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**QUESTION 1**

Flytraps in two pitcher plants ?Sundew and Venus ?are similar in that they both:

- A. are saprophyte.
- B. trap insects.
- C. are symbiotic.
- D. lack chlorophyll.

Correct Answer: B

QUESTION 2

Due to ever-increasing paranoia about the transmission of hepatitis and AIDS via blood transfusions and the frequent difficulty of procuring matching blood donors for patients, researchers have been working at a feverish pace to produce disease-free and easy-to-use blood substitutes. The difficulty most synthetic blood researches have had is in formulating a substance that combines qualities of sterility, high capacity for carrying oxygen to body tissues, and versatility within the human body. Three major substitute technologies have been developed to date; each has certain advantages and shortcomings.

"Red blood," the first of the blood substitute technologies, is derived from hemoglobin which has been recycled from old, dead, or worn-out red blood cells and modified so that it can carry oxygen outside the red blood cell. Hemoglobin, a complex protein, is the blood's natural oxygen carrier and is attractive to scientists for use in synthetic blood because of its oxygen-carrying capacity. However, hemoglobin can sometimes constitute a two-fold threat to humans when it is extracted from the red blood cell and introduced to the body in its naked form. First, hemoglobin molecules are rarely sterile and often remain contaminated by viruses to which they were exposed in the cell. Second, naked hemoglobin is extremely dangerous to the kidneys, causing blood flow at these organs to shut down and leading, ultimately, to renal failure. Additional problems arise from the fact that hemoglobin is adapted to operate optimally within the intricate environment of the red blood cell. Stripped of the protection of the cell, the hemoglobin molecule tends to suffer breakdown within several hours. Although modification has produced more durable hemoglobin molecules which do not cause renal failure, undesired side effects continue to plague patients and hinder the development of hemoglobin-based blood substitutes.

Another synthetic blood alternative, "white blood," is dependent on laboratory synthesized chemicals called perfluorocarbons (PFCs). Unlike blood, PFCs are clear oil like liquids, yet they are capable of absorbing quantities of oxygen up to 50% of their volume, enough of an oxygen carrying potential for oxygen-dependent organisms to survive submerged in the liquid for hours by "breathing" it. Although PFCs imitate real blood by effectively absorbing oxygen, scientists are primarily interested in them as constituents of blood substitutes because they are inherently safer to use than hemoglobin-based substitutes. PFCs do not interact with any chemicals in the body and can be manufactured in near-perfect sterility. The primary pitfall of PFCs is in their tendency to form globules in plasma that can block circulation. Dissolving PFCs in solution can mitigate globulation; however, this procedure also seriously curtails the PFCs' oxygen capacity.

The final and perhaps most ambitious attempt to form a blood substitute involves the synthesis of a modified version of human hemoglobin by genetically-altered bacteria. Fortunately, this synthetic hemoglobin seems to closely mimic the qualities of sterility, and durability outside the cellular environment, and the oxygen-carrying efficiency of blood. Furthermore, researchers have found that if modified hemoglobin genes are added to bacterial DNA, the bacteria will produce the desired product in copious quantities. This procedure is extremely challenging, however, because it requires the isolation of the human gene for the production of hemoglobin, and the modification of the gene to express a molecule that works without support from a living cell.



While all the above technologies have serious drawbacks and difficulties, work to perfect an ideal blood substitute continues. Scientists hope that in the near future safe synthetic blood transfusions may ease blood shortages and resolve the unavailability of various blood types.

The author mentions all of the following as weaknesses of synthetic bloods EXCEPT:

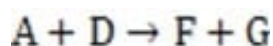
- A. naked hemoglobin can cause renal failure in humans.
- B. "red blood" can transmit viruses to a recipient.
- C. genetic engineering can be extremely difficult.
- D. "white blood" has a low oxygen-carrying potential.

Correct Answer: D

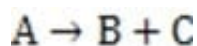
This is a detail question that requires you to identify the answer choice which is not a weakness of synthetic bloods. Choices (A) and (B) mention that naked hemoglobin can cause renal failure in humans and that "red blood" can transmit viruses to a recipient. These facts are expressed in the second paragraph, which addresses red blood and the problems associated with it. The second half of that paragraph states that naked hemoglobin, the basis of "red blood", can constitute a two-fold threat to the human body as it can transmit viruses and is extremely dangerous to the kidneys, causing blood flow at these organs to shut down and results in renal failure. Choice (C) mentions that genetic engineering can be extremely difficult. Paragraph 4 is all about modified hemoglobin derived from genetically-altered bacteria. Its last sentence emphasizes the challenges associated with the isolation and modification of the human hemoglobin gene. Although, in theory, genetic engineering can produce near-ideal synthetic blood, you can infer that a drawback of this process is the complexity of these procedures. So choice (C) is also a weakness, and therefore does not complete this question stem. Choice (D) mentions that "white blood" has a low oxygen-carrying potential. Were this true, it certainly would be a weakness, as one of the chief criteria of synthetic blood is that it mimic blood in its high oxygen-carrying capacity. However, this statement is not true. The third paragraph, regarding "white blood", notes that PFCs, a primary component of "white blood", have high oxygen-carrying capacities. The second and third sentences of this paragraph state that PFCs are capable of absorbing quantities of oxygen up to 50% of their volume and imitate real blood by effectively absorbing oxygen. From this we can infer that "white blood" is capable of transporting oxygen well. This contradicts choice (D). Since the passage never suggests that "white blood" has a low oxygen-carrying potential, choice (D) does not represent a weakness of synthetic blood and is the correct answer.

QUESTION 3

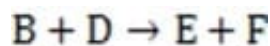
Several techniques have been developed to determine the order of a reaction. The rate of a reaction cannot be predicted on the basis of the overall equation, but can be predicted on the basis of the rate-determining step. For instance, the following reaction can be broken down into three steps.



Step 1



(Slow) Step 2



(fast) Step 3



(fast)

Reaction 1 In this case, the first step in the reaction pathway is the rate-determining step. Therefore, the overall rate of the reaction must equal the rate of the first step, $k_1 [A]$ where k_1 is the rate constant for the first step. (Rate constants of the different steps are denoted by k_x , where x is the step number.)

In some cases, it is desirable to measure the rate of a reaction in relation to only one species. In a second-order reaction, for instance, a large excess of one species is included in the reaction vessel. Since a relatively small amount of this large concentration is reacted, we assume that the concentration essentially remains unchanged. Such a reaction is called a pseudo first-order reaction. A new rate constant, k' , is established, equal to the product of the rate constant of the original reaction, k , and the concentration of the species in excess. This approach is often used to analyze enzyme activity.

