General Biochemistry

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Enzymes

Which of the following statements about Michaelis-Menten kinetics is correct

A. Km, the Michaelis constant, is the measure of affinity the enzyme has for its substrate

B. Km, the Michaelis constant, is defined as the concentration of substrate required for the reaction to reach maximum velocity

C. Km, the Michaelis constant, is expressed in terms of the reaction velocity

D. Km, the Michaelis constant, is defined as the dissociation constant of the enzyme-substrate complex

Which type of inhibitor "poisons" an enzyme

A. Non-competitive inhibitor

B. competitive inhibitor

C. Tightly bound inhibitor

D. Irreversible inhibitor

What factors would affect the reaction rate

A. pH

B. Temperature

C. Concentration of inhibitors

D. All of the above

Which of the following statements about the reactions at the active center of chymotrypsin are correct

A. The aspartate residue in the active site of chymotrypsin donates a proton to histidine

B. The histidine residue in the active site of chymotrypsin don't accepts a proton to from water

C. The aspartate residue in the active site of chymotrypsin holds the histidine in the correct orientation

D. A proton moves from the aspartate to the serine to the histidine side chain in the catalytic triad of chymotrypsin

The effect of non-competitve inhibitor on a lineweaver-Burk plot is that

A. It can move the entire curve to the right

B. It can change the Y-intercept

C. It can change the X-intercept

D. All of these

Which of the following is true about competitive inhibitors

A. It is a common type of irreversible inhibition

B. The apparent Km increases in the presence of inhibitor

C. The apparent Km decrease in the presence of inhibitor

D. The maximum velocity for the reaction decreases in the presence of a competitive inhibitor

Km= (choose best amswer)

A. The initial velocity prior to enzymatic activity

B. It represents the first order portion of the graph

C. The concentration of substrate at which all enzymes are being used (saturated) and it is producing at maximum effect

D. The concentration of substrate (moles/liter) needed to achieve 50% of the maximum

Which of the following statements is not true regarding the active site of an enzyme

A. An active site contains amino acids which are important to the binding process and the catalytic mechanism

B. An active site is normally a hollow or cleft on the surface of an enzyme

C. An active site is normally hydrophilic in nature

D. Substrates fit into active sites and bind to functional groups within the active site

The relationship between Vo and [S] of a single binding site is explained in which equation

A. Hill equation

B. Michaelis-Menten equation

C. Velocity equation

D. [S] equation

The conformational change in an enzyme after the substrate is bound that allows the chemical reaction to proceed, can be explained by

A. Induced fit

B. Transition

C. Fit and fine

D. Pasteur

The active site of an enzyme

A. Remains rigid and doesn't change shape

B. Is found at the center of globular enzymes

C. Is complementary to the rest of the molecule

D. Contains amino acids without sidechains

E. None of the above choices are correct

Michaelis-Menten equation doesn't apply to allosteric binding/multiple binding sites

A. True

B. False

The active site of an enzyme differs from an antibody-antigen binding site in that the enzyme active site

A. Contains modified amino acids

B. Catalyse a chemical reaction

C. Is complementary to a specific ligand

D. Contains amino acid acids without sidechains

The initial velocity, vo, of an enzyme catalyzed reaction reaches Vmax

A. At [S] = KM

B. At [S] = 10*KM

C. At 1/[S] = 1/KM

D. Only as 1/[S] --> 0

E. The third and forth choices are both correct

Which of the following statements is false with respect to an enzyme's ability to catalyze a reaction

A. An enzyme provides a reaction surface and a suitable environment for the reaction to take place

B. An enzyme binds reactant such that they are positioned correctly and can attain their transition-state configurations

C. An enzyme can weaken bonds in reactants through the binding process

D. An enzyme allows the reaction to go through a less stable transition state than would normally be the case

The rate determining step of Michaelis-Menten kinetics is

A. None if the mentioned

B. The product formation step

C. The complex dissociation step to produce products

D. The complex formation step

A classical uncompetitive inhibitor is a compound that binds

A. Irreversibly to the enzyme substrate complex yielding an acitve ESI complex

B. Reversibly to the enzyme substrate complex yielding an inacitve ESI complex

B. Reversibly to the enzyme substrate complex yielding an acitve ESI complex

C. Irreversibly to the enzyme substrate complex yielding an inacitve ESI complex

In a lineweaver-Burk plot, competitive inhibitor shows which of the following effect

