

MCAT-TEST^{Q&As}

Medical College Admission Test: Verbal Reasoning, Biological Sciences, Physical Sciences, Writing Sample

Pass MCAT MCAT-TEST Exam with 100% Guarantee

Free Download Real Questions & Answers **PDF** and **VCE** file from:

<https://www.leads4pass.com/mcat-test.html>

100% Passing Guarantee
100% Money Back Assurance

Following Questions and Answers are all new published by MCAT
Official Exam Center

- ⚙️ **Instant Download** After Purchase
- ⚙️ **100% Money Back** Guarantee
- ⚙️ **365 Days** Free Update
- ⚙️ **800,000+** Satisfied Customers



QUESTION 1

Electromagnetic radiation from space constantly bombards the earth. Most wavelengths are absorbed by the atmosphere; however, there are two "windows" of nonabsorption through which significant amounts of radiation reach the ground.

The first transmits ultraviolet and visible light, as well as infrared light or heat; the second transmits radio waves. As a result, terrestrial organisms have evolved a number of pigments that interact with light in various ways: some capture light

energy, some provide protection from light-induced damage, and some serve camouflage or signaling purposes.

Among these compounds are many conjugated polyenes, which play important roles as photoreceptors. For every chemical compound, there are certain wavelengths of light whose quanta possess exactly the correct amount of energy to

raise electrons from their ground state to higher-energy orbitals. For most organic compounds, these wavelengths are in the UV range. However, conjugated double bond systems stabilize the electrons, so that they can be excited by lower-

frequency photons with wavelengths in the visible spectrum. Such a pigment, known as a chromophore, will then transmit the "subtraction color," a color complementary to the one absorbed. For instance, carotene, a hydrocarbon compound

with eleven conjugated double bonds, absorbs blue light and transmits orange. The wavelength that is absorbed generally increases with the number of conjugated bonds; rings and side-chains also affect wavelength.

Wavelength Color Subtraction Color

480 nm blue orange

580 nm yellow violet

680 nm red green

Among the many biological molecules that are affected by light is DNA, the genetic material of living organisms. DNA absorbs ultraviolet light, and may be damaged by UVC (

light can actually repair light-induced damage to DNA by a process called photorepair. For this reason, UVA, which also stimulates tanning, was once considered beneficial. However, there is now increasing evidence that UVA can damage skin.

Why is benzene colorless?

- A. The absorption energy is of too high a frequency to be visible.
- B. The absorption energy is of too low a frequency to be visible.
- C. Benzene does not absorb light.
- D. Benzene is not conjugated.

Correct Answer: A

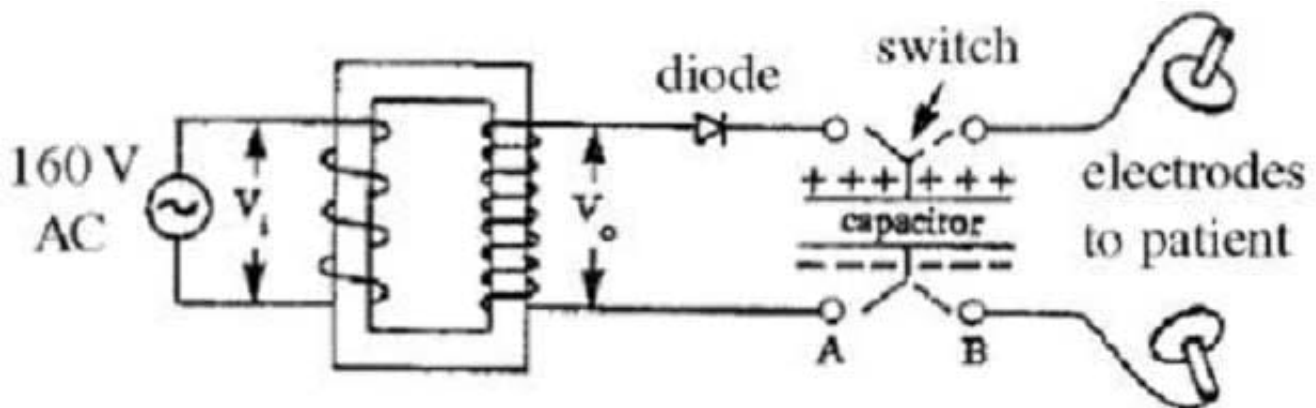
The greater the number of conjugated bonds in a molecule, the more strongly electrons in excited states will be

