



### NASAT 2015 - Round 01 - Tossups

1. An opera by this composer uses an onstage ensemble of three piccolos, six horns, a tam-tam, and a wind machine to depict an oncoming storm in Act III. In that opera by this composer, the protagonist ignores the nagging of her nurse Mary and sings "*Traft ihr das Schiff*," her namesake ballad, to a chorus of young girls at their spinning wheels. An opera by this composer ends as a character sings that her lover smiles "softly and gently" and that his dead body "shines ever brighter" in her final aria, the "*Liebestod*." The prelude to that opera by him introduces a dissonant chord named for the first title character, a knight of the Round Table. For 10 points, name this German composer of *The Flying Dutchman* and *Tristan und Isolde*.

ANSWER: Richard **Wagner** [or Wilhelm Richard **Wagner**] <Kim>

2. A poem by this man begins with a Lord Oxford quotation that warns "'Tis dangerous to be good," and is titled for a man who "sits musing o'er his scars and wooden leg." The title subject of another of his poems is "by nature's self in white arrayed," and is told by the speaker, "when you die you are the same, the space between is but an hour." That poem by this poet is addressed to a "fair flower, that dost so comely grow." Another poem by this writer begins, "In spite of all the learned have said, I still my old opinion keep," and describes a site that shows "the fancies of a ruder race." For 10 points, name this "Poet of the American Revolution" who wrote "The Wild Honeysuckle" and "The Indian Burying Ground."

ANSWER: Philip **Freneau** [or Philip Morin **Freneau**] <Sy>

3. A correction functional for calculating this quantity equals the dot product of two gradients of a probability function, over eight times the probability, and is named for von Weizsäcker. This quantity increases with the curvature of a wavefunction since its operator is proportional to del-squared. Relativistically, this quantity equals  $m$  times  $c$  squared, times the Lorentz factor minus one. The maximum amount of this quantity equals  $h\nu$  minus the workfunction in measurements of the photoelectric effect. Escape velocity is derived by setting  $2GM$  times two masses over the planetary radius equal to it. It is conserved for elastic collisions, but not for inelastic collisions. For 10 points, name this quantity equal to half the mass times velocity squared.

ANSWER: **kinetic energy** [or **K**; prompt on **energy**; do not accept "potential energy"] <Silverman>

4. The Schechter Letter uses the name "HLGW" to describe a ruler of this empire who led two thousand boats traveling on land to raid Constantinople, where he nailed his shield to the city gates. This empire sacked a neighboring state's city of Atil. Boleslaw the Brave intervened in a succession crisis in this empire, during which he chipped his sword after striking its capital's Golden Gate. This empire's history is recorded in Nestor's *Primary Chronicle*. A ruler of this empire was baptized at Chersonesus after marrying Basil II's sister, Anna. This empire, which conquered the Khazar Empire, was ruled by a dynasty began by Rurik. For 10 points, name this empire ruled by Yaroslav the Wise and Vladimir the Great from the modern-day capital of Ukraine.

ANSWER: Kievan **Rus** [or **Kiev**] <Golimlim>

5. Sylvester's theorem equates this function of the identity plus A times B to this function of identity plus B times A. This function is the unique antisymmetric multilinear form which takes the set of standard basis vectors to one. This quantity can be written as the sum over all permutations sigma of the sign of sigma times an expansion term, the product of a sub i comma sigma i, which is known as expansion by cofactors. It gives the area of the parallelogram formed by two vectors. The solutions to a system of linear equations are a ratio of two of these quantities, by Cramer's Rule. If this quantity is non-zero, a matrix is invertible. For 10 points, name this quantity that for a two by two matrix is a times d minus b times c.

ANSWER: **determinant** <Schindler>

6. An oracle tells a king of this city that he can win a war if he sacrifices one of his daughters; when he does so, his other daughters all commit suicide together. A princess of this city turns into stone when she blocks a doorway to keep Mercury from reaching her sister. A woman from this city murders and cooks her son Itys, and her sister turns into a nightingale after weaving a tapestry depicting her rape and mutilation by Tereus. Herse and Philomela are from this city, in which Poseidon summons saltwater from a spring, only to lose its patronage to a goddess that brings forth an olive tree. A king of this city navigates the Labyrinth and slays the Minotaur. For 10 points, name this Attican city named for the Greek counterpart to Minerva.

