



Question #1: Science – Chemistry

10 points

The Zimmerman-Traxler model of the **aldol** [AAL-dawl] concentration contains an intermediate ring formed from this many atoms. This number is the denticity of EDTA. A compound with this many carbons can exist in a boat conformation, but is more stable in its chair conformation. The **cycloalkane** [SYKE-loh-AL-“cane”] with this number of carbons experiences the least possible ring strain. This is the coordination number of an octahedral complex. A compound with this number of carbons and this many hydrogens had its ring-structure deduced by August **Kekulé** [KEK-yoo-lay]. Name this number of carbons in cyclohexane and in benzene.

six

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

10 points

During the Watergate scandal, George H. W. Bush resigned from this post, which as president he demoted from being a Cabinet-level position. Edward Stettinius resigned from being Secretary of State to become the first American to hold this position. On the other hand, Madeleine Albright resigned from this position to become Secretary of State. Susan Rice and Samantha Power have held this position during the Obama administration. Name this person who represents U.S. interests to an international organization.

United States **Ambassador** to the **United Nations** [accept variations like **United Nations Ambassador**; accept U.S. **Permanent Representative** to the U.N.; prompt on **ambassador**]



Question #3: Literature – U.S. Literature

10 points

<p>In this novel, the protagonist repeats the words “I am” to herself as she swims at the beach following a discussion with Cal about a play. This novel’s protagonist’s boyfriend, who has an affair with a waitress and is placed in a sanitarium when he gets tuberculosis, is Buddy Willard. Jay Cee works as an editor at <i>Ladies’ Day</i> magazine, where the protagonist gets an internship. Dr. Gordon and Dr. Nolan administer shock therapy as treatments for depression. Name this novel about Esther Greenwood, written by Sylvia Plath.</p>	<p><i>The <u>Bell Jar</u></i></p>
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Question #4: Miscellaneous – Agriculture

10 points

<p>Milk from this animal is a key ingredient in cajeta [kah-HAY-tah], a Mexican syrup. Meat from adults of this animal is called chevon [SHEV-un], while khashi, which comes from castrated ones, can be found in many biryani [beer-YAH-nee] dishes. Mohair is sourced from the Angora breed of this animal, and cashmere is also made of its wool. This animal is in the same genus [JEE-nus] as the ibex [“EYE”-beks] and the same family as the antelope and sheep. The young of these animals are called kids. Name these horned farm animals known for eating almost anything.</p>	<p>goats [accept answers containing <i>Capra</i>]</p>
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Question #5: Social Studies – World History

10 points

<p>As an adviser to this ruler, Guido Verbeck suggested sending students to study in other countries. This leader oversaw the creation of a new constitution that would later be replaced by a document stating “Sovereign power resides with the people”. The Satsuma [SAHT-soo-mah] rebellion was an attempt to overthrow this ruler, and it was led by Saigo Takamori [SIE-go tah-kah-MOR-ee]. He promulgated the Charter Oath after taking power by ending the the Tokugawa Shogunate [toe-koo-GAH-wah SHOW-gun-ate]. Name this Japanese emperor, the namesake of a 19th-century “Restoration”.</p>	<p>the Meiji emperor [accept Meiji-tenno or Mutsuhito]</p>
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Question #6: Science – Astronomy

10 points

<p>For this project, students at the University of Colorado built the Venetia [veh-NEE-shuh] Burney Student Dust Counter. This mission observed heat-induced lightning strikes away from Earth, took the closest images of the Little Red Spot, and made a map of Io [“EYE-oh”]. Carrying the Ralph telescope, Alice spectrometer [spek-TRAH-meh-ter], and Long Range Reconnaissance Imager, this spacecraft used a flyby of Jupiter to gain speed in 2007. This mission made the closest approach to Hydra, Kerberos, Nix, and Styx. Name this mission that, during the summer of 2015 approached Charon [“SHARE-on”] and Pluto.</p>	<p>New Horizons</p>
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Question #7: Mathematics – Geometry

10 points per part

If you know the coordinates of the endpoints of a segment in two dimensions, this point on the segment can be found by taking the average of the x -coordinates and the average of the y -coordinates.		
1	Name this kind of point that is halfway between the endpoints of a segment.	<u>midpoint</u> (s)
2	If a triangle has an area of 24 square units, what is the area of a triangle formed by connecting the midpoints of its three sides?	<u>6</u> square units
3	If a <i>square</i> has an area of 24 square units, what is the area of a square formed by connecting the midpoints of its four sides?	<u>12</u> square units