A. Decreas Vmax

B. Binds to Michaelis complex (ES)

C. Both (A) and (B)

D. Can actually increase reaction velocity in rare cases

A competitive inhibitor of an enzyme is usually

A. A highly reactive compound

B. A metal ion such as Hg2+ or Pb2+

C. Structurally similar to the substrate

D. Water insoluble

The Michaelis-Menton equation relates the rate of an enzyme-catalyzed reaction to which of the following

A. Substrate concentration

B. Product concentration

C. Activation energy

D. Inhibitor concentration

The Km of an enzyme can best be described in the Michaelis-Menton equation as what if Vi enzyme activity

A. 2/1Vmax

B. 2Vmax

C. 1/2Vmax

D. Vmax

E. 1/Vi

The transition state of a catalyzed reaction is

A. A highly-populated intermediate on the reaction pathway

B. Higher in energy than that of an uncatalyzed reaction

C. Lower in energy than that of an uncatalyzed reaction

D. Lower in energy than the reaction substrate

E. Bound very weakly to the catalyst

When [S]=KM, the velocity of an enzyme catalyzed reaction is about

A. 0.1*Vmax

B. 0.2*Vmax

C. 0.3*Vmax

D. 0.5*Vmax

E. 0.9*Vmax

When [S]= 0.1* KM, the velocity of an enzyme catalyzed reaction is about

A. 0.1*Vmax

B. 0.7*Vmax

C. 0.3*Vmax

D. 0.5*Vmax

E. 0.9*Vmax

Which of the following statements best describes an allosteric binding site

A. It is a binding site, which is separate from the active site, and affects the activity of an enzyme when it is occupied by a ligand

B. It is a binding site that can accept a wide variety of differently shaped molecules

C. It is a binding site containing amino acids with aliphatic side chains

D. It is a description of an active site which has undergone an induced fit

Which of the following statements about competitive inhibition of an enzyme-catalyzed reaction is correct

A. Competitive inhibition can be overcome by the addition of large amounts of substrate to a reaction

B. The Vmax of a reaction decreases in the presence of a competitive inhibitor

C. The addition of large amounts of substrate to a reaction cannot overcome the effect of a competitive inhibitor

D. A competitive inhibitor can bind to the enzyme-substrate complex

Which of the following statements about competitive inhibition of an enzyme-catalyzed reaction is correct

A. a competitive inhibitor and substrate can bind simultaneously to the enzyme

B. the Km for a reaction remains unchanged in the presence of a competitive inhibitor

C. the Vmax for a reaction remains unchanged in the presence of a competitive inhibitor

D. the Vmax and Km (Michaelis constant) for a reaction are unchanged in the presence of a competitive inhibitor

Which of the following best describes the assumption made in steady state kinetic analysis

A. The concentration of [S] is decreasing

B. The concentration of [ES] is constant

C. Both A and B are correct

D. Neither A nor B are correct

E. The total amount of enzyme decreases

Which if the following is true about Michaelis-Menton kinetics

A. Km, the Michaelis constant, is defined as that concentration of substrate at which enzyme is working at maximum velocity

B. It describes single substrate enzymes

C. Km, the Michaelis constant, is defined as the dissociation constant of the enzyme-substrate complex

D. It assume covalent binding occures between enzyme an substrate

The___of a douple reciprocal polt equals___and the___equals ____

A. Slope, Vmax, y-intercept, Km

B. Slope, Km, y-intercept, 1/Vmax

C. Slope, Km/Vmax, y-intercept, 1/Vmax

D. Slope, Km/Vmax, y-intercept, Vmax

E. Slope, Km/Vmax, x-intercept, Vmax

A noncompetitive inhibitor of an enzyme-catalyzed reaction

A. Increases Km and increases Vmax

B. Increases Km and reduces Vmax

C. Reduces Km and increases Vmax

D. Reduces Km and reduces Vmax

The transition state of a catalyzed reaction is lower in energy than that of the uncatyzed reaction

