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QUESTION 1

Artificial kidneys have been used for almost 50 years to treat patients with different forms of renal failure. The artificial kidney (dialysis machine) removes unwanted substances from the blood by diffusion. A patient\\'s blood is passed through channels bounded by a porous, semi-permeable membrane that allows the free diffusion in both directions of all plasma constituents except the plasma proteins. Erythrocytes and other cellular components of blood cannot pass through the membrane. The other side of the membrane is exposed to the dialyzing fluid which carries away the unwanted materials. If the concentration of a material in the blood is greater than in the dialyzing fluid, there will be a net flow of the material from the plasma to the dialyzing fluid. If the concentration of a material in the blood. The composition of normal plasma, plasma in an individual suffering renal failure, and dialyzing fluid are shown in Table 1.

Constituent	Normal Plasma	Plasma w/ renal failure	Dialyzing Fluid
	(mEq/L)	(mEq/L)	(mEq/L)
Na ⁺	142	142	133
K ⁺	5	7	1.0
CI-	107	107	105
HCO3-	27	14	35.7
Urate	0.3	2	0
Constituent	Normal Plasma	Plasma w/ renal	Dialyzing Fluid
	(mg/dl)	(mg/dl)	(mg/dl)
Glucose	100	100	125
Urea	26	200	0
Creatinine	1	6	0

Table 1

Dialysis replaces some functions of the kidneys and attempts to correct the effects of renal failure. For example, patients with renal failure develop acidosis due to a buildup of metabolically produced acids in the circulation. Without dialysis,

the pH of the blood will drop and coma may occur. Dialyzing fluid contains a relatively high concentration of bicarbonate which diffuses into the circulation and neutralizes the acid.

Which of the following provides the best explanation for the urea plasma concentration in individuals with renal failure?

A. Urea filtration decreases

B. Urea absorption decreases



- C. Urea filtration increases
- D. Urea secretion increases

Correct Answer: A

Reading from Table 1, it is clear that the urea concentration in a patient with renal failure is much higher than that in a normal individual. Filtration of urea decreases, leading to decreased excretion and a higher urea concentration in the

plasma.

Choice B is incorrect because a decrease of absorption from the nephron tubule would tend to increase excretion and decrease the plasma urea concentration.

Choice C is incorrect because increased urea filtration would lead to increased excretion. Choice D is incorrect because increased secretion of urea into the nephron tubule would increase excretion.

QUESTION 2

Millenialism is, generally speaking, the religious belief that salvation and material benefits will be conferred upon a society in the near future as the result of some apocalyptic event. The term derives from the Latin word for 1,000; in early Christian theology, believers held that Christ would return and establish his kingdom on earth for a period of a thousand years.

Millenialist movements, Christian and non-Christian, have arisen at various points throughout history, usually in times of great crisis or social upheaval. In "nativistic" millenialist movements, a people threatened with cultural disintegration attempts to earn its salvation by rejecting foreign customs and values and returning to the "old ways." One such movement involving the Ghost Dance cults, named after the ceremonial dance which cult members performed in hope of salvation, flourished in the late 19th century among Indians of the western United States.

By the middle of the 19th century, western expansion and settlement by whites was seriously threatening Native American cultures. Mining, agriculture and ranching encroached on and destroyed many Indian land and food sources. Indian resistance led to a series of wars and massacres, culminating in the U.S. Government\\'s policy of resettlement of Indians onto reservations which constituted a fraction of their former territorial base. Under these dire circumstances, a series of millenialist movements began among western tribes.

The first Ghost Dance cult arose in western Nevada around 1870. A Native American prophet named Wodziwob, a member of a Northern Paiute tribe, received the revelation of an imminent apocalypse which would destroy the white man, restore all dead Indians to life, and return to the Indians their lands, food supplies (such as the vanishing buffalo), and old way of life. The apocalypse was to be brought about with the help of a ceremonial dance and songs, and by strict adherence to a moral code which, oddly enough, strongly resembled Christian teaching. In the early 1870s, Wodziwob\\'s Ghost Dance cult spread to several tribes in California and Oregon, but soon died out or was absorbed into other cults.