In some cases, the reaction rate may be dependent on the concentration of a short-lived intermediate. This can happen if the rate-determining step is not the first step. In this case, the concentration of the intermediate must be derived from the equilibrium constant of the preceding step. For redox reactions, the equilibrium can be correlated with the voltage produced by two half-cells by means of the Nernst equation. This equation states that at any given moment:

$$E = E^\circ - \left(\frac{RT}{nf}\right) \ln$$

$$([C]^c [D]^d / [A]^a [B]^b)$$

Equation 1 When



Reaction 2

Note: $R = 8.314 \text{ J/K}\cdot\text{mol}$; $F = 9.6485 \times 10^4 \text{ C/mol}$.)

If Step 2 above were the rate-determining step of Reaction 1, which of the following equations would correctly define the rate?

A. $\text{Rate} = \frac{k_1 k_2 [D]}{k_{-1} [C]}$

B. $\text{Rate} = \frac{k_1 k_2 [D]}{k_{-1} k_{-2} [C]}$

C. $\text{Rate} = \frac{k_1 k_2 [A] [D]}{k_{-1} [C]}$

D. $\text{Rate} = \frac{k_1 k_2 [A] [D]}{k_{-1} k_{-2} [C]}$

A. Option A



B. Option B

C. Option C

D. Option D

Correct Answer: C

In this question we are trying to find the rate of the second step of reaction 1. The rate of this step is equal to: $k_2 [B][D]$, where k_2 is the rate constant of step 2, as described in the passage. The problem is that we can't measure the

$$K_{eq} = \frac{[B][C]}{[A]},$$

concentration of B since it is an intermediate. But, according to the passage, we can figure it out from the equilibrium constant of step 1. The equation for the equilibrium constant of step 1 is: or rearranging for [B],

$$[B] = K_{eq} \times [A]/[C]$$

$$\frac{K_{eq-step 1} \times k_2 \times [A][D]}{[C]}$$

By combining this formula with the rate constant for step 2, we find that the rate of step 2 equals. .

But none of the choices is expressed in terms of the equilibrium constant; instead they're in terms of k_1 and k_{-1} so to answer this question, you need to remember that the equilibrium constant for step one is equal to k_1/k_{-1} , where k_1 is the

rate constant for the forward reaction in step 1, and k_{-1} is the rate constant for the reverse reaction. This leaves us with choice C as the correct answer.

QUESTION 4

Synthetic dyes constitute a commercially significant area of organic chemistry. The color producing properties of these compounds are the result of highly delocalized electron systems giving rise to electronic transitions whose absorptions occur in the visible region. Most commercially useful dyes can be classified as one of three types -- anthraquinones, azo dyes, or triarylmethyl salts. Examples of each type are illustrated in Figure 1.

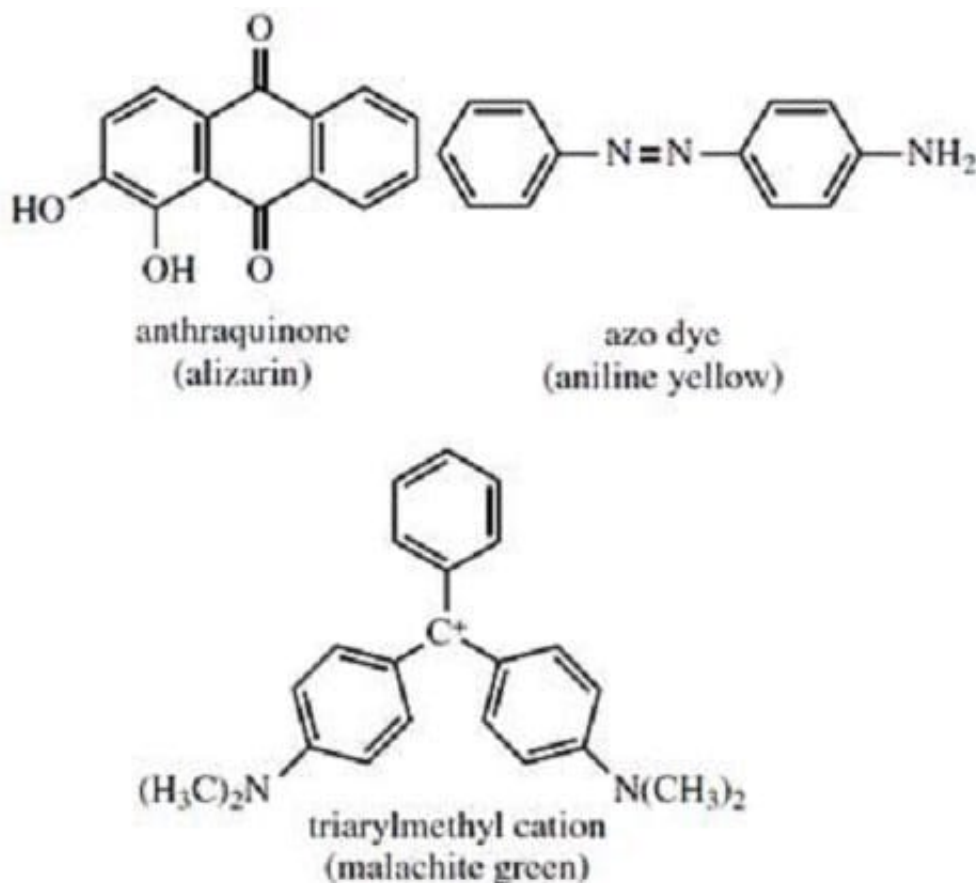


Figure 1

In order for a dye to be useful in the fabric industry, it must have sufficient affinity for the polymeric fibers of which the material is composed; the dye must not only impart a color to the fabric, but must also do so in a relatively permanent manner (color fastness). Proper design of synthetic polymers requires the placement of acidic or basic side chains along the polymer backbone such that binding sites are available for dyeing. Similarly, dyes must be produced not only with the appropriate color-producing structure, but also with an affinity for the fabric in question. The structural units of several common synthetic fibers are shown in Figure 2.