stabilized. Thus the more conjugated a molecule, the lower the frequency and the longer the wavelength that will excite it. Benzene, with only three double bonds, requires absorption of quite high energy light, higher than for the colored compounds discussed in the passage. In fact, the light required to excite benzene electrons is in the ultraviolet range, so no color is produced when benzene absorbs light, and benzene is colorless.

QUESTION 2

The periodic beating of the heart is controlled by electrical impulses that originate within the cardiac muscle itself. These pulses travel to the sinoatrial node and from there to the atria and the ventricles, causing the cardiac muscles to contract. If a current of a few hundred milliamperes passes through the heart, it will interfere with this natural system, and may cause the heart to beat erratically. This condition is known as ventricular fibrillation, and is life-threatening. If, however, a larger current of about 5 to 6 amps is passed through the heart, a sustained ventricular contraction will occur. The cardiac muscle cannot relax, and the heart stops beating. If at this point the muscle is allowed to relax, a regular heartbeat will usually resume.

The large current required to stop the heart is supplied by a device known as a defibrillator. A schematic diagram of a defibrillator is shown below. This device is essentially a "heavy-duty" capacitor capable of storing large amounts of energy. To charge the capacitor quickly (in 1 to 3 seconds), a large DC voltage must be applied to the plates of the capacitor. This is achieved using a step-up transformer, which creates an output voltage that is much larger than the input voltage. The transformer used in this defibrillator has a step-up ratio of 1:50.



The AC voltage that is obtained from the transformer must then be converted to DC voltage in order to charge the capacitor. This is accomplished using a diode, which allows current flow in one direction only. Once the capacitor is fully charged, the charge remains stored until the switch is moved to position B and the plates are placed on the patient's chest. To cut down the resistance between the patient's body and the defibrillator, the electrodes are covered with a wetting gel before use. Care must be taken to insure that the patient is not in electrical contact with the ground while the defibrillator is in use.

If the defibrillator has a capacitance of 10 F, how much charge will build up on the two plates?

- A. 0.08 coulombs
- B. 0.8 coulombs

Correct Answer: A

The correct answer choice here is A, 0.08 coulombs. To do this question, you must remember the equation $Q = CV$, where Q is the charge stored, C is the capacitance, and V is the voltage across the plates. We are given that the capacitance is 10 micro farads, but we do not have a value for the voltage V , since the input voltage to the transformer is stepped-up 50 times. From the diagram we can see that the input voltage is 160 volts. So the output voltage is 160 times 50, or 8,000 volts. Substituting the voltage and the capacitance into our equation, gives a value for the charge of

8,000 times 10×10^{-6} , or 0.08 coulombs, choice A.

QUESTION 3

Nitric oxide, NO, has recently been found to have widespread physiological effects, acting as a major regulator in the nervous, cardiovascular, and immune systems. The production of NO in the body is regulated by specific NOS enzymes which exist in at least three different isoforms -- bNOS, eNOS, and macNOS. Each of these isoforms differ in location and function and serve to mediate different physiological responses to NO. Some physiological roles of NO have been demonstrated as follows:

I. In the central nervous system, NO production is regulated by bNOS. Calcium ion concentrations of 200- 400 nM in the central nervous system activate bNOS to catalyze the formation of NO. NO exerts definite effects on brain function although its specific roles are not well established. bNOS inhibitors have been found to block the release of neurotransmitter from presynaptic neurons. Excess levels of NO are also thought to contribute to neurodegenerative disorders such as Alzheimer's disease.

II. In the blood vessels, NO is produced by eNOS which is activated by Ca^{2+} concentrations of 200-400 nM. NO acts as the major endogenous vasodilator in blood vessels. It diffuses into smooth muscle cells and leads to muscle relaxation by stimulating cGMP formation through activation of guanylyl cyclase. In addition, NO regulates the vascular system by inhibiting platelet aggregation and adhesion.

