



1. A magnetometer named for this quantity is used to measure magnetic anisotropy. For an electric dipole in an electric field, this quantity can be calculated as the product of electric field, charge, displacement, and sine of theta. That formula is equivalent to the cross product of electric dipole moment and electric field. Integrating this quantity with respect to angular displacement calculates its associated work. Although it is not force, this quantity must total zero at any given point in a physical system for the system to be in equilibrium. This quantity is defined as the cross product of the position vector and force. For 10 points, name this rotational analogue of force that describes twisting.

ANSWER: torque

014-13-83-06101

2. One poem about people killed in one of these events states, "O lang, lang may the ladies stand wi' their gold kems in their hair, waiting for their ain dear lords, for they'll see them na mair." Another poem about people killed in one of these events states, "Hope had grown grey hairs, Hope had mourning on...Hope was twelve hours gone." One of these events kills the title character of the ballad "Sir Patrick Spens." A poem about a victim of one of these requests, "Look homeward Angel now, and melt with ruth," before instructing shepherds to "weep no more." Five nuns fleeing Germany die in one of these events in a Hopkins poem, and one of these events killed Edward King. For 10 points, name this kind of accident that inspired Milton's "Lycidas."

ANSWER: shipwrecks [or obvious equivalents; prompt on drowning]

020-13-83-06102

3. McKay and Shaw's theory of this phenomenon held that it was most common in the second of Burgess's five "concentric zones." This phenomenon was also explained through the "differential association" theory of Edwin Sutherland. In Italian School theories, it is thought to be a result of inheritance, as explained in the "atavistic" theories of Cesare Lombroso. Robert Merton's "strain theory" holds that this is a natural product of *anomie*. Wilson and Kelling's "broken windows theory" provides a way to reduce this phenomenon, which Cesare Beccaria wrote about along with punishment. For 10 points, name this phenomenon in which individuals decide to disobey the laws of society.

ANSWER: crime [prompt on deviance]

080-13-83-06103

4. Allen Ginsberg and Lawrence Ferlinghetti translated poems such as "The Individual's Soliloquy" by one of this country's "anti-poets." That man, Nicanor Parra, praised Alonso de Ercilla's epic poem about this country, *La Araucana*. The lines, "no hand will reach into the obscure death to argue with me over your handful of bones," end the first poem of a collection by a poet from this country inspired by the suicide of Romelio Ureta. This country was home to the poet of *Sonnets of Death* and *Desolación*. For 10 points, name this country home to Gabriela Mistral, as well as Pablo Neruda.

ANSWER: Chile

121-13-83-06104

5. In the active high input implementation of the enabled SR latch, the enable bit is fed into this type of gate. In 3-CNF, this operation connects the groupings of no more than three variables. In a half adder, the carry out bit is produced by this operation. Minterms, which can be obtained from Karnaugh maps, consist of a set of variables to which this operation is applied. This operation holds over both P implies Q and NOT Q implies NOT P according to *modus tollens*. This Boolean operation corresponds to multiplication and yields true if all conditions are true and false if any condition is false. For 10 points, name this connective operation in mathematical reasoning which is contrasted with OR.

ANSWER: **AND** [or **conjunction**; or **product** before "multiplication" is read]

014-13-83-06105

6. While questing for this object, a god was asked for the red rings on his fingers by its owner's greedy sister; that god won this object after his red eyes and ravenous hunger were attributed to eight sleepless nights in anticipation of sex. This object is used daily to revive animals whose names translate as "teeth-barer" and "teeth-grinder." It was once stolen by Thrym, prompting its owner to cross-dress in order to retrieve it. This object was created with a shorter handle than expected after Brokkr was bitten on the eyelid by a god who transformed himself into a fly. It will be inherited by its user's sons, Magni and Modi. This weapon will slay the Midgard Serpent at Ragnarok. For 10 points, name this hammer of Thor.