A. Because of enthalpic interactions between the enzyme and the transition state

B. Because of the favorable interactions with the substrate

C. Because of a smaller delta S between the [Es] and [EX] complex

D. Because enzymes only work at low temperature

E. Both A and C are correct

Which of the following is true about uncompetitive inhibitors

A. The bind covalently at a site distinct from the substrate active site

B. They decrease the measured Vmax and also apparent Km

C. They increase the measured Vmax

D. Apparent Km also increases

What is the general mechanism of an enzyme

A. It acts by reducing the activation energy

B. It acts by increasing the activation energy

C. It acts by decreasing the pH

D. It acts by increasing the pH

What happens to Km in the presence of a non-competitive inhibitor

A. Km will shift to the right meaning that is takes more substrate to reach the max

B. Km will shift to the left meaning that is takes less substrate to reach the max

C. Km will not be affected in the presence of a non-competitive inhibitor

D. None of the above are correct

Enzyme reactions are not influenced by which item(s) below

A. Substrate concentration

B. Product concentration

C. Temperature of the reaction

D. K at equilibrium

E. All are influences

What is the function of phosphorylase

A. Transfer inorganic phosphate

B. Transfer a carboxylate group

C. Use H2O2 as the electron acceptor

D. Transfer amino group

What secondary messenger is generated as a result of the action of nitrous oxide

A. ATP

B. Cyclic GMP

C. GTP

D. Cyclic AMP

Which of the following statements about the active site of an enzyme is correct

A. The active site of an enzyme binds the substrate of the reaction it catalyzes less tightly than it does the transition state intermediate

B. The active site of an enzyme binds the substrate of the reaction it catalyzes more tightly than it does the transition state intermediate

C. The active site of an enzyme is complementary to the substrate of the reaction it catalyzes

D. The active site of an enzyme binds the product of the reaction it catalyzes more tightly than it does the transition state intermediate

Blocking of enzyme action by blocking its active sites is

A. Allosteric inhibition

B. Feedback inhibition

C. Competitive inhibition

D. Non-competitve inhibition

Which of the statements regarding enzymes is false

A. Enzymes are proteins that function as catalysis

B. Enzymes are specific

C. Enzymes provide activation energy for reactions

D. Enzyme activity can be regulated

E. Enzymes may be used many times for a specific reaction

Which of the following statements about lineweaver-Burk plots are correct

A. A lineweaver-Burk plot for a classical enzyme can provide estimates of Vmax and Km by linear extrapolation

B. A lineweaver-Burk plot provides estimates of Vmax and Km for allosteric enzymes

C. A lineweaver-Burk plot for a classical enzyme is a no straight line

D. All enzyme-catalyzed reactions give a linear lineweaver-Burk plot

Enzymes

A. Do not require activation energy

B. Do not change requirement of activation energy

C. Increase requirement of activation energy

D. Lowest requirement of activation energy

Which of the following statements about Michaelis-Menten kinetics are correct

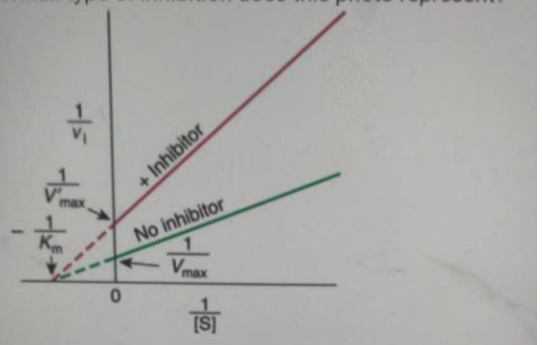
A. Michaelis-Menten kinetics assume the enzyme and substrate first bind to form an enzyme-substrate complex

B. Michaelis-Menten kinetics assume covalent binding occurs between enzyme and substrate

C. Michaelis-Menten kinetics apply only to reaction rates before the product is formed

D. Michaelis-Menten kinetics describe enzymes substrate complex

Which type of inhibition does this photo represent?