A second Ghost Dance cult, founded in January 1889, evolved as the result of a similar revelation. This time Wovoka -another Northern Paiute Indian, whose father had been a disciple of Wodziwob -- received a vision during a solar eclipse in which he died, spoke to God, and was assigned the task of teaching the dance and the millennial message. With white civilization having pushed western tribes ever closer to the brink of cultural disintegration during the previous twenty years, the Ghost Dance movement spread rapidly this time, catching on among tribes from the Canadian border to Texas, and from the Missouri River to the Sierra Nevadas -- an area approximately one-third the size of the continental United States.

Wovoka\\'s Ghost Dance doctrine forbade Indian violence against whites or other Indians; it also involved the wearing of "ghost shirts," which supposedly rendered the wearers invulnerable to the white man\\'s bullets. In 1890, when the Ghost Dance spread to the Sioux Indians, both the ghost shirts and the movement itself were put to the test. Violent



resistance to white domination had all but ended among the Sioux by the late 1880s, when government- ordered reductions in the size of their reservations infuriated the Sioux, and made them particularly responsive to the millenialist message of the Ghost Dance. As the Sioux organized themselves in the cult of the dance, an alarmed federal government resorted to armed intervention which ultimately led to the massacre of some 200 Sioux men, women and children at Wounded Knee, South Dakota in December of 1890. The ghost shirts had been worn to no avail, and Wounded Knee marked the end of the second Ghost Dance cult.

All of the following characteristics are described in the passage as common to all millenialist movements EXCEPT:

- A. the desire for salvation.
- B. the belief in imminent apocalypse.
- C. attempts to preserve cultural integrity.
- D. adherence to Christian doctrines.

Correct Answer: D

This is in the "all of the following EXCEPT" format. The correct answer will NOT be a characteristic ascribed to millenialist movements. The question stem\\'s key phrase, "millenialist movements," echoes back to the first paragraph. There we learn that followers of millenialist movements hope for salvation, or to be saved, which eliminates choice (A), because it IS a characteristic of such movements. And there we also learn that followers of such movements believe in a fast-approaching apocalyptic event, which eliminates choice (B). In the fourth sentence of paragraph 1, the author says that members of nativistic millenialist movements attempt to stave off cultural disintegration by returning to the "old ways;" another way of saying this is that they attempt to preserve their cultural integrity, which eliminates choice (C). Choice (D) is the correct answer. And indeed, though the word "millenialist" has Christian origins, the author never says that all millenialist movements adhere to Christian doctrines. Choice (D) is slightly confusing since the author notes that an odd element of the Ghost Dance cults was the resemblance of their moral code to Christian teachings. But the Ghost Dance cults are only one example of millenialist movements; presumably there have been others which had nothing to do with Christian doctrine. In fact, the author says in the third sentence of paragraph 1 that "millenialist movements, Christian and non- Christian," have appeared throughout history, so choice (D) is the best answer.

QUESTION 3

The enzymes in pancreatic juice digest:

- A. carbohydrates and proteins only.
- B. carbohydrates and proteins only.
- C. fats and proteins only.
- D. carbohydrates, proteins and fats.

Correct Answer: D

QUESTION 4

As Alice Echols went on to claim, "Nothing seems to conjure up the 1970s quite so effectively as disco. Even at the time, critics remarked upon disco\\'s neat encapsulation of that decade\\'s zeitgeist. `It must be clear by now to everyone with an ear or an eye that this era,\\' wrote journalist Andrew Kopkind in 1979, `is already the Disco Years, whether it will be called by that name or not.\\' A former sixties radical, Kopkind was by turns fascinated, bemused, and appalled by



the disco epoch, and he likely imagined that in years to come fellow cultural critics would share his interest. But the seventies have not loomed large in our national imagination, except perhaps as comic relief. For many Americans, these were the forgettable years.