ANSWER: **Mjolnir** [or **Thor's hammer** until mentioned]

052-13-83-06106

7. This protein is imaged using conjugated phalloidin. Discovery of its complex with DNase I helped determine its crystal structure. Microbes such as *Vaccinia* and *Shigella* can use this protein for motility within host cells, although bacteria often have MreB, an analogue of this protein. Gelsolin and cofilin help organize the assembly of this protein. This protein forms the light filaments of muscles, but it can be found in almost all cells, where it forms part of the cytoskeleton. Types of this protein include G and F, depending on whether it has been polymerized or not. For 10 points, name this protein that undergoes interactions with myosin to cause muscle contraction.

ANSWER: **actin** [accept **thin filaments** until mention]

140-13-83-06107

8. For six centuries, this nation was operated by a council called the "hlutdaw," which was staffed by "wungyi," or "bearers of great burden." Its Alaungpaya Dynasty suppressed the Bago, but was eliminated in 1885 after this country's third war against the British. The founder of this nation was Anawrahta, who converted to Theravada Buddhism and had a capital at Pagan. India is connected by the Stilwell Road to this country's road, which was a crucial Chinese supply route in World War II. This country was led for almost thirty years by the socialist Ne Win after the 1947 assassination of Aung San. For 10 points, name this Southeast Asian nation whose State Law and Order Restoration Council changed its name in 1989.

ANSWER: Union of **Burma** [or Union of **Myanmar**; or Pyidaungzu **Myanma** Naingngandaw]

015-13-83-06108

9. A Telemann suite in this key for flute and strings includes a movement called *Air a l'Italien* and concludes with six French dances. The "Larghetto" transitions without pause into the "Rondo" in Johann Nepomuk Hummel's second piano concerto, which is in this key. A symphony in this key concludes its first movement by restating the "Alma theme" and includes three "hammer blows of fate" in its final movement; that is Mahler's *Tragic Symphony*. *Rhapsody on a Theme by Paganini* is in this key because Paganini composed his 24th caprice in it. It is the key of Beethoven's *Fur Elise* and Grieg's *Piano Concerto*. For 10 points, name this relative minor of C major, whose key signature contains no sharps or flats.

ANSWER: **A minor** [do not accept or prompt on "A"]

080-13-83-06109

10. The first English-language periodicals, known as corantos, brought news from this war. Pompeius Planta's murder sparked a theater of this war fought for control of several Alpine passes known as the Confusion of the Leagues. Another offshoot of this war, caused by the deaths of two heirless dukes of Gonzaga, was the War of Mantuan Succession. A commander in this war used the contributions system to force civilians to finance his army. The Winter King fled after a defeat in this war at the Battle of White Mountain. This war's Bohemian Revolt and Danish phase were followed by Gustavus Adolphus bringing Sweden onto the scene. For 10 points, name this religious war that began with the Defenestration of Prague and ended with the Peace of Westphalia.

ANSWER: **Thirty Years'** Wars

020-13-83-06110

11. In this country, the Gandaki River forms a basin within which Dhualagiri rises. The Pahari people live primarily in this country's Hill Region. A popular tourist destination here is Lumbini, purportedly the site of a notable birth in 563 BCE. Its namesake language was once called Khaskura and Gorkhali. The Rana dynasty constructed the Singha Durbar in its capital, which lies on the Bagmati River. This country is located south of Tibet, and its border with China is the site of Lhotse and Mount Everest. For 10 points, name this landlocked Himalayan country between India and China.

ANSWER: Federal Democratic Republic of **Nepal**

192-13-83-06111

12. At one point in this film, a group of women dressed as soldiers help load a cannon before they all wave their hats together. One man in this film places his umbrella into the ground, upon which it promptly turns into a giant mushroom. Thomas Edison made secret copies of this film, earning a fortune off of it while its European director went bankrupt. Its most iconic scene features an object shaped like a face slowly getting closer to the viewer until a bullet-shaped vessel hits its eye. This film begins at a conference where a group of skeptical astronomers eventually approve the title event. For 10 points, name this science-fiction film directed by Georges Melies, a pioneering film in the genre about an expedition to Earth's only satellite.