ANSWER: **Athens** <Kim>

7. The leader of one of these military operations ordered his guide, Martin Robinson, hanged for allegedly misleading him. That leader of one of these operations was posthumously accused of intending to assassinate politicians and burn the city of Richmond. A more successful one of these events ended when its participants arrived safely in Baton Rouge, having distracted Confederate forces from the Siege of Vicksburg. A commander renowned for performing these with great skill carried out one while circumnavigating the Army of the Potomac, although a later failed one of them deprived Robert E. Lee of information at the Battle of Gettysburg. For 10 points, name these fast attacks used by commanders such as Ulric Dahlgren, Benjamin Grierson, and Jeb Stuart, who led horse-mounted troops.

ANSWER: **cavalry** raids [accept synonyms for "raid" like **attacks** or **operations**; prompt on partial answers] <Clarke>

8. This composer's final keyboard concerto ends with a D major "Rondo all'Ungarese." This composer wrote his Cello Concerto No. 1 in C major, a key he also used for a mass whose Agnus Dei introduces ominous timpani strokes and trumpet fanfares to evoke the title phenomenon. Like Johann Nepomuk Hummel, this composer wrote a concerto for the new keyed trumpet invented by Anton Weidinger. This composer of the *Mass in Time of War* wrote a symphony whose second movement prominently features a triangle, a pair of cymbals, and a bass drum, in order to imitate Turkish music. Another of his symphonies ends with all but two musicians leaving the stage. For 10 points, name this composer of symphonies nicknamed *Military*, *Farewell*, and *Surprise*.

ANSWER: Franz Joseph **Haydn** <Kim>

9. Along with John Allen, this man intervened in a child custody dispute to help out mutual friend Natalie Khawam. He acquired the nickname "Peaches" as a youth because his name was viewed as too hard to say. A 2007 advertisement from MoveOn.org claimed this man was "cooking the books for the White House." His reputation was tarnished after the FBI received a complaint about cyberstalking from Florida socialite Jill Kelley, who was being harassed by this man's mistress. He recently pled guilty to misdemeanor charges regarding classified information that stemmed from his affair with Paula Broadwell, the author of his biography *All In*. For 10 points, name this four-star general and former CIA chief.

ANSWER: David **Petraeus** <Cheyne>

10. In the fourth section of this poem, the speaker observes that "flowers have been known to heal a common man's despair." In this poem, the Chaplain refuses to pray beside the corpse of a man who "did not wear his scarlet coat, for blood and wine are red." This poem chiasmatically describes a man for whom "mourners will be outcast men, and outcasts always mourn," a passage chosen as the epitaph of the author, who wrote it under the pseudonym C.3.3. This poem declares that "some do it with a bitter look, some with a flattering word," to elaborate upon his assertion that "each man kills the thing he loves." For 10 points, name this poem in which Oscar Wilde describes his imprisonment for homosexuality in the title place.

ANSWER: "The **Ballad of Reading Gaol**" <Gupta>

11. This group settled the strategically-critical city of Naupactus. Part of this group was given garlands and slain at the temple of Poseidon at Taenarus. This group staged a revolt after an earthquake took place at the Taygetus Mountains in 464 BC. Many of them received their status after two Messenian Wars. These people, who could become *mothakes* by completing the *agoge*, could often be indiscriminately killed by the *krypteia*. Every autumn, the *ephors* declared war on these people, who could become *neodamodes* by serving as hoplites or paying a sum of 500 drachmas. For 10 points, name these people subjugated by the Spartan state.

