

*Bergen Academies Spring Quizbowl Tournament 2016*

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Round 5: Tossups

1. **One of these selects the median of the first, pivot and last elements in a range, and exhibits quadratic runtime on arrays of equal values. One desirable trait for these is stability, and all comparison-based algorithms of this type have runtime no better than (\*)  $n \log n$ .** The ‘bubble’ type repeatedly swaps adjacent elements, and the inefficient ‘bogo’ type randomly permutes the elements, until the desired result is achieved. For ten points, name this class of algorithms, typified by ‘insert’ and ‘merge’, whose goal is to order the elements of a list.

ANSWER: sorting algorithms, or any equivalent involving sorting

2. **The *Cruellest Journey* was a video account of a voyage on this body of water, whose tributaries include the Bani and the Banue. Mungo Park was the first modern European to reach the inland portion of this river, which has an “Inner Delta” the size of Belgium. The Kandadji Dam on this river is partially funded by (\*) OPEC, and the Oil Rivers form its delta. Although Ibn Battuta thought that this river was connected to the Nile, it actually flows past Timbuktu, and eventually into the Gulf of Guinea.** For ten points, name this river of western Africa that is the namesake of two countries.

ANSWER: Niger River

3. **This nation’s declaration of independence was written by Ambrosio Bautista, who sometimes served as an advisor to Jose Rizal. In the early 1900s, Adna Chaffee and William Howard Taft served as governor of this location, after its annexation was called for by Henry Cabot Lodge following the (\*) Spanish-American War. Named after the husband of Mary I, this nation was the site of the Moro Rebellion, which partly took place on Mindanao Island. For ten points, name this nation where Emilio Aguinaldo led guerilla forces and Admiral George Dewey was victorious at the Battle of Manila Bay.**

ANSWER: Republic of the Philippines

4. **An extension of this law models soil diffusion and is named for Planck. This equation can be generalized to the equivalence Tafel equation in high overpotential regions. That generalization is called the Butler-Volmer equation. A modification of this law, called the GHK equation, accounts for all (\*) ions; that modification was produced by Goldman. Two values in the denominator of one term of this law are multiplied to obtain the total charge from electrons. For ten points, name this equation in chemistry that states that  $RT$  over  $nF$  times the natural log of the reaction quotient subtracted from a reference value gives a cell’s voltage, named for a German scientist.**

ANSWER: Nernst equation

5. **The Tuonen tytti leads Väinämöinen [**“VIE-nah-MOY-nen”**] into one of these places, from which he escapes by turning into a snake. Izanami went to one of these places called Yomi after giving birth to Kagutsuchi. The Zaqquq tree lies in Jahannam, which is the Islamic one of these; Aeneas brings the golden bough to (\*) Proserpina, the queen of one of these places. The Duat is an Egyptian one, presided over by Osiris. Another of these places is divided 5 rivers including the Lethe and the Styx, and visitors to that Greek version of this realm must first pass Charon and Cerberus. For ten points, name these places exemplified by Hades, and Hell in Christianity.**

ANSWER: the land of the dead (accept equivalents or descriptions; accept underworld; prompt on “cave”; do NOT accept or prompt on “hell”)

6. **An “armored scythe-stroke” almost reached the site of this event, where the British Expeditionary Force lost almost 70,000 men. The Belgians surrendered in the battle preceding this action, during which over 400 tanks were (\*) left behind. The Halt Order given by Hitler gave time for this event to happen, and after its conclusion Winston Churchill proclaimed “we shall fight on the beaches.” For ten points, name this 1940 action, codenamed “Operation Dynamo” which took place on the beaches and harbors of northern France, and which saved over 300,000 men from Nazi forces.**

ANSWER: Dunkirk evacuations (accept anything involving the removal of troops from Dunkirk; accept Operation Dynamo before mentioned; prompt on just “Dunkirk”)

7. Works by this band include “My Apocalypse” and “Death Magnetic”, though Jethro Tull’s *Crest of a Knave* notably defeated this band’s ...*And Justice for All* at the 1989 Grammys. This band once cancelled an interview after an interviewer obtained one of their albums via the (\*) Pirate Bay, and a notable lawsuit filed by this band followed *A&M Records v. Napster*. Credited with causing the downfall of Napster, this band has been consistently outspoken against P2P file sharing. For ten points, name this metal band with drummer Lars Ulrich, fronted by James Hetfield.