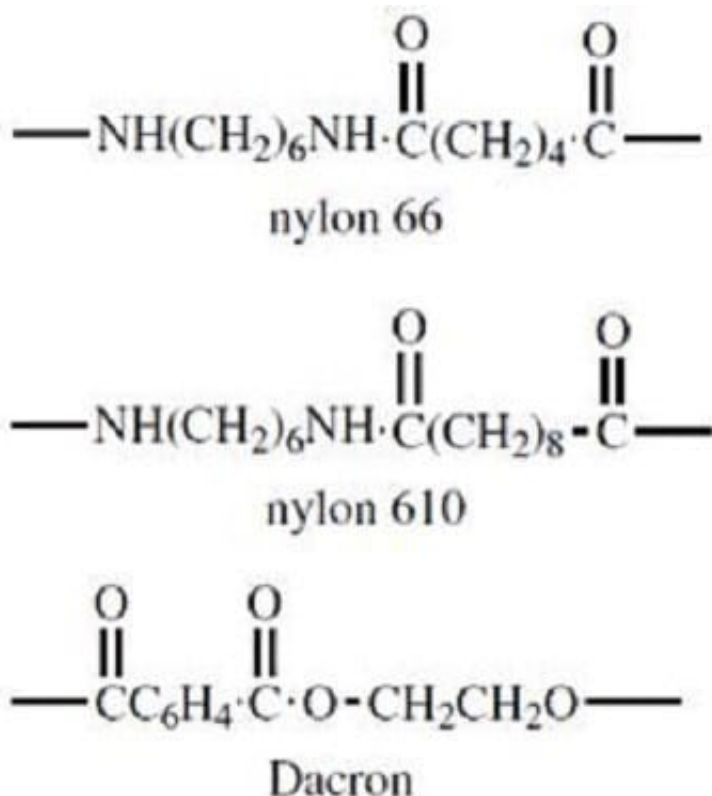


Figure 2

Certain natural protein fibers such as silk or wool can be treated with aqueous base, then with solutions containing cationic dyes such as malachite green to produce color fast yarns. The most likely explanation for the affinity of malachite green for silk or wool via this process is that:

- A. many of the R groups on the amino acids of which these fibers are composed contain COOH groups.
- B. very few of the R groups on the amino acids of which these fibers are composed contain OH groups.
- C. the aqueous base hydrolyzes some of the peptide linkages in these fibers.
- D. the aqueous base neutralizes the cationic dye.

Correct Answer: A

Since malachite green, as depicted in figure 1, is cationic, it follows that it will have an affinity for anionic binding sites. Such anionic binding sites, alluded to in the passage, would be produced from acidic side chains upon treatment with

aqueous base, and acidic side chains in natural proteins would most likely contain the COOH functionality.

Choice B is incorrect since acidic side chains on natural amino acids often contain OH groups. Choice C is wrong since treatment with base is part of the process of producing color-fast yarns; this treatment makes the color stick, it does not break down the yarn into smaller polypeptide chains as choice C suggests.

Choice D is incorrect because the base reacts with the fiber before the dye is added, and not with the dye.

QUESTION 5



A student conducts a chemical analysis of the components of a popular soft drink. The beverage label shows that the drink contains carbonated water, phosphoric acid, caffeine, and caramel color, but does not indicate the concentrations of these chemicals.

	Carbonic Acid	Phosphoric Acid
MW	62.03	98.00
mp (°C)	n/a	42.35
K_a	(1) 4.3×10^{-7}	(1) 7.52×10^{-4}
	(2) 5.61×10^{-11}	(2) 6.23×10^{-8}
		(3) 2.2×10^{-13}
Formula	H_2CO_3	H_3PO_4

Table 1

Dissolved carbon dioxide will react reversibly with water to form carbonic acid. In an attempt to analyze the beverage composition, the student conducts the following experiments on a one liter sample of the beverage.

Experiment 1

The sample is placed in a sealed beaker cooled to 10°C and a vacuum is created in the space above the beverage. The gas pumped from this space is passed through a solution of $BaCl_2$, producing a white precipitate. The process

continues until no more precipitate forms. The precipitate is dried and found to have a mass of 9.5 grams.

Experiment 2

The remaining solution left in the sealed beaker is then titrated with 0.01 M NaOH to give the titration curve shown in Figure 1.