ANSWER: A **Trip to the Moon** [or **Voyage to the Moon** or **Le Voyage dans la Lune**]

192-13-83-06112

13. The relative abundance of different types of this substance is affected by the CCD. A prominent example of this substance in the deep ocean is red from oxidized iron. The inclusion of this substance defines turbidity currents. In the neritic zone, ice rafting is a significant contributor to this substance. Manganese nodules are a small but significant portion of this substance. This substance can be classified as hydrogenous, lithogenous or biogenous; the latter constitutes the majority of it and is usually derived from radiolarians, foraminifera, coccolithophores, and diatoms. For 10 points, identify this substance that undergoes lithification to form a namesake type of rock.

ANSWER: marine **sediment** [or **ooze**; or reasonable equivalents; prompt on abyssal **clay**; do not accept or prompt on "earth"]

066-13-83-06113

14. This group was purchased in 1939 by veterinarian James Colescott and obstetrician Samuel Green. It fought the Lumbee Indians at the 1958 Battle of Hayes Pond, and information about it was leaked to the *Superman* radio program by undercover investigator Stetson Kennedy. The murder and rape of Madge Oberholtzer led to a trial in Indiana for one of its leaders, D.C. Stephenson. The 1924 Democratic National Convention was deadlocked over whether or not to denounce this group. Both Hugo Black and Robert Byrd were members as young men. This group rose in popularity in 1915 after the release of the film *The Birth of a Nation*. For 10 points, name this white supremacist group whose members burned crosses.

ANSWER: **Ku Klux Klan** [or **KKK**]

052-13-83-06114

15. James A. Michener donated a complete version of this series to the Honolulu Academy of Arts. A man paints the interior of a barrel in one entry from this series, which also depicts a grove of circular pine trees and several workers at a water mill. This series includes *South Wind*, *Clear Sky*, which is colloquially known as the "Red" version of the title object. Ten predominantly black-line artworks were later added to this series. Three boats are thrashed in the rapids in the first image from this series, which shows many claw-like extensions of a white foam crest. For 10 points, name this series that includes *The Great Wave off Kanagawa*, a set of ukiyo-e woodblocks by Hokusai featuring a Japanese landmark.

ANSWER: **Thirty-Six Views of Mount Fuji** [or **Fugaku Sajurokkei**]

192-13-83-06115

16. In one text, this man claims he "took up the markers fixed in many places." The doulos population expanded following one of his measures, as labor previously done by hektemoroi was replaced by slave labor. Three factions, the Shore, the Plain, and the Uplands, emerged in the wake of reforms passed by this man, such as the seisachtheia, which outlawed debt bondage. To avoid the temptation of becoming a tyrant, this man left his home for ten years, and according to Herodotus had a meeting with Croesus. According to Aristotle, homicide laws were the only laws written by Draco that were continued after this man's constitutional reform. For 10 points, name this Greek to whom the Athenian constitution was attributed.

ANSWER: **Solon**

121-13-83-06116

17. A poem written about one of these asserts, "We rise in thought to the heavenly throne, but our own nature still remains unknown." After one of these events, baby Juan is crushed against a pillar and Pedrillo kills Dona Costanza. Josefe and Jeronimo decide to return to Santiago at the end of that novella titled for one of these events by Heinrich von Kleist. Another of these events prompts the University of Coimbra to order the execution of a Biscay man who married his godmother. Jacques the Anabaptist dies immediately before one of these events, after which Don Issachar and the Grand Inquisitor are killed by Cunegonde's lover. For 10 points, name this natural phenomenon depicted by Voltaire in *Candide* after a disastrous one hit Lisbon.