ANSWER: Metallica

8. The Azalai was a route primarily meant for the transport of this good, which along with iron was the source of “Discourses” during the Han dynasty. The Alberger process can produce this good, which was the subject of the gabelle tax. A solution of this good was a common method of payment during the War of 1812, and it was used to (\*) sow the ruins of Carthage. The British tax on this substance inspired Mahatma Gandhi to lead a march to the sea and produce some of this mineral. For ten points, name this seasoning used to preserve meats that can be procured from the ocean and primarily contains sodium chloride.

ANSWER: table salt (prompt on “sodium chloride” or “NaCl” before mentioned)

9. The author of *Fear and Loathing in Las Vegas*, Hunter S. Thompson, founded the “Gonzo” style of this practice. Truman Capote and Norman Mailer wrote in the style of creative nonfiction, which was also known as the “New” form of this practice. Lincoln Steffens and Ida B. Tarbell were (\*) “muckrakers” in this practice, who published works about the government of Minneapolis and Standard Oil. Preceding and during the Spanish-American War, William Hearst and Joseph Pulitzer published sensational articles in the “yellow” form of this genre. For ten points, name this form of non-fiction that reports news.

ANSWER: journalism (prompt on “news” before mention)

10. He’s not E.M. Forster, but this philosopher’s essay *What I Believe* states that life ought to be “inspired by love and guided by knowledge.” Many of his mathematical works were refinements on the work of Gottlob Frege [fray-guh], including his most famous work on the predicate calculus, written with A.N. (\*) Whitehead. That work on the foundations of mathematical logic are related to his 1905 article *On Denoting*. He gave an unfalsifiable argument that a piece of china is between Earth and Mars, which is now called his “teapot”. For ten points, name this British pacifist, mathematician, logician, philosopher and author of *Principia Mathematica* and *Why I Am Not a Christian*.

ANSWER: Bertrand Russell

11. Goya painted a self-portrait with one person of this profession named Arrieta, who hands him a glass of water. Thomas Hinde, a man of this profession, appears in a painting of the title general by Benjamin West. Vincent van Gogh painted one man with this job leaning on a table with two yellow books and a vase of foxgloves on it. Two men with this profession, David Agnew and Samuel (\*) Gross, both appear in paintings by Thomas Eakins. Seven students watch as one man with this profession perform a dissection in a Rembrandt painting that shows his “anatomy lesson”. For ten points, name this occupation, held by Paul Gachet and Nicolaes Tulp, that requires a medical degree.

Answer: medical doctors (accept physicians)

12. Three sadists in this novel, Warren, Washington and William, are connected to the primary antagonist by a perceived telephone line. Mr. Turkle, a late-night security guard, lets in the prostitutes Sandy and Candy in this novel; the latter takes Billy Bibbit’s virginity. Those girls are friends of this book’s protagonist, who organizes a vote to watch the (\*) World Series. In this novel, the Combine purportedly placed Chief Bromden and the other patients in a facility run by a woman who rations cigarettes, Nurse Ratched. For ten points, what Ken Kesey novel tells of Randall P. McMurphy’s time at an Oregon mental asylum?

ANSWER: One Flew Over the Cuckoo’s Nest

13. One branch of this tradition believes that there are three cloud-souls and seven white-souls that together form the human soul. In this school of thought, the liver is associated with earth, while the kidneys are associated with water. Bigu is a grain-free diet practiced by some in this tradition to expel the “three corpses”. Compassion, moderation, and humility form the (\*) Three Treasures of this philosophy, which draws upon trigrams and hexagrams from the *I Ching*, or “The Book of Changes”. Lao Tzu wrote the central text of, for ten points, what Chinese school of philosophy and religion that means “the way”?