That forgettability owes a lot to the 1960s, the outsized decade that dwarfs all others in recent memory. The sixties will always be remembered for their audacity, whether found in the courage of civil rights protesters who put their bodies on the line or in those doomed but beautiful rock stars who tried breaking through to the other side. By contrast, the seventies seem the decade when nothing, or nothing good, happened ?an era memorable for the country\\'s hapless presidents, declining prestige, bad fashions, ludicrous music, and such over-the-top narcissism that Tom Wolfe dubbed it the `Me Decade.\\' Before the decade was out, this narrative of decline had become routine. `After the poetry of the Beatles comes the monotonous bass-pedal bombardment of Donna Summer,\\' huffed one New York Times writer in 1979. It is a measure of the era\\'s persistent bad press that a recent book challenging this view carries the pleading title Something Happened.

As for the sixties, it doesn\\'t matter how much silliness went down, we still invest those times with seismic significance. Take Joe Cocker\\'s performance at Woodstock. His spasmodic thrashing about and his vocals, slurred to the point of incomprehensibility, are something of a joke today. Cringe-inducing though it may be, however, Cocker\\'s performance is never made to stand in for the whole of the sixties. The sixties remain enveloped in the gauzy sentimentalism of what might have been. Yet the iconic image of John Travolta as dance-floor king Tony Manero in white polyester suit, arm thrust to the disco heavens, has come to symbolize the narcissistic imbecility and inconsequentiality of the disco years.

Were it not for the Rubaiyat, I, too, might well regard the seventies as a lamentable and regrettable period in American history. The Rubaiyat was, yes, a disco. It was located in the heart of sixtiesland: Ann Arbor, Michigan, the home of the University of Michigan and legendary incubator of radical activism. At the height of the seventies, the town\\'s annual Hash Bash ?a smoke-in to reform marijuana laws ?was still going strong and so were its two food co-ops-one reform, the other orthodox when it came to selling white foods (that is, rice, sugar, and flour of the white variety). Ann Arbor also had bookstores galore, including the original, wonderful Borders Bookstore, and any number of hippie-ish restaurants and bars such as the Fleetwood Diner, the Del Rio, and the Blind Pig. Musically, it prided itself on its vintage music (it hosted one of the earliest blues festivals), but at heart it was a rock town besotted with Iggy Pop and the Stooges and Sonic\\'s Rendezvous, a band fronted by Patti Smith\\'s future husband, Fred Smith. Its leading music store, Schoolkids\\' Records, stocked disco, but never played it. All of this is to say that disco-averse Ann Arbor came close to providing something of a safe haven from glitterball culture.

The Rubaiyat was no red-velvet-rope disco where fashionista doormen determined who was sufficiently fabulous to gain entry. This would never have worked in a town where down jackets and army surplus were hardly an unusual sight. The club did have some pretensions to classiness, but the mismatched, sagging booths and bordello red defeated occasional efforts at upmarket sophistication. What the Rubaiyat did have were better-than-average speakers, a heterogeneous cliente, and a weekend cover of three dollars."

Echols, A. (2011). Hot stuff: Disco and the Remaking of American Culture. New York: W. W. Norton.

Which of the following possible approaches to studying the music of the 60s would the author be LEAST interested in?

A. A historical study that aims to see the decade as it really was and explore its failures to live up to its idealistic goals.

B. A sociological study that examines fans of 60s rock who did not fit the stereotypes of counterculture members.

C. A musicological study that uses the music of the Beatles to encapsulate what the decade was really about.

D. A memoir exploring how a person from small-town Kansas used the music of the Beatles to experience the counterculture from afar.

Correct Answer: C

This Reasoning Beyond the Text question asks you to make generalizations about the author\\'s approach to music criticism in order to determine which other works would interest her. The author criticizes the existing one-sided view of the 60s, stating that they "will always be remembered for their audacity...in those doomed but beautiful rock stars who



tried breaking through to the other side" although they contained many embarrassing moments. Thus, the 60s have been viewed in a skewed way since the era\\'s greatest moments have stood in for its entire culture. This suggests the author would be against using a single popular band as an encapsulation of an entire era. A ?incorrect. The author writes, "The sixties remain enveloped in the gauzy sentimentalism of what might have been." This suggests she would prefer seeing it in a realistic light. B ?incorrect. The author focuses on her personal experience with non-stereotypical disco fans, so she might be interested in the same approach applied to other genres. D ?incorrect. The author incorporates elements of memoir and focuses on people far from the center of disco culture, so this approach might interest her.