ANSWER: **helots** [prompt on Spartan **slaves**] <Golimlim>

12. This book has been criticized for switching between differential and physiocratic theories of rent. The four principles of a good tax system outlined in this book are proportionality, transparency, convenience, and easy enforceability. This book analyzes the history of the ban on exporting live sheep in its discussion of monopoly power, and it claims that the relationship between income and fertility creates a wage floor that is static in the long-term in its "subsistence theory of wages." The start of this book contains a description of a factory where a 2000-fold increase in productivity was achieved by the division of labor. For 10 points, name this 1776 text which denounces mercantilism and explains the functioning of the "invisible hand," written by Adam Smith.

ANSWER: *The **Wealth of Nations*** [or *An Inquiry into the Nature and Causes of the **Wealth of Nations***] <Bollinger>

13. One of this man's paintings is traditionally covered up by a flag when exams are held in the gallery that it's in, due to rumors that it can drive viewers to suicide. This artist satirized the legal profession in a painting in which a French poodle sits as the judge, titled *Laying Down the Law*. This artist painted the wreckage of John Franklin's lost expedition to the Northwest Passage being torn up by two polar bears in his painting *Man Proposes, God Disposes*. This artist's most reproduced painting, set in the sunlit Scottish Highlands, depicts a stag looking proudly up at the sky. For 10 points, name this British artist who sculpted the four bronze lions in Trafalgar Square and painted *The Monarch of the Glen*.

ANSWER: Edwin **Landseer** [or Sir Edwin Henry **Landseer**] <Gupta>

14. A film center in this city is rumored to be haunted, since over a hundred workers were supposedly buried alive in cement during its construction. A seaside park in this city now contains the Noli Me Tangere Garden in honor of the park's namesake. The abacá plant was made into a type of durable hemp nicknamed for this city. Like Baguio (**BAHG-yo**) to its north, this city was redesigned by Daniel Burnham. Spanish ships that traveled between this city and Acapulco were known as its namesake "galleons." One of this capital city's major roads is named for a former Governor-General, William Howard Taft. Quezon City is grouped into this city's metropolitan area. For 10 points, name this capital of the Philippines.

ANSWER: **Manila** <Golimlim>

15. A character in this play explains her fear of "endless bitterness" while her servant combs her hair. This play ends with a lyric poem describing a knife that "stops there in the quivering dark roots of the scream." In a scene from this play, a man asks a former flame whether she has received an orange corsage. Act III of this play opens with three woodsmen discussing the events of Act II, before a Beggar Woman prophesies the coming tragedy while talking to a white-faced personification of the Moon. This play's title event is interrupted by a man who is often reported as riding a horse near the estate, Leonardo Felix. For 10 points, name this play about the ill-fated marriage between the Bride and Bridegroom, by Federico Garcia Lorca.

ANSWER: **Blood Wedding** [or **Bodas de sangre**] <Sy>

16. It's not behavior, but Ulric Neisser coined the term for the "echoic" form of this process. A model of this process includes a component known as the "episodic buffer." John Palmer co-lead a study showing that this process was affected by verb choice like "collided" and "smashed" in analyzing a car crash. The conductor of that study observed errors in this process when participants in another study were told that they became lost in a shopping mall. The serial position effect explains troubles with this process, which was studied by Elizabeth Loftus. George Miller proposed that "seven plus or minus two" bits of information can be held by the "working" form of this process. For 10 points, identify this process that is impaired by amnesia.

ANSWER: **memory** [accept specific types] <Sarc>

17. A character in this poem recalls "a day when historians left blanks in their writings" and states "the blossoms of the apricot blow from the east to the west and I have tried to keep them from falling." The line "Pull down thy vanity" is repeated in this poem. In this poem, Acoetes describes the appearance of vines and lynxes on a pirate ship after the exclamation "Hang it all, Robert Browning!" This poem attacks money-lending in its "with usura" section. The first part of this poem is adapted from the *Odyssey* and begins, "And then went down to the ship." One section of this poem quotes from the writings of John Adams, and another was written while the author was imprisoned in Pisa. For 10 points, name this lengthy unfinished poem by Ezra Pound.

