

2015 NSC - Official Scoresheet

Round	10	Room	
Bracket			
Reader			

Team									Team								
Player Names																	
Q#					Bonus	Steals	Ques. Total	Run. Score						Bonus	Steals	Ques. Total	Run. score
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SD																	
Player 20s																	
Player 10s																	
Point totals																	
Final score																	
	Substitutions before Tossup 11								Substitutions before Tossup 11								
	Out:				In:				Out:				In:				
	Out:				In:				Out:				In:				

Circle winning team above. Clearly mark if game goes to OT/SD. Fill out "Point totals" row completely. If there are substitutions, please note tossups by each player in "20s" and "10s" rows. Below is for Tab Room use only:

RH	RS	BH	BS	Left	Right	BH	BS	RH	RS
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PACE NSC 2015 - Round 10 - Tossups

1. This poet first raised a recurring subject of his in a poem that described how "Everywhere the eye concedes to / Encroaching horizon, / Is wooed into the cyclops' eye / Of a tarn." The work of P.V. Glob inspired his poem "Tolland Man", a pseudo-sequel to the aforementioned poem from *Door to the Dark*. This author of several "bog poems" included a collection titled "Sweeney Redivivus" in his collection (*) *Station Island*. The speaker of another of his poems vows to use the "squat pen" resting "between my finger and my thumb" to perform the title action, which both his father and grandfather did with a spade. That poem, "Digging", was published in his collection *Death of a Naturalist*. For 10 points, name this Irish author of a famed 1996 translation of *Beowulf*.

ANSWER: Seamus Heaney [or Seamus Justin Heaney] <Bentley>

2. In the IS-LM model, the LM function is bounded by the liquidity preference and this other quantity. In a liquidity trap, fluctuations of this quantity do not correspond to fluctuations in price levels. This quantity is equal to the base times the inverse of the reserve ratio when institutions employ a fractional-reserve policy. A broad definition of this quantity includes negotiable order of withdrawals and certificates of deposits as well as (*) savings accounts and travelers checks. Those various components of this quantity are split into groups called M0, M1, and M2, which distinguish between that left in the bank and the amount of this value in circulation. For 10 points, name this value, which can be defined as the total quantity of currency in the economy.

ANSWER: money supply [or supply of money; or money stock; prompt on money] <Jose>

3. In one of his operas, two characters remember how they both witnessed the appearance of a beautiful veiled woman, and now they notice that their hands push each other apart. One of those characters later burns his village to allow his love interest and his rival to escape execution. This composer adapted material from the carol "March of the Kings" into the "Farandole (fa-run-dole)" that closes his (*) *L'Arlesienne (labr-lay-syen) Suite No. 2*. Nadir and Zurga sing this composer's aria "Au fond du temple saint," better known as the "Friendship Duet." Another of his operas features Escamillo singing the "Toreador Song," and ends with Don José stabbing the title gypsy girl. For 10 points, name this French composer of *The Pearl Fishers* and *Carmen*.

ANSWER: Georges Bizet <Rosenberg>

4. Near the end of Jacob's life, he blesses his son Judah by comparing him to this animal. A dead variety of this animal inspires the riddle "Out of the eater, something to eat; out of the strong, something sweet." The faces of an ox, a man, an eagle, and this animal characterize the drivers of the flaming chariot in Ezekiel's vision. A swarm of bees populate the carcass of one of these animals discovered by (*) Samson on his way to marry Delilah. When satraps push through a thirty-day ban on worshiping anyone who is not Darius, a righteous Jewish official is to be punished by being fed to these animals, but their mouths are kept shut by an angel. For 10 points, identify these animals which populate a den in which Daniel is imprisoned.

ANSWER: lions [or Panthero leo; or P. leo] <Kim>

5. Visitors to this city can spin around on top of a floor mosaic of a bull for good luck, below a massive glass dome in a glass-covered shopping complex. The Fininvest holding company was founded in this city. This city, which founded a renowned tram system in 1881 which maintains an orange color scheme, contains an Arch of Peace lying at the northwest end of its Sempione Park. Expo (*) 2015 began in this city on May 1. Malpensa airport brings visitors into this city, whose reputation as the financial center of its country grew in part due to native media tycoon Silvio Berlusconi. The Galleria Vittorio Emanuele is in this city, whose opera house is called La Scala. For 10 points, name this capital of Lombardy, a bustling city of northwestern Italy.

ANSWER: Milan, Italy <Jackson>

6. A very strong form of this statement holds in spaces like the p-adics. Along with symmetry and non-negativity restriction, this statement must be true for a distance function to be a metric. The generalization of this statement to the p-norm is named for Minkowski, and it can also be derived from a statement named for (*) Cauchy and Schwarz. One reformulation of it states that absolute value of quantity x plus y is less than or equal to absolute value of x plus absolute value of y. This statement follows from the law of cosines, because the magnitude of cosine in the namesake shapes is less than one. For 10 points, identify this statement which says that, for a certain three-sided figure, a plus b is greater than c.