QUESTION 5

A researcher in a molecular biology lab planned to carry out an extraction procedure known as an alkaline plasmid prep. which is designed to purify plasmids, small pieces of the hereditary material DNA, from bacterial cells. The bacteria are first placed into a test tube containing liquid nutrient medium and allowed to grow until they reach a high population density. The culture, which consists of solid cells suspended in the medium, is then centrifuged; a solid pellet is formed. The supernatant is poured out, leaving the pellet behind, and the cells are resuspended in a mL of lysis buffer solution (50 mM glucose, 25 mM Tris buffer and 10 mM ethylenediaminetetraacetic acid (EDTA), with 5 mg of the enzyme lysozyme added). They are then incubated for 30 minutes at 0°C, during which time the bacterial cell walls break down and the cell contents are released into the solution. After incubation, 1 mL of 0.4 N sodium hydroxide and 1 mL of 2% sodium dodecyl sulfate (SDS) are added, and the solution is again incubated on ice for 10 minutes. 2 mL of 3 M sodium acetate are added and the mixture is incubated for 30 minutes at 0°C. The test tube is centrifuged once more and the supernatant is decanted into a clean tube, leaving behind the protein and most other cell components in the pellet. Finally, 10 mL of pure ethanol are added to the supernatant from the previous step to precipitate out the DNA, and the test tube is incubated at -20°C for 60 minutes, during which the mixture remains liquid. The mixture is centrifuged a final time and the supernatant removed. The translucent precipitate that results is washed with 70% ethanol (70% ethanol and 30% water by volume), allowed to dry, and resuspended in 1 mL of TE buffer (10 mM Tris, 1 mM EDTA). In preparation for this experiment, the researcher prepared stock solutions of the various chemicals that she will need in the experiment. Stock solutions are highly concentrated solutions of commonly used chemicals in water from which dilute solutions are prepared for daily use. Table 1 shows the chemicals, their molecular formulas and weights, and the composition of commonly used stock solutions.



Table 1

Compound	Formula	MW	Stock
Tris	(CH ₂ OH) ₃ CNH ₂	121	1 <i>M</i> (pH 8)
EDTA	(HOOCCH ₂) ₄ (CNH ₂) ₂	292	0.5 M (pH 8)
Sodium hydroxide	NaOH CuHacHaOSOa ⁻ Na ⁺	40	5 N
Sodium acetate	CH ₃ COO ⁻ Na ⁺	82	3 M (pH 5.2)
Ethanol	CH ₃ CH ₂ OH	46	95%

What is the molality of a stock solution that is 10% SDS by mass?

A. 0.028 m

B. 0.100 m

C. 0.347 m

D. 0.385 m

Correct Answer: D

To answer this, you have to know the definitions of two measures of solution concentration; percentage by mass and molality. The percentage by mass of a solution is the mass of the solute divided by the total mass of the solution, multiplied by 100. Thus, a 10% SDS solution has 10% of its mass in the form of sodium dodecyl sulfate and 90% of its mass in the form of water. The molality of a solution is the number of moles of solute per kilogram of solvent. Let\\'s assume that this solution contains one kilogram of water. Remember that the water makes up only 90% of the total weight of the solution. We can find the total weight of the solution by using the formula 1000 equals zero point nine x. This tells us that the total weight of the solution is one thousand, one hundred eleven grams, so the weight of the SDS must be one hundred eleven grams. Now we need to know how many moles of SDS there are in the 111 grams. The number of moles is equal to the mass of the SDS over its molecular weight; this comes to 0.38 moles. Since there are 0.385 moles of SDS for every thousand grams of water, the solution is 0.385 molal, choice D.

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