ANSWER: **earthquakes**

190-13-83-06117

18. Van Laar modified this equation to find the excess enthalpy of a liquid mixture. One parameter in this equation is equal to twenty-seven sixty-fourths times R-square T sub c squared over P sub c. The Joule-Thomson inversion temperature is equal to twenty-seven fourths times the critical temperature predicted by this equation. The isotherms predicted by this equation tend to oscillate around a phase transition, a fact corrected by Maxwell's equal area rule. This equation has parameters that account for the excluded volume of a particle and one accounting for attractive forces between particles. Those parameters are labelled a and b. For 10 points, name this equation of state, a modification of the ideal gas law named after a Dutch scientist.

ANSWER: **van der Waals** equation

140-13-83-06118

19. At one point in the work she appears in, this character tells the narrator, "It should take you about four seconds to walk from here to the door. I'll give you two." This character shoplifts Halloween masks with the narrator and gives a weekly "weather report" to a gangster in Sing Sing. She makes plans to marry a Brazilian diplomat after her roommate's wedding. This woman's possessions include a cat that she refuses to name. This character lives in the same apartment as the unnamed narrator, whom she calls "Fred" after her soldier brother. For 10 points, name this socialite, the protagonist of Truman Capote's *Breakfast at Tiffany's*.

ANSWER: **Holly** Golightly [or Holly **Golightly**; or **Lula** Mae Barnes; or Lula Mae **Barnes**]

192-13-83-06119

20. In Matthew, this person's death is said to fulfill a prophecy from Jeremiah, though most scholars believe Matthew meant Zechariah. His namesake Gospel, part of the Codex Bezae Cantabrigiae, delineates the division of souls into those that are immortal and those that disappear at death, and states that his actions were ordered by Jesus. He fell into the Akeldama after his death, which by some accounts was a suicide by hanging. This man was replaced by Matthias after accepting the Sanhedrin's offer of thirty pieces of silver to kiss his mentor. For 10 points, name this Apostle who betrayed Jesus.

ANSWER: **Judas** Iscariot [or Judas **Iscariot**]

192-13-83-06120

21. One of this author's title characters leaves the management of her estate to Ivy Peters while she has an affair with Frank Ellinger, much to the dismay of the narrator, Niel Herbert. Another of this author's protagonists falls in love with Fred Ottenburg while on a trip to the pueblos in Flagstaff, Arizona after taking music lessons with Harsanyi. This author of *A Lost Lady* wrote about Dr. Archie in a novel centering on an opera singer from Moonstone. In another of her novels, the narrator flirts with Lena Lingard and impresses the future lover of Larry Donovan, a member of the Shimerda family. For 10 points, name this author of *The Song of the Lark* and *My Antonia*.

ANSWER: Willa **Cather**

192-13-83-06121

22. This hero consolidated power by ambushing and killing his fifty cousins, the Pallantides. Cimon celebrated a military victory by bringing back the bones of this hero. After committing rape in a bed of asparagus, he fathered Melanippus on Perigune. This man lost part of his thigh after being ripped out of a chair by his relative, Heracles, who saved him from his ill-considered visit to the underworld with Pirithous. This man married Phaedra after abandoning a woman who had helped him out with a ball of string. For 10 points, name this Athenian hero who, with Ariadne's help, killed the Minotaur.

ANSWER: **Theseus**

080-13-83-06122

23. The city of Naberezhnye Chelny was once named for this man. During World War II, this man served as the head of the political commissars on the Ukrainian front and wrote memoirs of his participation in the Battle of Malaya Zemlya. Frol Kozlov's stroke helped this leader eventually gain power. He came to prominence after being placed in charge of the Virgin Lands Campaign. This man ordered a military action that saw to the overthrow of Hafizullah Amin and made Babrak Karmal president; that action was the Soviet invasion of Afghanistan. For 10 points, name this Soviet leader whose namesake doctrine asserted the Soviet Union's ability to intervene in the affairs of its satellite states.