ANSWER: triangle inequality [prompt on ultrametric inequality before the word metric is said, do not accept "Cauchy-Schwarz" inequality at any point] <Schindler>

7. A character created by this author observes a pack of stubborn mules on a bridge, then returns home and beats his wife, hoping that she'll make him his favorite meal. A book by this author with the subtitle "Prince Galehaut" contains a story beginning with King Solomon ordering a man to visit the Bridge of Geese. Christine de Pizan was inspired by a collection of 106 biographies of (*) women by this man, who fictionalized his muse as "Fiammetta". In a story by this man, the Marquis of Saluzzo pretends to have his first two children killed in order to test the patience of his wife Griselda. Seven men and three women go to Fiesole in the countryside to avoid the Black Death in Florence in his most famous work. For 10 points, name this Italian author of *The Decameron*.

ANSWER: Giovanni Boccaccio <Jose>

8. This scientist is the first namesake of a strip reaction in which a deuterium nucleus gives a neutron to a heavier nucleus, causing the release of a proton. A *Physical Review* paper written by Hartland Snyder and this physicist provided the modern concept of a black hole. With Tolman and Volkoff, he calculated the upper bound on the mass of a neutron star. He is the second namesake of a statement that permits factorization of an atomic (*) wavefunction by fixing the position of the nucleus and factoring out the electronic wavefunction, an approximation he names with Max Born. He quoted from the *Bhagavad Gita* after the success of the Trinity test near Alamogordo, New Mexico in 1945. For 10 points, name this American physicist who directed Los Alamos National Laboratory during the Manhattan Project.

ANSWER: Robert Oppenheimer [or Julius Robert Oppenheimer] <Silverman>

9. In one campaign, this man vowed that his first act in office would be to fire Carey McWilliams, who did not share his anti-Japanese-American views. In 1948 this man was unable to deliver his home state for his running mate, Thomas Dewey. This man proposed a compulsory state health care system in 1945 while serving as Governor of California. Eisenhower claimed he made a "damned-fool mistake" about this successor to (*) Fred Vinson. This man was the subject of a 1961 campaign by the John Birch Society that called for his impeachment. This judge ordered that "all deliberate speed" be used to carry out his decision in a case that overturned *Plessy v. Ferguson*. For 10 points, name this Chief Justice of the Supreme Court who wrote the *Brown v. Board* decision.

ANSWER: Earl Warren <Bentley>

10. This present-day country was the place where a highly-regarded wine called *cerentum* was produced. Because it was manufactured by skilled swordsmiths from this present-day country, the *gladius* was nicknamed the sword of this place. In this present-day country, Metellus Pius was deadlocked against the rogue general Quintus Sertorius for three years until Pompey's arrival. The province corresponding to this country was divided into regions marked (*) "Citerior" and "Ulterior." The emperors Hadrian and Trajan were born in what is now this country, where the siege of Saguntum triggered the start of the Second Punic War. The Visigoths settled in this country and its smaller western neighbor. For 10 points, name this present-day country corresponding to the Roman province of Hispania.

ANSWER: Spain [or Espana; or Kingdom of Spain; or Reino de Espana] <Gupta>

11. The final section of this poem claims that "it was evening all afternoon". A man who "rode over Connecticut in a glass coach" mistook the subject of this poem for "the shadow of his equipage". Its speaker claims to know "noble accents and lucid, inescapable rhythms" but notes that the subject of the poem "is involved in what I know". This poem contrasts the "beauty of inflections" with the "beauty of (*) innuendos". One section of this poem opens by mentioning the "thin men of Haddam", while in another, the speaker looks through icicles for the shadow of the title creature, whose eye is the only moving thing "among twenty snowy mountains". For 10 points, name this Wallace Stevens poem about various perspectives on a certain animal.

ANSWER: "Thirteen Ways of Looking at a Blackbird" <Sy>

12. This artist painted stones falling out of the arches of a building while the king who ordered its construction oversees his workers. He made a series of six panels depicting different times of the year, although the panel depicting late spring is lost. In one of those paintings, three men and their dogs return from an unsuccessful trip, and silhouettes can be seen ice skating in the distance. In another of his paintings, bowls of soup at a (*) feast are carried on a door that has been removed from its hinges. This artist of *The Tower of Babel* and *Hunters in the Snow* painted a mythical character drowning in the sea, unnoticed by the shepherd on a cliff. For 10 points, name this Flemish painter of *The Peasant Wedding* and *Landscape with the Fall of Icarus*.

