



**Question #1: Science – Biology**

10 points

<p>In <b>prokaryotes</b> [“pro-CARRY-oats”], the 5-prime untranslated region contains binding sites for these structures called the Shine-Dalgarno sequence. Antibiotics typically work by inhibiting these structures in bacteria without impacting these structures in the host. These structures are characterized by a sedimentation rate measured in svedberg units. These structures have two subunits and are the reason the rough <b>endoplasmic reticulum</b> [EN-do-PLAZ-mik reh-TIK-yoo-lum] is called rough. Name these structures that synthesize proteins.</p>	<p><b>ribosomes</b> [“RYE”-boh-sohmz]</p>
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**Question #2: Literature – British Literature**

10 points

<p>This poet remembered his childhood innocence with the phrase “in the moon that is always rising”, though he then added “Time held me green and dying.” That poem was the last work in <i>Deaths and Entrances</i>. Another poem by this writer states “Though lovers be lost, love shall not”. In another of this author’s poems, the narrator describes wise men, good men, wild men, and grave men, and how they “rage, rage against the dying of the light.” Name the author of “Fern Hill,” “And death shall have no dominion,” and “Do Not Go Gentle Into That Good Night”.</p>	<p>Dylan (Marlais) <b>Thomas</b></p>
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**Question #3: Miscellaneous – Industrial Arts**

*10 points*

Ivan **Ostromislensky** [OH-stroh-mees-LEN-skee] suggested using peroxides as a curing agent in this process. The result of this process was sometimes marketed under the brand name Ebonite. This process essentially consists of creating cross-links in **isoprene** [“EYE-so-preen”]. This process was patented in Britain by Thomas Hancock in 1845, the same year the U.S. patent for this process went to Charles Goodyear. Name this process in which sulfur and heat are added to increase the elasticity and strength of rubber.

vulcanization of rubber  
[or vulcanizing rubber]

**Question #4: Mathematics – Math Concepts**

*10 points*

The fact that in certain cases two versions of this operation are equivalent is called **Clairaut’s** [klair-oh’z] theorem, and is the reverse of **Fubini’s** [foo-BEE-nee’z] theorem. The entries of a Hessian matrix are all the possible versions of this operation; when the determinant of the Hessian is negative at a stationary point, the point is a saddle point. The test named for this operation states that the result of this operation is negative at local maxima and positive at local minima. This quantity changes sign at inflection points. Name this type of derivative used to determine a function’s **concavity** [“con”-KAV-ih-tee].

second(-order)  
derivatives or [accept twice or double in place of second; accept differentiating in place of derivative; accept variations that include both underlined portions or said equivalents thereof; accept answers that also contain “partial”; prompt on partial derivative before “all (the possible versions)”]



**Question #5: Social Studies – World History**

*10 points*

During winters in World War II, the Road of Life was used to supply this city, which Adolf Hitler said should be eliminated from the face of the Earth. During World War I, General **Lavr Kornilov** [LAH-vur KOR-nih-lawff] tried to take over this city, which weakened Alexander Kerensky’s provisional government. In 1914, this city changed its name to sound less German, and in 1924 it changed its name to honor a revolutionary leader. This city has now reverted to its original name, which honors the person who made it a national capital in the early 18th century. Name this city formerly called Leningrad, where Catherine the Great started the Hermitage Museum.

**St. Petersburg**, Russia  
[prompt on **Leningrad** or **Petrograd**]

**Question #6: Science – Earth Science**

*10 points*

A “great” event named for this element took place a little over two billion years ago; in it, nickel and methane became less prevalent as this element became much more common in Earth’s atmosphere. Feldspars always contain aluminum, silicon, and this element. This is the most abundant element in the Earth’s crust and the second-most abundant element in the atmosphere. An **allotrope** [“AL-oh-trope”] of this element absorbs most of the ultraviolet radiation directed towards Earth. Name this element in ozone that combines with hydrogen to form water.