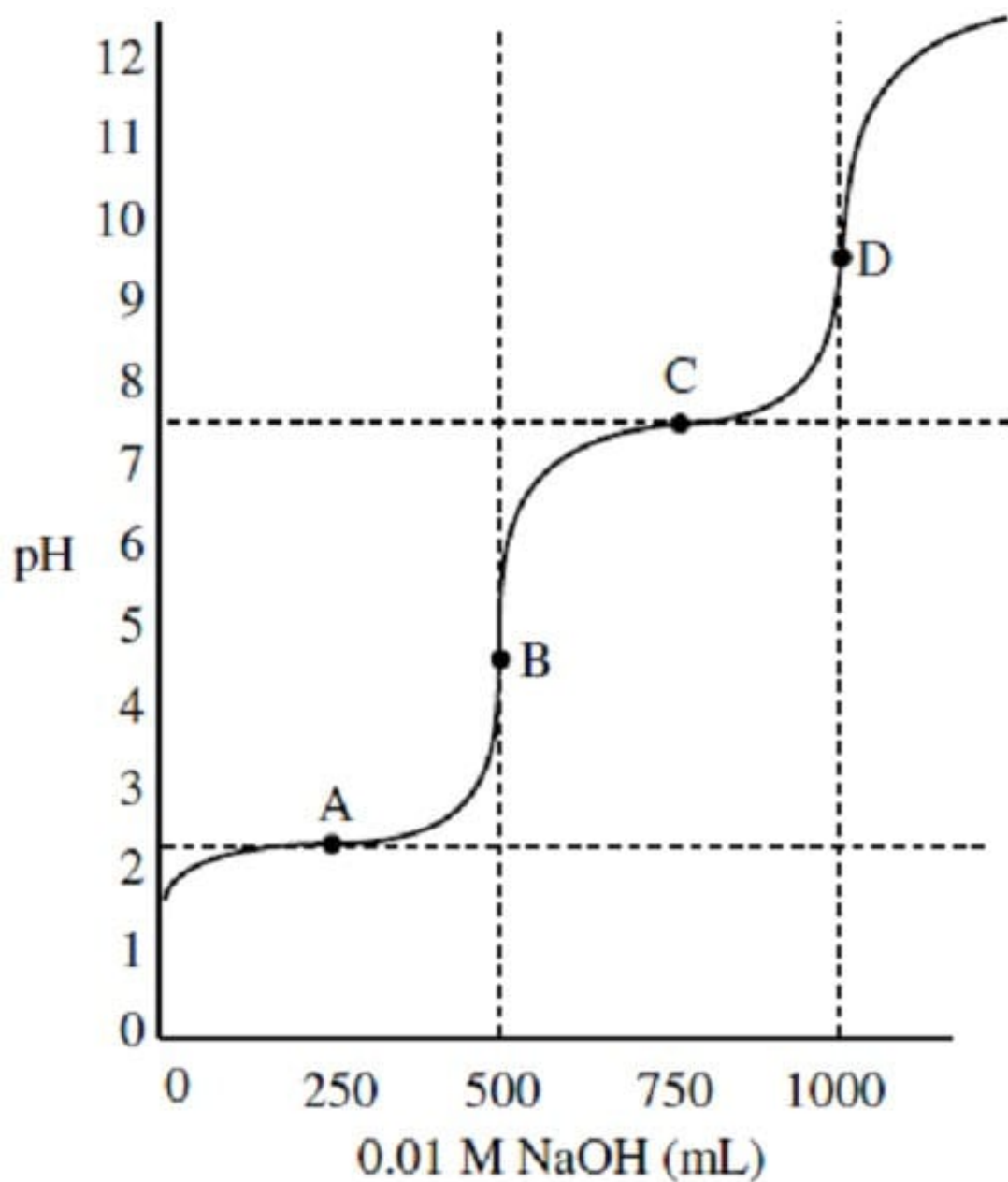


Figure 1

CO₂

Why did the student choose to keep the sealed beaker of beverage at 10°C while vacuuming the from solution?



- A. To reduce dipole-dipole interactions between the water and the CO_2 .
- B. To ensure that CO_2 did not expand explosively.
- C. To minimize the loss of water vapor from the solution.
- D. To increase the kinetic energy of CO_2 and make its removal more efficient.

A. Option A

B. Option B

C. Option C

D. Option D

Correct Answer: C

The beverage is kept at a low temperature to reduce its kinetic energy and minimize the loss of water by evaporation. If too much water were lost, the concentration of the remaining fluid would increase and inaccurate measurements of the

phosphoric acid concentration would result. Choice A is incorrect because CO_2 is a non-polar molecule and would not be involved in dipole-dipole interactions with water.

Choice B is incorrect because extracting the gas from the beverage would not result in a violent expansion of the gas.

Choice D is incorrect because reducing the temperature would decrease the kinetic energy.

QUESTION 6

At a recent meeting of the American Public Transit Association, the Environmental Protection Agency unveiled stringent new standards for pollution control. The transit authorities were particularly concerned about the implementation of a proposed "Clean Air Act." They believed the provisions of the Clean Air Act could severely affect basic services to their local communities. Many transit agencies were concerned that it would be difficult to comply with the pollution and emissions control standards while continuing to operate within realistic budgets. The aim of the Clean Air Act is to assure that by the year 2000, there will be a reduction of at least 10 million tons of sulfur dioxide from 1980 levels. The bill also calls for a reduction in pollutants that contribute to the depletion of ozone. Strict regulations of toxic air emissions would have to be established and enforced. Additionally, the Clean Air Act would establish specific acid-rain reduction quotas and enforce severe penalties for transgressors of any of the new clean air regulations. There is little doubt that mass-transit suppliers will be considerably affected by this new legislation, just as the chemical and petroleum industries have already been affected by similar legislation. Transit authorities are challenged to strike a difficult balance between complying with the government's new standards and developing an official concern for the environment, while continuing to fulfill the transportation needs of the general population. Among the areas addressed by the Clean Air Act, the topic of mobile resources is of particular interest to mass transit authorities. Provisions contained in the Act under this title are aimed at encouraging the development and practical use of alternative fuel sources, like solar energy and methane fuel. The goal of this section of the Act is to eradicate toxic fuel emissions in order to provide cleaner air and a more favorable environment. The Act even goes so far as to declare that in cities like New York, Los Angeles and Houston -- where air quality is particularly noxious and toxins exceed the limits of federal regulations -- forms of mass transit should run on so-called "clean-burning fuels" by the year 2000. Such fuels include reformulated gasoline, propane, electricity, natural gas, ethanol, methanol, or any similar type of low-emission fuel. In



addition, the Act proposes that, by 1994, all new urban buses in cities with populations exceeding one million must operate solely on clean-burning fuels. The topics of alternative fuels and alternative fuel vehicles represent, by far, the most controversial issue in the Clean Air Act. President Bush has called alternative fuels "bold and innovative" means to control pollution, but according to many transportation experts, the Act's proposals on alternative fuel usage are unrealistic. The transit authorities recognize that concern for the environment and health hazards like pollution are global issues. However, most transit officials concur that inventing and developing new ways to fuel mass transit will take at least 50 years to realize. They point out that the Act does not mention the political and social ramifications of usurping the role of the petroleum industries. The Act does not mention if or how the thousands of people employed by the oil industry will get retrained to produce and implement the use of "clean" fuel. No one disputes the fact that people need some form of transportation to get from place to place. Preserving the environment should be a priority, yet we need to remember that even if toxic emissions are completely eliminated sometime in the future, the challenge of moving mass numbers of people where they want to go will still exist and must remain a priority. Transit authorities contend that unless the Clean Air Act also acknowledges this, and develops a way to encourage mass transit over personal transportation, the problems of pollution might not be significantly altered. They suggest that there are many areas in this country that have little or no mass transit and that, if the Clean Air Act's goal is to reduce pollution, perhaps the most practical and realistic means to achieve that goal is to encourage the development and maintenance of mass transit systems.

According to transit authorities, unless the Clean Air Act acknowledges the necessity for mass transit, and encourages its use over that of personal transportation:

- A. the cost of mass transit will rise to a prohibitive level.
- B. private automobile manufacturers will take advantage of the loopholes in the Clean Air Act.
- C. pollution may continue unabated.
- D. the use of public transportation in rural areas will decrease.

Correct Answer: C

The correct answer to this inference question can be found by looking at the first two sentences of the last paragraph. Transit authorities believe that unless the Clean Air Act acknowledges that people need some form of mass transportation, the problems of pollution might not be significantly altered. Choice C paraphrases this idea. It is stated in the first paragraph that compliance with the Act might make it difficult for transit agencies to continue to operate within realistic budgets. However, one could not infer from the information given in the passage that transportation costs will rise to a prohibitive level. Choice A is therefore incorrect. B is out because private automobile manufacturers aren't mentioned anywhere in the passage. Finally, Choice D is wrong because there is no reason to think that the use of public transportation would decrease from the present level if nothing were done to affect it.