ANSWER: Pieter Bruegel the Elder <Rosenberg>

13. This event disrupted a community of drug-addled aristocrats called the Happy Valley set. During this event, prisoners classified as "White," "Grey," and "Black," were moved up and down the Pipeline concentration camp system. In response to this event, land was redistributed to families via the Swynnerton Plan. Rawson Macuria claimed that participants in this event practiced blood-drinking initiations during the trial of the Kapenguria Six. General (*) China led forces in this conflict, during which Operation Anvil occurred. This rebellion prompted Governor Evelyn Baring to declare a State of Emergency, and it was begun by the Kikuyu-dominated Land and Freedom Army. For 10 points, name this rebellion against British rule in Kenya.

ANSWER: Mau Mau Uprising [or equivalents such as Mau Mau Rebellion; or Kenya Emergency until "Kenya" is read] <Brownstein>

14. This author wrote a poem that describes a scene "in the childhood of the world" in which a group calls for "milky sap" and "honey from the hollow oak". A mention of a "still, small voice of calm" ends a poem by this man that was the source of the hymn "Dear Lord and Father of Mankind". The uncle tells hunting stories and the schoolmaster relays news from Dartmouth in a poem by this man whose speaker wakes up after a storm to "no cloud above, no earth below, / a universe of (*) sky and snow!" In a poem by this author of "The Brewing of Soma", Stonewall Jackson orders his men not to harm the title character, who says "Shoot, if you must, this old gray head, / But spare your country's flag". For 10 points, name this Quaker poet of "Snow-Bound" and "Barbara Frietchie".

ANSWER: John Greenleaf Whittier <Carson>

15. This man was abandoned by his cosmographer Ruy Faleiro, who either went insane or was spooked by an unfavorable horoscope. This man suppressed a mutiny on Easter day led by Juan de Cartagena (car-ta-HAY-na), an event chronicled by the scholar Antonio Pigafetta. This man ran into trouble when the *San Antonio* abandoned the other ships at the Cape of the Virgins. Charles I of (*) Spain asked this man to find a route to the Spice Islands. The chieftain Lapu-Lapu is revered as a hero on the island of Cebu for defeating this man. Juan Sebastian del Cano, sailing aboard the *Victoria*, completed the voyage after this man was killed by natives in the Battle of Mactan in 1521 in the Philippines. For 10 points, name this explorer who led the first expedition to circumnavigate the Earth.

ANSWER: Ferdinand Magellan [or Fernão de Magalhães or Fernando de Magallanes or Hernando de Magallanes or Fernando de Magallanes] <Bentley>

16. In 20th century philosophy, the question of what does or doesn't count as this activity was the "problem of demarcation." A 1962 book defined the "normal" type of this activity as an accumulation of results from "problem-solving," and used Wittgenstein's image of the "duckrabbit" to show how different types of it might perceive differently. This activity is disrupted during times of "paradigm shift" according to philosopher (*) Thomas Kuhn, and its claims must be falsifiable according to Karl Popper's work on this type of discovery. In 1620, a new way of doing this was proposed in *Novum Organum*. For 10 points, name this method of academic inquiry championed by Francis Bacon, whose "revolutions" might replace ideas such as Newtonian physics with special relativity.

ANSWER: science [or scientific method; or scientific research; or scientific revolutions] <Jackson>

17. The second subject of this symphony's first movement is unusually stated in the submediant G major in the exposition, but in D major in the recapitulation. The second movement is marked "andante con moto" and is in E major. Although not premiered until 1865, decades after its composer's death, this is the earliest symphony in B minor in the standard repertoire. August Ludwig modified this symphony by (*) adding a "Philosopher's Scherzo" and a "March of Destiny." It has been theorized that an entr'acte from the composer's incidental music to *Rosamunde* was intended to serve as the finale. It was followed up by its composer's "Great" C Major symphony. For 10 points, name this symphony by Franz Schubert with only two complete movements.

ANSWER: Unfinished *Symphony* [or Franz Schubert's *Symphony No. 8*; Schubert's name is not required after it is read] <Rosenberg>

18. This compound has two ESCA peaks, at 14.2 and 22.9 electron-volts, which valence bond theory cannot predict. This is the simplest compound whose bond angles exactly equal the arccosine of negative one-third. Bacteria can metabolize glucose to three molecules of carbon dioxide and three molecules of this compound. It reacts with water during steam reforming to make syngas, and it is triply chlorinated to make (*) chloroform. This compound is stored in ice in clathrates. After carbon dioxide, this compound is the second most common greenhouse gas emitted by humans. It is the most reduced form of carbon. One mole of this compound combusts with oxygen to form one mole of carbon dioxide and two moles of water. For 10 points, name this tetrahedral alkane found in natural gas, with formula CH₄.

ANSWER: methane [or CH₄ until it is read] <Silverman>

19. The lumen of this structure contains BiP, or binding immunoglobulin protein. The desmotubule passes through the plasmodesmata and links two of these organelles in adjacent cells. In eukaryotes, signal recognition particle targets proteins and sends them to the translocons on this organelle's membrane. In excitation-contraction coupling, large stores of (*) calcium are released from a specialized form of this organelle in myocytes. One form of this organelle metabolizes lipids and detoxifies drugs, whereas another type is covered with ribosomes. Membrane-bound vesicles shuttle between the Golgi apparatus and this organelle. For 10 points, name this organelle, a network of flattened sacs that comes in "smooth" and "rough" forms.

