aragon in order to marry Anne Boleyn [boh-LIN].	**Henry VIII** [8] [prompt on **Henry**]
2	This adviser to Henry VIII refused to recognize the monarch as leader of the Anglican Church, for which he was beheaded. This man also wrote *Utopia*.	Sir Thomas **More**
3	Edward VI [6], the only son of Henry VIII, was succeeded by this cousin. After nine days, this noblewoman was replaced by Bloody Mary.	Lady Jane **Grey** [accept Lady Jane **Dudley**]

Question #26: Social Studies – World History

10 points per part

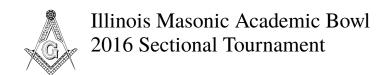|	This event began at the Bürgerbräukeller ["BURGER-brow"-KELL-ur] and relied on the Kampfbund [KAHMPF-boond] for paramilitary support.	
1	Name this attempt to overthrow the government, launched in Munich [MYOO-nik] in 1923.	**Beer Hall Putsch** [prompt on **Munich Putsch**]
2	The self-proclaimed "drummer" of the Kampfbund was this future Chancellor of Germany.	Adolf **Hitler**
3	While in prison for his role in the Putsch, Hitler dictated the first portion of his autobiography *Mein Kampf* to this man, his personal secretary. This deputy leader of the Nazis eventually was captured in Scotland.	Rudolf **Hess**

Question #27: Fine Arts – Classical Music & Opera

10 points per part

	Each of these violin concertos [kun-"CHAIR-toes"] is paired with a sonnet.	
1	Name these pieces published in 1725 as part of *The Contest Between Harmony and Invention*.	The **Four Seasons** [or Le **quattro stagioni**]
2	*The Four Seasons* were written by this composer, who was nicknamed "The Red Priest".	Antonio **Vivaldi**
3	Vivaldi named one of his flute concertos in D major for this type of small bird.	**goldfinch** [or **gardellino**]

Question #28: Fine Arts – Classical Music & Opera

10 points per part

	This composer's musically talented family included his son Carl Philipp Emanuel.	
1	Name this 18th-century composer of a *Toccata and Fugue in D minor* and the *Goldberg Variations*.	Johann Sebastian **Bach**
2	Bach often performed on this instrument. He designed the one for Divi Blasii [DIH-vee BLAH-see] Church in Muhlhausen, which is still used. The one in St. Thomas Church in Leipzig [LYPE-tsig] is designed to look like the one he used.	pipe **organ** or church **organ**
3	This other composer's third symphony, completed in 1886, is nicknamed the "Organ Symphony" because of the major role the organ plays in it.	(Charles-)Camille **Saint-Saens** [kaa-meel san-sahnss]

Question #29: Science – Physics

10 points

For a probability distribution, this quantity is equal to the sum of the product of each term's probability with the natural log of the probability. That form of this quantity is named for Claude Shannon. This quantity is the conjugate variable of temperature. It does not change in a reversible process. This quantity is proportional to the log of the number of microstates. Maxwell's demon could hypothetically decrease this quantity. The second law of thermodynamics states that this quantity cannot decrease in a closed system. Name this quantity that measures the disorder of a system.	**entropy** [prompt on **S**]

Question #30: Literature – World Literature

10 points

This author wrote of a gatekeeper who prevents a man from going through a door in the story "Before the Law", which appears within this writer's novel that ends with a bank officer dying "like a dog". Max Brod chose to publish most of this author's manuscripts after this author's death. In one of this writer's novellas, the protagonist attempts to listen to his sister Greta [GREH-tuh] play the violin, after which his family abandons him. That protagonist is injured when his dad throws apples at him. Name this Czech author who wrote of Gregor Samsa's transformation into an insect in *The Metamorphosis*.	Franz **Kafka**

Question #31: Mathematics – Math Concepts

10 points

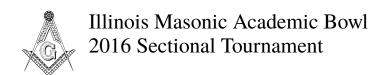| A special case of Jensen's inequality states that one of these quantities is less than or equal to the other, and those quantities are only equal if a distribution just has one value. This quantity is the first raw moment of a distribution. The law of large numbers states that over many samples, this quantity converges to the expected value. The fact that extreme measurements are usually followed by less extreme measurements is referred to as the "regression to" this value. This measurement of central tendency is less robust than the mode and the median. Name this average of a set of numbers.	arithmetic **mean** [prompt on **expected value** or **average**]

Question #32: Social Studies – U.S. History

10 points

This president defeated a candidate whose nominating convention was nicknamed the "Klanbake". In his inaugural address, this president said the United States had reached "a state of contentment seldom before seen". Earlier, as governor, this man sent a telegram indicating that "there is no right to strike against the public safety" to Samuel Gompers during the Boston Police Strike. This person became president when his predecessor suffered a cerebral hemorrhage in 1923. Name this president who was nicknamed "Silent Cal".	(John) Calvin **Coolidge**(, Jr.)