Question #8: Mathematics – Geometry

10 points per part

A polygon is called cyclic [" SICK-lick "] if this kind of circle can be drawn for it.		
1	Name this circle that goes through all of the vertices [VER-tuh-sees] of a polygon.	<u>circumcircle</u> or <u>circumscribed</u> circle
2	Find the radius of a circle circumscribed about a square whose sides each measure 10 units.	<u>5 root 2</u> units [or <u>5 times the square root of 2</u> or <u>5 radical 2</u> or equivalents]
3	Find the radius of a circle circumscribed about a 3-4-5 right triangle.	<u>2.5</u> units [or <u>2 1/2</u> or <u>5/2</u> units]



Question #9: Fine Arts – Musical Theatre

10 points per part

Yul Brynner, who played the pharaoh in the movie <i>The Ten Commandments</i> , also played one of the title characters in the stage and film versions of this musical.		
1	Name this Rodgers and Hammerstein musical set in Siam.	<i>The <u>King and I</u></i>
2	This is the first name of the female lead in <i>The King and I</i> . She is hired to teach the king's children.	<u>Anna</u> [do not accept "Ann"]
3	Near the end of the musical, the title characters sing this song whose title asks a question. In this song, the king repeats, "One, two, three and?"	<u>"Shall We Dance?"</u>

Question #10: Fine Arts – Musical Theatre

10 points per part

This musical, loosely based on <i>Romeo and Juliet</i> , is set in New York City and portrays the conflicts between white people and Puerto Rican immigrants.		
1	Name this musical, a collaboration between Leonard Bernstein and Stephen Sondheim.	<i><u>West Side Story</u></i>
2	The conflict in <i>West Side Story</i> comes from this former member of the Jets falling in love with Maria.	<u>Tony</u>
3	At the end of the musical, Maria holds Tony and sings a brief reprise of this song that is performed earlier in the musical. This song says "Hold my hand and I'll take you there."	<u>Somewhere</u> [or <u>There's a Place for Us</u>]



Question #11: Science – Biology

10 points per part

This protein’s affinity for oxygen decreases in low pH [P-H] , a phenomenon known as the Bohr effect.		
1	Name this protein responsible for transporting oxygen in the blood.	<u>hemoglobin</u>
2	Hemoglobin’s affinity for this compound is significantly higher than its affinity for oxygen, which leads to this compound’s toxicity.	<u>carbon monoxide</u> [accept <u>CO</u>]
3	The mutation in hemoglobin that causes sickle-cell anemia results from this amino acid being changed to glutamate [GLOO-tuh-mate] .	<u>valine</u> [accept <u>Val</u> ; prompt on <u>V</u>]

Question #12: Science – Biology

10 points per part

Due to inbreeding, the genetic diversity of these animals is so lacking that they can transmit a face cancer by biting.		
1	Name these carnivorous marsupials found on an island south of Australia.	<u>Tasmanian devils</u> [or <u>Sarcophilus harrisii</u> ; accept <u>Sarcophilus</u>]
2	Because they are carnivorous, Tasmanian devils are this sort of organism, which hunts for prey.	<u>predators</u>
3	Predator-prey interactions can be modeled by this pair of non-linear differential equations.	<u>Lotka-Volterra</u> equations



Question #13: Literature – Mythology

10 points per part

This daughter of Peneus [puh-NAY-us] was turned into a laurel tree.		
1	Name this nymph who was shot with a lead-tipped arrow and called out to her father for help.	<u>Daphne</u>
2	After this god insulted Eros's [AIR-ohss'z] archery skills, Eros shot him with a gold-tipped arrow. The arrow made this god fall in love with Daphne and made the laurel tree sacred to him.	<u>Apollo</u>
3	Daphne's father Peneus was this kind of god. Collectively called the <i>Potamoi</i> , they possessed the power of transformation. Heracles defeated one of them for the hand of Deianeira [day-uh-NAIR-uh].	<u>river</u> god(s) [prompt on <u>water</u> god(s)]