ANSWER: endoplasmic reticulum [or sarcoplasmic reticulum; or ER; or SR; or smooth endoplasmic reticulum; or smooth ER; or SER; or rough endoplasmic reticulum; or rough ER; or RER] <Gupta>

20. This man is once taunted for having "the face of a dog but the heart of a deer." This man is forced from the battlefield by a wound inflicted by Coon (co-ON), who tries to avenge his brother Iphidamas. This man enters his house on an ornate purple carpet with his war bride, Cassandra, in tow. After Apollo sends a plague in response to this man's capture of Chryseis, he pilfers another man's war prize (*) Briseis. This man is ensnared in a robe and chopped with an axe in his bath by Aegisthus and his adulterous wife. This man, who sacrifices his daughter Iphigenia to garner a favorable wind for his fleet, alienates Achilles at the start of the *Iliad*. For 10 points, name this king of Mycenae and husband of Clytemnestra, who leads the Greeks during the Trojan War.

ANSWER: Agamemnon <Gupta>

21. A chapter in this text likens virtuous people to newborns who have a strong grip despite their brittle bones and weak muscles. According to this text, the Heaven and Earth are just as heartless as humans who fashion straw dogs to use in sacrifices. The sixth chapter of this text exalts the "mysterious female" for her role in bridging Heaven and Earth. This text declares that "Knowing others is (*) intelligence," but "Knowing yourself is true wisdom." The second line of this text declares that "the names that can be named are not unvarying names." This text, which is more popular than the similar *Zhuangzi*, (**JUANG zeh**) promotes a paradoxical action through non-action, known as *wu wei*. For 10 points, name this key Taoist text sometimes named for its author, Lao-tzu.

ANSWER: Daodejing [or Tao Te Ching; or Lao-tzu before mentioned] <Gupta>

22. This author wrote a story in which a syphilitic soldier overhears a conversation between Scipio and Berganza about how they can talk even though they are animals. After one of this man's characters refuses to pay at an inn, another character is wrapped in a blanket and tossed up and down. A rash of spurious sequels to a work that this man initially attributed to (*) "Cide Hamete Benengeli" caused him to write a continuation ten years later. "The Colloquy of the Dogs" is one of this man's *Exemplary Novels*. The title character of another of his novels confuses a washbasin for the helmet of Mambrino, names his horse Rocinante and an unsuspecting village girl Dulcinea, and tilts at windmills with his friend Sancho Panza. For 10 points, name this author of *Don Quixote*.

ANSWER: Miguel de Cervantes <Jose>

23. This man called for leniency in punishing James Nayler for recreating Christ's entry into Jerusalem. This man was given the power to appoint a new chamber of government in the Humble Petition and Advice. This man built a pontoon bridge over the Thames to win the Battle of Worcester, one year to the day after he defeated the Scots at the Battle of Dunbar. This man's son-in-law Henry Ireton was captured by Prince (*) Rupert of the Rhine at the Battle of Naseby. Large numbers of prisoners and civilians were killed during the Siege of Drogheda during this man's invasion of Ireland. This commander of the New Model Army was briefly succeeded by his son, Richard, who himself was succeeded by Charles II. For 10 points, name this Lord Protector of England.

ANSWER: Oliver Cromwell <Bentley>

24. In natural units, this quantity equals 0.303, or the square root of four pi times the fine structure constant. The product of this quantity, the Josephson constant, and the von Klitzing constant equals two. It is raised to the fourth power in the Rydberg formula. An experimental measurement of this quantity, which differed from the true value by five standard deviations, was described as "Cargo Cult Science" by Richard Feynman. For quarks, this constant is prefixed by either (*) two-thirds or negative-one-third. This constant was determined by manipulating voltage until the terminal velocity of falling oil droplets was reached. For 10 points, name this constant measured by Millikan, whose magnitude is around 1.6 times ten to the negative nineteen, and which is symbolized e.

ANSWER: elementary charge [or e until it is read; or fundamental charge; or charge on a proton; or charge on an electron] <Silverman>



PACE NSC 2015 - Round 10 - Bonuses

1. The false Messiah Shabbetai Zvi took this action in the court of Mehmed IV, who gave him the choice of doing this or magically surviving a hail of arrows. For 10 points each:

[10] Name this religious action which requires the undergoer to have a type of intent called *niyyah* and two credible witnesses.

ANSWER: **conversion** to **Islam** [accept equivalents, such as **becoming Muslim**]

[10] Converts to Islam must say this phrase known by a one-word name, the declaration that there is no god but Allah, whose messenger is Muhammad.