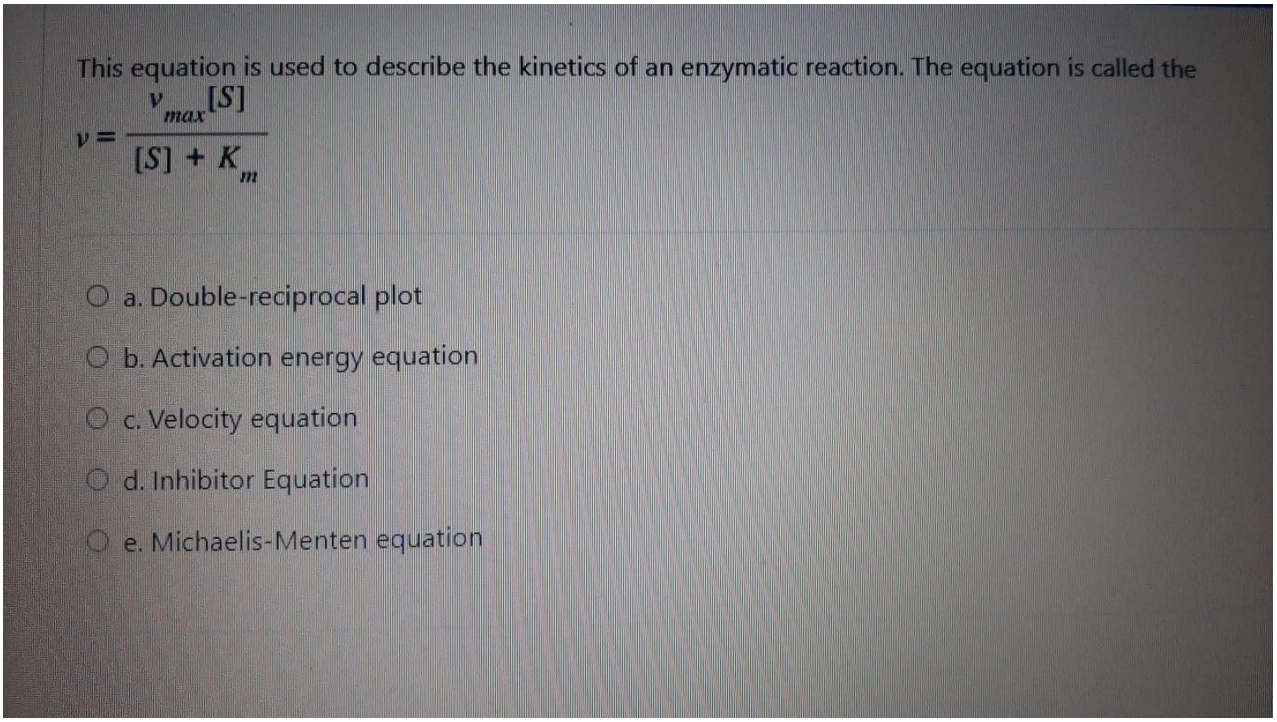


- a. Irreversible inhibitor
- b. Non-competitive inhibition
- c. Competitive inhibitor
- d. Mechanism-based inhibition

What equation is represented?

$$\frac{1}{v_i} = \left(\frac{K_m}{V_{max}}\right)\frac{1}{[S]} + \frac{1}{V_{max}}$$

- a. Hill Equation
- b. Michaelis-Menten
- c. Lineweaver-Burk Plot



1. A _____is a biocatalyst that increases the rate of the reaction without being changed.
a) Aluminum oxide
b) Silicon dioxide
c) Enzyme
d) Hydrogen peroxide
2. Enzyme increases the rate of reaction by lowering the activation energy.
a) True
b) False
3. What is the nature of an enzyme?
a) Vitamin
b) Lipid
c) Carbohydrate
d) Protein
4. What is an apoenzyme?
a) It is a protein portion of an enzyme
b) It is a non-protein group
c) It is a complete, biologically active conjugated enzyme
d) It is a prosthetic group
5. Name the coenzyme of riboflavin (B2)?
a) NAD or NADP
b) FAD and FMN
c) Coenzyme A
d) Thiamine pyrophosphate
6. Which of this vitamin is associated with the coenzyme Biocytin?
a) Nicotinic acid
b) Thiamine
c) Biotin
d) Pyridoxine