**oxygen** [accept **O**; accept Great **Oxygenation**]



**Question #7: Mathematics – Trigonometry**

*10 points per part*

For every angle, the value of this function squared plus the cosine function squared equals 1.		
<b>1</b>	Name this function.	<b>sine</b> [accept answers that additionally mention a variable]
<b>2</b>	Find the sine of an angle if the cosecant of the angle equals 2.5.	<b><u>2/5</u></b> or <b><u>0.4</u></b>
<b>3</b>	If the cosine of an acute angle equals 7/8, find the sine of <i>half</i> of that angle.	<b><u>1/4</u></b> or <b><u>0.25</u></b>

**Question #8: Mathematics – Trigonometry**

*10 points per part*

Suppose two sides of a triangle measure 5 units and 6 units, and the sine of the angle between them is 4/5.		
<b>1</b>	Find the area of the triangle.	<b><u>12</u></b> square units
<b>2</b>	In general, you can find the area of a triangle by multiplying this number times the product of two side lengths times the sine of the angle between them.	<b><u>1/2</u></b> or <b><u>0.5</u></b>
<b>3</b>	That formula can be applied to equilateral triangles by using the sine of 60°. What is the sine of 60°?	<b><u><math>\sqrt{3}/2</math></u></b> [“the square <b>root</b> of <b>3</b> , <b>over 2</b> ” or “ <b>radical 3</b> , <b>over 2</b> ”] or <b><u><math>\frac{1}{2}\sqrt{3}</math></u></b> [“one- <b>half</b> times the square <b>root</b> of <b>3</b> ” or “one- <b>half</b> times <b>radical 3</b> ”]



**Question #9: Literature – World Literature**

*10 points per part*

This title object was baked into a hot roll by <b>Prascovia Osipovna</b> [prahss-KOH-vee-uh oh-see-POHV-nuh], the wife of a barber.		
<b>1</b>	Name this body part that tried to travel to Riga while being pursued by its owner, Major Kovalev.	(Kovalev’s) <b>nose</b>
<b>2</b>	“The Nose” was written by this author, who wrote about the ghost of <b>Akaky Akakievich</b> [ah-KAH-kee ah-KAH-kee-eh-vich] in “The Overcoat”.	Nikolai (Vasilievich) <b>Gogol</b>
<b>3</b>	In this novel by Nikolai Gogol featuring an exploding blacksmith, Chichikov purchases serfs who no longer occupy the mortal realm.	<b><i>Dead Souls</i></b> [or <b><i>Myortvyeh Dooshee</i></b> ]

**Question #10: Literature – World Literature**

*10 points per part*

In the opening of this poem, the speaker compares himself to an “empty net, at the advent of autumn”; at its end, this poem tells the reader to “speak through my words and my blood”.		
<b>1</b>	Name this poem whose speaker describes rising “up the the ladder of the earth...through the awful tangles of lost forests” before calling the title location “my friend”.	“The <b>Heights of Macchu Picchu</b> ” [or “Las <b>Alturas de Macchu Picchu</b> ”]
<b>2</b>	“The Heights of Macchu Picchu” is the second poem in this collection, which includes “The Liberators” and “The Earth’s Name is Juan”.	<b><i>Canto General</i></b> [KAHN-toh <b>hen-ay-RAHL</b> ] [accept <b><i>General Song</i></b> ]
<b>3</b>	This Chilean poet wrote the <i>Canto General</i> .	Pablo <b>Neruda</b> [or Neftali Ricardo <b>Reyes</b> Basoalto]



**Question #11: Science – Physics**

*10 points per part*

This person measured the specific gravity of the Earth, which was used to find its mass and eventually the gravitational constant.		
<b>1</b>	Name this English scientist who carried out that experiment in the late 18th century using a torsion balance.	Henry <u>Cavendish</u>
<b>2</b>	The gravitational constant was first used in the law of universal gravitation, which — like Coulomb’s law — is known as this type of law because of the relationship between force and the distance between two objects.	<u>inverse-square</u> law(s) [or <u>inverse-second-power</u> laws; do not prompt on answers that omit “inverse”]
<b>3</b>	In the Einstein field equations, the gravitational constant is multiplied by a tensor combining energy and this quantity. Hooke’s law says that strain is proportional to this quantity.	<u>stress</u>