Extra Question #1: Science – Biology

10 points

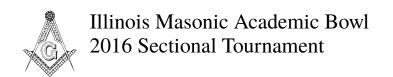|	
One step in this pathway is catalyzed by the iron-sulfur protein aconitase [uh-KAH-nih-tayss]. In the first step of this pathway, oxaloacetate ["OX"-uh-loh-ASS-uh-tayt] reacts with a thioester ["THIGH"-oh-ES-tur] to form citrate ["SIT-rate"]. Each instance of this pathway yields one ATP, four NADH, and one $FADH_2$, as well as three molecules of carbon dioxide. Acetyl-CoA [uh-SEE-tul koh-ay] is formed in this pathway by the activity of pyruvate dehydrogenase ["pie"-ROO-vayt dee-"high"-DRAH-juh-nayss], which uses the product of glycolysis [gly-KAH-luh-sis]. The products of this pathway are used to provide electrons for the electron transport chain. Name this "cycle" that occurs during aerobic respiration.	**Krebs** cycle [or **citric acid** cycle or **tricarboxylic acid** cycle or **TCA** cycle; prompt on aerobic cellular **respiration** before "aerobic"]

Extra Question #2: Fine Arts – Classical Music & Opera

10 points

William Kincaid played a platinum version of this instrument with open-hole keys. The pianist Francis Poulenc [poo-lenk] wrote a sonata for this instrument that he first performed with Jean [zhahn]-Pierre Rampal. Modern-day versions of this instrument use the Boehm [baym] system. Their lowest note is either middle C or the B one note lower. James Galway played this instrument, which is a woodwind but does not use a reed. Name this instrument, a larger and lower version of the piccolo, which creates sound when air is blown across an opening.	(transverse) **flute**

Extra Question #3: Mathematics – Math Concepts

10 points

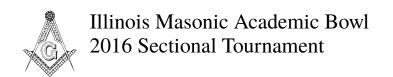|	
Laplace's [luh-PLAH-suz] formula uses these object's adjugates, which are also known as their adjoints or adjuncts, and which are found by calculating their minors and then transposing. The Cayley-Hamilton theorem states that these objects satisfy their own characteristic equations, which are typically used to find their eigenvalues ["eye-gun-values"]. The trace of a square example of one of these objects is calculated by adding the entries on the main diagonal. Name these rectangular arrangements of numbers, square examples of which have a determinant.	**matrix** or **matrices**

Extra Question #4: Social Studies – World History

10 points

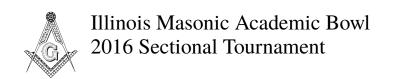|	
This group took on the "Armalite-and-ballot box strategy" following protests over prisoners not being granted Special Category Status. Members of this group planted a bomb that killed Lord Mountbatten. Its support swelled after Bobby Sands died in a hunger strike. This organization has undergone several splits, the first of which occurred after Michael Collins signed a treaty with Great Britain. Sinn Fein [shin fayn] is this group's political arm. Name this terrorist group whose ultimate goal is to unite all of Ireland.	(Provisional) **Irish Republican Army** [or **IRA**; accept **Sinn Fein** before "Lord Mountbatten" is mentioned; do not accept it after that]

Extra Question #5: Literature – U.S. Literature

10 points

After attacking a man in a red sweater, this character is taught the law of the club. Sold by the compulsive gambler Manuel, this character was spared from the fate that befell Hal, Charles, and Mercedes. He delivered on a wager by pulling a half-ton sled one hundred yards. He attacked a group of Yeehat natives that killed his master, John Thornton. This character defeats Spitz after being sent from California to the Klondike. Name this St. Bernard-Scotch Collie, the protagonist of Jack London's *The Call of the Wild.*	**Buck**

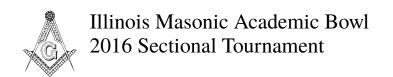## Extra Question #6: Social Studies – U.S. History

10 points per part

	The Civil Service Commission was initially set up to enforce the provisions of this act, meant to ensure competent people were hired for certain jobs.	
1	Name this 1883 civil service reform act that was meant to do away with the "spoils system" for jobs with the federal government.	**Pendleton** (Civil Service Reform) Act
2	The impetus for the Pendleton Act was the assassination of this president, which took place because Charles Guiteau [gee-toh] believed he deserved an appointment as an ambassador.	James A(bram) **Garfield**
3	This state was the first to set up a similar system for state workers, but because its system did not apply on the municipal level, it did little to curb the influence of Tammany Hall.	**New York** (State)

Extra Question #7: Social Studies – U.S. History

10 points per part

	To enforce the 15th Amendment, this law banned literacy tests for voting.	
1	Name this act amended in 1975 to cover language-based minorities. Some of its provisions were weakened by the *Shelby County v. Holder* decision in 2013.	**Voting Rights** Act of 1965
2	Shelby County, which was able to weaken the act, is located in this state.	**Alabama**
3	The Voting Rights Act gave the Justice Department the authority to investigate poll taxes; poll taxes were made unconstitutional via this amendment.	**24**th Amendment to the United States Constitution

Extra Question #8: Science – Chemistry

10 points per part

	This element was used in Madame Wu's experiments to detect parity violation.	
1	Name this element, found after iron on the periodic table, whose symbol is Co [C-O].	**cobalt**
2	Alfred Werner studied these compounds that often have cobalt centers. These compounds consist of metal centers bound to multiple ligands [LIG-undz].	coordination **complex**es [or metal **complex**es or **complex** ions]
3	Cobalt is found in the center of this B vitamin, which the body needs intrinsic factor to absorb.	vitamin B**12** [or **cobalamin** or cyano**cobalamin**]

Extra Question #9: Science – Chemistry

10 points per part

	A stretch of the spectrum at 1700 inverse centimeters is characteristic of one of these structures.	
1	Name this functional group consisting of a carbon double-bonded to an oxygen. They are present in aldehydes [AL-duh-"hides"] and ketones ["KEY-tones"].	**carbonyl** [KAR-buh-nil] group(s)
2	To test for the presence of an aldehyde, one can use this reagent, which forms a silver mirror in the presence of an aldehyde.	**Tollens**'(s) reagent [accept **Tollens** test]
3	Carbonyl ligands [LIG-undz] consist of this diatomic molecule, which also has the formula CO. This molecule is a poisonous, odorless, colorless gas produced by incomplete combustion.	**carbon monoxide**