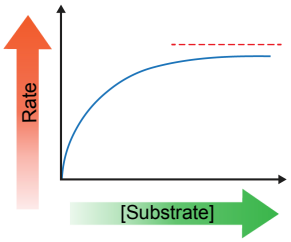
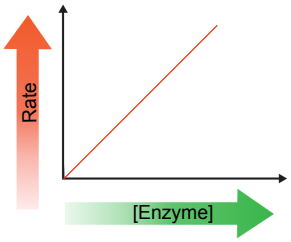
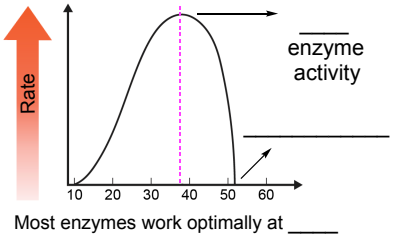
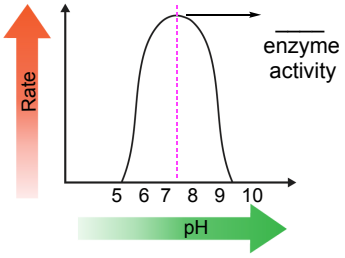
CONCEPT: FACTORS AFFECTING ENZYME ACTIVITY

- The activity of an enzyme is the _____ or _____ in which an enzyme catalyzes a substrate to a product.
  - □ The activity ___ when a substrate binds to the enzyme's active site.
  - □ **Enzyme Saturation:** when there are _____ substrate molecules than active sites.

4 Factors Affecting Enzyme Activity

Factors	Conditions	Limitations	Effect on Activity
1 Concentration of Substrate	**Saturated** Excess substrate □ ___ [Substrate] **Unsaturated** Excess active sites □ ___ [Substrate]		___ Activity ___ Activity
2 Concentration of Enzyme	**Saturated** Excess substrate □ ___ [Enzyme] **Unsaturated** Excess active sites □ ___ [Enzyme]		___ Activity ___ Activity
3 Temperature	**Temperature Dependent** □ Temperature < ____ □ Temperature > ____	 Most enzymes work optimally at ____	___ Activity ___ Activity
4 pH	**pH Dependent** □ pH within ___ ___ units of optimal pH range **Enzyme / Optimal pH** Pepsin 1.7 Amylase 6.8 Arginase 9.4	 Most enzymes work optimally at ____	___ Activity outside optimal range

- Temperatures and pH values that lie outside optimal ranges can *denature* the enzyme.
  - □ **Denaturation:** the _____ of the 3D structure of an enzyme which can disrupt its function.

EXAMPLE: Which of the following would cause the activity of a typical enzyme to diminish?

a) Increase the temperature from 20ºC to 35ºC

b) At [S] = 0.030 M and [E] = 0.050 you add more [S]

c) Adjusting the pH from 6.8 to 9.0

d) All statements would increase the activity of an enzyme

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PRACTICE: Pepsin, a peptidase that hydrolyzes proteins, functions in the stomach at an optimum pH of 1.5 to 2.0. Which of the following would cause an increase in its activity?

a) Changing the pH to 8.0.

b) Running the reaction at 0ºC.

c) Increasing the concentration of pepsin two-fold.

d) Changing the aqueous environment temperature to 60ºC.

PRACTICE: Sucrase has an optimum pH range of 4.5 – 7.0. Which of the following statements is true?

a) Addition of HCl to increase the pH to 9.0 would decrease its activity.

b) Sucrase as an enzyme would catalyze the hydrolysis of fructose.

c) The activity of sucrase would be greater at 100ºC than at 10ºC.

d) When [Sucrase] = 0.03 M and [Sucrose] = 0.055 M increasing [Sucrase] to 0.07 M will increase the activity.