ANSWER: Taoism (or Daoism)

14. **One play set in this country sees Nonno write his last poem and the Reverend Shannon give tours to American visitors. That play is *The Night of the Iguana* by Tennessee Williams. A poet from this country described “a journey in the galleries of sound” and a “willow of crystal, a poplar of water” in a 584-line poem inspired by the calendar of a (\*) people native to this country, “Sunstone”. That poet also included the sections titled for the sons of La Malinche and the Day of the Dead in his essay “The Labyrinth of Solitude”. One novelist from this country told of the title business man in *The Death of Artemio Cruz*. For ten points name this country, home to Carlos Fuentes and Octavio Paz.**

ANSWER: Mexico

15. **P, R, and S are used as designations for some processes integral to these events, and they can be categorized based on the existence of the Balmer series in their spectra. One classification of this event has an absolute magnitude of -19.3, allowing it to be used as a standard candle. A white dwarf may experience this event when it exceeds the (\*) Chandrasekhar limit, and the Crab Nebula was formed by one of these events. They can be caused by the core collapse of an especially sizable star, and are grouped either as Type I or Type II. For ten points, name these stellar explosions.**

ANSWER: supernova (do not accept or prompt on “nova”)

16. **The narrator of one of this man’s works knows that he shall meet his fate “somewhere in the clouds above” as the title “...Airman foresees his Death”. Cormac McCarthy’s novel *No Country for Old Men* derives its title from the first line of one of this man’s poems, which describes “sages standing in God’s holy fire”, (\*) “Sailing to Byzantium”. He described a “turning and turning in the widening gyre” and asked “what rough beast... slouches toward Bethlehem to be born?” in his most famous poem. For ten points name this Irish poet of “The Second Coming.”**

ANSWER: William Butler Yeats

17. **Along with Robert Lewis and Cheryl Crawford, this man is attributed with introducing and popularizing Method Acting in America. This director took credit for removing Zero Mostel from the Hollywood Blacklist, and testified against eight members of the Group Theater to (\*) HUAC [“HYEW-ack”]. He directed “Death of a Salesman” in its Broadway debut. Films directed by this man included *East of Eden* and *On the Waterfront*. For ten points, name this director who brought Marlon Brando to fame with *A Streetcar Named Desire*.**

ANSWER: Elia Kazantzoglou

18. **One person with this surname lost a gubernatorial election to the then-incumbent Lawton Chiles, and he declined the position of NFL Commissioner while still Governor. Another person with this surname was mockingly attributed the quote “not gonna do it, wouldn’t be prudent,” and said on a campaign that there would be (\*) “no more taxes”. That President won an election alongside Dan Quayle. His elder son also served as President, defeating Al Gore in 2000 and John Kerry in 2004. For ten points, give the surname of former Florida governor Jeb and former presidents George H.W. and George W.**

ANSWER: Bush family, or anything about the Bush surname, incl. Jeb/George H.W./George W. Bush

19. **In yeast, these structures may produce black particles made of crystallized sodium phosphates named “dancing bodies”. In the vascular cambium cells of most plants, smaller kinds of these are present during the winter while their larger kind is responsible for maintaining plant tonicity. Versions of these structures that (\*) pump out excess water are called contractile ones while those used in digestion are called 'food' ones. Surrounded by a membrane called a tonoplast, for ten points, identify these organelles that may represent 90% of a cell’s volume and that play a role in the storage of water, food and other materials.**