ANSWER: **Shahadah**

[10] The Shahadah is the first of these obligations of the Muslim faith, which also includes *salat*, *zakat*, and *sawm*.

ANSWER: Five **Pillars** of Islam [or **arkan** al-Islam] <Jackson>

2. Christian missionaries in this modern-day country were persecuted by Queen Ranavalona I, who reversed many of the policies of her husband and predecessor. For 10 points each:

[10] Name this island country home to ruins of the Merina culture, which was first turned into a kingdom by Radama I.

ANSWER: **Madagascar** [or Kingdom of **Madagascar** or Republic of **Madagascar**]

[10] The so-called Red Togas resisted the rule of this colonial power on Madagascar in the early 20th century. This European nation's other African colonies included modern-day Gabon and the Ivory Coast.

ANSWER: **France** [or **French** Republic]

[10] The Malagasy language is closely related to the Barito languages of this distant island, whose peoples may have settled Madagascar centuries ago. The English Brooke family ruled as "White Rajahs" of this island's Kingdom of Sarawak.

ANSWER: **Borneo** [or **Kalimantan**] <Bentley>

3. Many cases of situs inversus, an exceedingly rare condition where visceral organs develop mirrored, or reversed, from where they should be, are due to a condition that immobilizes these structures. For 10 points each:

[10] Name these small, hair-like projections that work in concert with structurally-similar flagella to move cells.

ANSWER: **cilia** [or **cilium**; or motile **cilia**; or primary **cilia**; or non-motile **cilia**]

[10] A specialized, non-motile cilium connects the outer segment and cell body of these photoreceptor cells, which are concentrated on the outer edges of the retina and detect light of low intensity.

ANSWER: **rod** cells [or **rods**]

[10] Ciliogenesis requires outward intraflagellar transport, driven by this family of molecular motors that uses ATP to "walk" to the positive end of microtubules. Dyneins (**DIE-neens**) go the other way.

ANSWER: **kinesins** <Gupta>

4. Answer the following about Seneca the Younger, for 10 points each.

[10] He wrote a satirical piece named for the "pumpkinification" of this ruler. Robert Graves wrote a pair of historical novels narrated by this Roman Emperor, titled *I, [this man]*, and *[this man] the God*.

ANSWER: Tiberius **Claudius** Caesar Augustus Germanicus [do not prompt on any partial answers; accept *I, Claudius* or *Claudius the God*]

[10] Seneca's bloody tragedies inspired a genre of Elizabethan and Jacobean drama named for this concept, examples of which include Shakespeare's *Titus Andronicus*. Thomas Kyd's *The Spanish Tragedy*, the first play in that genre, includes a personification of this concept in the chorus.

ANSWER: **revenge** [accept **revenge** tragedy or **revenge** play; answer must include the word **revenge**]

[10] Seneca was forced to commit suicide in the wake of the Pisonian conspiracy, as was this other Roman playwright, Seneca's nephew. This man wrote an epic poem about the civil war between Pompey and Julius Caesar called *Pharsalia*.

ANSWER: **Lucan** [or Marcus Annaeus **Lucanus**] <Jose>

5. Battus is turned into stone when he witnesses the theft of this type of property but fails to keep it secret. For 10 points each:

[10] Identify this type of property whose theft is forgiven when it is exchanged for a lyre created out of a tortoise shell.

ANSWER: a herd of **cattle** [or Apollo's **cattle**; or obvious equivalents; prompt on **animals** or **livestock**]

[10] The theft of Apollo's cattle is perpetrated by this Greek deity that wears winged sandals to aid in his duty as a messenger god.

ANSWER: **Hermes** [or **Mercury**]

[10] This son of Aeacus protects his own herd of cattle by praying for a wolf to turn into stone. At this man's wedding, Eris rolls a golden apple inscribed "to the fairest."

ANSWER: **Peleus** <Kim>

6. In one of these pieces, the calm variations in the second movement are interrupted by a jarring fully diminished seventh chord, from which the piece rips into the finale. For 10 points each:

[10] Identify these pieces which include the "Hammerklavier," "Waldstein," and "Appassionata."

ANSWER: **piano sonatas** [of Ludwig van Beethoven; prompt on **sonatas** or nonspecific answers mentioning **Beethoven**]

[10] Those piano sonatas were all by Beethoven, whose earlier experiments with variation form included seven variations on this national anthem of the United Kingdom. Beethoven also quoted in it in his *Battle Symphony*.

ANSWER: "**God Save the King**" [or "**God Save the Queen**" or "**My Country Tis of Thee**"]

[10] Beethoven's last major composition for the piano was a set of 33 variations on a waltz by this other Austrian composer. Instead of capping it off with a grand climax as expected, Beethoven wrote a lighthearted minuet for the final variation.