**Question #12: Science – Physics**

*10 points per part*

The first artificial self-sustaining nuclear chain reaction, carried out by Enrico Fermi at the University of Chicago, was this type of reaction.		
<b>1</b>	Name this type of reaction in which a nucleus splits into smaller parts.	nuclear <u>fission</u> [accept <u>fissing</u> ]
<b>2</b>	The first artificial self-sustaining nuclear chain reaction combined neutrons with this isotope of uranium.	uranium- <u>235</u>
<b>3</b>	This type of nuclear reactor produces more fissionable material than it consumes.	<u>breeder</u> reactor



**Question #13: Social Studies – Current Events**

*10 points per part*

In the 2016 U.S. Senate elections, incumbents lost races in two states.		
<b>1</b>	Mark Kirk lost to Tammy Duckworth in Illinois. In what state did Kelly <b>Ayotte</b> [AY-aht] lose to Maggie Hassan?	<u>New Hampshire</u>
<b>2</b>	Name the longest-serving current U.S. Senator, who was re-elected in 2016 and represents Vermont. He was first elected in 1974.	Patrick (Joseph) <b>Leahy</b> [LAY-hee]
<b>3</b>	This 2008 Republican presidential nominee from Arizona was also re-elected in 2016.	John (Sidney) <b>McCain</b> (III)

**Question #14: Social Studies – Current Events**

*10 points per part*

This leader’s vice president, <b>Leni Robredo</b> [LEN-ee “rob”-RAY-doh], resigned as Chair of the Housing and Urban Development Coordinating Council in late 2016.		
<b>1</b>	Name this president who gained power in 2016. He has encouraged extra-judicial killings of drug dealers.	Rodrigo (“Rody” Roa) <b>Duterte</b>
<b>2</b>	Rodrigo Duterte leads this populous country in the Pacific Ocean. He is from <b>Mindanao</b> [min-duh-“NOW”], but most of this country’s people live on the island <b>Luzon</b> [loo-ZAHN].	(Republic of the) <b>Philippines</b> [or Republika ng <b>Pilipinas</b> ]
<b>3</b>	Duterte defended police when they killed Rolando Espinosa in a jail cell. Espinosa held this general political position when he was killed. Duterte held the same position for many years in a different location before becoming president.	<b>mayor</b> of Albueria, Leyete or Davao City, Mindanao



**Question #15: Literature – World Literature**

10 points

<p>In one story by this author, the protagonist does not survive an exercise to claim as much land as he could traverse, and ended up with six feet from head to heels. This author of “How Much Land Does a Man Need?” wrote of the growing distance between Masha and her older husband as she enjoys parties in St. Petersburg in <i>Family Happiness</i>. In another of this writer’s works, Kitty lives a happy life with Konstantin, while the title character’s love for Alexei Vronsky leads to her throwing herself in front of a train. Name this Russian author of <i>Anna Karenina</i>.</p>	<p>Leo <u>Tolstoy</u> [or Lev Nikolayevich <u>Tolstoy</u>]</p>
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**Question #16: Social Studies – U.S. History**

10 points

<p>This fort has been restored and turned into a museum by the Pell family. Before it was renamed, this fort was the site of the Battle of Carillon. The Continental Army took this fort from the English under William Delaplace in 1775 just before taking nearby Fort Crown Point. It was taken back by the English under John Burgoyne at the beginning of the Saratoga Campaign. Henry Knox moved its cannons to Boston at the beginning of 1776 so they could be used at Dorchester Heights. Name this fort captured by Benedict Arnold and Ethan Allen that is at the southern end of Lake Champlain.</p>	<p>Fort <u>Ticonderoga</u></p>
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**Question #17: Fine Arts – Classical Music & Opera**

10 points

This composer wrote his only piano trio just after the death of his four-year-old daughter. Soon after that, he moved to Sweden, where he used literature as the basis of his symphonic poems *Richard III* and *Wallenstein's [VAH-lun-shteen'z] Camp*. In an opera by this composer, Vashek demonstrates that he is not ready for marriage when he appears in a bear costume. That opera, which features a polka and a furiant, is about the love between Mařenka and **Jeník [yen-eeek]**. This composer also wrote a group of six symphonic poems starting at the high castle in Prague. Name this composer of *The Bartered Bride* and *Má vlast*, which includes *The Moldau*.

