## Tossups:

1. In relativistic mechanics, this quantity is multiplied by the Lorentz factor, and along with kinetic energy, it is conserved in a certain process in which the coefficient of restitution is one. An object that is moving in any reference frame will be observed to have this vector quantity in that frame. It's conservation can be demonstrated using Newton's cradle as well as in elastic collisions, but some of it is lost when the colliding bodies stick together in inelastic collisions. FTP, identify this quantity, which comes in linear and angular varieties, and when multiplied with velocity gives force.

ANSWER: momentum
2. "All the world is a joke" are the words to the one that closes Verdi's Falstaff, and the first movement of Beethoven's string quartet opus 131 is this type of piece. Brahms wrote a set of variations and one of these based on a theme by Handel, and twelve of these pieces are separated by eleven interludes in Paul Hindemith's Ludus tonalis. The "Of Science" section of Richard Strauss's Also Sprach Zarathustra is one of these employing all twelve notes of the chromatic scale. One element of this type of piece can be real or tonal; that is the answer, which is a repetition of the subject in a different voice. For 10 points, identify this type of composition paired with preludes in The Well-Tempered Clavier by Bach, who also wrote a piece called The Art of them.

ANSWER: fugue
3. One nearly successful attempt to remove this man from power was pioneered by the Marquis of CinqMars. Another unsuccessful attempt against this man is remembered as the Day of the Dupes, when not even the influence of the King's mother could remove this man from power. This man led an army to besiege the city of La Rochelle, a part of his plan to weaken Hugenout power within the country. Although leader of a catholic country, this man hated the Habsburgs more than he hated protestants, and so persuaded his country to go to war against the Holy Roman Empire in the Thirty Years War. FTP, identify this French minister to Louis XIII.

## ANSWER: Cardinal Richelieu

4. This author wrote about Jack Duluoz' friendship with Cody Pomeray in several novels including Visions of Cody, Desolation Angels, and a novel named after a cabin in Bixby canyon owned by the character Lorenzo Mansanto, Big Sur. This author wrote a book-length jazz poem in 242 "choruses" called Mexico City Blues. But he is best known for a book with such characters as Old Bull Lee, Carlo Marx, and a fictionalized depiction of Neal Cassady, named Sal Paradise. FTP, this is what American author who depicted himself as Sal Paradise in On the Road?

ANSWER: Jack Kerouac
5. The first war to be photographed extensively and the first war to utilize modern devices such as the telegraph and the railroad, this conflict was instigated when the leader of one of the warring nations insisted on sending forces into Moldavia and Wallachia in order to protect Eastern Orthodox Christians in the area. The other warring powers, however, interpreted this maneuver as an aggressive invasion of a certain empire, using the skills of such medical luminaries as Mary Seacole and Florence Nightingale to revolutionize the role of the military nurse on the battlefield. For ten points, name this war notable for the stupidity of its commanders, pitting Great Britain, France, Austria, and the Ottoman Empire against Imperial Russia.

ANSWER: Crimean War
6. The protagonist of this novel, as a youth, is forced into slave labor by his foster brother and sworn enemy. The protagonist later falls in love with the sister of that character, Hindley, though the sister, in order to protect the protagonist from Hindley and gain favor with the noble family that lives on Thrushcross Grange, goes on to marry Edgar Linton. That sister, Catherine Earnshaw, later affirms that she has fallen in love with the Byronic hero Heathcliff in, FTP, what stormy Gothic novel written by Emily Bronte taking place in the titular estate?

ANSWER: Wuthering Heights
7. 1,3-dichloroallene exhibits the axial version of these property, and (E)-cyclooctene has the planar variety. Walden inversion, which involves this property of a molecule, can occur in reactions with an $\mathrm{S}_{\mathrm{N}} 2$ mechanism. First discovered in tartaric acid, this property is not exhibited by meso compounds, and it can be tested by a polarimeter. It occurs in tetrahedral molecules in which all four substituents are different. Describing molecules that are non-superimposable on their mirror images, it results in enantiomers. FTP, identify this concept in chemistry often conceptualized as "handedness."