Question #14: Literature – Mythology

10 points per part

One Chinese tale concerning this event involved Pangu growing 10 feet per day until he burst apart.		
1	Name this process that in Greek mythology was undertaken by Eurynome [yur-IN-oh-mee] and Ophion ["OH-fee-on"] acting on Chaos.	<u>creation</u> of the Universe [accept equivalents, including "Earth" in place of "Universe"; do not accept answers referring to people]
2	The creation myth with Pangu revolved around one of these objects from which Pangu was born. These objects are commonly painted for a holiday celebrating the resurrection of Jesus.	<u>eggs</u> [accept more specific answers]
3	These creation deities of Aboriginal tribes live in permanent waterholes and awoke during Dreamtime. Their bodies created rivers, mountains, and valleys.	<u>Rainbow Serpents</u> [accept <u>Rainbow Snakes</u> ; prompt partial answers]



Question #15: Social Studies – U.S. History

10 points

<p>In an 1893 speech on the moral leadership of the religious press, this person complained about being called an infidel for fifty years. This advocate's writings are found in the collection <i>Failure is Impossible</i>. When the University of Rochester promised to widen its acceptance policies if it raised enough money, this person pledged her life insurance policy. She never paid the 100-dollar fine levied against her for voting in the 1872 presidential election. This person and Elizabeth Cady Stanton started the National Woman Suffrage Association. Name this activist whose likeness is on some dollar coins.</p>	<p>Susan B(rownell) <u>Anthony</u></p>
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Question #16: Science – Physics

10 points

<p>A method of analyzing these structures plots intensity against $2 \times \theta$. The orientation of a plane in one of these structures can be depicted with a Miller index. These structures can be idealized with a construct named for Bravais [bruh-VAY]. The angle at which an X-ray will diffract through one of these structures is determined by Bragg's law. Compounds composed of these structures are defined by a unit cell, and thus have long-range order, unlike amorphous substances. Name these solids with repeating structures, such as table salt and diamonds.</p>	<p><u>crystals</u> [or <u>crystalline</u> substances; prompt on <u>unit cells</u>; prompt on <u>solids</u>]</p>
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Question #17: Literature – British Literature

10 points

The speaker of this poem gets much pleasure from rest and sleep, and claims that poppy or charms can have the same effect as this poem's subject. This poem looks forward to a time in which "we wake eternally". The subject of this poem dwells with "poison, war, and sickness", and the speaker calls the title figure "a slave to fate, chance, kings, and desperate men". Give the common name, or first line, of Holy Sonnet X ["ten"] by John Donne [dun], in which the speaker ridicules the Grim Reaper.

"Death Be Not Proud"
[accept **Holy Sonnet X**
before "Holy"]

Question #18: Mathematics – Math Concepts

10 points

This type of mathematics combined with addition produces the cyclic groups. Pocklington's algorithm uses this type of mathematics to find quadratic residues. Euler's totient [OY-lur'z TOE-shent] relies on this type of math and is a generalization of Fermat's [fair-mah'z] little theorem, which also uses it. This system reduces numbers to equivalence classes based on their residues, or remainders when divided by a given number. It is sometimes compared to counting on a clock. Name this kind of arithmetic in which numbers are said to be "congruent" rather than equal, a fact symbolized by a "triple equals sign".

modular arithmetic [accept
modulo or **modulus**; prompt
on **clock** arithmetic]



Question #19: Fine Arts – Art History

10 points

One painting by this artist has a bright white spot at the bottom surrounded by white strokes that get progressively darker at the top. That painting was renamed by this artist from *White Rose — Abstraction to Ballet Skirt or Electric Light*. One painting by this painter showed an expanse of hills behind a very close cross. Flying across the country inspired this painter's series *Sky Above Clouds*, and many paintings by this artist depict large flowers or animal skulls. Name this painter of *Black Cross, New Mexico* who was the wife of the photographer Alfred Stieglitz.

Georgia (Totto) **O'Keeffe**

Question #20: Literature – World Literature

10 points

A civil war in this country inspired a play in which Cripple and Blindman wager body parts in a dice game. The drama *A Dance in the Forests* was written in commemoration of this nation's independence. In one drama set in this country, Simon Pilkings was able to stop Elesin from taking his own life, but not Olunde; that play is *Death and the King's Horseman*. Name this country, the setting for many plays by **Wole [waw-leh] Soyinka** and novels by Chinua Achebe.