ANSWER: Leonid Ilich **Brezhnev**

030-13-83-06123



1. This place is the namesake of a poem by Jonathan Swift Sommers describing "John Cabanis' wrath" and "the strife of hostile parties." For 10 points each:

[10] Name this town whose other inhabitants include Webster Ford and Indignation Jones, as well as a woman who says, "Life is too strong for you--it takes life to love Life."

ANSWER: **Spoon River**

[10] The *Spoon River Anthology* was written by this American poet.

ANSWER: Edgar Lee **Masters**

[10] Several of the poems in the *Spoon River Anthology* place blame on this greedy banker, who defends himself by saying, "we, seekers of earth's treasures, getters and hoarders of gold, ...are self-contained, compact, harmonized, even to the end."

ANSWER: Thomas **Rhodes** [or **Thomas** Rhodes]

190-13-83-06201

2. The site of this battle is where "St. Mary Magdalene's Church, Battlefield" is located today. For 10 points each:

[10] Name this 1403 battle, the first in which longbows faced each other on English soil. It resulted in the death of Henry Percy, also known as "Hotspur."

ANSWER: Battle of **Shrewsbury**

[10] Shrewsbury put down a revolt against Henry IV, the first king of what house that feuded with the House of York?

ANSWER: House of **Lancaster** [or **Lancastrians**]

[10] Henry IV entertained Manuel II, a Byzantine emperor from this dynasty. This was the final Byzantine ruling dynasty and ended with the death of Manuel's brother, Constantine XI.

ANSWER: **Palaeologos** Dynasty

052-13-83-06202

3. This quantity is symbolized Z and is approximately two percent for the Sun. For 10 points each:

[10] Identify this quantity equivalent to the proportion of stellar mass not represented by hydrogen or helium.

ANSWER: **metallicity**

[10] Metallicity is usually expressed as the base-10 logarithm of the amount of this element to that of hydrogen. It is also a major contributor to line blanketing.

ANSWER: **iron** [or **Fe**]

[10] A large concentration of iron in a star's core may eventually lead to the Ib or Ic ("one b or one c") types of these stellar explosions.

ANSWER: **supernovae**

190-13-83-06203

4. Vasari relates that this artist was tremendously afraid of death and avoided large gatherings at all costs. For 10 points each:

[10] Name this Florentine painter, whose most famous work lies above the altar in the Capponi Chapel and depicts Mary and several women swooning as the limp body of Christ is lowered to the ground.

ANSWER: Jacopo **Pontormo** [or Jacopo da **Pontormo**; or Jacopo **Carucci**]

[10] Pontormo painted in this 16th century Renaissance style characterized by exaggerated physical features. It was supplanted by Baroque art.

ANSWER: **Mannerism** [or word forms]

[10] This Mannerist painter of the Bardi Altarpiece exaggerated the size of both the infant Jesus and Mary in his *Madonna With a Long Neck*.

ANSWER: **Parmigianino** [or Girolamo Francesco Maria **Mazzola**; or **Parmigiano**]

020-13-83-06204

5. Aristotle calls this field “first philosophy” in a book since titled for this field. For 10 points each:

[10] Name this branch of philosophy, which studies being insofar as it is being. Members of the Vienna Circle attacked statements in this field as meaningless.

ANSWER: **metaphysics**

[10] In Book Zeta of the *Metaphysics*, Aristotle considers possible candidates for this primary kind of being, including essence and universals.

ANSWER: **substance** [or **substantia**; or **ousia**]

[10] Aristotle's views of substance made him differ from this teacher of his, who argued for immaterial Forms in the *Phaedo*.

ANSWER: **Plato**

121-13-83-06205

6. The protagonist of this story is criticized by Mr. Bons. For 10 points each:

[10] Name this story in which a boy meets Thomas Browne and Dante on the title vehicle, which he believes will take him to heaven.

ANSWER: "The **Celestial Omnibus**"

[10] "The Celestial Omnibus" was written by this English author of *Howards End* and *A Room with a View*.