QUESTION 7

Saul Hoffman's scientific journal paper published in 2015 in *Societies* explores the relationship between two topics that at the surface are very distant from each other. As he goes on to state, "It is relatively easy, at least for an economist, to see why economists would be attracted to issues like teen pregnancy and teen childbearing, despite their apparent distance from the core topics of economics. First, economics ?especially microeconomics ?is fundamentally the study of choices that individuals make, traditionally and most often in formal markets with monetary prices, but now more and more frequently outside that sphere. Viewed from that perspective, choices involving sexual and fertility behavior among teens are an incredibly challenging, but inviting, target. Is it possible to identify the role of economic incentives, including government policy, on these behaviors? Is it sensible to apply traditional models of rational choice decision-making to teens?

Second, the traditional concern about teen fertility was predicated on the notion that it was an economically catastrophic act. In a famous and oft-quoted 1968 article, Arthur Campbell wrote that "The girl who has an illegitimate child at the age of 16 suddenly has 90 percent of her life's script written for her," including reduced opportunities for schooling, the



labor market, and marriage. But it doesn't take too much reflection to appreciate that more may be going on in leading to these poor outcomes than just a teen birth. Disentangling the causal effect of teen childbearing on subsequent socio-economic outcomes from its correlational effect is another deliciously inviting and challenging target, this time well-suited for the applied economist or econometrician.

Just to make all this yet more inviting, the two research strands are closely related. Suppose it could be demonstrated that for some teens the socio-economic impact of a teen birth was negligible. For example, maybe future prospects for some teens were equally poor with or without a birth or perhaps government programs provided substantial benefits, so that the net impact on socio-economic well-being was consequently small or even positive. Then, it might well be 'rational' in an economic sense to have a teen birth in the first place, thereby linking the research on the causal impact of a teen birth with the research on the choice determinants of a teen birth. So what came to be known as the teen birth 'causes' literature and the teen birth 'consequences' literature were clearly interrelated.

And then, to add yet another layer of challenge, the teen fertility rate in the U.S. has fallen at a rate that is totally unprecedented. Teen fertility was once widespread, with most of it occurring within early and sometimes not entirely voluntary marriage. In 1960, the teen fertility rate was approximately 90 births per 1000, which implied that more than 40% of women ever had a teen birth. When I published my first article on teen births 25 years ago, the teen fertility rate was 60 births per 1000, down one-third from 1960, but it had increased six years in a row in what turned out to be a deviation from the downward trend. Since then the rate has declined every single year, except for a short but puzzling uptick between 2005 and 2007. In 2014, the teen fertility rate was 24.2 births per 1000, the lowest teen fertility rate ever recorded in the U.S., though still shockingly high by European standards. Thus, the rate fell by more than 50% during my professional association with the topic and by 70% since 1960. Of course, at the same time teen marital births largely disappeared, falling from 85% of teen births to 12%.

This adds yet another focus for economic research. Why did the rate fall? Did it have anything to do with changes in the costs of teen childbearing or changes in policy? Is it a good thing or not?

In this article I try to make sense out of these various research strands by providing a personal narrative through the economics literature on teen childbearing, with a special emphasis on the three issues discussed above. My goal is to make the literature, including some reasonably technical content, accessible and valuable to a non-economist."

Hoffman, S. (2015). Teen Childbearing and Economics: A Short History of a 25-Year Research Love Affair. *Societies*, 5(3), 646-663. doi:10.3390/soc5030646

The author's main point could be most strongly undermined by a sociological or economic study showing that:

- A. statistics on teen birth make little apparent sense because even when there is an overall downward trend, the teen birth rate can unpredictably swing upward, and vice versa.
- B. many teens who give birth do so not out of desire to be parents, but because they lack access to birth control and effective sex education.
- C. in recent years, the economic and career results of teen pregnancy have been getting worse.
- D. potential teenage mothers are minimally influenced by economic considerations like career and financial prospects, but make choices based on irrational factors like community beliefs about morality.

Correct Answer: D

This Reasoning-Beyond-the-Text question asks you to consider the effects of possible outside information on the passage. The author cites reasons to apply economic theory to teen pregnancy, writing "Viewed from that perspective, choices involving sexual and fertility behavior among teens are an incredibly challenging, but inviting, target. Is it possible to identify the role of economic incentives, including government policy, on these behaviors?" If such incentives had little or no effect on the behavior being studied, it would not make sense to apply the framework of economics to it. A ?incorrect. This would not undermine the author's claim since he describes the data as in need of explanation and cites times when the birth rate rose during periods of overall decline. B. ?incorrect. The author does not suggest that desire to be a parent is a key motive in teen childbirth. C ?incorrect. The passage states teen birth has been declining. If



the potential consequences have been getting worse, this would reinforce the author's assumption that economic considerations influence behavior.