(Federal Republic of)
Nigeria



Question #21: Science – Chemistry

10 points per part

An “R” is sometimes added to the name of these constructs to refer to the reaction.		
1	Name these tables which use initial concentrations to find final concentrations of reactants and products.	RICE tables
2	The concentrations found using an ICE table can be used to determine this constant, symbolized <i>keq</i> [“K sub E Q”].	equilibrium constant
3	Equilibrium constants can also be written in terms of this quantity, which is related to the mole fraction of a gas by Dalton’s law.	partial pressure [prompt on pressure]

Question #22: Science – Chemistry

10 points per part

This technique typically uses an indicator like phenolphthalein [fee-nawl-THAY-leen] as a reference.		
1	Name this technique which uses a substance of known concentration to find the concentration of another substance.	acid-base titration [or titrating]
2	A titration is finished at this point, where the known has fully reacted with the unknown.	equivalence point
3	Titration is used in this test which uses manganese, iodide, and hydroxide to determine the concentration of dissolved oxygen in solution.	Winkler test



Question #23: Social Studies – U.S. History

10 points per part

In 2003, Gray Davis lost a recall election and was replaced in this post by Arnold Schwarzenegger.		
1	Name this position that was held by Earl Warren when he was nominated to become Chief Justice. During the Civil War, Leland Stanford held this post for two years.	governor of California [accept equivalents; prompt on governor]
2	This person served two terms as governor of California before seeking the 1976 Republican presidential nomination. He lost that nomination, but four years later he won both the nomination and the presidency.	Ronald (Wilson) Reagan
3	This man, nicknamed “Moonbeam,” succeeded Reagan as governor. He was twice elected mayor of Oakland before becoming governor again in 2011.	(Edmund Gerald) Jerry Brown (Jr.)

Question #24: Social Studies – U.S. History

10 points per part

The Clark Memorandum concerning this policy was written in response to the Kellogg-Briand Pact.		
1	Name this policy dating back to 1823, expressing American opposition to European interference in the affairs of countries west of the Atlantic Ocean.	Monroe Doctrine
2	This was the name of Franklin Roosevelt’s Latin American policy. He used these words in his inaugural address, saying the United States would respect the rights of other countries.	Good Neighbor policy
3	Theodore Roosevelt’s corollary to the Monroe Doctrine was issued as a response to European “gunboat diplomacy” with regard to this South American nation, later led by Hugo Chávez.	Venezuela



Question #25: Mathematics – Pre-Calculus

10 points per part

If these figures are horizontal or oblique lines, then graphs approach them as x approaches positive or negative infinity.		
1	Name these figures approached, but not necessarily reached, by graphs. A hyperbola always has two of them.	asymptotes [“ASS-imp-totes”]
2	In graphs of rational functions, some discontinuities are at values of x with vertical asymptotes. If a rational function’s graph has a discontinuity that is not a vertical asymptote, then what feature does it have instead?	hole [or removable discontinuity]
3	Find the y -coordinate of the hole in the graph of y equals the quantity x squared minus nine, end quantity, divided by the quantity x plus three.	-6 [or (-3, -6)]; do not accept “6”]

Question #26: Mathematics – Pre-Calculus

10 points per part

This type of change can be represented by a matrix.		
1	Name this kind of change that may shift, stretch, or reflect points or functions.	(linear) transformations (prompt on bijections or bijective functions)
2	This type of linear transformation consists of moving points in one direction based on their initial position in a perpendicular direction.	shearing [or shear mapping or shear transformation or transvection]
3	The way in which a transformation affects area is dependent on its determinant. Find the determinant of the two-by-two matrix whose top row is 3, 5 and whose bottom row is 6, 3.	-21 [do not prompt on “21”]



Question #27: Literature – British Literature

10 points per part

A performance of <i>Pyramus and Thisbe</i> [THIZ-bee] by a group of “rude mechanicals” occurs during a wedding in this play.		
1	Name this play in which Theseus gives Hermia four days to submit to her father and marry Demetrius, or be put to death.	<u>A Midsummer Night’s Dream</u>
2	In <i>A Midsummer Night’s Dream</i> , this mischief-maker gives Nick Bottom the head of a donkey, and when told to find a certain flower, bragged that he could go around the world in 40 minutes.	<u>Robin Goodfellow</u> or <u>Puck</u> [accept any underlined name]
3	Puck’s love potion blunder caused this character, the beloved of Hermia, to fall in love with Helena.	<u>Lysander</u>