ANSWER: E. M. **Forster**

[10] In Forster's *A Passage to India*, this Muslim doctor is accused of sexually assaulting Adela Quested. This friend of Cyril Fielding organizes a trip to the Marabar Caves.

ANSWER: Dr. **Aziz**

192-13-83-06206

7. An empire centered in this modern-day country was ruled by kings named Jayavarman. For 10 points each:

[10] Name this modern-day country that contained the center of the Khmer empire. Suryavarman II built this country's Angkor Wat.

ANSWER: Kingdom of **Cambodia** [or Preahreacheanachakr **Kampuchea**]

[10] The Khmer empire conquered this kingdom that was centered in present-day southern Vietnam, but it rose back up under Jaya Harivarman I. It also had to defend itself against the Dai Viet and was known for its navy.

ANSWER: **Champa** Kingdom

[10] The Champa Kingdom and Dai Viet, under the Tran Dynasty at the time, successfully defended themselves against this group of people from the north three times, including winning a decisive victory at the Battle of Bach Dang.

ANSWER: **Mongols** [or **Mongol** Empire]

140-13-83-06207

8. The title character of this opera sings a setting of the *Salve regina* after waking up from a drugged sleep. For 10 points each:

[10] Name this opera in which Laca slashes the title character's cheeks to show that his rival, Steva, only loves her for her beauty. Laca marries the title character, and they live happily ever after when the title character's stepmother drowns her baby in icy water.

ANSWER: **Jenufa**

[10] This composer, who took inspiration from a creepy obsession with Kamila Stosslova, wrote the operas *Jenufa* and *The Cunning Little Vixen*.

ANSWER: Leos **Janacek**

[10] This fellow Czech composer wrote the opera *The Bartered Bride* and the tone poem *Ma Vlast*.

ANSWER: Bedrich **Smetana**

080-13-83-06208

9. This novel opens with a man reading *The Divine Comedy* while sitting in a cafe in Piraeus. For 10 points each:

[10] Name this novel whose title character calls Madame Hortense "Bouboulina" and wishes to open a mine in Crete.

ANSWER: **Zorba the Greek** [or **Life and Adventures of Alexis Zorbas**]

[10] This Greek novelist of *Zorba the Greek* also wrote *The Last Temptation of Christ*.

ANSWER: Nikos **Kazantzakis**

[10] This protagonist of Kazantzakis's *The Greek Passion* is a shepherd chosen to play Christ in the title play. He is ultimately murdered by his fellow villagers.

ANSWER: **Manolios**

192-13-83-06209

10. For two solutions, the temperature ratio for when this quantity is equal is a constant, a fact described by Duhring's rule. For 10 points each:

[10] Name this quantity, which is described by Raoult's law. Volatile compounds have a high value for it, which is high for compounds with weak intermolecular forces.

ANSWER: **vapor pressure**

[10] This equation calculates the vapor pressure using the enthalpy of vaporization, and shows that vapor pressure does not increase linearly with temperature.

ANSWER: **Clausius-Clapeyron** equation

[10] This equation uses coefficients labeled A, B, and C to describe an individual substance in order to calculate its vapor pressure. It only works for pure substances and a limited temperature range.

ANSWER: **Antoine** equation

140-13-83-06210

11. This composer paid tribute to the tenth anniversary of the October Revolution in his second symphony. For 10 points each:

[10] Name this Russian composer who evoked the resistance to a Nazi invasion in his rousing seventh symphony, nicknamed the *Leningrad*.

ANSWER: Dmitri Dmitriyevich **Shostakovich**

[10] Shostakovich regarded his symphony of this number as a "Soviet artist's creative response to just criticism." Mstislav Rostropovich claimed that Shostakovich would have been executed for writing it, had there not been a forty-minute ovation at its premiere.

ANSWER: **fifth** symphony [or *Symphony No. 5 in D minor, Op. 47*]

[10] Shostakovich used this four note musical motif, expressed in German notation, as a signature in works like his first cello concerto and his fifteenth symphony.