ANSWER: Anton **Diabelli** [or **Diabelli Variations**] <Rosenberg>

7. This poet asked "Who shall say that Fortune grieves him / While the star of hope she leaves him?" in his poem "Ae Fond Kiss" and described how "the best laid plans of mice and men" often go awry in another poem. For 10 points each:

[10] Name this Scottish poet of "To a Mouse" and the popular New Year's Eve song "Auld Lang Syne".

ANSWER: Robert **Burns** [or Rabbie **Burns**; or **Robden of Solway Firth**]

[10] The speaker vows to "love thee still, my dear / While the sands o' life shall run" in a Burns poem that begins by comparing the speaker's love to a "red, red" one of these things.

ANSWER: a red, red **rose** [prompt on **flowers** or **plants**]

[10] Burns's poem "A Man's A Man For A' That" extols the benefits of this virtue. Its first line asks if there is poverty for this quality, and it later notes that this type of man "tho' e'er sae poor, / Is king o' men for a' that."

ANSWER: **honesty** <Mukherjee>

8. A way to optimize this algorithm when facing the "Dutch national flag problem" is to take a "fat pivot" that includes items equal to the pivot. For 10 points each:

[10] Identify this speedy divide-and-conquer sorting algorithm developed by Tony Hoare. In the ordinary variant of this algorithm, items less than or greater than the pivot are placed into two sub-arrays.

ANSWER: **quicksort**

[10] In order to avoid this worst case runtime of quicksort, the input data is often randomized before starting the sort. It is infamously the average case runtime for bubble sort. Express your answer in big O notation.

ANSWER: big O of **n^2** [or **quadratic**; or obvious equivalents; prompt on **polynomial** or **algebraic**]

[10] Randomization is used in these types of algorithms, which have deterministic runtimes but aren't guaranteed to produce correct results. These methods were first developed by Stanislaw Ulam and implemented by John von Neumann on the ENIAC.

ANSWER: **Monte Carlo** algorithms [or **Monte Carlo** methods] <Bentley>

9. In the 1950s, Hollywood stars including Bing Crosby and Jimmy Stewart invested heavily in this industry as a tax dodge. For 10 points each:

[10] Name this industry which Edwin Drake helped start in Titusville, Pennsylvania.

ANSWER: **oil** mining/extraction industry [or **petroleum**; or **crude oil**; prompt on **energy**]

[10] The oil industry suffered public relations setbacks when this tanker ran aground in 1989, causing significant ecological damage to Prince William Sound.

ANSWER: *Exxon* **Valdez**

[10] This largest privately held company in the world produces almost eight billion barrels a year from its wells in the Middle East. Its namesake *World* magazine covers Arabic culture.

ANSWER: Saudi **Aramco** <Bentley>

10. *Moderator note: do not reveal the alternate answer to the first bonus part.*

The man who negotiated this treaty gave the emperor an ultimatum from President Fillmore and then left the country for a year. For 10 points each:

[10] Identify this 1854 treaty which opened up the ports of Shimoda and Hakodate in Japan to American trade.

ANSWER: Treaty of **Kanagawa** [prompt on **Perry** Convention]

[10] The Treaty of Kanagawa was signed after this US Commodore sailed four ships into Tokyo Bay. His brother, Oliver Hazard, was known as the Hero of Lake Erie.

ANSWER: Commodore Matthew Calbraith **Perry**

[10] This right, the right to be exempted from local law was established for foreign traders in Japan in followup agreements to the Treaty of Kanagawa. The Treaty of Nanking granted it to British subjects in China.

ANSWER: **extraterritoriality** [or **extraterritorial** rights; or **extraterritorial** jurisdiction] <Bentley>

11. This man painted part of the 100-days fresco depicting Pope Paul III in Rome's Cancelleria. For 10 points each:

[10] Identify this artist best known for his biography, *Lives of the Most Excellent Painters, Sculptors, and Architects*.

ANSWER: Giorgio **Vasari**

[10] Vasari spuriously claimed that the Bolognese painter Francia died of shame after viewing an excellent painting by this better artist. He painted *The School of Athens*.

ANSWER: **Raphael** [or **Raffaello** Sanzio da Urbino or Raffaello **Sanzio**]

[10] Vasari trained with this "faultless painter" who also taught Il Rosso and Pontormo. Mary stands on a pedestal as two angels grab her legs in this man's painting *Madonna of the Harpies*.

ANSWER: Andrea **del Sarto** <Bentley>

12. In a novel by this author, the Faehmel family eats a cake shaped like St. Anthony's Abbey, which various members designed, built, and blew up. For 10 points each:

[10] Name this German Nobel Laureate who wrote novels such as *The Lost Honor of Katharina Blum* and *Billiards at Half-Past Nine*.

ANSWER: Heinrich Theodor **Böll**

[10] In a Heinrich Böll short story, a family celebrates this holiday every day to prevent Aunt Milla from screaming. Clement Clarke Moore wrote a poem set on the "night before" this holiday.

