

2021 ACF Fall

In the presence of a target, toehold switches become a functional form of this molecule. The function of this molecule can be inhibited by a stem-loop at its RBS. This molecule features UTRs near either end. One process involving this molecule can be initiated by motifs named for Shine and Dalgarno or Kozak. In one process, this molecule is sequentially fed through adjacent aminoacyl, peptidyl, and exit sites. This molecule is protected from cytoplasmic enzymes by its poly-A tail and 5-prime cap. Spliceosomes process the “pre-” form of this molecule by removing its introns. This molecule is created complementary to the template strand by transcription. For 10 points, name this single-stranded nucleic acid that carries genetic information from the nucleus to the ribosomes.

ANSWER: **mRNA** [or **messenger RNA** or **messenger ribonucleic acid**; prompt on **RNA** or **ribonucleic acid**]

<David Bass> (Biology - genetics/genetics-related)

Values of this quantity corresponding to the C, D-1, and F Fraunhofer lines can be used to calculate a material's Abbe number. Birefringent materials are defined as being anisotropic with respect to this quantity. Relative permeability times relative permittivity equals this quantity squared. Brewster's angle for an interface equals the arctangent of a ratio of values for this quantity, while the arcsine of a ratio of values for this quantity equals the critical angle, beyond which total internal reflection occurs. Dispersion can occur when this quantity depends on wavelength. This quantity is the ratio of the speed of light in a vacuum to the speed of light in a given medium. For 10 points, name this dimensionless quantity that multiplies “sine of theta” in Snell's law.

ANSWER: **index of refraction** [or **refractive index**; prompt on **n**]

<David Bass> (Physics - waves-related (optics/sound/other))

A theorem named for the “dominated” form of this property gives conditions for this property in the L-1 norm. The Arzelà–Ascoli theorem gives conditions for the existence of a subsequence of functions with the “uniform” type of this property, which Karl Weierstrass formally differentiated from the “pointwise” form of this property. All Cauchy sequences in complete metric spaces have this property. Series that have this property, but fail to have this property when constructed from the absolute values of their addends, have the “conditional” form of this property. A geometric series has this property if the absolute value of its ratio is less than one. For 10 points, name this property of well-behaved sequences and series whose elements reach a finite limit.

ANSWER: **convergence** [accept **convergent** or **dominated convergence** theorem or **uniform convergence** or **pointwise convergence** or **conditional convergence** or **absolute convergence**; accept word forms of all answerlines with **convergent** instead of **convergence**]

<David Bass> (Math)

Under this condition, the equation “ p -squared plus two $p q$ plus q -squared equals one” describes relative frequencies of alleles p and q for a biallelic gene.

[10] Name this double-eponymous type of equilibrium in which allele and genotype frequencies remain constant within a population.

ANSWER: **Hardy–Weinberg** equilibrium [or **Hardy–Weinberg** principle; prompt on **HWE** or **HWP**]

[10] Applying Hardy–Weinberg equilibrium as a model requires the assumption that this quantity is infinitely large. Bottlenecks cause genetic drift because they reduce either genetic diversity or this quantity.

ANSWER: **population size** [prompt on partial answer]

[10] This behavior disturbs Hardy–Weinberg equilibrium by increasing the ratio of homozygotes to heterozygotes. One minus the ratio of observed heterozygotes to expected heterozygotes is the namesake coefficient of this behavior, which is avoided by some species via natal dispersal.

ANSWER: **inbreeding** [prompt on **incest**]

<David Bass> (Biology - ecology)

The Nosé–Hoover thermostat uses a heat bath consisting of one imaginary particle in order to maintain the properties of this ensemble in molecular dynamics simulations. For 10 points each:

[10] Name this statistical ensemble in which the number of particles, volume, and temperature are held constant.

ANSWER: **canonical** ensemble [prompt on *NVT* ensemble]

[10] The canonical ensemble was first described by this scientist, who also gave the first statistical justification of the second law of thermodynamics. Thermodynamic beta equals one over temperature times a constant named for this scientist.

ANSWER: Ludwig (Eduard) **Boltzmann**

[10] The partition function for the canonical ensemble equals the exponential of the “Helmholtz” form of this quantity times negative thermodynamic beta. Enthalpy minus the temperature times entropy gives its “Gibbs” form.

ANSWER: **free energy** [accept **Helmholtz free energy** or **Gibbs free energy**; prompt on *F* or *A* or delta *G*]

<David Bass> (Physics - thermodynamics)

A character in this play requests “the swift sting of a vicious wasp” and calls himself “the panther of the trees” while having his armpit hairs plucked. A surveyor in this play gestures that “*the earth is most unsuitable*” after being bribed to move the path of a railroad. In this play, a character is able to enter a room because servants have formed the Palace Workers’ Union to get the day off. A character known as the Bale of Ilujinle wins over a woman in this play by printing her face on stamps. This play opens with a schoolteacher offering to carry the pail that his love interest carries, after which he refuses to pay her bride-price because it is “A savage custom.” For 10 points, name this play in which the traditional Baroka is chosen over the progressive Lakunle by Sidi, written by Wole Soyinka.

ANSWER: *The **Lion and the Jewel***

<David Bass> (World Literature - drama)

The prostitute Sonya’s “voice broke like an overstrained string” as she reads this story “distinctly and forcibly as though she were making a public confession of faith.” For 10 points each:

[10] Name this story that Raskolnikov forces Sonya to read aloud before begging her to run away with him.