ANSWER: *The **Cantos*** <Brownstein>

18. A 2008 issue of *Time* Magazine received criticism for depicting this action with its central object replaced by a tree. A person involved in this action lived on a Gila Indian reservation in Arizona and died as a result of his alcoholism. Another person involved in this action was erroneously identified as Hank Hansen, and was in reality Harlon Block. The first attempt at this action ended after James Forrestal asked to take its central object as a souvenir. Ira Hayes participated in this action, which inspired Felix de Weldon to create the Marine Corps War Memorial outside of Arlington National Cemetery. This action was famously depicted in a photograph by Joe Rosenthal. For 10 points, identify this action done by six soldiers atop Mount Suribachi.

ANSWER: **raising the flag** on **Iwo Jima** [or equivalents involving Mount **Suribachi** until it is read; prompt on partial answer] <Golimlim>

19. An Emlen funnel is most often used to study behavior linked to this phenomenon. The forebrain region Cluster N may assist this process through a quantum-entangling radical pair mechanism induced by cryptochrome activation in the retina. Anxiety during this process is called *Zugunruhe*. Vagrants can result from defects in this process such as spring overshoot. The trigeminal nerve is thought to facilitate this process by transducing signals from magnetite-based receptors in the beak. Planetarium studies show that in some species it may be performed using celestial navigation. The record for this yearly action is held by the arctic tern. For 10 points, name this mass seasonal movement undertaken by geese.

ANSWER: bird **migration** [or **migrating**; prompt on **orientation**; prompt on animal **behavior** until "behavior" is read; prompt on **navigation** until it is read] <Smart>

20. This scientist revealed that an obviously fake seven-headed hydra owned by the burgomeister of Hamburg was, in fact, fake. The twinflower was named for this man after his expedition to Lapland to study the Sami, which resulted in the book *Flora Lapponica*. He inverted the Celsius scale to make 0 degrees the freezing point, and inaugurated the field of phenology with *Calendarium Florae*. Carl Peter Thunberg was among the "apostles" this man sent on collecting expeditions around the world. He wrote *Philosophia Botanica* shortly after becoming rector of Uppsala University. This scientist, the type specimen of *Homo sapiens*, founded modern taxonomy with his *Systema Naturae*. For 10 points, name this Swedish naturalist who invented binomial nomenclature.

ANSWER: Carolus **Linnaeus** [or Carl von **Linné**] <Kothari>

21. This composer's final piano sonata includes a scherzo marked *Allegro vivace con delicatezza* and begins with a lengthy *Molto moderato* movement in B-flat major. He may have originally intended his Piano Trio No. 1 in B-flat major to include his Notturmo in E-flat major as one of its movements. This composer included two cellos, rather than the traditional two violas, in his *String Quintet in C major*. One of his string quartets ends with a D minor tarantella and includes a second-movement set of variations on the song "Death and the Maiden." This composer included a double bass instead of a second violin in a piano quintet whose fourth movement quotes his own lied "Die Forelle." For 10 points, name this composer of the *Trout Quintet*.

ANSWER: Franz **Schubert** [or Franz Peter **Schubert**] <Kim>



### NASAT 2015 - Round 01 - Bonuses

1. Recently, this woman has targeted Sheryl Sandberg's *Lean In* and Beyonce's 2013 album as cultural touchstones that uphold the patriarchy. For 10 points each:

[10] Name this black feminist who analyzed the interaction between sexist, racist, and capitalist power structures in her first major work of theory, *Ain't I a Woman?*.

ANSWER: bell **hooks** [or Gloria Jean **Watkins**]

[10] hooks' *Ain't I a Woman?* takes its title from a famous speech by this black female abolitionist.

ANSWER: Sojourner **Truth** [or Isabella "Bell" **Baumfree**]

[10] In a 1994 book, hooks wrote about performing his action "to transgress,." hooks was inspired by a Paolo Freire book arguing that the "banking model" of this duty hurts "the oppressed."