ANSWER: **Christmas** [or **Weihnachten**]

[10] In 1968, Böll won a literary prize named for this earlier German playwright, who fictionalized events from the French Revolution in *Danton's Death* but never finished his masterpiece *Woyzeck*.

ANSWER: Georg **Büchner** [or Karl Georg **Büchner**] <Brownstein>

13. During his first official trip outside of Rome, Pope Francis condemned the circumstances that allowed one of these events to happen near Lampedusa. For 10 points each:

[10] Identify these events. One of them killed hundreds of people emigrating from Africa in April 2015 off the coast of Libya, and 32 people were killed in another involving the *Costa Concordia* in 2012.

ANSWER: **shipwrecks** [or ship **grounding**; or ship**wreck**; or **capsize**; accept any answer indicating mass **drownings** due to a shipwreck in the Mediterranean Sea]

[10] This current Prime Minister phased out Italy's Mare Nostrum rescue program, in hopes that the cheaper EU-led Triton program would replace it. This onetime Mayor of Florence is the youngest PM in Italy's history.

ANSWER: Matteo **Renzi**

[10] This agency of the EU announced the Triton program in October 2014. This Warsaw-headquartered agency handles undocumented migration and human trafficking on the common frontier of the EU.

ANSWER: **Frontex** [or European Agency for the Management of Operational Cooperation at the **External Borders** of the Member States of the European Union] <Bentley>

14. This man was betrayed by the patrician Giovanni Mocenigo, who lured him to Venice by asking him to become an in-house tutor. For 10 points each:

[10] Name this Dominican friar who was deemed a heretic by the Roman Inquisition for his dogged support for a heliocentric model of the universe, and was burned at the stake in 1600.

ANSWER: Giordano **Bruno** [or Filippo **Bruno**; or Iordanus **Brunus** Nolanus; prompt on Il **Nolano**; prompt on **Nolanus**]

[10] Bruno was a contemporary of this scientist, who was placed under house arrest for writing *Dialogue Concerning the Two Chief World Systems*, but was not killed. He discovered the moons Ganymede, Io, Europa, and Callisto.

ANSWER: **Galileo** Galilei [or Galileo **Galilei**]

[10] Bruno and Galileo both lectured at the second-oldest university in Italy, located in this city in northern Italy that was governed by the Carrara family, then controlled for nearly four centuries by its eastern neighbor Venice.

ANSWER: **Padua** [or **Padova**] <Bentley>

15. The Maxwell-Boltzmann distribution gives the probability of a gas molecule having a given speed as a function of this quantity. For 10 points each:

[10] Name this quantity which scales directly with internal energy of an ideal gas. It's measured in Kelvins.

ANSWER: absolute **temperature**

[10] The Maxwell-Boltzmann distribution is the basis for this theory of ideal gases. It assumes random particle motion and completely elastic collisions that result in gas pressure.

ANSWER: **kinetic** theory of gases

[10] The root-mean square velocity according to the Maxwell distribution equals the square root of this quantity, times the most probable speed. The internal energy of a monoatomic ideal gas equals this value times RT.

ANSWER: **3/2** [or **1.5**; or **1 1/2**] <Silverman>

16. The first one of these buildings in Ancient Egypt was formed by stacking six mastabas, one on top of another, and was built for Djoser by Imhotep. For 10 points each:

[10] Name these monumental layered buildings, also exemplified by the ziggurats of Mesopotamia.

ANSWER: **step pyramids** [prompt on partial answer]

[10] New World examples of step pyramids include the Pyramid of the Sun and Pyramid of the Moon at this archaeological site in the Valley of Mexico, pre-dating the Aztec empire.

ANSWER: **Teotihuacan (tay-oh-tee-wa-KAHN)**

[10] The Teotihuacan may have also built this most voluminous pyramid in the world. Located in the Mexican state of Puebla, it is now mostly buried under a hill and topped by the Church of Our Lady of Remedies.

ANSWER: Great Pyramid of **Cholula** <Mehigan>

17. A sentence asserting that this person "is not bald" has ambiguous truth value -- it could be false since there is no such person, or have no truth value at all since nonexistent people cannot have hair. For 10 points each:

[10] Name this purported official. Philosophical sentences about him are common examples used to ascertain what happens when phrases denote a non-existent entity.

ANSWER: the **present king of France** [answer must indicate a purported **king** of **France** who is reigning at the **present** moment; prompt on **king of France**]

[10] This prolific 20th century British philosopher introduced the example of the present king of France in "On Denoting." His theory of types resolves a paradox about "the set of all sets which contain themselves".

ANSWER: Bertrand **Russell** [or Bertrand Arthur William **Russell**, 3rd Earl **Russell**]

[10] With Alfred North Whitehead, Bertrand Russell tried to axiomatize all of this academic field. Other philosophers who worked in this field include Pythagoras and Gottfried Leibniz, who respectively developed its subfields geometry and calculus.