Question #28: Literature – British Literature

10 points per part

While at the Salem House Academy, this character is forced to wear a sign that says “beware of him, he bites.”		
1	Name this narrator who is unsure as to whether he “shall be the hero of [his] own life”.	<u>David Copperfield</u> [accept either]
2	This author of <i>David Copperfield</i> occasionally published works under the pseudonym “Boz”.	Charles (John Huffam) <u>Dickens</u>
3	This rival of David taught himself law and planned to marry Agnes Wickfield, but his schemes are undone by Wilkins Micawber.	<u>Uriah Heep</u> [accept either]



Question #29: Mathematics – Math Concepts

10 points

This quantity can be calculated by dividing a covariance by a product of standard deviations. A quantity used for similar purposes to this one is named for Spearman and based on rankings. This quantity is squared to find the coefficient of determination, which tells what percent of a variation in one variable is determined by the variation in another variable. This quantity measures how linear the relationship between two variables is, and it must fall between negative one and positive one, inclusive. A large value for this quantity does not imply causation. Name this quantity often represented by a lower-case r .

(Pearson product-moment)
correlation coefficient
[accept **PPMCC** or **PCC**;
accept Pearson's **r** before the
end]

Question #30: Social Studies – World History

10 points

This country's colonies were liberated via the Armed Forces Movement. This country sent political prisoners to Tarrafal Camp, which became known as "Camp of the Slow Death". This country and the Vatican signed the Concordat of 1940. That agreement was made under António de Oliveira Salazar, whose policies were called the Estado Novo and were ended by the Carnation Revolution in 1974. This country was the predominant colonial power in Angola and Mozambique. Name this country that occupies the southwest part of the Iberian Peninsula, which it shares with Spain.

Portugal [or **Portuguese Republic** or **República Portuguesa**]



Question #31: Literature – U.S. Literature

10 points

<p>In one of this writer's novels, a professor of classics at Athena College was accused of racism, and it is revealed that he was an African-American passing as a Jew. That professor, Coleman Silk, was the neighbor of one of this author's recurring characters who served as the narrator for a novel about the Swede. In another novel, the Pilgrim, the Pumpkin, and the Monkey are revealed in psychoanalysis sessions held by Dr. Spielvogel. Name this author of <i>American Pastoral</i>, <i>The Human Stain</i>, and <i>Portnoy's Complaint</i>.</p>	<p>Philip (Milton) Roth</p>
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Question #32: Science – Biology

10 points

<p>The alkaloids in belladonna dilate the pupils by preventing the action of this compound, as atropine [ay-TROH-peen] blocks this compound's muscarinic [mus-kuh-RIN-ik] receptors. A large amount of this compound is found in the basal nucleus of Meynert. This neurotransmitter's re-uptake is performed through the action of a namesake esterase [ESS-tur-"ace"] enzyme. The release of this compound opens ligand-gated sodium channels, which in turn stimulate the t-tubules, causing the sarcoplasmic reticulum [SAR-koh-PLAZ-mik reh-TIK-yoo-lum] to release calcium. This compound is found in vesicles at the neuromuscular junction. Name this neurotransmitter responsible for muscle contraction.</p>	<p>acetylcholine [uh-SEE-tul-KOH-leen] [prompt on ACh]</p>
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Extra Question #1: Social Studies – U.S. History

10 points

Chinese participants referred to this event's location as *Gum San*. James Polk's inaugural address included the results of Richard Mason's report concerning this event. Initially centered in the New **Helvetia** [hel-VESH-yuh] settlement on the American River, it exploded after a public display by Sam Brannan. This event resulted from a discovery by James Marshall at Sutter's Mill, and participants in it were known as Forty-Niners. Name this event in which people traveled towards the Pacific in hopes of striking it rich.

California gold rush
[accept **1849 gold rush**
before "Forty-Niners";
prompt on **gold rush**; accept
answers referring to the
finding of **gold** at **Sutter's**
Mill or Sutter's Ranch before
"Sutter's"]

Extra Question #2: Mathematics – Math Concepts

10 points

This adjective refers to data collected from a person without that person's knowledge, and to a data structure that as much as possible only includes actual data. This type of differentiation is equivalent to using the opposite of the partial derivative with respect to x , divided by the partial derivative with respect to y . This form of differentiation uses the chain rule and the fact that one variable depends on another variable. Name this adjective that refers to functions whose expressions cannot be solved for the dependent variable.

implicit [accept **implicit**
data or **implicit**
differentiation or **implicit**
derivatives]



Extra Question #3: Fine Arts – Composers of the Modern Era

10 points

This composer's only symphony, completed in 1928, is less than 10 minutes long even though the first minute is immediately repeated and some parts are played backwards to create palindromes. This composer claimed that all of his pieces addressed the death of his mother. This composer lost his job composing for the Vienna Workers Symphony Orchestra at about the time he wrote *Concerto for Nine Instruments*. His most performed piece is his Opus One *Passacaglia* [*pah-sah-KAH-lee-ah*]. Name this composer who, along with Alban Berg and Arnold Schoenberg [SHURN-burg], was part of the Second Viennese School.