ANSWER: **teaching** [or **pedagogy**] <Bollinger>

2. A brown dwarf is distinguished from a red dwarf by the presence of this element in its spectra. For 10 points each:

[10] Name this heavy element produced by the big bang nucleosynthesis whose quantity in the universe was further increased by the subsequent decay of beryllium-7.

ANSWER: **lithium**-7

[10] Lithium-7 collides with this particle to form two helium-4 nuclei. This particle names a cycle where two of them combine to form deuterium in its first step, after one beta decays into a neutron.

ANSWER: **proton**

[10] Thirteen helium-4 nuclei and some neutrons are produced when this isotope of iron is hit by a photon during supernovae, a process called photodisintegration. It has the second-highest binding energy of the iron isotopes.

ANSWER: iron-**56** <Prieto>

3. The word "traveling" is inscribed on business cards bought from this place, because the owner of the cards doesn't ever know where she'll be. For 10 points each:

[10] Name this location in New York which is visited by a woman whenever she has the "mean reds" because "nothing very bad could happen to you" at this place.

ANSWER: **Tiffany's** [or **Tiffany** and Company]

[10] This writer, Harper Lee's childhood friend, wrote *Breakfast at Tiffany's* and the nonfiction novel *In Cold Blood*.

ANSWER: Truman **Capote** [or Truman Streckfus **Persons**]

[10] *In Cold Blood* centers on the quadruple murder of this Kansas family.

ANSWER: the **Clutter** family <Sy>

4. Pyotr Kapitsa's experiments with this phase below the lambda point led him to coin the term superfluid. For 10 points each:

[10] Name this phase of helium for which Landau proposed the two-fluid model, explaining superfluidity in terms of phonons and rotons.

ANSWER: superfluid helium **II**

[10] Helium-4's phase diagram is kind of cool because it notably lacks one of these points at which the solid, liquid, and gas phases all exist in equilibrium, due to the fact that solid helium can only be formed above 25 atmospheres of pressure, at absolute zero.

ANSWER: **triple** point

[10] Near absolute zero, solid helium takes on this crystal lattice, though at higher temperatures it's known to be a bcc or fcc lattice. This non-cubic lattice has a packing density of 74%.

ANSWER: **hcp** [or **hexagonal close packed**] <Golimlim>

5. This character earns a commission in the Life Guards Green, where he serves as a "heavy dragoon with strong desires and small brains." For 10 points each:

[10] Name this son of Sir Pitt, who makes a marriage to a governess after she fails to marry Joseph. This character abandons his wife after concluding that she only cares about money, eventually dying on Coventry Island.

ANSWER: **Rawdon** Crawley [or **Rawdon Crawley**; prompt on **Crawley**]

[10] Rawdon Crawley marries this woman, who leaves Miss Pinkerton's Academy with Amelia Sedley. This protagonist of an 1848 novel is confounded in her first attempts to get married by the machinations of George Osborne.

ANSWER: **Becky** Sharp [or Becky **Sharp**; or **Rebecca** Sharp]

[10] Becky Sharp is the protagonist of this William Makepeace Thackeray novel.

ANSWER: **Vanity Fair** <Sy>

6. The Mu'tazilah and Ash'ariyya were two major schools of this form of theology. For 10 points each:

[10] Give this term for a "rationalist theology" of Islam, which is sometimes translated as "dialectic," and which derives from a term meaning "word of God."

ANSWER: **Kalam** [or **Kalam** Allah]

[10] Ibn Hanbal was flogged for refusing to believe that this text was created by Allah and not co-eternal with him. The Mu'tazilites espoused that doctrine about this Islamic holy book.

ANSWER: **Quran** [or **Koran**]

[10] The first of the Mu'tazilites' Five Doctrines is *tawhid*, which refers to this doctrine that is also stated in the first part of the *shahada*.

ANSWER: **monotheism** [or word forms; or obvious equivalents] <Yu>

7. This artist glued a red fence onto a canvas in which a faceless man reaches for a red-and-blue disc and a ghastly woman waves a knife at the title bird. For 10 points each:

[10] Name this German surrealist painter of *Two Children are Threatened by a Nightingale*, whose alter ego was an anthropomorphic bird named Loplop.