7. Name the enzyme secreted by pancreas?
a) Pepsin
b) Chymotrypsin
c) Trypsin
d) Alcohol dehydrogenase
8. Name the enzyme which catalyzes the oxidation-reduction reaction?
a) Transaminase
b) Glutamine synthetase
c) Phosphofructokinase
d) Oxidoreductase
9. What is the function of phosphorylase?
a) Transfer inorganic phosphate
b) Transfer a carboxylate group
c) Use H_2O_2 as the electron acceptor
d) Transfer amino group
10. Mark the CORRECT function of enzyme, Peptidase?
a) Cleave phosphodiester bond
b) Cleave amino bonds
c) Remove phosphate from a substrate
d) Removal of H_2O
11. Which of the following reaction is catalyzed by Lyase?
a) Breaking of bonds
b) Formation of bonds
c) Intramolecular rearrangement of bonds
d) Transfer of group from one molecule to another
1. Which of the following function is catalyzed by Racemases?
a) Removal of water
b) Intramolecular transfer of a functional group
c) Interconversion of L and D stereoisomers
d) Inversion of asymmetric carbon atom
2. The zymogen is an inactive precursor of an active enzyme.
a) True
b) False
3. Which of the following is an example of ligases enzyme?
a) Mutases
b) Epimerases
c) Racemases
d) Carboxylases
4. What is the binding energy?
a) Free energy released in the formation of enzyme-substrate interaction
b) The energy required to form a bond
c) The energy required to bind substrate
d) It is the activation energy
5. Which of the following is INCORRECT for the lock-and-key model?
a) It is used to describe the binding process
b) The active site of the enzyme is complementary to the substrate
c) It demonstrates enzyme-substrate complex
d) The binding of the substrate produces a conformational change in enzyme
6. Which of the following is not a catalytic strategy for an enzyme to perform specific reaction?
a) Covalent catalysis
b) Metal ion catalysis
c) Michaelis constant
d) Acid-base catalysis

7. What is the SI unit of enzyme activity?
a) Km
b) Kat
c) K_{cat}
d) V_{max}
8. Which of the following is not an example of irreversible enzyme inhibitor?
a) Cyanide
b) Sarin
c) Diisopropyl phosphoflouridate (DIPF)
d) Statin drugs
9. Lineweaver-Burk plot is also known as_____
a) Double reciprocal plot
b) Hanes-Woolf plot
c) Eadie-Hofstee plot
d) Steady-state equation
10. Name the enzyme which is found in tears, sweat, and an egg white?
a) Ribozyme
b) Lysozyme
c) Zymogen
d) Isozymes
11. What is an Isozyme?
a) Same structure, different function
b) Different structure, the same function
c) Same structure, the same function
d) Different structure, different function
1. By what factor chymotrypsin enhances the rate of peptide bond hydrolysis?
a) 10^7
b) 10^8
c) At least 10^9
d) 10^6
2. The active site of chymotrypsin consists of a catalytic triad of which of the following amino acid residues?
a) Serine, histidine and aspartate
b) Serine, histidine and glutamate
c) Threonine, histidine and aspartate
d) Methionine, histidine and aspartate
3. Which of the following statements are true about the reactions at the active center of chymotrypsin?
a) The aspartate residue gives an electron to histidine
b) The aspartate residue gives a proton to histidine
c) The aspartate residue keeps the histidine in the correct direction
d) A proton moves from the aspartate to serine to histidine in the catalytic triad of chymotrypsin
4. The polypeptide chains in chymotrypsin are linked by _____
a) Hydrogen bonds
b) Ionic bonds
c) Disulfide bond
d) SH-SH bond

