ACT Practice (Biomolecule Reaction) BTR _____

PASSAGE I

Amino acids are considered the building blocks of *protein* in the body. Amino acids combine with each other to form chains called *peptides*, which then combine to form proteins. The human body requires twenty different amino acids, whose combinations produce every essential protein in the body. When amino acids form peptides, the *residue* is what is left after the amino acid sheds a molecule of water (a hydrogen ion from one end and a hydroxide ion from the other end). The *reaction rate* is the factor by which the protein is able to build itself up through the combination of peptides. Figures 1–3 show the effects that changes in temperature, water volume, and residue concentration have on the rate of reaction when Amino Acids A and B are present. Figure 4 shows the effects that changes in the concentrations of Amino Acids A and B have on the rates of reaction in solutions of the same concentration.

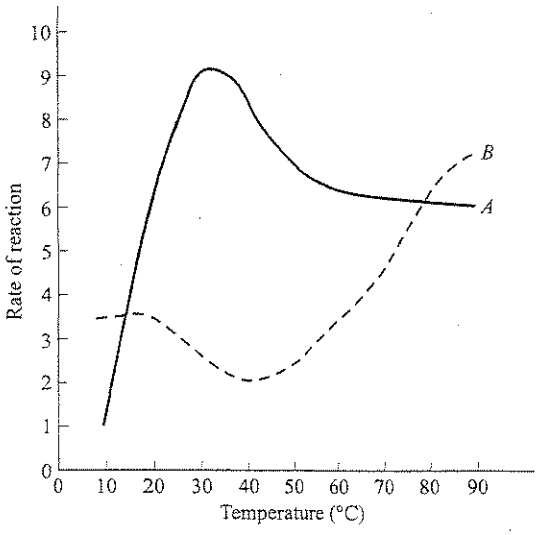
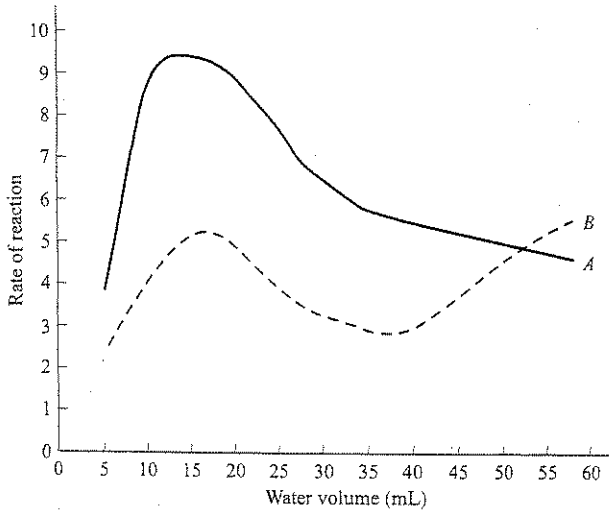


Figure 1



Note: The amount of amino acid is held constant.

Figure 2

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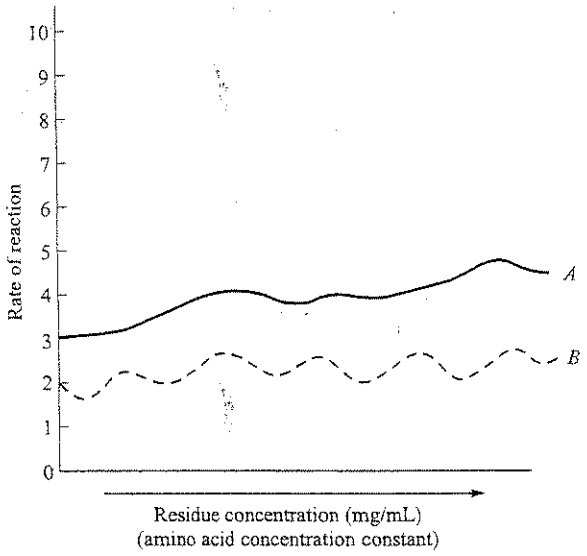