ANSWER: vacuole

20. **In an opera by this composer, the priests of Dagon dance a Bacchanale just before their temple is pulled down by one of the title characters. That opera is *Samson and Delilah*. One work by this composer opens with the harp playing “D” twelve times to represent the (\*) clock striking midnight and violins that sound like they are tuning, and is quoted extensively by the xylophone in a movement of another work of his entitled “Fossils”. That work also includes the movements “Kangaroos”, “Tortoises” and the cello feature “The Swan”. For ten points name this French composer who created *Danse macabre* and *The Carnival of the Animals*.**

ANSWER: Camille Saint-Saëns

Tiebreaker Question:

21. **One of the characters in this play calls children “no-neck monsters”, while another character replies to a question about his relationship with “Wouldn’t it be funny if that was true?” That character waits for a “click” after he drinks alcohol to cope with death of his friend, (\*) Skipper. Gooper and Mae attempt to steal their father’s estate from that character, when they discover that Big Daddy’s “spastic colon” is really cancer. Maggie, who has a feline nickname, confronts her loveless marriage to Brick in this play. For ten points, name this Tennessee Williams play about the Pollitt family’s feud over inheritance.**

ANSWER: ***Cat on a Hot Tin Roof***

## Round 5: Bonuses

1. Naval warfare has played a crucial part in military history, from rowboats to nuclear submarines. For ten points each:  
[10] The *Housatonic* was sunk by the *H. L. Hunley*, a ship from this nation during the Civil War. This nation's ironclad *Virginia* also fought the *Monitor*.

ANSWER: Confederate States of America (or the **Confederacy**, do not accept or prompt on "America" or equivalents)

[10] Admiral Yi Sun-shin of this country used turtle ships, featuring covered, spiked decks, to fight off Japanese invasions.

ANSWER: **Korea** (accept **Joseon**)

[10] *Pal* were three-masted warships employed by this Indian confederacy, which rose to power under Shivaji and lasted until 1818.

ANSWER: **Maratha**

2. The writing of this poem was interrupted by the apocryphal "Person from Porlock." For ten points each:

[10] Name this incomplete poem that tells of the city Xanadu; its mere 54 lines were only published in 1816 at the urging of Lord Byron.

ANSWER: "**Kubla Khan**"

[10] This much longer poem, told by the title character at a wedding, is about a sailor who shoots an albatross. Its title alludes to a type of frost rather than a poetic style.

ANSWER: "The **Rime of the Ancient Mariner**"

[10] "Kubla Khan" and "The Rime of the Ancient Mariner" were written by what author of "Christabel" and friend of William Wordsworth?

ANSWER: Samuel Taylor **Coleridge**

3. Answer the following questions about a mythos, for ten points each.

[10] Name this demon who bargains with God and three archangels over the right to tempt a young man to evil, and is granted free reign, "as long as he on Earth shall live."

ANSWER: **Mephistopheles**

[10] One author who uses the Faust myth, in which Mephistopheles offers a scholar all his heart desires, is this German master, a prominent member of the *Sturm und Drang* literary movement.

ANSWER: Johann Wolfgang von **Goethe** ["gur-ta"]

[10] In his 1604 version of *Faust*, this author calls him Faustus instead, possibly as a result of writing in English. He also wrote the history plays *Tamburlaine* and *Edward II*.

ANSWER: Christopher **Marlowe**

4. Did you hope there would be no sociobiology bonuses at this tournament? If so, make a Grumpy Cat face! For ten points each:

[10] Name these self-propagating social structures that change as they are passed between individuals, known as the cultural analogue to the gene. Examples include the question of how dogs would wear pants and John Cena.

ANSWER: **memes**

[10] Memes and meme theory were introduced in the 1976 book *The Selfish Gene* by this evolutionary biologist. This noted atheist also published *The God Delusion* and is notably controversial on Twitter.

ANSWER: Richard **Dawkins**

[10] *The Selfish Gene* more generally discusses altruism in society and its connection to survival, describing how societies reach what Dawkins calls evolutionarily stable strategies, which are examples of what stable states in game theory where no individual is incentivized to deviate?