**Bedřich Smetana**  
[BED-rik SMEH-tah-nah]

**Question #18: Science – Chemistry**

10 points

This equation was the focus of a Supreme Court case that allowed James Diehr to get a patent for molding rubber. This equation only works with gases, but it is almost identical to the Eyring equation, which works for mixed phases. The **steric [“STARE”-ik]** factor is multiplied by the collision frequency to calculate this equation's pre-exponential factor, which depends on the reaction. The exponent in this equation is the opposite of activation energy divided by the universal gas constant times temperature. Identify this equation that relates reaction rate to temperature, named for a Swedish Nobel laureate.

**Arrhenius** equation



**Question #19: Social Studies – Geography**

10 points

During the early 1970s, the Temple of Debod was moved from Egypt and rebuilt in this city. A region in this city whose name means “Park of the Pleasant Retreat” features the Fountain of the Fallen Angel in addition to a Forest of Remembrance dedicated to people who died in this city during a 2004 terrorist attack. This city also contains the **Cibeles** [“SEE-bay-lace”] Fountain and the large gate **Puerta de Alcalá** [PWAIR-tah day ahl-kah-LAH]. This city is just south of Segovia and just north of **Toledo** [toh-LAY-doh]. Name the most populous city and capital of Spain.

Madrid, Spain

**Question #20: Literature – Mythology**

10 points

Because of this person’s dead body, birds have difficulty crossing the **Eridanus** [air-ih-DAH-nuss] River, which has a terrible odor. According to the *Metamorphoses*, Ethiopians’ black skin comes from this character’s actions forcing their blood too close to the skin. He was made into the constellation Auriga upon his death, while his sisters turned into poplar trees and wept tears of amber. This mortal died when Zeus struck him with a thunderbolt to mitigate the damage he did driving his father’s chariot. Name this son of Helios.

Phaëthon  
[FAY-uh-thahn] or  
Phaëton [FAY-uh-tahn]



**Question #21: Literature – British Literature**

*10 points per part*

This poet’s real name is unknown; they got their nickname from a poem about an object “flawlessly set in gold so fair” that the narrator lost in a garden.		
<b>1</b>	Name this poet. In another work, he wrote about a character who called the members of the Round Table “beardless children”.	the <u>Pearl</u> poet [accept, but do not otherwise reveal, the <u>Gawain</u> poet]
<b>2</b>	The character who used the phrase “beardless children” is the Green Knight, who is beheaded — but not killed — by this nephew of King Arthur.	Sir <u>Gawain</u>
<b>3</b>	Sir Gawain broke his agreement with Bertilak when he kept this object given to him by Lady Bertilak.	<u>girdle</u>

**Question #22: Literature – British Literature**

*10 points per part*

After their family’s patriarch dies, Hindley forces this stepbrother to work in the field.		
<b>1</b>	Name this orphan who returns after Hindley’s wife dies, and takes control of a manor after Hindley himself.	<u>Heathcliff</u>
<b>2</b>	Heathcliff takes over Thrushcross Grange in this novel.	<u>Wuthering Heights</u>
<b>3</b>	<i>Wuthering Heights</i> was written by Emily Brontë using this pen name.	<u>Ellis Bell</u> [prompt on <u>Bell</u> ]



**Question #23: Fine Arts – Art History**

*10 points per part*

One work by this painter is a double self-portrait, in which she wears both a European dress and a Mexican dress, and holds hands with herself.		
<b>1</b>	Name this artist whose other self-portraits include <i>Self-Portrait with Monkey</i> and <i>Self-Portrait with Thorn Necklace and Hummingbird</i> . She twice married Diego Rivera.	(Magdalena Carmen) Frida <b>Kahlo</b> (y Calderón) [prompt on de <b>Rivera</b> ]
<b>2</b>	One of Kahlo’s paintings portrays the suicide of this friend, who jumped out of a 16th-floor apartment in New York.	Dorothy <b>Hale</b>
<b>3</b>	Diego Rivera painted this fresco for the Rockefeller Center. Because it showed Lenin, Nelson Rockefeller ordered its destruction before it was completed, and it was repainted in Mexico as <i>Man, Controller of the Universe</i> .	<u><i>Man at the Crossroads</i></u>