Figure 3

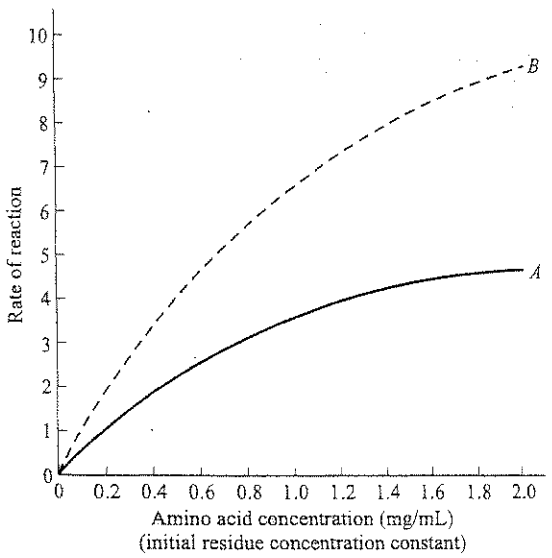


Figure 4

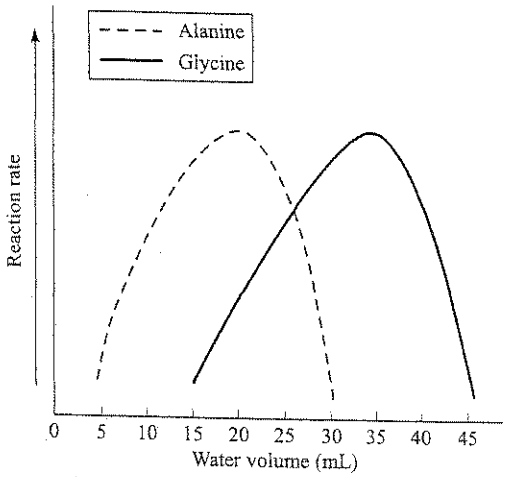
1. According to Figure 2, Amino Acid A has the highest reaction rate at a water volume closest to:
   - **A.** 0 mL.
   - **B.** 4 mL.
   - **C.** 12 mL.
   - **D.** 20 mL.

2. Based on the data presented in Figure 2, at approximately which of the following water volumes does Amino Acid A have the same reaction rate as Amino Acid B?
   - **F.** 30 mL
   - **G.** 40 mL
   - **H.** 50 mL
   - **J.** 60 mL

3. A researcher claims that the reaction rate of Amino Acid B is dependent on both residue concentration and amino acid concentration. Do the data in Figures 3 and 4 support this claim?
   - **A.** No, the reaction rate is dependent on the amino acid concentration, but not on the residue concentration.
   - **B.** No, the reaction rate is not dependent on either the residue concentration or the amino acid concentration.
   - **C.** Yes, the reaction rate is dependent on both the residue concentration and the amino acid concentration.
   - **D.** Yes, the reaction rate is dependent on the residue concentration, but not on the amino acid concentration.

4. A researcher claims that under the conditions used to determine the data for Figure 4, the reaction rate for Amino Acid A at any given concentration will always be greater than the reaction rate for Amino Acid B at the same concentration. Do the data support this conclusion?
   - **F.** No, Amino Acid A has a lower reaction rate at all given residue concentrations tested.
   - **G.** No, Amino Acid A has a lower reaction rate at all given amino acid concentrations tested.
   - **H.** Yes, Amino Acid A has a higher reaction rate at all given residue concentrations tested.
   - **J.** Yes, Amino Acid A has a higher reaction rate at all given amino acid concentrations tested.

5. The figure below shows the relative reaction rates for *alanine*, an amino acid found in DNA, and *glycine* an amino acid found in the muscles.



Note: The amount of amino acid is held constant.

Based on this figure, one would best conclude that compared to the water volume at the peak reaction rate of amino acids in DNA, the water volume at the peak reaction rate of amino acids in the muscles:
- **A.** is higher.
- **B.** is lower.
- **C.** is the same.
- **D.** cannot be measured.