ANSWER: chirality
8. One character on this show considers wearing a Native American headdress to his wedding after shaving off a strip of his hair. In another episode, it is revealed that the protagonist's girlfriend was once a Canadian pop singer with hits like "Let's go to the Mall" and "Sandcastles in the Sand." After criticizing a building shaped like a penis, the protagonist is put in charge of designing his first building in New York, but later quits his job and is forced to design a Rib Restaurant shaped like a cowboy hat. FTP, Bob Saget narrates the titular story to his children in which CBS comedy, featuring Ted Mosby and his womanizing "bro" Barney Stinson, played by Neil Patrick Harris?

ANSWER: How I Met Your Mother
9. One collection of poems by this author ends with the lines "It is the hour of departure. Oh abandoned one." and contains such poems as "Ah Vastness of Pines" and "Tonight I Can Write". This author wrote poems to an artichoke, conger chowder, and a large tuna in the market in his collection Elementary Odes. In another poem by this author, the speaker says "rise and be born with me, my brother" while ascending to the titular Incan structure. FTP, "The Heights of Macchu Picchu" is part of the collection, Canto General, by what Chilean poet who wrote Twenty Love Poems and A Song of Despair?

ANSWER: Pablo Neruda
10. While treaching at a private school in Vienna, this man became acquainted with Anna Freud, after which he decided to study the Montessori method of education. In contrast to an earlier work, his 1969 book Ghandi's Truth focused on the later stages of the life cycle. This author of Young Man Luther broke with Freud and expanded upon his five stages of development with eight of his own, including Autonomy vs. doubt and Industry vs. inferiority. FTP, Identify this psychologist, the author of Childhood and Society.

## ANSWER: Erik Ericson

11. One author from this country wrote a play in which an inspector is constantly outwitted by The Maniac, whom he is trying to interrogate, Accidental Death of an Anarchist. Another author from this nation wrote a novel detailing a conversation between Marco Polo and Kublai Khan, describing the title entities, Invisible Cities. While this country's most famous playwright wrote one play in which a character is convinced that he's Emperor Henry IV, and one in which a family barges into a rehearsal of a play to demand that the Manager help them finish their story, Six Characters in Search of an Author. FTP, Dario Fo, Italo Calvino, and Luigi Pirandello all hail from what nation?

ANSWER: Italy
12. The son of a gardener, this man started out as a royal cupbearer, but soon rose to tremendous imperial prominence and took a name meaning "true king". After becoming king of his home city of Kish, he campaigned against Lugalzagezi of Uruk. This ruler's grandson, who was called a god-king and was named Naram-Sin, was the last great ruler of the polity this man founded, which collapsed suddenly after an extended drought stopped shipments of grain to Sumer from northern Mesopotamia. FTP, name this man who founded arguably the world's first empire, with its capital at Akkad.

ANSWER: Sargon (or Sharru-ken) the Great of Akkad
13. The main concept of this text is discussed in relation to medicine by Eryximachus and in relation to law by Pausanias, while Phaedrus discusses its positive effects on individuals. Specifically, Phaedrus believes that the concept can inspire bravery on the battlefield, and reflects on the relationship between Achilles and Patroclus in the Iliad. Poetic praise of the god rather than the concept itself is given by the host of the titular event of this text, the tragedian Agathon. The focus of this tract is Socrates' account of his encounter with Diotima of Mantinea, but more famous episodes include Alcibiades' drunken speech about his attempted
seduction of Socrates and Aristophanes' creation myth explaining homosexual and heterosexual lovers. For ten points, name this Platonic dialogue discussing the nature of love set at an Athenian drinking party. ANSWER: Symposium
14. He was responsible for kidnapping Xochiquetzal from her previous husband, Tlaloc, who later married Chalchiuhtlicue. He also captured the monster Cipactli by using his own foot as bait, and created the earth from her body. For this reason, he is depicted with only one foot, and his face is usually shown to be covered in black and yellow stripes. His animal counterpart is the jaguar, and when he takes its shape, he is known as Tepeyollotl. Embodying change through conflict, this deity was often considered a tempter of humans. As a god of nighttime and the north, he was a constant opponent of Quetzalcoatl, against whom he battled for control of the world. For ten points name this Aztec god associated with royalty, known as the smoking mirror.