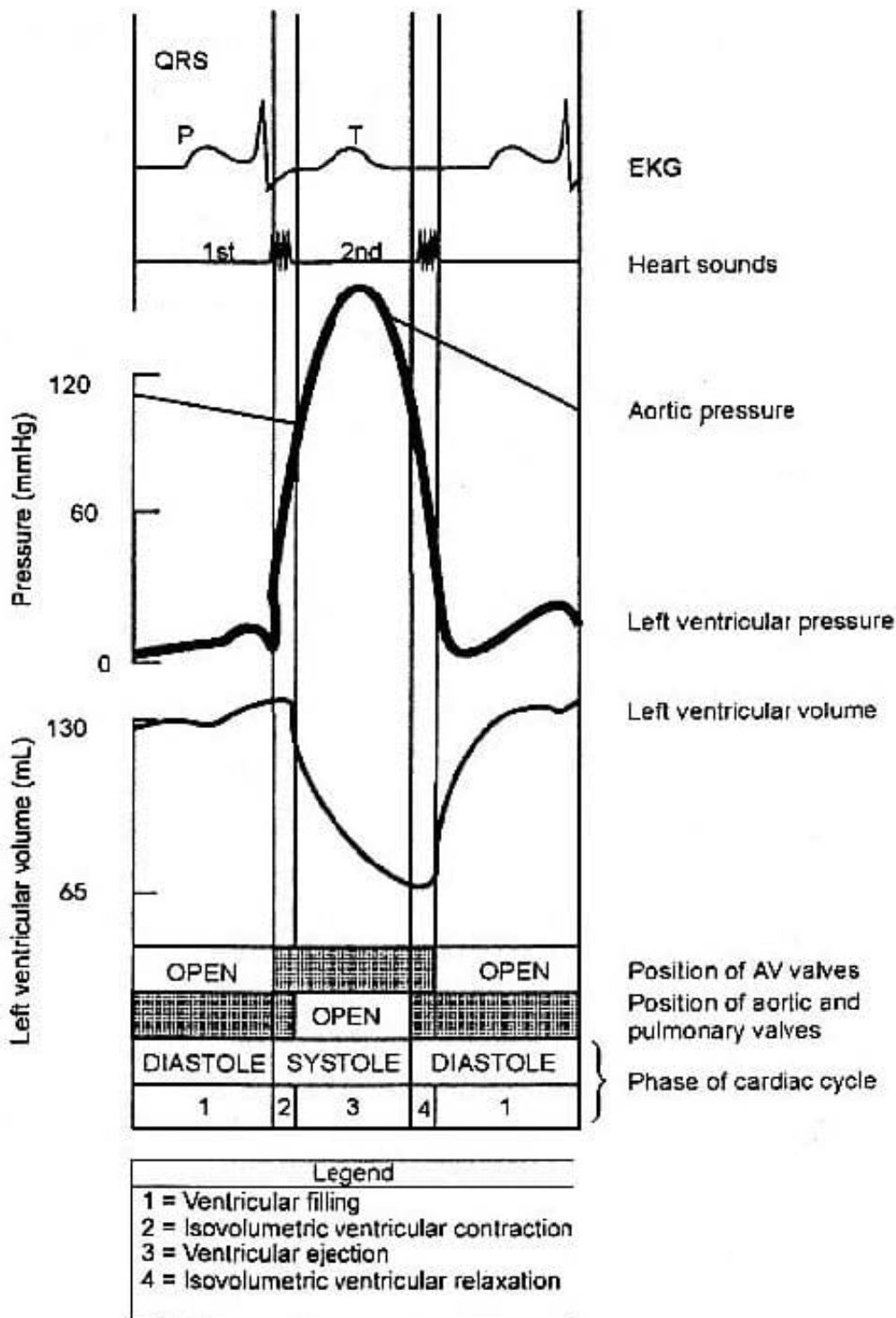
QUESTION 8

The process of depolarization triggers the cardiac cycle. The electronics of the cycle can be monitored by an electrocardiogram (EKG). The cycle is divided into two major phases, both named for events in the ventricle: the period of ventricular contraction and blood ejection, systole, followed by the period of ventricular relaxation and blood filling, diastole.

During the very first part of systole, the ventricles are contracting but all valves in the heart are closed thus no blood can be ejected. Once the rising pressure in the ventricles becomes great enough to open the aortic and pulmonary valves, the ventricular ejection or systole occurs. Blood is forced into the aorta and pulmonary trunk as the contracting ventricular muscle fibers shorten. The volume of blood ejected from a ventricle during systole is termed stroke volume.

During the very first part of diastole, the ventricles begin to relax, and the aortic and pulmonary valves close. No blood is entering or leaving the ventricles since once again all the valves are closed. Once ventricular pressure falls below atrial pressure, the atrioventricular (AV) valves open. Atrial contraction occurs towards the end of diastole, after most of the ventricular filling has taken place. The ventricle receives blood throughout most of diastole, not just when the atrium contracts.

Figure 1: Electronic and pressure changes in the heart and aorta during the cardiac cycle.



The wall of the left ventricle is at least three times as thick as that of the right ventricle. This feature aids circulation by assuring that:

- A. blood entering the pulmonary artery is at a much higher pressure than blood entering the aorta.
- B. blood entering the aorta is at a much higher pressure than blood entering the pulmonary artery.
- C. the left ventricle has a higher blood capacity than the right ventricle at all times.



D. the right ventricle has a higher blood capacity than the left ventricle at all times.

Correct Answer: B

It is commonly known that as a rule, the size of a muscle is proportional to its strength. The heart, which is a muscle, contains a chamber which must pump blood into the aorta to perfuse the grand majority of the body's tissues. Clearly, this chamber (= the left ventricle) must contain thicker muscle (= stronger) than a chamber that pumps blood only to the lungs (= the right ventricle through the pulmonary artery). The stronger chamber pumps blood with a greater force which means a higher pressure (recall from physics: $P = F/A$).

QUESTION 9

When Gwendolyn Brooks published her first collection of poetry *A Street In Bronzeville* in 1945 most reviewers recognized Brooks's versatility and craft as a poet. Yet, while noting her stylistic successes few of her contemporaries discussed the critical question of Brooks's relationship to the Harlem Renaissance. How had she addressed herself, as a poet, to the literary movement's assertion of the folk and African culture, and its promotion of the arts as the agent to define racial integrity? The New Negro poets of the Harlem Renaissance expressed a deep pride in being Black; they found reasons for this pride in ethnic identity and heritage; and they shared a common faith in the fine arts as a means of defining and reinforcing racial pride. But in the literal expression of this impulse, the poets were either romantics, or realists and, quite often within the same poem, both. The realistic impulse, as defined best in the poems of McKay's *Harlem Shadows* (1922), was a sober reflection upon Blacks as second class citizens, segregated from the mainstream of American socio-economic life, and largely unable to realize the wealth and opportunity that America promised. The romantic impulse, on the other hand, as defined in the poems of Sterling Brown's *Southern Road* (1932), often found these unrealized dreams in the collective strength and will of the folk masses. In comparing the poems in *A Street in Bronzeville* with various poems from the Renaissance, it becomes apparent that Brooks brings many unique contributions to bear on this tradition. The first clue that *A Street In Bronzeville* was, at its time of publication, unlike any other book of poems by a Black American is its insistent emphasis on demystifying romantic love between Black men and women. During the Renaissance, ethnic or racial pride was often focused with romantic idealization upon the Black woman. A casual streetwalker in Hughes's poem, "When Sue Wears Red," for example, is magically transformed into an Egyptian Queen. In *A Street In Bronzeville*, this romantic impulse runs headlong into the biting ironies of racial discrimination. There are poems in which Hughes, McKay and Brown recognize the realistic underside of urban life for Black women. But for Brooks, unlike the Renaissance poets, the victimization of poor Black women becomes not simply a minor chord but a predominant theme. ...Brooks's relationship with the Harlem Renaissance poets, as *A Street in Bronzeville* ably demonstrates, was hardly imitative. As one of the important links with the Black poetic tradition of the 1920s and 1930s, she enlarged the element of realism that was an important part of the Renaissance world-view. Although her poetry is often conditioned by the optimism that was also a legacy of the period, Brooks rejects outright their romantic prescriptions for the lives of Black women. And in this regard, she serves as a vital link with the Black Arts Movement of the 1960s that, while it witnessed the flowering of Black women as poets and social activists as well as the rise of Black feminist aesthetics in the 1970s, brought about a curious revival of romanticism in the Renaissance mode.