ANSWER: Max **Ernst**

[10] Max Ernst included an uncomfortable-looking brown fish resting upon a white tablecloth in his parody of this Edouard Manet which caused a stir for portraying a nude woman in the company of two clothed men.

ANSWER: *The **Luncheon on the Grass*** [or *Le **Déjeuner sur L'Herbe***]

[10] Ernst created many forest and cityscape scenes using this technique in which paint is applied to a canvas and then partially scraped off.

ANSWER: **grattage** <Saric>

8. During this event, a man was questioned about having read *The Exorcist* and if he ever had used the term "Long Dong Silver." For 10 points each:

[10] Name this 1991 event involving a replacement for William Brennan. It centered on the possible displays of sexual harassment carried out by a man while he worked at the Education Department and the Equal Employment Opportunity Commission.

ANSWER: The Clarence **Thomas** confirmation **hearings** for the **Supreme Court** [accept obvious equivalents]

[10] Florynce Kennedy compared the Thomas nomination to the Supreme Court to the failed nomination of this former Solicitor General in 1987 by Ronald Reagan. This man's name has become synonymous with focused opposition against Court nominees.

ANSWER: Robert **Bork**

[10] Thomas memorably compared the confirmation hearing to a "high tech" example of one of these events during his denunciation of the accusations.

ANSWER: **lynching** [do not accept any other answers] <Cheyne>

9. Answer the following about Britain's involvement in the Arab world, for 10 points each:

[10] In his autobiography *Seven Pillars of Wisdom*, this officer described his experiences leading a revolt against the Ottoman Empire during World War I.

ANSWER: T.E. **Lawrence** [or Thomas Edward **Lawrence**; or **Lawrence of Arabia**]

[10] This document, sent to Baron Rothschild by David Lloyd George's Foreign Secretary, promised the establishment of a Zionist state in Palestine.

ANSWER: **Balfour** Declaration

[10] In this country, British officers shot a village's domesticated pigeons in the Denshawai Incident. Anti-British sentiments led to the establishment of the Wafd Party in this country.

ANSWER: **Egypt** [or Arab Republic of **Egypt**; or Jumhuriyyat **Misr** al-Arabiyyah] <Golimlim>

10. An F minor piece in this genre, marked *Allegro agitato molto*, is included in a collection alongside *Feux follets* and *Wilde Jagd*. For 10 points each:

[10] Name this genre which characterizes *Un sospiro*, included in a set of *Three Concert* varieties of these pieces, and a piece in G-sharp minor based on Niccolò Paganini's Violin Concerto No. 2.

ANSWER: **etudes**

[10] The composer of those etudes also wrote this set of four pieces, which begins with a depiction of "The Dance in the Village Inn," and is sometimes grouped with the *Bagatelle sans tonalité*.

ANSWER: **Mephisto Waltzes** [or **Mephisto-Valses**]

[10] This composer wrote the *Transcendental Etudes*, the *Mephisto Waltzes*, and a collection of nineteen *Hungarian Rhapsodies*.

ANSWER: Franz **Liszt** [or Franz Ritter von **Liszt**; or **Liszt** Ferenc] <Kim>

11. Marco Polo recounted how this archipelago's inhabitants had dog-like heads. For 10 points each:

[10] Name this island group that composes a union territory with the Nicobar Islands.

ANSWER: **Andaman** Islands

[10] Other union territories owned by this country include Daman and Diu, which were seized from the Portuguese. This country has fought over the Siachen Glacier with its western neighbor, Pakistan.

ANSWER: **India** [or Republic of **India**; or **Bharat** Ganarajya]

[10] These people inhabit a small island west of the main Andaman archipelago and remain virtually devoid of outsider influence. After killing two fishermen, they were able to repel a rescue helicopter with mere arrows.

ANSWER: **Sentinelese** people [or answers that mention North **Sentinel** Island] <Golimlim>

12. This title was held by a man who called on Pope Zachary to depose Childeric III. For 10 points each:

[10] Give this title bestowed upon officers of the Frankish king's household. The holders of this title gained more power during the reigns of the so-called "do-nothing" kings.