III. The role of NO in the immune system is regulated by macNOS through a pathway that is not Ca^{2+} dependent. Rather, exposure to cytokines, including interleukin-1 and interferon- γ , leads to synthesis of large amounts of NO by activation of macNOS in response to inflammatory stimuli. The NO produced plays a definitive role in the mediation of the activities of macrophages and neutrophils. NO also acts to inhibit the mechanism of viral replication.

A patient has accidentally ingested a toxin which acts as an eNOS inhibitor. According to the passage, the effects of this toxin would most likely include:

- A.
- B. decreased blood pressure.
- C. increased immune response.
- D. decreased urine production.
- E. increased blood pressure.

Correct Answer: D

eNOS produces NO in endothelial tissue, leading to vasodilation. This would tend to decrease blood pressure. An eNOS inhibitor would thus block production of NO, decreasing vasodilation and thereby increasing blood pressure.

Choice A is incorrect because an eNOS inhibitor would produce an increase in blood pressure. Choice B is incorrect because a macNOS regulates the production of NO in the immune system. Also, inhibiting NO production would not increase immune response which is positively linked to NO concentration.

Choice C is incorrect because increased blood pressure would tend to increase urine production.

QUESTION 4

The Russian wheat aphid, *Diuraphis noxia*, is a small green insect discovered in southern Russia around the turn of the century. Agricultural researchers are not quite sure, but they believe the Russian aphid adapted itself to wheat about ten thousand years ago, when the crop was first domesticated by man. What is not in doubt is the insect's destructiveness. Spread by both wind and human transport, the Russian aphid has destroyed wheat fields throughout Asia, Africa, and Latin America. Until a few years ago, the United States had been free of this pest. But in the spring of 1986, a swarm of Russian aphids crossed the Mexican border and settled a few hundred miles north, in central Texas. From there, it quickly spread to other Western states, destroying wheat fields all along its path. In fact, the level of destruction has been so great over the past five years that entomologists are calling the Russian aphid the greatest threat to American agriculture since the Hessian fly, *Phytophaga destructor*, was inadvertently brought to the colonies on ships by German mercenary troops during the Revolutionary War. A combination of several factors have made it particularly difficult to deal with the threat posed by this aphid. First, Russian aphids reproduce asexually at a phenomenal rate. This process, known as parthenogenesis, often results in as many as twenty generations of insects in a single year. Although most generations remain in a limited geographic area because they have no wings, a few generations are born with wings, allowing the insect to spread to new areas. Second, because wheat is a crop with a very low profit margin, most American farmers do not spray it with pesticides; it simply is not economical to do so. And since the Russian aphid has only recently entered the United States, it has no natural enemies among North American insects or animals. As a result, there have been no man-made or natural obstacles to the spread of the Russian aphid in the United States.

Agricultural researchers seeking to control the Russian aphid have looked to its place of origin for answers. In the Soviet Union, the Russian aphid has been kept in check by predators which have evolved alongside it over many thousands of years. One species of wasp seems to be particularly efficient at destroying the aphid. The pregnant females of the species search the Russian aphid's home, the interior of a wheat stalk, sting the aphid into paralysis, and then inject an egg into its body. When the egg hatches the wasp larva feeds off of the aphid, killing it in the process.

The introduction of predators like the wasp, coupled with the breeding of new strains of insect-resistant wheat, may substantially curb the destructiveness of the Russian aphid in the future. For the time being, however, American farmers are left to their own devices when it comes to protecting their wheat crops

According to the passage, which of the following statements is/are true of Russian wheat aphids?

- I. Most are capable of flight.
 - II. They are resistant to pesticides.
 - III. They are capable of spreading rapidly.
- A. II only
 - B. III only
 - C. I and II only
 - D. II and III only

Correct Answer: B

This is a scattered detail question in Roman numeral format. It's scattered in the sense that the reader must scan

various parts of the passage in order to pinpoint the details the question requires. The fourth sentence of the third paragraph tells us that most Russian aphids are born without wings (only a few generations have them), so most can't fly, making option I a false statement. Option II suggests that aphids are resistant to pesticides. We have no basis for concluding that this is true because the passage doesn't provide any information about whether or not Russian aphids are resistant to pesticides. In fact, the only piece of information the passage provides about pesticides is the fact, stated in the middle of the third paragraph, that American farmers haven't used pesticides against the Russian aphid for economic reasons. So far, then, neither options I nor II are true statements. The third sentence of the second paragraph asserts that once Russian aphids invaded the United States, they spread rapidly to different areas. Option III, therefore, is a true statement. They are capable of spreading rapidly.