**Question #24: Fine Arts – Art History**

*10 points per part*

This painting’s left side shows Willy Lott’s cottage.		
<b>1</b>	Name this 1821 painting whose title object is being pulled in the River Stour.	<i>The <u>Hay Wain</u></i>
<b>2</b>	<i>The Hay Wain</i> is by this artist. He also painted several canvasses showing Salisbury Cathedral.	John <b>Constable</b>
<b>3</b>	This other painter depicted an enormous haywain in a 1516 triptych [“TRIP-tick”].	Hieronymus <b>Bosch</b> [or Jheronimus <b>van Aken</b> ]



**Question #25: Social Studies – U.S. History**

*10 points per part*

This labor organization had its membership drop after an 1886 strike by cigar makers and the Haymarket Square riots.		
<b>1</b>	Name this once-powerful group that was started by Uriah Smith Stephens.	(Noble and Holy Order of the) <b><u>Knights of Labor</u></b>
<b>2</b>	Many of the unions that left the Knights of Labor joined this other organization. This group merged with the Congress of Industrial Organizations in 1955.	<b><u>American Federation of Labor</u></b> or <b><u>AFL</u></b> [accept <b><u>AFL-CIO</u></b> or equivalents]
<b>3</b>	Hundreds of thousands of Knights of Labor workers struck against the Union Pacific and Missouri Pacific railroads, which were both owned by this person.	Jay <b><u>Gould</u></b>

**Question #26: Social Studies – U.S. History**

*10 points per part*

This small town is the county seat of Neshoba.		
<b>1</b>	Name this town where the civil rights workers James Chaney, Andrew Goodman, and Mickey Schwerner were released from prison just before being killed by a mob in an incident called “Mississippi Burning”.	<b><u>Philadelphia</u></b> , Mississippi
<b>2</b>	This person, who directed the FBI from 1935 to 1972, was criticized for his handling of the investigation, though an informant eventually told the FBI where the bodies were buried.	J(ohn) Edgar <b><u>Hoover</u></b>
<b>3</b>	The three workers were part of Freedom Summer, which was an effort to take advantage of the 24th Amendment. Name the policy that was banned by the 24th Amendment.	<b><u>poll taxes</u></b> [or <b><u>tax</u></b> on <b><u>voting</u></b> or equivalent; prompt on <b><u>tax</u></b> ]



**Question #27: Mathematics – Algebra**

*10 points per part*

A function is continuous at a point if it is defined at that point, and this property is defined and equals the value at that point.		
<b>1</b>	Name this property that a function may have at a point, or as its input approaches positive or negative infinity.	<b>limit(s)</b> or <b>limiting</b> value [accept <b>convergence</b> or <b>convergent</b> value]
<b>2</b>	Some limits are found using this theorem in which a function is bounded above by one function and below by another, and the bounding functions have the same limit.	<b>squeeze</b> theorem [accept <b>sandwich</b> theorem or <b>pinch</b> theorem]
<b>3</b>	Find the limit, as $x$ approaches infinity, of the sine of $x$ divided by $x$ . That limit can be evaluated using the squeeze theorem.	<b>0</b>

**Question #28: Mathematics – Algebra**

*10 points per part*

There are several ways to solve a system of linear equations.		
<b>1</b>	One way is to form a matrix containing the coefficients of the equations, as well as the equations' constant terms. Such a matrix is known by this name.	<b>augmented</b> matrix
<b>2</b>	Performing Gaussian elimination on a matrix puts it into this form in which the leading coefficient of each row is to the right of all the leading coefficients in higher-up rows.	(reduced) row- <b>echelon</b> form [or <b>row-reduced</b> form; prompt on (r) <b>ref</b> or <b>reduced</b> form]
<b>3</b>	Find the value of $x$ in the system of the following two equations: $3x + 5y = 7$ and $2x - 5y = 13$ .	$x = \underline{4}$ [accept <b>(4, -1)</b> ]



**Question #29: Social Studies – World History**

*10 points*

There is disagreement as to whether this leader's advisor Damon was expelled for using music to control behavior, or for convincing this person to pay juries. This person tried unsuccessfully to prosecute one of his rivals for bribery, but that rival was later ostracized after a failed attempt to help Sparta. This person came to power after the assassination of his mentor **Ephialtes** [eff-ee-AL-teez] and the ostracism of **Cimon** ["Simon"]. This person introduced a law stating that citizenship would only be given to people with two Athenian parents. Name this leader praised by **Thucydides** [thoo-SID-ih-deez], who supported the reconstruction of the **Acropolis** [uh-KRAH-puh-liss].