ANSWER: Tezcatlipoca
15. Many sufferers of this disease have alpha-synuclein-containing Lewy neurites in the CA2-3 region, and all have APP that has been fragmented via proteolysis. It can only be definitively diagnosed via treatment of tissue samples with Congo Red or Bielschowsky staining for a specific peptide derived from APP. Those that have the E4 allele of apolipoprotein E are at an increased risk for this condition, which causes the breakdown of microtubules in the brain due to tau protein aggregation. FTP, name the incurable neurodegenerative disease that affects the hippocampus and results in dementia, a condition which is characterized by the formation of beta-amyloid plaques and tangles.

ANSWER: Alzheimer's disease
16. The artist of this painting began it immediately following the attack on Pearl Harbor, and the gloom of the country is visible in this painting. The store Phillies is the only source of light in this painting, wherein an old man with two cones of white hair stands in front of two silver containers and he bends down at a counter as if fetching drinks for the three patrons of the diner, two somber men in dark suits and an unsmiling woman in a red dress. Depicting the corner of a city block across the street from a darkened empty glass storefront, FTP name this 1942 painting depicting a diner by Edward Hopper.

## ANSWER: Nighthawks

17. This battle began with Operation Lightfoot, so named because of the initial infantry assault designed not to set off the 500,000 mines placed by the enemy and allow for minesweepers to remove them, allowing the tanks that were the major player in this conflict to advance. This battle ended with Operation Supercharge, which featured heavy attrition termed "the Hammering of the Panzers." The Allies sank the tanker Proserpina during this battle, leaving the enemy tanks with little fuel. Rommel hoped that a victory at Stalingrad would force the British to pull back their tanks into Persia, allowing for a victory at this conflict that would allow the Germans to push across the Suez and the Caucasus into the oil-rich Middle East. But as at Stalingrad the Axis lost this battle, which was a turning point in the war: Churchill remarked that before this battle, the Allies never had any victories; after this battle, they never had any defeats. FTP, name this victory for the Allies under Montgomery, a 1942 battle in the Egyptian desert. ANSWER: Second Battle of El Alamein
18. These structures are the basic building blocks of the universe as they contain the elements which form stars and solar systems. These are some of the largest objects in our galaxy, measuring hundreds of lightyears across. The emission and reflection types are bright but lack a noticeable shape while the planetary kind, named for their brightness and round shape, are produced by stars ejecting their outer layers of gas. Neutron stars and pulsars lie at the center of the supernova remnant type. FTP, what is this interstellar cloud of dust, hydrogen gas, helium gas, and plasma which include the Eagle, Crab, and Hourglass ones.

ANSWER: nebulae
19. A similarly named "interim" agreement was signed in the same city as this document. That interim was soon overthrown by a revolt lead by Prince Maurice of Saxony. The Peace of Passau followed that interim, and preceded this treaty by 3 years. The principle of ecclesiastical reservation enumerated in this measure was tested by the outbreak of the Cologne war in 1583 . One of the principle problems with this treaty was that it did not take into account the many Calvinists living in the Holy Roman Empire, although this treaty
did bring peace until the outbreak of the Thirty Years War. FTP, identify this peace between Charles V and the Schmalkaldic league, which ended the religious struggle between Protestants and Catholics for a time.

## ANSWER: Peace of Augsburg

20. A trilogy of plays by this author details the spiritual conversion of a write called The Stranger who eventually becomes a monk, The Road to Damascus. Another character created by this author, Agnes, is secretly a daughter of Indra placed on earth to witness the problems of humanity in his A Dream Play. And his so-called "chamber plays" include The Burned Site and The Ghost Sonata. FTP, the titular character has relations with the manservant and Jean, who kills her pet bird at the end of Miss Julie, a play by what Swedish dramatist?

## ANSWER: August Strindberg

21. This property can be tested in resins and other composite materials with the Barcol test. It increases as particle size decreases, a relationship known as the Hall-Petch relationship. Cubic boron nitride, often known by the brand name of Borazon, has one of the highest known values for this property. It can be tested in metal via the Leeb test, and scales for measuring it include the Brinell scale and the Rockwell scale. The Vickers pyramid number is another unit for this property of a material, and apatite has a moderate value for this property according to the most common scale for measuring it. Sometimes defined in terms of the ability to scratch other substances, FTP identify this property measured by the Mohs scale.