Anton **Webern** [VAY-burn]

Extra Question #4: Literature – World Literature

10 points

This play's last act opens with the Head of Construction cursing the lack of written documentation on the part of two other department heads, Dr. Gall and Dr. Hallemeier. The opening scene of this play features a poster advertising "the cheapest workforce you can get", as well as one of the title characters taking dictation from Domin. It ends with **Primus** [PREE-mus] and Helena falling in love. Name this Karel **Capek** [CHAH-pek] play in which almost all of humanity is destroyed by robots.

R.U.R.: Rossum's Universal Robots [or *R.U.R.: Rossumovi univerzální roboti*; accept any underlined portion]



Extra Question #5: Science – Health

10 points

This disease can be treated by **isoniazid** [“eye”-suh-NYE-uh-zid], and the FDA has recently approved **bedaquiline** [beh-DAK-wih-leen] for it. This disease can be prevented in children by the **Bacillus** [buh-SIL-lus] Calmette-Guerin vaccine. Like leprosy, this disease is caused by **mycobacteria** [MY-koh-“bacteria”]. A detection method for it involves injecting a small amount of fluid under the skin in the arm. That injection, called the **Mantoux** [man-too] test, leads to a raised hard skin region in positive cases. Name this infectious disease, once known as consumption, that most commonly affects the lungs.

tuberculosis [or **TB**; prompt on **consumption** before it is mentioned]



Extra Question #6: Social Studies – World History

10 points per part

He led the victorious Ottoman forces at the Gallipoli [guh-LIP-uh-lee] Campaign and became the first president of Turkey.		
1	Name this rival of Enver Pasha who was victorious over the Greeks at the Battle of Sakarya. The subsequent deposition of Sultan Mehmet VI [6] led to his transition from a military career to a political one.	(Mustafa) Kemal Atatürk [accept either]
2	Following the Sultan’s resignation, the Allied Powers agreed to this treaty that set the boundaries of modern Turkey.	Treaty of Lausanne
3	This group of principles promoted by Atatürk included adopting the Latin alphabet and expanding state-owned manufacturing.	Six Arrows [or Alti ok ; prompt on Kemalism or Atatürkism]

Extra Question #7: Social Studies – World History

10 points per part

The turning point in this uprising was Louis Riel’s [loo-ee ree-el’z] agreement with the decision to execute Thomas Scott.		
1	Name this uprising in which Scott had been held at Upper Fort Garry, a key position later recaptured by Garnet Wolseley.	Red River Rebellion [accept synonyms for “Rebellion”]
2	The Red River Rebellion occurred during John MacDonal’d’s first time as Prime Minister of this country.	(Dominion of) Canada
3	The Red River territory was eventually folded into this Canadian province. A late-19th-century compromise solved a crisis over the segregation of Catholics in its public schools.	Manitoba



Extra Question #8: Mathematics – Trigonometry

10 points per part

Instead of a unit circle, this version of trigonometry uses the graph of the equation $x^2 - y^2 = 1$.	
1	Name this version of trigonometry whose functions are often given in terms of the exponential function. hyperbolic trig(onometry) [prompt on hyperbola]
2	This function equals one-half the quantity e raised to the x power minus e raised to the opposite of x power. hyperbolic sine of x [or sinch x or sinh x ; do not prompt on “sine” or “sin”]
3	Find the limit as x approaches infinity of the hyperbolic tangent of x . one

Extra Question #9: Mathematics – Trigonometry

10 points per part

One of these identities for the tangent function is the quantity one minus the cosine function, end quantity, divided by the sine function; it can also be written as the sine function divided by the quantity one plus the cosine function.	
1	Name this set of trigonometric identities. half-angle identities [accept more specific answers]
2	The half-angle identity for sine has this function inside a square root, subtracted from one and then divided by two. cosine [accept answers additionally mentioning any letter]
3	If the sine of an angle in the first quadrant is one-half of the square root of three, then what is the sine of half that angle? 1/2 [or 0.5]