**Pericles**  
["PAIR"-ih-kleez]

**Question #30: Science – Physics**

*10 points*

These types of laws are used to limit Gell-Mann's Totalitarian Principle from stating that in the many-worlds interpretation, all processes are compulsory. Local versions of these types of laws are called continuity equations. This type of law applies to the difference between baryon number and lepton number, but not the individual values. Each law of this type must be associated with a physical symmetry according to **Noether's** [NOY-tur'z] theorem. Two prominent examples of these laws were combined by the concept of mass-energy equivalence. Name these laws stating that total values of certain quantities in a system, such as momentum and angular momentum, cannot change.

**conservation** laws or laws of **conservation** [accept answers containing **conserve**, prompt on **continuity** equations before they are mentioned]



**Question #31: Literature – U.S. Literature**

10 points

<p>When aiding the ill governor, this character was described as “a rightful inmate, into the household that was darkened by trouble”. She is buried in the cemetery next to where King’s Chapel has since been built. One woman says that at the very least this character should have had her forehead branded. When threatened with the loss of her child, this character proclaims “Ye shall not take her! I will die first!”. At the beginning, middle, and end of the novel she is in, she stands on a scaffold. Name this wife of Roger Chillingworth in Nathaniel Hawthorne’s <i>The Scarlet Letter</i>.</p>	<p><u>Hester Prynne</u> [accept either]</p>
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**Question #32: Mathematics – Math Concepts**

10 points

<p>This person tried to improve upon Gottlob Frege’s [FRAY-guh’z] theories by developing a ramified theory of types that uses the axiom of reducibility. The concept of set classes was introduced in an attempt to avoid the paradox named for this mathematician. This person and his former teacher wrote a book that included a very detailed proof that <math>1 + 1 = 2</math>, but which was weakened by ideas Kurt Gödel [“girdle”] developed. This person’s letter to Frege included the aforementioned paradox named for this person, which incorporates the idea of a set containing all sets that are not members of themselves. Name this mathematician and philosopher who worked with Alfred North Whitehead on <i>Principia Mathematica</i>.</p>	<p>Bertrand (Arthur William) <u>Russell</u></p>
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**Extra Question #1: Social Studies – U.S. History**

10 points

Before coming to America, William Mead and this person were arrested for inciting a riot. This person wrote the book *No Cross, No Crown*. Before the Founding Fathers, this person wrote the first constitution that included an amendment process. After leaving America, this man convinced King James II to make a Declaration of Indulgence promoting religious freedom. He was unable to stay long in America because of a border dispute with Lord Baltimore. In order to pay off a debt owed by King Charles II to this man's father, he was given Delaware and a colony named after his father. Name this Quaker.

William Penn

**Extra Question #2: Science – Physics**

10 points

This person and Hendrika Johanna van Leeuwen [hen-DREE-kah yoh-HAH-anh van LAY-oh-wen] independently concluded that classical physics cannot explain magnetic properties of materials. This person's work was improved by the Sommerfeld-Wilson quantization condition of the action integral. This scientist was able to derive a value for the Rydberg [rid-BERG] constant starting from his postulates, which included the creation of radiation during state transitions. This person engaged in famous discussions over the nature of quantum theory with Albert Einstein, in which this person defended his Copenhagen interpretation. Name this scientist whose model of the atom puts electrons in discrete orbits and is fairly accurate for the hydrogen atom.

Niels (Henrik David) Bohr ["bore"]



**Extra Question #3: Fine Arts – Art History**

10 points

This person claimed to have studied painting under **Jacques-Louis David** [zhahk loo-ee dah-veed], but that was probably a lie. One of his goals was to surpass the work of Alexander Wilson. After this person died in 1851, his family and John Bachman completed a book of illustrations he was working on, *Viviparous Quadrupeds of North America*. This person had to travel to England and Ireland to get his illustrations published, though they were all set in the United States. Some of the animals he drew are now extinct, and a prominent conservation society is named after him. Name this person who created the book *The Birds of America*.