ANSWER: **Nash equilibrium** (or **Nash equilibria**, prompt on just "equilibrium")

5. This organ contains Purkinje fibers that assist in transmitting electrical impulses at a steady beat. For ten points each:

[10] Name this valve-containing organ that is responsible for pumping blood throughout the body.

ANSWER: **heart**

[10] These cells, located in the Bundle of His and the sinoatrial node, dictate the rhythm of the heartbeat. They share their name with a medical device used to regulate that same heartbeat.

ANSWER: **pacemaker** cell

[10] This type of cell makes up cardiac muscle and contains myofibrils and sarcomeres.

ANSWER: **cardiomyocyte** (accept **myocardiocyte** and **cardiac myocyte**, prompt on “myocyte”)

6. This author has been described as “Nebraska’s foremost citizen” for her works set there. For ten points each:

[10] Name this modernist author of *Death Comes for the Archbishop* and *My Ántonia*.

ANSWER: Willa **Cather**

[10] Cather also penned this novel in which Thea Kronborg dreams of being an opera star.

ANSWER: *The **Song of the Lark***

[10] Collectively, *The Song of the Lark*, *O Pioneers!* and *My Ántonia* are known as Cather’s “*This* trilogy”, named after the Midwestern frontiers where they are set. Laura Ingalls Wilder wrote of a “Little House on” *this* place.

ANSWER: the **prairie**

7. In the *Prose Edda*, Snorri Sturluson claims that this mythical location was based on the city of Troy. For ten points each:

[10] Name this place home to Thor, whom Snorri portrays as a grandson of Priam. Odin rules this realm of the gods, which contains Valhalla and is destroyed during Ragnarök.

ANSWER: **Asgard**

[10] Ratatoskr is a squirrel that relays messages up and down this structure that connects the nine worlds of Norse mythology. One of its three roots extends into Asgard and Midgard.

ANSWER: **Yggdrasil** (prompt on “world tree”)

[10] Asgard is connected to Midgard by this bridge, which is destroyed by the sons of Muspell during Ragnarök.

ANSWER: **Bifröst** (accept **Bilröst**; accept **Asbrú**; prompt on “rainbow bridge”)

8. Among producers, Kanye West ranks behind only Quincy Jones in the number of Grammys won. For ten points each:

[10] Kanye West sampled this French electronic duo in his song “Stronger”, which won for Best Rap Solo Performance. This group reentered the mainstream with their 2013 hit single “Get Lucky”.

ANSWER: **Daft Punk** (accept Guy-Manuel de **Homem-Christo** and Thomas **Bangalter** in either order)

[10] “Blame Game”, a track on the Best Rap Album-winning *My Beautiful Dark Twisted Fantasy*, features a sample of “Avril 14th” by this British producer. His latest album is 2014’s *Syro*.

ANSWER: **Aphex Twin** (accept Richard David **James**)

[10] The chorus of “Heard ‘Em Say”, a song from Best Rap Album *Late Registration*, is reused in this band’s “Nothing Lasts Forever”. Other songs from their album *It Won’t Be Soon Before Long* include “Makes Me Wonder” and “Wake Up Call”.

ANSWER: **Maroon 5**

9. Congressional sessions open with a recitation of this statement. For ten points each:

[10] Name this statement often recited at school in the morning, to which the phrase “under God” was added in 1954.

ANSWER: the **Pledge of Allegiance** (prompt on “the Pledge”)

[10] The author of the Pledge of Allegiance was this Christian socialist, who created it for schools to celebrate the 400th anniversary of Columbus’s voyage.

ANSWER: Francis **Bellamy**

[10] The 1943 Supreme Court case *West Virginia State Board of Education v. Barnette* questioned the pledge as in violation of religious law forbidding this practice, such as that against making up graven images in Exodus that was also protested in iconoclastic movements.

ANSWER: **idolatry**, accept equivalents like **idol worship** or **worshipping idols**

10. This man wrote *Elementary Treatise of Chemistry*, often considered the first modern chemistry textbook. For ten points each:

[10] Name this French chemist, known for the discovery of oxygen and often called the father of modern chemistry.