According to the passage, critics praised the quality of Brooks's first collection of poetry but:

- A. rejected her description of the plight of poor Black women in urban America.
- B. failed to consider the links between her work and the work of earlier Black poets.
- C. assumed incorrectly that she had borrowed many ideas from the poems of Sterling Brown.
- D. argued that she had neglected to demystify romantic love between Black men and women.

Correct Answer: B

This comes right out of the opening paragraph: Critics didn't examine how Brooks's poems linked up with the Harlem Renaissance that preceded her. In choice A, no such reaction on the part of critics is mentioned. Anyhow, (A) would be the judgment of sociologists, not literary critics. Choice C cites a comparison between Brown and Brooks that is



nowhere made, let alone alluded to by Brooks\' contemporary critics. Choice D is incorrect because even though Brooks did demystify romantic love (line 32), there\'s no sense that critics failed to notice that.

QUESTION 10

In an experiment to study frictional forces, a student attached a spring scale to identical bricks wrapped in different kinds of paper: brown paper, waxed paper and sand paper. Holding the spring scale, the student pulled the bricks across a table and measured the force required to pull the bricks across the table. The student wrapped the bricks in different paper to change the frictional forces between which two objects?

- A. The bricks and the spring scale.
- B. The paper and the bricks.
- C. The wrapped bricks and the table.
- D. None of these.

Correct Answer: C

Changing the type of wrapping paper would change the friction between the wrapped bricks and the table top. A greater frictional force would make it harder to pull the brick across the table and give a higher reading on the spring scale.

QUESTION 11

Many nutrients required by plants exist in soil as basic cations:

Mg^{2+} , Mn^{2+} , and Ca^{2+} .

A soil\'s cation-exchange capacity is a measure of its ability to adsorb these basic cations as well as exchangeable hydrogen and aluminum ions. The cation-exchange capacity of soil is derived from two sources: small clay particles called micelles consisting of alternating layers of alumina and silica crystals, and organic colloids.

Al^{3+}

Replacement of H^+ and H^+ by other cations of lower valence creates a net negative charge within the inner layers of the micelles. This is called the soil\'s permanent charge. For example, replacement of an atom of aluminum by calcium within a section where the net charge was previously zero, as shown below, produces a net charge of -2 , to which other cations can become adsorbed.

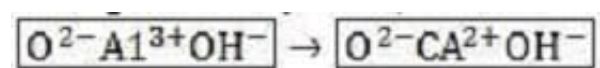


Figure 1

A pH-dependent charge develops when hydrogen dissociates from hydroxyl moieties on the outer surfaces of the clay micelles. This leaves negatively-charged oxygen atoms to which basic cations may adsorb. Likewise, a large pH-

dependent charge develops when hydrogen dissociates from carboxylic acids and phenols in organic matter.



In most clays, permanent charges brought about by substitution account for anywhere from half to nearly all of the total cation-exchange capacity. Soils very high in organic matter contain primarily pH-dependent charges. In a research study,

three samples of soil were leached with a 1 N solution of neutral KCl, and the displaced Al^{3+} and basic cations measured. The sample was then leached again with a buffered solution of BaCl_2 and triethanolamine at pH 8.2, and the

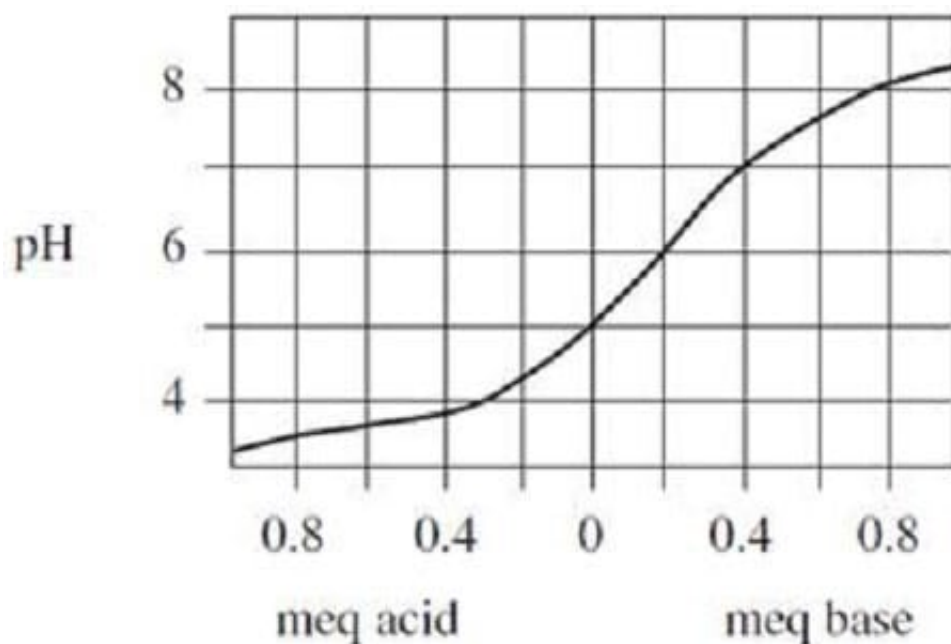
displaced H^+ measured. Table 1 gives results for three soils tested by this method.

Table 1

	(meq/100 g)				Total Cation Exchange Capacity
	pH	Al^{3+}	Basic Cations	H^+	
Sample I	4.5	11.7	1.9	34.0	47.6
Sample II	5.3	1.6	16.3	19.5	37.4
Sample III	6.0	0.5	9.8	7.8	18.1

Due to the buffering effect of the soil's cation exchange capacity, just measuring the soil solution's pH will not indicate how much base is needed to change the soil pH. In another experiment, measured amounts of acid and base were added to 10-gram samples of well-mixed soil that had been collected from various locations in a field. The volumes of the samples were equalized by adding water. The results were recorded in Figure 2.

Figure 2.



If 29 g of maleic acid () is dissolved in 500 g of ammonia (N), what is the molality of the resulting solution?

- A. 0.05 m
- B. 0.10 m
- C. 0.25 m
- D. 0.50 m

Correct Answer: D

This is a relatively simple concentration problem. Molality is defined as the number of moles of solute per kilogram of solvent. Here, you must first calculate the molecular weight of maleic acid, or 116 grams per mole, and determine the number of moles. Dividing actual grams by the grams per mole you get 0.25 moles. Since this is dissolved in 500 grams or 0.5 kilograms of ammonia you have a 0.5 molal solution, so choice D is the correct response.