John James Audubon

**Extra Question #4: Literature – U.S. Literature**

10 points

The river named for this region has Frenchman’s Bend along its banks. Malcolm Cowley requested the first official map to be drawn of this location. The Tallahatchie River forms the northern border of this area, where a golf club was sold so that one resident could go to Harvard. In “Barn Burning”, a judge jokes that anyone from this location who is named for Colonel Sartoris “can’t help but tell the truth”. This location was based on Lafayette County, and its seat is the town of Jefferson. Name this fictional county created by William Faulkner.

Yoknapatawpha County



**Extra Question #5: Mathematics – Math Concepts**

*10 points*

The area of a regular polygon with this many sides equals the side length squared times  $6 + 3\sqrt{3}$  [“6 plus 3 root 3”]. In a regular polygon with this many sides, the apothem [AP-uh-thum] length equals the side length times  $1 + \frac{1}{2}\sqrt{3}$  [“1 plus one-half times root 3”]. This is the smallest two-digit highly composite number, since it is the smallest number with six factors. The Platonic solid with this number of faces has faces that are pentagons. Both octahedrons and cubes have this many edges. Give this number, the number of faces of a dodecahedron [do-DEK-uh-HEE-drun] and the number of sides of a dodecagon [do-DEK-uh-gahn].

12 [prompt on dodecagon  
or dodecahedron]



**Extra Question #6: Literature – U.S. Literature**

*10 points per part*

In this novel, several characters investigate a mysterious device called the <b>Schwarzgerät</b> [shvarts-gair-et].		
<b>1</b>	Name this book in which Tyrone Slothrop’s sexual encounters parallel wartime attacks.	<u><i>Gravity’s Rainbow</i></u>
<b>2</b>	The Schwarzgerät is a black device installed in one of these weapons with the serial number 00000.	<u>V-2 rockets</u> [accept either underlined portion]
<b>3</b>	Slothrop’s movements are investigated by this organization, whose members are “concerned with a rather strictly defined, clinical version of truth”.	<b>PISCES</b> [ <b>“pie-sees”</b> ] [or <u>Psychological Intelligence Schemes for Expediting Surrender</u> ]

**Extra Question #7: Literature – U.S. Literature**

*10 points per part*

This 90-year-old supposedly dared Stonewall Jackson’s troops to shoot her, and on his orders, they stood down.		
<b>1</b>	Name this woman who, in the poem named for her, waves the Union flag at oncoming Confederate troops.	<u>Barbara Frietchie</u> [accept either]
<b>2</b>	This author wrote “Barbara Frietchie”, and described stories told by people sitting around a fireplace in “Snow-Bound”.	John Greenleaf <u>Whitter</u>
<b>3</b>	The poem takes place in this city. The poem concludes that “ever the stars above look down / On thy stars below in” this place.	<u>Frederick</u> town



**Extra Question #8: Science – Biology**

*10 points per part*

The name for this group of animals means “to chew again”.		
<b>1</b>	Name these animals that pass their food through their first two stomachs to form a cud, chew their cud, and then pass it through their other two stomachs.	<u><b>ruminants</b></u>
<b>2</b>	This is the fourth chamber in a ruminant’s stomach. It secretes rennet and is <b>homologous</b> [huh-MAH-luh-guss] to the stomachs of non-ruminants.	<u><b>abomasum</b></u> [ <b>ab-oh-MAY-sum</b> ] [or <b>abomasa</b> ; prompt on <b>maw</b> ]
<b>3</b>	This section of the large intestine exists in many vertebrates, going from the <b>cecum</b> [SEE-kum] to the rectum. In ruminants, the ascending part of this organ has a spiral shape.	<u><b>colon</b></u>

**Extra Question #9: Science – Biology**

*10 points per part*

This system prevents predators from attacking dangerous prey. It is the opposite of camouflage, though some organisms use both methods.		
<b>1</b>	Name this phenomenon in which organisms use a “warning system” like bright colors to signify that they are dangerous.	<u><b>aposematism</b></u> or <u><b>aposematic</b></u> coloring
<b>2</b>	Some safe prey take advantage of other animals’ aposematism via the Batesian form of this type of relationship between species.	<u><b>mimicry</b></u> [MIM-ik-ree]
<b>3</b>	This type of mimicry involves members of the same species. For example, predators avoid male wasps, which are harmless, because male wasps resemble female wasps.	<u><b>automimicry</b></u>