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QUESTION 1

PLASTICS

Plastics have long been considered one of the great conveniences of the modern era, but evidence is mounting to indicate that these conveniences have come at an incredible cost. The chief benefit of plastics is their durability, but this benefit turns out to be the same reason plastic has become a significant problem: It takes 200 to 400 years to decompose. All of this plastic has accumulated into a catastrophic mess and has also caused disease in humans.

Between Hawaii and Japan, a giant mass of plastic twice the size of Texas slowly swirls with the currents of the Pacific Ocean. This area has come to be known as the Great Pacific Garbage Patch, and its effects on the ecology of the ocean are unimaginable. According to United Nations researchers, a hundred thousand sea mammals and a million seabirds die each year. They are found with cigarette lighters, syringes, and other plastics that they mistake for food in their stomachs.

Evidence also indicates that the plastic receptacles that people store their food in poses health risks. For instance, phthalates have been shown to have detrimental effects on the reproductive system, yet they are found in many plastic products including baby bottles and water bottles. They have also been linked to various forms of cancer. Additionally, a chemical called bisphenol A that is found in many plastics can mimic the effects of the hormone estrogen, which can also affect the reproductive system.

As used in this passage, the word "mimic" most nearly means:

- A. Intensify
- B. Reduce
- C. Cancerous
- D. Resemble

Correct Answer: D

QUESTION 2

Which of the following is a characteristic of an enzyme cofactor?

- A. It binds to an enzyme's active site.
- B. It is covalently bound to the enzyme.
- C. It is consumed in the enzymatic reaction.
- D. It inhibits the enzymatic reaction.
- E. It binds to an allosteric site.

Correct Answer: B

A cofactor binds to the active site along with the substrate in order to catalyze an enzymatic reaction. Like the enzyme, it is not consumed by the reaction. Allosteric effectors bind to a second binding site on the enzyme, not the active site.

QUESTION 3

Since 1997, the American Heart Association (AHA) has attempted to increase awareness about cardiovascular disease (CVD) among women. Fortunately, great progress has been made to educate individuals about CVD and its consequences. According to the AHA's 2011 Guidelines for Prevention of Cardiovascular Disease in Women, the misconception that CVD is a "man's disease" has been somewhat disproved, as awareness among the general public increased from 30% in 1997 to 54% in 2009. Unfortunately, CVD continues to be the leading cause of death in the United States for both men and women. Since 1984, the number of deaths related to CVD in women exceeded those in men. In the United States, CVD death rates among women aged 35 to 54 years appear to be increasing by 1% annually, which is most likely attributable to the escalating obesity epidemic. According to the AHA, even though CVD is the number 1 cause of death among women, only 13% of women perceive CVD as a health threat. CVD is responsible for more deaths among women than the next 3 leading causes of death combined, including all forms of cancer. Due to the ongoing prevalence of CVD, increasing awareness and understanding of CVD, especially among the female population, is still a top priority for many health care professionals. As one of the most accessible health care professionals, pharmacists are in a pivotal position to educate and inform their patients of the risks associated with CVD, possible drug therapies, and preventive measures. The AHA has set a goal for 2020 to improve cardiovascular health in all Americans by 20%, while reducing deaths from CVD and stroke by 20%. According to the American Heart Association, in the United States a woman dies of some form of CVD every minute and more than 1 in 3 females have some form of CVD. Studies have demonstrated that gender differences may play an important role in the diagnosis, treatment, and prevention of CVD. Unfortunately, many women may not always recognize the warning signs and symptoms of a heart attack because they sometimes appear more subtle when compared with those typically experienced by men. Results from a study of 515 women who had heart attacks report that 43% did not experience any type of chest pain or pressure during the heart attack. Although the classic symptoms include chest pain, tingling in the left arm, sweating, and shortness of breath, women may also experience some "atypical" symptoms, such as extreme fatigue, nausea, dizziness, indigestion, vomiting, and pain in the neck or back. By learning and recognizing the warning signs, women can take a proactive approach to their cardiovascular health and get treatment earlier to prevent further complications.

Of the following, which is an opinion expressed by the author?

- A. "...only 13% of women perceive CVD as a health threat." In paragraph 1.
- B. "...the misconception that CVD is a 'man's disease'..." in paragraph 1.
- C. "Unfortunately, many women may not always recognize..." in paragraph 4.
- D. "...43% did not experience any type of chest pain..." in paragraph 5.

Correct Answer: C

While it may be true that many women do not recognize the warning signs and symptoms of a heart attack, the inclusion of the word "unfortunately" categorizes this remark as an opinion of the author, and not necessarily and indisputable fact.

QUESTION 4

A virulent phage is one which infects via:

- A. the lysogenic cycle
- B. phagocytosis
- C. immunoglobins

D. the lytic cycle

Correct Answer: D

Virulent phages use the lytic cycle to infect an organism. The lytic cycle is the process by which a phage DNA replicates itself via the host cell before causing the cell to lyse and release all of the phage's replications.

QUESTION 5

At two independently assorting loci, a man has the following genotype: GgHh. He marries a woman with the genotype ggHh. What is the probability that they will have a child who has the same genotype as the father?

A. 0

B. 1/2

C. 1/4

D. 1/8

Correct Answer: C

This is a "probability" genetics question that can be answered by practical application of Mendel's Laws. Mendel's Law of Segregation states that alleles segregate during meiosis, resulting in gametes that carry only one allele for any given inherited trait (i.e., haploid gametes). Mendel's Law of Independent Assortment states that unlinked genes assort independently during meiosis. By applying Mendel's Laws, we can conclude that each parent in the problem can produce two possible gametes. The father can produce the gametes GH and gH, and the mother can produce the gametes gH and gh. The probability of the father's genotype (GgHh) appearing in the progeny can be determined by calculating the number of different gamete combinations that will produce this genotype. Thus, a GgHh zygote can only be produced by the fusion of a GH gamete and a gH gamete. The probability that one parent will donate a particular gamete is independent of the probability that the other parent will donate a particular gamete. Thus, the probability of the father donating a GH gamete is 1/2, and the probability of the mother donating a gH gamete is 1/2. The probability of producing a genotype that requires the occurrence of both these independent events is equal to the product of the individual probabilities that these events will occur. Thus, $1/2 \times 1/2 = 1/4$, so the probability that this couple will have a child with the genotype GgHh is 1/4.

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