ANSWER: Antoine-Laurent de **Lavoisier**

[10] Lavoisier's discovery of oxygen demonstrated the mechanism of combustion, thereby disproving the existence of this hypothetical "fire-like element" previously believed to be necessary for burning.

ANSWER: **phlogiston**

[10] During the French revolution, Lavoisier was accused of selling this substance and was guillotined as a result. It was popularly cultivated at Jamestown for use in pipe smoking and is a major constituent of modern day cigarettes.

ANSWER: **tobacco**

11. The Sho Dynasty ruled this kingdom, which contains what is now the westernmost point of Japan. For ten points each:

[10] Name this archipelagic kingdom between Japan and Taiwan that lasted from the 15th through 19th centuries.

ANSWER: **Ryukyu** Kingdom

[10] U.S. Military bases currently occupy 20% of this island in the Ryukyus, which was the site of the largest amphibious assault in the Pacific War.

ANSWER: **Okinawa** (accept **Uchinaa**)

[10] The Ryukyu Kingdom became a vassal state of this Domain during the Edo Period. A rebellion of discontent samurai during the Meiji Era was named after it.

ANSWER: **Satsuma** Domain

12. For ten points each, name the following mathematicians who were also proficient in other fields:

[10] Edward FitzGerald attributed to this a collection of poetry known as the *Rubaiyat* to this Persian mathematician and astronomer from the middle-ages

ANSWER: Omar **Khayyam**

[10] This Hungarian-born member of the Institute for Advanced Study coined the term Mutually Assured Destruction and developed many subfields of quantum mechanics, economics and computer science.

ANSWER: John **von Neumann**

[10] Von Neumann invited this Polish scientist to join him at the IAS. He shares the name of a bomb design with Edward Teller.

ANSWER: Stanislaw **Ulam**

13. Dominique Strauss-Kahn headed this organization until his 2011 resignation. For ten points each:

[10] Name this international financial organization that works to ensure global economic security. It should not be confused with the World Bank, whose goals are more humanitarian.

ANSWER: **International Monetary Fund (IMF)**

[10] This struggling European nation was the first to default on an IMF loan. Its Prime Minister, Alexis Tsipras ["SEE-pruhs"], stepped down for less than a month in 2015.

ANSWER: **Greece** or the **Hellenic Republic**

[10] Tsipras has served as the leader of this Greek political party since 2009. Also known as the Coalition of the Radical Left, its members staunchly oppose German-led austerity measures.

ANSWER: **Syriza**

14. This work opens with the Continental Congress complaining about the heat of Philadelphia. For ten points each:

[10] This 1969 musical focuses on the drafting and signing of the Declaration of Independence and features such songs as "But, Mr. Adams", "The Lees of Old Virginia" and "The Egg". It shares its title with a David McCullough book.

ANSWER: **1776**

[10] This 2009 musical reimagines its title president as a rockstar who advocates for "Populism Yea Yea" and includes "The Corrupt Bargain" between John Quincy Adams, John Calhoun and Henry Clay.

ANSWER: **Bloody Bloody Andrew Jackson**

[10] Although he wasn't a president, this man titles a new Broadway musical that includes the song "My Shot" and characters such as King George III and Aaron Burr. Perhaps more famously, this man appears on the \$10 bill.

ANSWER: Alexander **Hamilton** or **Hamilton**

15. This conflict was stalled for 12 years until the outbreak of the Thirty Years' War. For ten points each:

[10] Name this war in which William of Orange was successful in overthrowing Habsburg rule over the Netherlands.

ANSWER: **Eighty Years' War** (prompt on things like "Dutch War of Independence")

[10] The Eighty Years' War, like the Thirty Years' War, was ended by a series of treaties collectively known by this term.