ANSWER: story of **Lazarus** [prompt on the *fourth gospel*]

[10] After Sonia rejects Raskolnikov, he implicitly admits to her that he killed Lizaveta, the abused half-sister of this character whom he also killed with an axe. Give either the name or profession of this miserly character who is introduced as “first-rate,” but “an awful old harpy.”

ANSWER: **Alvona** Ivanovna [accept **pawnbroker** or equivalents; prompt on *Ivanovna*]

[10] Raskolnikov goes to prison and lives happily-ever-after with Sonya in the controversial epilogue of this novel by Fyodor Dostoevsky.

ANSWER: ***Crime and Punishment*** [or ***Prestupléníye i nakázániye***]

<David Bass> (European Literature - long fiction)

Dhū Nuwās violently converted much of this modern-day country’s Christian population to Judaism before committing suicide by riding his horse into the sea. For 10 points each:

[10] Name this modern-day country whose Jewish population can be traced back to its Himyarite Kingdom.

ANSWER: Republic of **Yemen** [or *al-Jumhūrīyah al-Yamanīyah*]

[10] Many Jewish people immigrated to the Himyarite Kingdom from this empire’s province of Judea after the Bar Kokhba revolt. Aelius Gallus led an unsuccessful expedition to *Arabia Felix*, a region that contains modern-day Yemen, for Caesar Augustus, an emperor of this empire.

ANSWER: **Roman** Empire [or **Rome** or ***Imperium Rōmānum*** or *Basileía tōn Rhōmaíōn*]

[10] Description acceptable. In the 20th century, Operation Magic Carpet assisted Yemenite Jews with performing this action, known in Hebrew as “*aliyah*.” The Law of Return gives Jewish people the right to perform this action.

ANSWER: **returning to Israel** [accept any answer indicating people **immigrating** to **Israel**; prompt on answers about **Zionism**, the **founding of Israel**, or **obtaining Israeli citizenship**; prompt on **ascent** or **the act of going up**]

<David Bass> (World history)

In an 1837 speech, this politician stated that slavery “is, instead of an evil, a good—a positive good.” For 10 points each:

[10] Name this member of the Great Triumvirate from South Carolina who served as Vice President under John Quincy Adams and Andrew Jackson.

ANSWER: John Caldwell **Calhoun**

[10] John C. Calhoun orchestrated his resignation from the vice presidency and subsequent election as a Senator in order to better defend South Carolina during this event. This event, which began when South Carolina claimed that the Tariff of Abominations was unconstitutional, foreshadowed the secession of southern states three decades later.

ANSWER: **Nullification Crisis** [prompt on nullification]

[10] In response to the Nullification Crisis, Andrew Jackson passed this act to authorize potential military action against South Carolina. After repealing its Nullification Ordinance, South Carolina symbolically nullified this act.

ANSWER: **Force Bill** [or ***An Act to further provide for the collection of duties on imports***]

<David Bass> (American history)

One of these siblings races against Hugi, the personification of thought, while the other is excluded from the trials in the myth in which they appear. For 10 points each:

[10] Name either of these siblings that are taken as servants by Thor after one of them eats the marrow from a leg bone of one of Thor’s goats.

ANSWER: **Þjálfi** or **Röskva**

[10] Þjálfi and Röskva accompany Thor and Loki to the hall of Útgarða-Loki, who is one of these beings. Surtr will lead these beings to fight against the gods during Ragnarök.

ANSWER: **giants** [or ***jötunn*** or ***jötnar*** or **frost giants**; prompt on answers describing being from Múspell, like Múspell's sons]

[10] In the hall of Útgarða-Loki, Thor is tricked into trying to drink this thing, causing the creation of tides. Ryūjin and Poseidon are gods of this domain in Japanese and Greek mythologies, respectively.

ANSWER: the **sea** [or the **ocean**]

<David Bass> (Mythology)

Tuck and Yang criticize the “easy adoption” of the “discourse” of this process in a 2012 paper titled “[this process] is not a metaphor.” For 10 points each:

[10] Name this process that is “always a violent event” and “quite simply the substitution of one ‘species’ of mankind by another” according to the section “On Violence.”

ANSWER: **decolonization**

[10] “On Violence” is the first section of this work, which discusses the role of the *lumpenproletariat* in the process of decolonization. In his preface to this work, Jean-Paul Sartre quips that the Earth “numbered two billion inhabitants,” including “1.5 billion ‘natives.’” This work takes its title from the first line of the “The Internationale.”

ANSWER: *The **Wretched of the Earth*** [***Les Damnés de la Terre***]

[10] *The Wretched of the Earth* is by this Martinican thinker who also wrote *Black Skin, White Masks*.

ANSWER: Frantz (Omar) **Fanon** [or Ibrahim Frantz **Fanon**]

<David Bass> (Social Science)

Though this policy was not involved in *Jacobson v. Massachusetts*, Judge John S. Kastrenakes cited it in a decision supporting this policy. A June 2020 report from Goldman Sachs states that this policy “could potentially substitute for” events that “might reduce GDP by just under 5%.” Joe Biden’s seventh executive order is titled for “Protecting the Federal Workforce and [this policy].” Disney World closed a loophole in its implementation of this policy by specifying that “you should be stationary” while eating. The Paris Independent School District incorporated this policy into its dress code after Governor Greg Abbott issued an executive order banning this policy in Texas. For 10 points, name this policy that requires people to wear a certain item in order to prevent the spread of COVID-19.

ANSWER: **mask mandates** [accept any answer about **obligating** people to wear face **coverings** in certain contexts; accept “Protecting the Federal Workforce and **Requiring Mask-Wearing**”]
<David Bass> (Current events)