5. Which of the following is false about chymotrypsin?
a) Hydrolytic cleavage of a peptide bond by chymotrypsin has two phases
b) It is activated in the presence of trypsin
c) It is synthesized in the thyroid gland
d) Polypeptide chains in chymotrypsin are linked by S-S bonds
6. Which of the following is true about the structure of hexokinase?
a) U-shaped
b) T-shaped
c) E-shaped
d) G-shaped
7. Which of the following is true?
a) Xylose is stereo chemically similar to glucose but one carbon shorter
b) Xylose binds to hexokinase in a position where it can be phosphorylated
c) Addition of xylose increases the rate of ATP hydrolysis
d) The binding of xylose is sufficient to induce a change in hexokinase to its active conformation
8. Which of the following catalyzes the reversible degradation of 2-phosphoglycerate to phosphoenolpyruvate?
a) Chymotrypsin
b) Hexokinase
c) Enolase
d) Trypsin
9. Which of the following catalyzes the reversible reaction of β-D-Glucose to glucose 6-phosphate?
a) Chymotrypsin
b) Hexokinase
c) Enolase
d) Trypsin
10. Which of the following is false about lysozyme?
a) It is an antibacterial agent found in tears and egg white
b) The substrate of lysozyme is peptidoglycan
c) Lysozyme cleaves (β1 → 4) glycosidic C-O bonds between two types of sugar residue in the molecule NAM and NAG
d) It is a bisubstrate enzyme
1. Which of the following is true about Michaelis-Menten kinetics?
a) K_m, the Michaelis constant, is defined as that concentration of substrate at which enzyme is working at maximum velocity
b) It describes single substrate enzymes
c) K_m, the Michaelis constant is defined as the dissociation constant of the enzyme-substrate complex
d) It assumes covalent binding occurs between enzyme and substrate

2. When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained?

a) Hyperbolic curve

b) Parabola

c) Straight line with positive slope

d) Straight line with negative slope

Explanation: At low substrate concentration, the rate of a reaction is determined by the rate of formation of an enzyme-substrate complex.

3. Which of the following is the correct Line weaver-Burk equation?

a) $1V_0=K_mV_{max}[S]+1V_{max}$

b) $1V_{max}=K_mV_0[S]+1V_0$

c) $V_0=V_{max}[S]K_m+[S]$

d) $V_{max}=V_0[S]K_m+[S]$

4. Which of the following statements is true about competitive inhibitors?

a) It is a common type of irreversible inhibition

b) In the presence of a competitive inhibitor, the Michaelis-Menten equation becomes $V_0=V_{max}[S]\alpha K_m+[S]$

c) The apparent K_m decreases in the presence of inhibitor by a factor α

d) The maximum velocity for the reaction decreases in the presence of a competitive inhibitor

5. Which of the following statements is true about uncompetitive inhibitors?

a) They bind covalently at a site distinct from the substrate active site

b) In the presence of a uncompetitive inhibitor, the Michaelis-Menten equation becomes $V_0=V_{max}[S]K_m+\alpha'[S]$

c) They increase the measured V_{max}

d) Apparent K_m also increases

6. The rate determining step of Michaelis-Menten kinetics is _____

a) The complex dissociation step to produce products

b) The complex formation step

c) The product formation step

d) None of the mentioned

7. The molecule which acts directly on an enzyme to lower its catalytic rate is _____

a) Repressor

b) Inhibitor

c) Modulator

d) Regulator

8. Which of the following is an example for irreversible inhibitor?

a) Disulfiram

b) Oseltamivir

c) Protease inhibitors

d) DIPF

9. Which of the following is an example of reversible inhibitor?
a) DIPF
b) Penicillin
c) Iodoacetamide
d) Protease inhibitors
10. Where does inhibitor binds on enzyme in mixed inhibition?
a) At active site
b) Allosteric site
c) Does not bind on enzyme
d) Binds on substrate
11. The catalytic efficiency of two distinct enzymes can be compared based on which of the following factor?
a) K_m
b) Product formation
c) Size of the enzymes
d) pH of optimum value
12. What is the general mechanism of an enzyme?
a) It acts by reducing the activation energy
b) It acts by increasing the activation energy
c) It acts by decreasing the pH
d) It acts by increasing the pH

Which of the following statements about the active site of an enzyme is correct?
a) The active site of an enzyme binds the substrate of the reaction it catalyses more tightly than it does the transition state intermediate.
b) The active site of an enzyme binds the substrate of the reaction it catalyses less tightly than it does the transition state intermediate.
c) The active site of an enzyme binds the product of the reaction it catalyses more tightly than it does the transition state intermediate.
d) The active site of an enzyme is complementary to the substrate of the reaction it catalyses.