ANSWER: **Peace of Westphalia** (prompt on "Westphalia")

[10] Dutch independence was formally recognized by Philip IV at this city in northwestern Germany. An earlier rebellion in this city led to Anabaptists being left in cages to die.

ANSWER: **Münster**

16. Practitioners of this syncretic religion are known as "sèvitè" or servants of the spirits. For ten points each:

[10] Haiti and Louisiana hold many of the practitioners of this religion, well known for its eponymous dolls.

ANSWER: **Vodou** (you may be familiar with the incorrect spelling **voodoo**)

[10] This highest deity in Vodou interacts with Earth primarily through the loa ["LO-uh"], his underlings, which have been compared to angels.

ANSWER: **Bondye**

[10] Many practitioners of Vodou speak dialects of this language, a combination of various languages and French.

ANSWER: Haitian **Creole**

17. For ten points each, answer the following questions about Buddhist literature:

[10] This Buddhist priest, who lives and trains at a monastery, befriends the club-footed Kashiwagi, who teaches him corrupted, misunderstood Buddhist teachings.

ANSWER: **Mizoguchi**

[10] First published in 1956, Mizoguchi appears in this novel by Yukio Mishima, in which he is transfixed by the beauty of the titular building, until he burns it down. It is based off of real events.

ANSWER: ***The Temple of the Golden Pavilion*** or ***Kinkaku-ji***

[10] *The Temple of the Golden Pavilion* takes place on this island nation, known for its traditional practice of Zen Buddhism.

ANSWER: **Japan** or **Nihon**-koku or **Nippon**-koku

18. This opera begins outside a cigarette factory. For ten points each:

[10] Name this opera in which the title character sings "Habanera", which makes heavy use of the chromatic scale, whilst wooing the soldier Don José.

ANSWER: ***Carmen***

[10] The aria "Votre toast, je peux vous le rendre" ["vo-truh toe, juh puh voo le rahnd"] from *Carmen* has this popular name derived from the profession of its singer, Escamillo.

ANSWER: **Toreador** Song

[10] *Carmen* was the last work of this French composer, who also composed *The Pearl Fishers*.

ANSWER: Georges **Bizet**

19. For ten points each, answer the following questions about a class of compounds.

[10] This class is distinguishable by deformation when a shear stress is applied.

ANSWER: **fluid**

[10] The difference in how syrup and ethanol flow is due to this property shared by most fluids, which relates to the impact of fluid particles moving at different speeds on overall flow.

ANSWER: **viscosity** or equivalents such as how **viscous** it is

[10] This set of partial differential equations used to describe the behavior of a viscous fluid was introduced by two scientists in 1822. Solving them is one of the Clay Institute Millennium Prize Problems.

ANSWER: **Navier-Stokes** equations (do not accept or prompt on incomplete answers)



20. In this work, two young girls light lanterns in a garden. For ten points each:

[10] Name this painting of the daughters of Frederick Barnard which prominently features the title flowers.

ANSWER: **Carnation, Lily, Lily, Rose**

[10] *Carnation, Lily, Lily, Rose* was painted by this man who also painted Virginie Gautreau in *Portrait of Madame X* and *The Daughters of Edward Darley Boit*.

ANSWER: John Singer **Sargent**

[10] Sargent also created the painting *Gassed* which depicts numerous soldiers in blindfolds and uniform for participation in this war, where they had presumably been mustard gassed.

ANSWER: **World War I** or the **Great War**

21. Answer the following questions about a pre-Socratic philosopher, for ten points each.

[10] This thinker was considered to be the first philosopher in the Greek tradition by Aristotle; he taught Anaximander, who taught Pythagoras.

ANSWER: **Thales** of Miletus [“THAIL-ease”]

[10] Thales believed the universe was made up of this substance, which was one of Empedocles’ four roots and a classical element along with fire, earth and air.

ANSWER: **water**

[10] Thales was also a noted geometer, and he used his knowledge of similar triangles to measure the height of these tombs of the Menkaure and Khafre.

ANSWER: **pyramids** of Giza