

May 2022: Kaplan MCAT stumpers put pre-meds to the test

MAY 19, 2022

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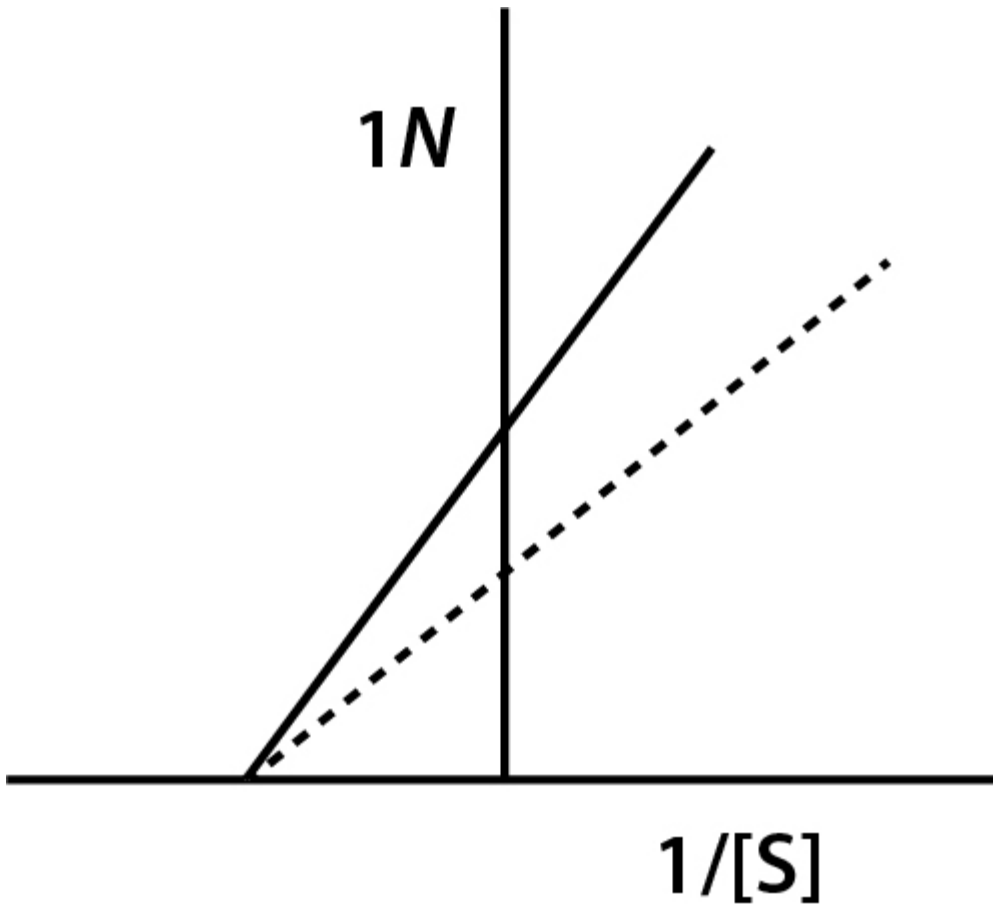
If you're preparing for the Medical College Admission Test (MCAT), you will want to consult the experts. These selections from Kaplan's MCAT Question of the Day series can help you sharpen your skills as you prepare to begin your potential journey into medical training.

The questions below come from three of the four MCAT sections—biological and biochemical foundations of living systems; chemical and physical foundations of biological systems; and psychological, social, and biological foundations of behavior. A fourth section, critical analysis and reasoning skills (commonly referred to as CARS), is based largely on inference.

Medicine can be a career that is both challenging and highly rewarding but figuring out a medical school's prerequisites and navigating the application process can be a challenge unto itself. For students preparing for medical school, the [AMA pre-med glossary guide](#) has the answers to frequently asked questions.

Section: Biological and biochemical foundations of living systems

Question: A student measures the activity of an enzyme with and without an inhibitor, and plots the data on the below Lineweaver-Burk graph. Based on the graph, which of the following statements is true?



- A. The dotted line is uninhibited, because its y-intercept is lower than the solid line.
- B. The solid line is uninhibited, because its y-intercept is lower than the dotted line.
- C. The enzyme is uncompetitively inhibited, because the x-intercept is the same for both dotted and solid lines.
- D. The enzyme is competitively inhibited, because the x-intercept is the same for both dotted and solid lines.

The correct answer is A.

Kaplan explains why: On a Lineweaver-Burk plot, the y-intercept is equal to $1/V_{\max}$. In comparison to an uninhibited enzyme, the V_{\max} will be the same when competitively inhibited, or lower when uncompetitively inhibited, noncompetitively inhibited, or exhibiting mixed inhibition. Since the y-intercept between the two lines are different, and a lower y-intercept indicates a higher V_{\max} , the uninhibited line will have a lower y-intercept, making **choice A** the correct answer. **Choice B** is opposite since a higher y-intercept has a lower V_{\max} , making the solid line inhibited. For **choices C** and **D**, the x-intercept on a Lineweaver-Burk plot is equal to $-1/K_M$, and since both lines have the same x-intercept, inhibiting the enzyme does not change the K_M . This is characteristic of noncompetitive inhibition.

Section: Chemical and physical foundations of biological systems

Question: A rifleman shoots a 3-g silver bullet into a wooden wall. If the bullet leaves the rifle at 250 m/s, and if all of the energy of the bullet goes into heating it as it strikes the wood, what is the temperature change of the bullet? (The specific heat of silver is 234 J/kg?K)

A. 0.53 K

B. 44.5 K

C. 133.5 K

D. 267.0 K

The correct answer is C.

Kaplan explains why: All of the kinetic energy of the bullet gets transferred into heat:

$$Q = \frac{1}{2} mv^2$$

The temperature change of the bullet is related to the heat energy it receives:

$$Q = mc\Delta T$$

where c is the specific heat of the bullet material, silver. By combining these two equations, we can solve for the change in T :

$$\Delta T = \frac{\frac{1}{2}mv^2}{mc} = \frac{v^2}{2c} = \frac{(250)^2}{2(234)} = 133.5 \text{ K}$$

Section: Psychological, social and biological foundations of behavior

Question: An individual reports that seeing a bear up close in a zoo was exciting and fun, while seeing a similar bear in the wild was very scary. Which theory of emotion best accounts for these differing responses to a similar stimulus?

- A. Cannon-Bard theory
- B. James-Lange theory
- C. Yerkes-Dodson theory
- D. Schachter-Singer theory

The correct answer is D.

Kaplan explains why: The key here is that the context of the stimulus has changed from relatively safe (in the zoo) to potentially more dangerous (in the wild). Schachter-Singer theory takes this context into account by adding in the notion of cognitive appraisal into emotional responses, making **choice D** correct. Neither Cannon-Bard theory nor James Lange theory involve context, and the Yerkes-Dodson law is about performance versus arousal, not emotional responses.