ANSWER: hardness

## Bonuses:



1. FTPE, answer the following questions about DNA replication.
[10] These entities, which are usually no more than 200 nucleotides long in eukaryotes, are produced when DNA is replicated from the lagging strand.

## ANSWER: Okazaki fragments

[10] Before an Okazaki fragment can even form, a short sequence of RNA nucleotides must be attached to the lagging strand through the action of this enzyme.

## ANSWER: DNA primase

[10] The RNA primers formed by primase are removed by DNA polymerase I before the remaining DNA fragments are joined together by this enzyme.

ANSWER: DNA ligase
2. FTPE, name some things related to a certain area of physics.
[10] This theory, proposed in 1905, describes the behavior of objects observed in reference frames moving at a constant velocity with respect to the frame of the observer. One of its tenets is that there is no preferred reference frame.

ANSWER: special relativity
[10] This phenomenon in special relativity allows for the observation of transient particles, such as muons, due to their half-life increasing. The twin paradox is an apparent contradiction involving this phenomenon.

ANSWER: Time dilation
[10] This factor, denoted with a lowercase gamma, is used to calculate the degree of time dilation and length contraction. It equals one over the square root of one minus beta squared, where beta is the velocity in the reference frame and c is the velocity of light.

## ANSWER: Lorentz factor

3. The protagonist of this novel kills Spitz while he is still the property of Francois and Perrault, FTPE: [10] This is what novel in which Buck is allowed to succumb to the title phenomenon after his last master, Thornton, is killed by Yeehat Indians.

ANSWER: The Call of the Wild
[10] The Call of the Wild is by this American author of The Sea-Wolf.
ANSWER: Jack London
[10] This companion novel to The Call of the Wild has the reverse plot, and concerns the titular wolf-dog hybrid that is successfully civilized.

## ANSWER: White Fang

4. Harry Truman decided to recognize this country 11 minutes after its creation in 1948. FTPE:
[10] Name this country, now led by a pugnacious MIT grad, Benjamin Netanyahu.
ANSWER: Israel
[10] This man led Israel to victory in the 1948 Arab-Israeli war. He became Israel's first Prime Minister and oversaw massive immigration from Yemen during Operation Magic Carpet.

ANSWER: David Ben-Gurion
[10] This ambiguous statement from 1917 said that the British favored a national home for the Jews in Palestine.

ANSWER: Balfour Declaration
5. The protagonist of this novel explains his proto-Nietzschian theories about the uber-mensch to the police clerk Zamyotov, FTPE:
[10] This is what novel in which Raskolnikov a pawnbroker and her sister?
ANSWER: Crime and Punishment
[10] Crime and Punishment is by this Russian author of The Brothers Karamazov.
ANSWER: Fyodor Dostoevsky
[10] Prince Myshkin is the title character of this Dostoevsky novel, who finds himself in the midst of the romantic troubles of Natasya and Rogozhin.

## ANSWER: The Idiot

6. Name stuff about this ever-evolving economic alliance, the European Union, for ten points each: [10] This 1950 economic agreement initially between France and Germany was proposed by the French foreign minister Robert Schuman as a way to regulate important sources of energy as well as a way to avoid war between the two powers through the use of the common market.

ANSWER: European $\underline{\text { Coal }}$ and $\underline{\text { Steel Community }}$
[10] This 1992 treaty created the euro and formalized the creation of the European Union.
ANSWER: Treaty of Mastricht
[10] All or nothing, name six of the twelve countries inducted into the EU since 2004.
ANSWER: Romania, Bulgaria, Malta, Cyprus, Slovenia, Latvia, Lithuania, Estonia, Poland, Czech Republic, Hungary, Slovakia
7. Several of the Canterbury Tales of Chaucer including "The Franklin's Tale" and "The Clerk's Tale" take their plots directly from tales in this collection, FTPE:
[10] This is what collection of stories told by seven women and three men as they wait out the Black Death in a villa outside Florence?

## ANSWER: The Decameron

[10] This Italian author wrote The Decameron.
ANSWER: Giovanni Boccaccio
[10] The most famous tale of The Decameron is this patient woman, whose husband Gualtieri tests her by demanding that both their children be put to death.

## ANSWER: Griselda

8. FTPE, answer these related chemistry questions.
[10] This term refers to the amount of energy that is required to remove an electron, to infinity, from an atom. It greatly increases if an electron has to removed from a shell below the valence shell.