ANSWER: **DSCH** motif

192-13-83-06211

12. This book warns against marriage with non-Christians in its verse, "Be ye not unequally yoked together with unbelievers." For 10 points each:

[10] Name this epistle whose 10th through 13th chapters may be part of the lost "letter of tears." This work outlines how one should collect from the poor in Jerusalem, and it follows an epistle that states "love is patient, love is kind."

ANSWER: **Second Corinthians**

[10] The Epistles to the Corinthians, along with the Epistles to the Romans and the Galatians, were written by this apostle, originally from Tarsus.

ANSWER: Saint **Paul** the Apostle [or **Saul** of Tarsus]

[10] In the King James translation of the 13th chapter of First Corinthians, these four words follow "For now we see." These four words illustrate the inadequacy of human knowledge on the divinity.

ANSWER: "**through a glass, darkly**"

192-13-83-06212

13. The most elaborate form of this ceremony was practiced by the Kwakiutl, and it was often used by those who had suffered public embarrassment to save face. For 10 points each:

[10] Name this ritual practiced by American Indians in the Pacific Northwest which involved the distribution of property and gifts.

ANSWER: **potlatch**

[10] This man succeeded his uncle Emile Durkheim as editor of the journal *The Sociological Year*, and he examined the potlatch ceremony, Kula Ring, and other exchange rituals in his major book.

ANSWER: Marcel **Mauss**

[10] This anthropologist wrote *Introduction to the Work of Marcel Mauss*. This author of *The Raw and the Cooked* used the term bricolage to describe the ability of premodern societies to put pre-existing items to new use in his work *The Savage Mind*.

ANSWER: Claude **Levi-Strauss**

030-13-83-06213

14. Answer the following about the Cahokia settlement, for 10 points each.

[10] The Cahokia historic site across from St. Louis features about 120 man-made examples of these structures, whose "builders" are the colloquial name for the people who built Cahokia.

ANSWER: **mounds** [accept **pyles**, **hills**, or equivalent answers]

[10] The largest mound at the Cahokia site is this one, the largest pre-Columbian earthwork north of Mesoamerica. It is basically built from clay and soil.

ANSWER: **Monks Mound**

[10] Cahokia residents enjoyed playing the game of Chunkey, which featured players rolling stones across the ground and then throwing these objects as close to the stone as possible.

ANSWER: **spears**

052-13-83-06214

15. This operation is applied to the matrix A minus λI in order to find the eigenvalues. For 10 points each:

[10] Name this operation applied in Cramer's rule to solve a system of equations. For a two-by-two matrix, it equals the difference of the product of the diagonals.

ANSWER: **determinant**

[10] If the determinant of a matrix does not equal zero, its columns have this property, which means no column can be written as a linear combination of the others.

ANSWER: **linear independence** [or word forms]

[10] The sum of these two quantities is equal to the number of columns of a matrix according to a namesake theorem. One is the number of linearly independent columns in a matrix while the other is the dimension of the kernel.

ANSWER: **rank** and **nullity**

190-13-83-06215

16. This series is narrated by Nick Jenkins, while its other characters include Charles Stringham and Kenneth Widmerpool. For 10 points each:

[10] Name this series of twelve novels depicting societal tensions in mid-20th-century England. Its first volume is *A Question of Upbringing*.

ANSWER: *A **Dance to the Music of Time***

[10] Anthony Powell, the author of *A Dance to the Music of Time*, had a valuable acquaintance with this other English novelist of *Decline and Fall* and *Brideshead Revisited*.

ANSWER: Evelyn **Waugh**

[10] Waugh described the disintegration of Tony and Brenda Last's marriage in this novel, which takes its title from "The Waste Land."

ANSWER: *A **Handful of Dust***

192-13-83-06216

17. These functions are written in terms of associated Legendre polynomials for the theta-dependent term. For 10 points each:

[10] Name these functions, the eigenfunctions of the angular momentum operator, usually symbolized with a capital Y. They have two associated quantum numbers which correspond to l and m-sub-l for the hydrogen atom.

