1. (3 points) Sketch a Michaelis-Menten plot of [S] versus reaction rate (V) for a typical enzyme. Be sure to label the axes and include units. (Pick any units you like, just be sure they are in the correct form).

2. (4 points) The $V_{\text{MAX}}$ for an enzyme is 9 mg/min. If the [S] is 5 mM when the rate of the reaction (V) is 3 mg/min, calculate the $K_m$ for this enzyme.

*Remember to include correct units in your answer.

\[
V_o = \frac{[S][V_{\text{MAX}}]}{K_m + [S]}
\]

\[
3 = \frac{(5)(9)}{K_m + 5}
\]

\[
3 = \frac{45}{K_m + 5}
\]

\[
3K_m + 15 = 45
\]

\[
K_m = 10 \text{mM}
\]
3. (2 points) If a different enzyme was used in question 3, and had a LARGE $K_m$ value, would this new enzyme have a higher or lower affinity for the substrate?

Higher affinity  Lower affinity

4. (2 points)

a. What is the name of the area of an enzyme that holds a substrate in place via non-covalent interactions and where the reaction takes place?

Active site; Binding site

b. Name one of the possible non-covalent interactions that help hold substrates in place.

H-bonds, ionic bonds, van der Waals forces, hydrophobic interactions

5. (2 points) On the reaction diagram below, circle the SPECIFIC region of the graph that can be altered by an enzyme.

A. What is the name of this value?

Activation Energy

B. Is the value changed with the addition of an enzyme?

Yes

C. If YES in B, is it increased or decreased?

Decreased
6. (6 points) A certain inhibitor has a shape and structure very similar to the substrate and physically blocks the substrate's access to the active site.

a. What **type** of inhibitor is this?

   - COMPETITIVE
   - NON-COMPETITIVE
   - UN-COMPETITIVE

b. What effect does the presence of this inhibitor have on $K_m$?

   - INCREASE
   - DECREASE
   - NONE

c. What effect does the presence of this inhibitor have on $V_{max}$?

   - INCREASE
   - DECREASE
   - NONE