ANSWER: ionization energy
[10] Ionization energy is affected by the positive charge that an electron experiences from the protons in the nucleus of an atom. Due to shielding effects, this quantity is always less than the atomic number by a constant S.

ANSWER: effective nuclear charge or Z-effective ( $\mathrm{Z}_{\text {eff }}$ )
[10] The shielding constant $S$ can be calculated via this set of empirically-formulated rules published in 1930.

ANSWER: Slater's rules
9. Answer some questions about the geography of Canada, FTPE.
[10] Part of Canada's easternmost province, this island's capital is St. John's. You should not confuse it with Nova Scotia.

ANSWER: Newfoundland
[10] Canada's westernmost province, the city of Vancouver found here recently hosted the 2010 Winter Olympics. Its name was picked by Queen Victoria, after it became part of her empire.

ANSWER: British Columbia
[10] Found in the Yukon territory, this is Canada's highest mountain. Given that Wolverine is Canadian too, that might explain why his real name is the same as this mountain's.

ANSWER: Mount Logan
11. FTPE, answer some questions about wars that led to or were subsumed into the Second World War. [10] The Spanish Civil War of 1936-9, a victory for Francisco Franco's Falange fascist forces over the Republicans, is often considered a "trial run" or proxy for World War II. It was characterized by atrocities on both sides, including the bombing of this Basque town by the Condor Legion of the Luftwaffe, an event commemorated by Picasso.

## ANSWER: Guernica

[10] This war started with the Mukden Incident of 1931 but did not begin in earnest until the Marco Polo Bridge incident in 1937. This conflict was terribly bloody, and included events such as the Rape of Nanjing.

ANSWER: Second Sino-Japanese War (Accept equivalents)
[10] This 1939-40 war between the Soviet Union and Finland was far longer and bloodier Stalin anticipated--largely because he had wiped out much of the Red Army's officer corps in his purges--and led to the Soviet expulsion from the League of Nations.

## ANSWER: Winter War

12. FTPE Answer some questions about the rebirth of the Númenorean kingdom of Middle-Earth. [10] This Dúnedain ranger of the north and descendant of Elendil and Isildur unites the free peoples of Middle-Earth.

ANSWER: Aragorn or Elessar (prompt on Strider)
[10] Aragorn is descended from the kings of this great kingdom of the North, which was senior to Gondor and destroyed by the Witch-King of Angmar, as were its successor kingdoms of Arthedain, Cardolan, and Rhudaur.

ANSWER: Arnor
[10] Aragorn wields this sword whose name means "Flame of the West" and was forged from the shards of Narsil with the skill of the elves of Imladris.

ANSWER: Andúril
13. Identify these composers of notoriously difficult piano pieces, for 10 points each.
[10] "Mazeppa" and "Feux Follets" are two of this composer's Transcendental Etudes. His other piano compositions include three Mephisto Waltzes and nineteen Hungarian Rhapsodies.

## ANSWER: Franz Liszt

[10] "Ondine," "Le gibet," and "Scarbo" are the three movements of Gaspard de la nuit, probably the most difficult by this French composer, who also wrote the ballet Daphnis and Chloe.

ANSWER: Maurice Ravel
[10] Ravel's "Scarbo" was intended to be more difficult than Islamey, an "Oriental Fantasy" by this member of the Mighty Five.

ANSWER: Mily Balakirev
14. John Ruskin heaped immense praised on this man throughout his career. FTPE:
[10] Identify this English romantic landscape painter who was known as the "painter of light." He painted such things as Ulysses Deriding Polyphemus.

ANSWER: J.M.W. Turner
[10] Perhaps Turner's most famous work, this painting subtitled the Great Western Railway represents a barely visible train coming towards the view in a fog of yellowish-Brown mist.

ANSWER: Rain, Steam, and Speed
[10] This contemporary of Turner's was also a landscape painter, also his paintings were much more conventional, like Dedham Vale and View of Salisbury Cathederal from the Bishop's Grounds. Oh yeah, he also painted this thing called the Hay Wain

ANSWER: John Constable
15. FTPE, answer some questions about Middle English.
[10] Middle English is the child of both Old English and Norman French, which became the language of government and the aristocracy following this man's victory at Hastings in 1066.