ANSWER: **Mayor of the Palace** [or **Major Palatii**]

[10] That aforementioned usurper of Childeric III had this name. A different man of this name from Herstal abolished the title of Mayor of the Palace, instead opting to call himself Duke of the Franks.

ANSWER: **Pepin** [or **Pepin** the Short; or **Pepin** of Herstal]

[10] This founder of the Carolingian dynasty was Pepin the Short's oldest son. He was crowned Holy Roman Emperor on Christmas Day.

ANSWER: **Charlemagne** [or **Charles the Great**; or **Charles I**; or **Carolus Magnus**] <Golimlim>

13. After this character saves the land of Amaurots, he marries the king, Anarchus, to a lantern-carrying hag and makes him the crier of green sauce. For 10 points each:

[10] Name this Rabelais character who is so troublesome as an infant that he is bound with four great chains by his father, Gargantua.

ANSWER: **Pantagruel**

[10] During his travels, Pantagruel befriends this scoundrel, who knows 63 ways to make money and 214 ways to spend it, and eventually makes him Laird of Salmigondin.

ANSWER: **Panurge**

[10] This minister of the Abbey of Theleme accompanies Panurge to the Oracle of the Holy Bottle when the trickster decides that he wants to get married.

ANSWER: Friar **John** [prompt on the **Friar**] <Gupta>

14. These contracts allow, but do not require, one party to buy or sell something at the strike price. For 10 points each:

[10] Name this type of financial contract, which is typically divided into "call" and "put" varieties.

ANSWER: **options**

[10] This model uses a stochastic differential equation to determine the appropriate premium for a call option. Robert Merton, who independently derived it, shared the 1997 Nobel Prize in Economics with one of its developers.

ANSWER: **Black-Scholes** model [or **Black** and **Scholes**; or the names in reverse order]

[10] One of the assumptions of the Black-Scholes model is that the option is of this type, which allows the buyer to purchase or sell an asset only on the day the option expires.

ANSWER: **European** option <Wynne>

15. A falcon flies up to a tower in the estate of Heimir, where this character, Heimir's sister-in-law, dutifully embroiders a tapestry. For 10 points each:

[10] Name this woman who secludes herself in a castle surrounded by a wall of flame, which is breached by Sigurd, disguised as Gunnar, who spends three nights next to her with his sword placed between them.

ANSWER: **Brynhildr** [or **Brunhild**]

[10] Earlier in life, Brynhild had arbitrated a dispute between Agnar and Hjalgunnar in her role as one of these Norse shieldmaidens, who bring deceased warriors to Valhalla.

ANSWER: **valkyries**

[10] Sigurd and Brynhild fall in love after he reaches the summit of a mountain by crossing yet another circle of flame, and wakes the sleeping woman by performing two actions. Name either.

ANSWER: **removing her helmet** and **cutting off her armor** [either answer is acceptable, but prompt on **taking off her armor** or **taking off her clothes**] <Gupta>

16. In his essay "On Humor," Luigi Pirandello defends as a priest from this novel who throws a tablecloth in a woman's face and drops a lamp to thwart an attack in his study. For 10 points each:

[10] Name this Italian novel in which Don Rodrigo covets Lucia, who is engaged to the silk-weaver Renzo.

ANSWER: The Betrothed [or I promessi sposi]

[10] *The Betrothed* and its appendix, *The Column of Infamy*, contain detailed descriptions of an outbreak of this disease that ravaged Milan in 1630. The ten protagonists of Boccaccio's *Decameron* flee Florence to avoid this disease.

ANSWER: bubonic plague [or the Black Death]

[10] Together with the *Divine Comedy*, *The Betrothed* was instrumental in establishing this dialect as the basis for the standard Italian language.

ANSWER: Tuscan dialect <Gupta>

17. This government's PIDE security force would often send political dissidents to the Camp of the Slow Death, especially after the Academic Crisis. For 10 points each,

[10] Name this staunchly Catholic government ruled by Antonio Salazar.