QUESTION 12

It is very important for children to have quality time with their parents. Parents who provide this type of interaction may be assured of a bright future for their offspring. By the same token, according to a study by the Centers for Disease Control, parents who work do not have as much time to devote to parenting. Thus, working mothers automatically thrust an obstacle into their children's developmental future.

The argument in the passage illustrates the following component/s:

- A. faulty appeal to authority
- B. faulty application of cause and effect
- C. faulty initial premise
- D. faulty appeal to authority and faulty application of cause and effect



Correct Answer: D

The Centers for Disease Control would not be an authority on parenting time. The author cannot assume that little time means little time with children. Therefore, both of these premises are faulty. The initial premise is not obviously faulty, just the information given in the passage.

QUESTION 13

A symbolic interactionism researcher who is observing two people enjoying a coffee together at a cafe would primarily point out that:

- A. the drinking ritual is symbolic and more important than the drink itself.
- B. coffee is a stimulant drug.
- C. coffee is the second most valuable commodity in international trade.
- D. coffee is a branded and politicized consumption good.

Correct Answer: A

A is correct. Symbolic interactionists observe how people relate to things on their daily life based on the meanings those things have for them. These meanings or symbols are created mainly through social interaction and language, and shape subsequent behavior. For instance, people can agree to meet to 'have a coffee' but are not obliged to actually consume the drink. This is because the idea of meeting for a coffee is merely symbolic, standing for a short period of togetherness and socialization. Thus, they will not feel they are going against the initial plan if they have a tea instead. They will still enjoy the shared meaning of comfort and spending time with friends that stems from the idea of 'having a coffee'. Thus, knowing the meaning of actions, words, and images for people is critical for understanding people's behavior and interaction. B. This is incorrect. The claim that coffee is a stimulant drug is true but a social interactionist perspective would not be interested in that issue. Rather, it would search for the underlying meaning of 'having a coffee' or why it is acceptable to consume a particular type of stimulant drugs in certain settings and under certain circumstances.

C. This is incorrect. A Marxist perspective might pay attention to the nature of coffee as a commodity and how the global supply chain affects workers and economies worldwide. This is not of primary concern for social interactionism theory.

D. This is incorrect. This would be of interest to theories about consumption and lifestyle. This is not of primary concern for social interactionism theory.

QUESTION 14

...Squeaking sand produces sounds with very high frequencies -- between 500 and 2,500 hertz, lasting less than a quarter of a second. The peals are musically pure, often containing four or five harmonic overtones. Booming sand makes louder, low-frequency sounds of 50 to 300 hertz, which may last as long as 15 minutes in larger dunes (although typically they last for seconds or less). In addition, they are rather noisy, containing a multitude of nearby frequencies. Booms have never been observed to contain more than one harmonic of the fundamental tone. These dramatic differences once led to a consensus that although both types of sand produce acoustic emissions, the ways in which they do so must be substantially different.... In the late 1970s, however, Peter K. Haff, then at the California Institute of Technology, produced squeaks in booming sand, suggesting a closer connection between the two. Both kinds of sand must be displaced to make sounds. Walking on some sand, for example, forces the sand underfoot to move down and out, producing squeaks. In the case of booming sand, displacement occurs during avalanches. It is within the avalanche that sound begins and where the answers must be hiding. Before an avalanche can occur, winds must build a dune up to a certain angle, usually about 35 degrees for dry desert sand. Once an angle is achieved, the sand on the leeward



side of the dune begins to slump. Intact layers of sand slip over the layers below, like a sheared deck of cards. At the same time, the individual grains in the upper layers tumble over the grains underneath, momentarily falling into the spaces between them and bouncing out again to continue their downward journey. Their concerted up-and-down motion is believed to be the secret source of sound. Fully developed avalanches, in which sliding plates of sand remain intact for most of their motion, have the greatest acoustic output. In some places, where large amounts of sand are involved, booming can be heard up to 10 kilometers away. Because it is caused by large volumes of shearing sand, the roaring is also loud. In fact, sounds made by booming sand can be nearly deafening, and the vibrations causing them can be so intense that standing in their midst is nearly impossible. A good place to start in exploring the vibrational properties of sand is with the grains themselves. The mean diameter of most sand grains, whether acoustically active or not, is about 300 microns. Usually the grains in a booming dune are very similar in size, especially near the leeward crest, where the sound most often originates; such uniformity allows for more efficient shearing. Otherwise, the smaller grains impede the smooth motion of the larger ones. Similar sizes do not alone allow sand to boom. On the contrary, the booming sands of Korizo and Gelf Kebib, also in Libya, feature an uncharacteristically broad range of particle sizes. Moreover, silent dune sand often contains grains somewhat similar to nearby booming sand. Grains of booming sand also tend to have uncommonly smooth surfaces, with protrusions on the scale of mere microns. Booming dunes are often found at the downwind end of large sand sources; having bounced and rolled across the desert for long distances, the sand grains in these dunes are usually highly polished. Over time a grain can also be polished by repeated shifts within a moving dune. And squeaking sand as well tends to be exceptionally smooth.... Another important factor is humidity, because moisture can modify the friction between grains or cause sand to clump together, thus precluding shearing. Sounds occur in those parts of the dune that dry the fastest. Precipitation may be rare in the desert, but dunes retain water with remarkable efficiency. Sand near the surface dries quickly, however, and sand around a dune's crest tends to dry the fastest.

According to information presented in the passage, which of the following is true of all booming dunes?

- A. The dune needs to build up to a certain critical angle.
- B. The dune is composed of sand grains of similar size.
- C. The dune is composed of exceptionally rough sand grains.
- D. The dune needs to be dried for a while by winds to have moisture removed.

Correct Answer: A

The fourth paragraph describes the processes that cause sand to "boom". The acoustic vibrations are generated by avalanches of sand, and for that to occur, the sand must dune up to a certain angle:

generally about 35° although this is not necessarily the case. Choice B is incorrect since the third last paragraph explicitly gives examples of booming sands that contain particles that are of a broad range of sizes. Choice C is incorrect

because grains of booming sand tend to be smooth, as is stated in the next-to-last paragraph. Choice D is incorrect because while moisture does need to be removed, the process described here is not necessarily the only way this can occur.

QUESTION 15

If a wire carrying a current flowing into the screen is placed in a magnetic field pointing left, in which direction will the Lorentz force act on the charge carriers?

- A. to the left
- B. to the right



C. upward

D. out of the screen

Correct Answer: C

The right hand rule can be used to find the direction of the Lorentz force.

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