ANSWER: William I of England or II of Normandy the Bastard the Conqueror (at least one of these identifiers--regnal number or either nickname--is required and may be prompted for)
[10] Despite its debts to French, Middle English, like Modern and Old English, is part of this language family, whose other old members include Frisian, Gothic, and Norse.

ANSWER: Germanic language or language family
[10] This phenomenon, in which the pronunciation of vowels changed from their French-influenced continental values to their distinctive English sounds, is a major dividing line between Middle and Modern English.

## ANSWER: Great Vowel Shift

16. Answer some questions about $19^{\text {th }}$ Century American poets, FTPE:
[10] This most popular of the Fireside Poets wrote about a grisly shipwreck in "The Wreck of the Hesperus" and the titular hero who loves Minehaha in "The Song of Hiawatha".

ANSWER: Henry Wadsworth Longfellow
[10] This poet declared that the saddest words are "it might have been" in Maud Muller and about an old woman who chastised Stonewall Jackson by shouting "Shoot, if you must, this old gray head / But spare your country's flag" in Barbara Frietchie.

ANSWER: John Greenleaf Whittier
[10] This American poet an editor of the New York Evening Post is most famous for his poems "To a Waterfowl" and his mediation on death, "Thanatopsis".

ANSWER: William Cullen Bryant
17. Name some leaders from South African history FTPE:
[10] This leader of the African National Congress was imprisoned on Robben Island for twenty seven years before becoming President of South Africa.

ANSWER: Nelson Mandela
[10] This man succeeded Nelson Mandela but suffered international criticism for questioning the viral theory of AIDS.

ANSWER: Thabo Mbeki
[10] This man preceded Mandela as President. He ended South Africa's nuclear weapons program, and was central to the end of apartheid.

ANSWER: Frederik Willem de Klerk
18. For ten points each, name the following philosophical arguments for the existence of God:
[10] First devised by St. Anselm of Canterbury and refuted by Gaunilo of Marmoutiers, this argument claims that if one can conceive of a being greater than which nothing can exist, then this being must necessarily exist.

ANSWER: ontological argument
[10] First developed by Aristotle, this is also known as the "first cause" or "prime mover" argument. It claims that in a world with causality, one "first cause" must necessarily exist because infinite regression is illogical.

ANSWER: cosmological argument
[10] This argument claims that complexity and order in the universe indicate that it was created for some end or purpose. It is illustrated by the analogy that finding a watch leads one to assume the existence of a watchmaker.

ANSWER: teleological argument or argument from design
19. For ten points, name these entities from Chinese mythology.
[10] This hairy, horned giant was the first living being, who separated earth from heaven in the primordial egg.

ANSWER: Pangu
[10] The ruler of heaven and head of the celestial bureaucracy was this Daoist deity who often helped Monkey in the Journey to the West.

ANSWER: Jade Emperor
[10] Revered as the Goddess of Heavenly Mercy by Taoists, this is the Chinese female interpretation of the Buddhist Bodhisattva of Compassion Avalokitesvara.

## ANSWER: Guan Yin

20. The A* algorithm uses a special version of these data structures which assign an additional priority measure to data added to them. FTPE:
[10] Identify these date structures, which are last in first out and which can be modeled by people standing in a line.

ANSWER: queue
[10] Implementing a queue in real life requires these structures, which is a data type that refers to another value stored somewhere in memory. Dangling ones are annoying to use.

ANSWER: pointer
[10] Dangling pointers can be rectified via this procedure, which removes data objects that won't be used by the program anymore. Mark-and-sweep is one method of implementing it.

## ANSWER: garbage collection

21. The word "malapropism" comes from the name of a character in this play, who confuses the big words that she attempts to use in conversation, FTPE:
[10] This is what play in which Captain Jack Absolute causes a mass of trouble when he woos Lydia Languish under the name of Ensign Beverly.

ANSWER: The Rivals
[10] The Rivals is by this Irish playwright of comedies of manners such as A Trip to Scarborough. ANSWER: Richard Brinsley Sheridan
[10] Characters in this Sheridan play include Joseph and Charles Surface, the latter of whom is pursued by the gossip-loving Lady Sneerwell.
ANSWER: The School for Scandal

## we are the people with buzzers who answer questions