QUESTION 5

In the United States, breast cancer is the second leading cause of death for women, and as a result, the American Cancer Society, has recommended annual mammography screening for women age 40 years and older. It is estimated that the risk of mortality can be reduced through this procedure by approximately 20-25% during a ten-year period for women age 40 years and older.

In general, cancer screening behaviors have increased in the United States. According to the National Health Interview Survey, in 1987, approximately 29% of women age 40 years and older reported having had a mammogram in the last 2 years. By 2000, this increased to 70%. However, there are racial disparities, as fewer African American and Hispanic women have mammograms compared to their Caucasian female counterparts. Some studies have looked into these differences. Cultural factors seem to play a role in minority women obtaining fewer mammograms. Asian women, for example, do not like to discuss sensitive topics with strangers. Prevention promotions have been designed to increase awareness for the need of breast cancer screening, particularly for women in racial and ethnic minority groups. An innovative breast cancer education program, called the Educational Intervention Asian Grocery Store-Based Education Program, was designed to target Asian women. Located in 20 different Asian grocery stores in communities, the cancer screening exhibits were placed at the entrances of the stores. As Asian women came into the grocery store, health information was passed out to Asian women. Even though only a small amount of women who were considered non-adherents to breast cancer screening ended up scheduling a screening, the study demonstrated an innovative culturally competent approach to health promotion.

Source: Adapted from G.R. Sadler, P.R. Beerman, K. Lee et al. "Promoting Breast Cancer Screening Among Asian American Women: The Asian Grocery Store Based Cancer Education Program." Copyright 2012 Journal of Cancer Education.

If the goal of the health communication is to influence individuals, families, neighborhoods, medical and social service organizations, and ultimately public health policy, health promoters are adhering to:

- A. Urie Bronfenbrenner's ecological systems theory.
- B. Murray Bowen's family systems theory.
- C. John Bowlby's attachment theory.
- D. Milton Gordon's assimilation theory.

Correct Answer: A

A is correct. Ecological systems theory was first applied to understand child development and their socialization. It maintains that human behavior (in this case, health behavior) is influenced by multiple levels or spheres of influence of different orders, including the microsystem, which is related to the individual (e.g., the patient's beliefs, personality, past experiences, etc.); the mesosystem, which is related to those with whom the person relates to directly (e.g., the family, community, neighborhood, workplace, school, friends, etc.); the exosystem, which relates to institutions and organizations which regulate that person's community and with which the person does not often interact directly (e.g., health services, social services, legal institutions, industry, mass media, etc.); the macrosystem, which relates to that

person's cultural milieu (e.g., culture, traditions, laws, etc.); and the chronosystem, which relates to the dimension of time (e.g., when the person was born, when they lost their parents, etc.). The latter system was introduced a later stage of his career.

B. This is incorrect. Family systems theory argues that individual behaviors must be understood within the family system they come about. That is, one cannot understand individuals outside their family unit. It does not identify a wider frame of influence, as ecological system theory does. C. This is incorrect. Attachment theory emphasizes that behavior stem from the emotional attachments developed between infant and parents/caregivers. There are several types of attachment, characterized by the different sets of behaviors and experiences, and that influence relationship patterns established during adulthood. This theory is not concerned with the spheres of social influence upon the individual, as ecological system theory is. D. This is incorrect. Assimilation theory is used in sociology to understand how immigrants adopt the cultural norms of the new host country. It is not concerned with the spheres of social influence upon the individual, as ecological system theory is.

[Latest MCAT-TEST Dumps](#)

[MCAT-TEST VCE Dumps](#)

[MCAT-TEST Braindumps](#)