ANSWER: Estado Novo

[10] The Estado Novo ruled this European nation. After said government's overthrow in the Carnation Revolution, this nation lost its colonial holdings, including Mozambique.

ANSWER: Portugal

[10] This politician and Air Force general was murdered in Spain after he was exiled for opposing the regime. He lost an election to Américo Tomás, after which he fled to Rome to form the Portugese National Liberation Front.

ANSWER: Humberto da Silva Delgado <Mukherjee>

18. Vantablack, the blackest substance known, is composed of these structures. For 10 points each:

[10] Name these long, hollow, cylindrical allotropes of carbon that are classified as "single-walled" or "multi-walled."

ANSWER: carbon nanotubes [prompt on fullerenes]

[10] The solubility of single-wall carbon nanotubes can be bolstered by adding this kind of nitrogen-containing compound to their sidewalls. These compounds couple two aryl groups in the Gomberg-Bachmann reaction, and decompose in the presence of copper I (**one**) compounds in the Sandmeyer reaction.

ANSWER: diazonium salts [or diazonium compounds]

[10] The Peierls distortion in carbon nanotubes generates a very small example of this quantity compared to thermal fluctuations. This quantity is the difference in energy between namesake valence and conduction regions.

ANSWER: band gap [prompt on partial answer] <Gupta>

19. Type 3 secretion systems are frequently located in regions where this action has occurred. For 10 points each:

[10] Name this process that can occur via conjugation using the F-plasmid. Other mechanisms for this process include transformation and transduction.

ANSWER: **horizontal gene transfer** [or **lateral gene transfer**; or **HGT**; or **LGT**]

[10] The "retro" type of these genetic sequences consist of LTRs, LINEs, and SINEs and have an RNA intermediate. These elements were identified by Barbara McClintock and are able to move to other positions in the genome.

ANSWER: **transposons** [or retro**transposon**; or **transposable element**; or **jumping gene**; prompt on **TE**]

[10] These regions of a genome are acquired through horizontal gene transfer. Their "pathogenicity" types carry virulence factors such as type 3 secretion systems, toxins, and superantigens.

ANSWER: **islands** [or pathogenicity **islands**; prompt on **PAI**] <Smart>

20. This material was often faced with irregular stones, tuff blocks arranged in a diamond pattern, and regularly-laid brick, in techniques respectively known as *opus incertum*, *opus reticulatum*, and *opus latericium*. For 10 points each:

[10] Name this Roman composite building material made from volcanic *pozzolana*, pumice, and quicklime. This material was not used for eight centuries after the fall of the Roman Empire.

ANSWER: **concrete** [or *opus caementicium*; prompt on **cement**]

[10] An oculus is positioned at the apex of the world's largest unreinforced concrete dome in this Roman temple, which despite its name was not dedicated to all the gods.

ANSWER: **Pantheon**

[10] Roman architects adjusted the formula for concrete when building the breakwaters for the gigantic Sebastos harbor in this city, established by Herod the Great as an administrative capital for Roman Judea.

ANSWER: **Caesarea** [or **Caesarea** Maritima; or **Caesarea** Palaestinae; or Horbat **Qesari**] <Gupta>

21. While serving this emperor, Dong Zhongshu first established Confucianism as state doctrine for China. For 10 points each:

[10] Name this emperor of the 2nd century BCE. He sent out expeditions to retrieve blood-sweating "heavenly horses" from the Fergana valley and to fight the Xiongnu to his north.

ANSWER: **Wu Di** [or Emperor **Wu**; or **Liu Che**]

[10] Wu Di was a prominent emperor of this dynasty, which controlled the eastern part of the Silk Road as Augustus declared himself emperor of Rome. It names China's dominant ethnic group.

ANSWER: **Han** dynasty

[10] The Han dynasty was briefly interrupted by this commander's Xin dynasty, which lasted from 9 to 23 CE.

ANSWER: **Wang Mang** <Jackson>