ANSWER: **mathematics** <Jackson>

18. Per this organization's "real beautiful oath," any member who betrays its secrets will have their entire family killed. For 10 points each:

[10] Name this fictional organization that includes Jo Harper and Ben Rogers. Its "crimes" include attempting to steal some pigs and disrupting a Sunday school picnic.

ANSWER: Tom **Sawyer's gang** [or **Tom's gang**; accept answers that include Tom Sawyer and a term synonymous with a group of criminals, such as **robbers**]

[10] This character describes joining Tom Sawyer's Gang at the beginning of a Mark Twain novel in which he travels along the Mississippi River with a slave named Jim.

ANSWER: **Huckleberry Finn** [accept either underlined portion; or **Huck** Finn]

[10] Because Huck is technically an orphan, he is only allowed to join Tom Sawyer's Gang after he volunteers this woman, his caretaker, to be killed should he betray them. Along with her sister, Miss Watson, she tries to "sivilize" Huck.

ANSWER: the Widow **Douglas** <Weiser>

19. The interaction between two forms of this quantity splits energy levels in spin-orbit coupling. For 10 points each:

[10] Name this physical quantity equal to the cross product of displacement and linear momentum and typically symbolized with a capital L.

ANSWER: **angular momentum** [do not accept "momentum"]

[10] Quantum mechanical calculations involving angular momentum are complicated because the commutator of L-x with L-y equals this constant times h-bar times L-z.

ANSWER: **i** [or the **square root of negative one**]

[10] The commutation relation between this quantity and momentum is equal to i h-bar.

ANSWER: **position** <Eltinge>

20. This man once worked to tend the wounds of gladiators in Pergamum. For 10 points each:

[10] Identify this one-time physician for Marcus Aurelius and several of the emperor's successors. This author's treatises, such as *On Anatomical Procedure*, were massively influential to the medical theories of the Middle Ages.

ANSWER: **Galen** [or Claudius **Galenus**]

[10] This earlier Greek physician was dubbed "the Asclepiad of Cos" by Plato and is best known today for his namesake oath where doctors pledge to do no harm to their patients.

ANSWER: **Hippocrates** [or **Hippocratic** Oath]

[10] Herophilus of Chalcedon, who figured out that the brain was the center of the nervous system, worked in this city. Callimachus compiled an influential catalog of Greek literature in this city, which was home to the mathematician Hypatia.

ANSWER: **Alexandria**, Egypt <Bentley>

21. The protagonist of this novel breaks off his affair with Norah Nesbit in order to resume his on-again, off-again relationship with the awful Mildred Rogers. For 10 points each:

[10] Name this 1915 novel in which the clubfooted Philip Carey eventually decides to settle down with Sally Athelny and become a doctor, rather than traveling the world.

ANSWER: ***Of Human Bondage***

[10] *Of Human Bondage* is the magnum opus of this British author of *The Razor's Edge* and the short story "Rain".

ANSWER: W. Somerset **Maugham** [or William Somerset **Maugham**]

[10] The protagonist of this Maugham novel abandons his wife and children, seduces then abandons his supporter Dirk Stroeve's wife, and eventually moves to Tahiti in an effort to become a better painter.

ANSWER: *The **Moon and Sixpence*** <Carson>

22. The Akan people today often produce this art form in black, green, yellow, and red. For 10 points each:

[10] Name this type of cloth whose tessellated patterns and colors convey meanings. Some American families put out a tablecloth resembling this art form during Kwanzaa.

ANSWER: **kente** cloth

[10] The makers of kente cloth include this ethnic group of present-day Ghana, whose central city of Kumasi was besieged by the British during several wars against the Gold Coast colony.

ANSWER: **Ashanti** people [or **Ashanti** empire; or **Asante**]

[10] On some examples of kente cloth, a roughly anvil-shaped design on a black background represents this valuable object, which is too sacred to touch either the ground or the seated body of an Ashanti king. Colonial governor Frederic Hodgson sought to desecrate this object.

ANSWER: **Golden Stool** [or **Sika dwa**] <Jackson>

23. The only protein that contains the unusual amino acid hypusine is an initiation factor for this process, which is inhibited by streptomycin and erythromycin. For 10 points each:

[10] Name this process in which ribosomes synthesize proteins by reading codons on mRNA and bringing the appropriate amino acid corresponding to its anticodon.

ANSWER: **translation**

[10] Translation happens on three sites along the ribosome: one where the aminoacyl tRNA enters, one where the growing polypeptide chain is being formed, and one where the unloaded tRNA leaves. Name any of the three letters of these sites.

ANSWER: **A** site, **P** site, or **E** site [just one is needed]

[10] The secondary structure of a tRNA molecule -- with its D loop, T loop, acceptor stem, variable loop, and anticodon loop -- is often compared to this shape.

ANSWER: **cloverleaf** [prompt on **leaf**] <Gupta>