ANSWER: **spherical harmonics**

[10] The spherical harmonics are the entire eigenfunctions of this model system used to represent microwave spectroscopy. This system represents a chemical bond which is free to rotate but not to vibrate.

ANSWER: **rigid rotor** [or **rigid rotator** model]

[10] A correction term is introduced to the spacing of lines in a microwave spectrum to account for this phenomenon, which lengthens the rotor. This "force", really a result of inertia, is directed away from the center of rotation.

ANSWER: **centrifugal** force

190-13-83-06217

18. This seat of Polk County is a common site for presidential candidates to set up headquarters, due to its importance in the election season. For 10 points each:

[10] Name this Midwestern city with a name literally translating to "of the monks." Eliel Saarinen designed its art center.

ANSWER: **Des Moines**

[10] Des Moines is the capital of this state, found between Missouri and Minnesota. Its other cities include Davenport and Cedar Rapids.

ANSWER: **Iowa**

[10] Iowa's city of West Branch has both a National Historic Site and a Presidential Library dedicated to this man, who was born in Iowa. This president was the first one born west of the Mississippi.

ANSWER: Herbert **Hoover**

192-13-83-06218

19. The "warrior gene," heavily represented in Maori men, is a version of a gene coding for this family of enzymes. For 10 points each:

[10] Name this family of enzymes that play a crucial role in inactivating neurotransmitters. Their inhibitors are used as antidepressants and as treatments for Alzheimer's and Parkinson's.

ANSWER: **monoamine oxidases** [or **MAOs**; accept **MAO-A** or **MAO-B**]

[10] MAOs are considered "flavoproteins" because they're covalently bound to the oxidized form of this molecule. This molecule produces 1.5 equivalents of ATP in respiration and is made once per turn of the citric acid cycle.

ANSWER: **FADH2** [or **flavin adenine dinucleotide**]

[10] Heavy use of this drug can deplete MAOs. Abusers of this drug often end up with COPD, emphysema, and lung cancer.

ANSWER: **tobacco** [or **cigarettes**; or **nicotine**]

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20. This event may have been precipitated by grief faced after the death of Hephaestion. For 10 points each:

[10] Name this event suggested by some to be as the result of poisoning, but may just have been the result of disease. It led to the wars of the Diadochi.

ANSWER: **death of Alexander the Great** [or **death of Alexander III**; or **death of Alexander of Macedonia**; prompt on just **death of Alexander**]

[10] This Roman emperor reportedly snatched Alexander's breastplate from his tomb. He is better known for allegedly trying to appoint his horse as a consul.

ANSWER: **Caligula** [or **Gaius Caesar** Germanicus]

[10] This later Roman emperor visited the tomb of Alexander, even though it was closed to the public. His namesake edict granted citizenship to all freemen, and he became sole ruler by killing his brother, Geta.

ANSWER: **Caracalla** [or **Caracallus**; or **Marcus** Aurelius Severus Antoninus Augustus; or **Septimius Bassianus**; do not accept "Marcus Aurelius" on its own]

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21. As *strategos*, this man opposed sending Athenian forces to help put down a helot revolt in Sparta. For 10 points each:

[10] Name this enemy of Cimon, an Athenian democrat who weakened conservative institutions while strengthening the Boule and Ecclesia. He was assassinated for his democratic reforms.

ANSWER: **Ephialtes**

[10] This lieutenant of Ephialtes was called "the first citizen of Athens" by Thucydides, who also recorded this man's funeral oration for fallen Athenians after the first year of the Peloponnesian War.

ANSWER: **Pericles**

[10] Ephialtes' democratic reforms weakened this Athenian council, which consisted of elite citizens who had previously served as archon. After the reforms, its jurisdiction was restricted to murder trials.

ANSWER: **Areopagus**

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