Which of the following statements about the nature of enzyme catalysis is correct?
a) An enzyme can change the equilibrium position of the reaction it catalyses by lowering the energy of activation of that reaction.
b) An enzyme can lower the energy of activation of the reaction it catalyses by increasing the molecular collisions between the molecules.
c) An enzyme lowers the free energy difference between substrate(s) and product(s) but it cannot change the equilibrium position of the reaction it catalyses.
d) An enzyme cannot change the equilibrium position of the reaction it catalyses but it lowers the energy of activation of that reaction.

Which of the following statements about Michaelis-Menten kinetics is correct?
a) Km, the Michaelis constant, is defined as the concentration of substrate required for the reaction to reach maximum velocity.
b) Km, the Michaelis constant, is defined as the dissociation constant of the enzyme-substrate complex.
c) Km, the Michaelis constant, is expressed in terms of the reaction velocity.
d) Km, the Michaelis constant, is a measure of the affinity the enzyme has for its substrate.

Which of the following statements about the competitive inhibition of an enzyme-catalyzed reaction is correct?
a) A competitive inhibitor and substrate can bind simultaneously to the enzyme.
b) The Vmax and Km (Michaelis constant) for a reaction are unchanged in the presence of a competitive inhibitor.
c) The Vmax for a reaction remains unchanged in the presence of a competitive inhibitor.
d) The Km for a reaction remains unchanged in the presence of a competitive inhibitor.

Which of the following statements about the mechanism of the catalytic triad of chymotrypsin is correct?
a) A proton moves from the serine to the histidine to the aspartate side chain in the catalytic triad of chymotrypsin.
b) A proton moves from the aspartate to the serine to the histidine side chain in the catalytic triad of chymotrypsin.
c) A proton moves from the serine to the histidine side chain in the catalytic triad of chymotrypsin.
d) A proton moves from the aspartate to the histidine side chain in the catalytic triad of chymotrypsin.

Which of the following statements is false with respect to an enzyme's ability to catalyse a reaction?

a) An enzyme provides a reaction surface and a suitable environment for the reaction to take place.

b) An enzyme binds reactants such that they are positioned correctly and can attain their transition-state configurations.

c) An enzyme allows the reaction to go through a less stable transition state than would normally be the case.

d) An enzyme can weaken bonds in reactants through the binding process.

Which of the following statements is not true regarding the active site of an enzyme?

a) An active site is normally a hollow or cleft on the surface of an enzyme.

b) An active site is normally hydrophilic in nature.

c) Substrates fit into active sites and bind to functional groups within the active site.

d) An active site contains amino acids which are important to the binding process and the catalytic mechanism.

Which of the following statements best describes an allosteric binding site?

a) It is a binding site containing amino acids with aliphatic side chains.

b) It is a binding site that can accept a wide variety of differently shaped molecules.

c) It is a binding site, which is separate from the active site, and affects the activity of an enzyme when it is occupied by a ligand.

d) It is a description of an active site which has undergone an induced fit.

Which of the following descriptions best describes an induced fit?

a) The process by which an active site alters shape such that it is ready to accept a substrate.

b) The process by which a substrate adopts the correct binding conformation before entering an active site.

c) The process by which a substrate binds to an active site and alters the shape of the active site.

d) The process by which an active site alters the shape of the substrate such that it can adopt the necessary active conformation for binding.

Which of the following statements is incorrect with respect to an enzyme's ability to catalyse a reaction?

a) an enzyme provides a reaction surface and a hydrophilic environment for the reaction to take place

b) an enzyme binds reactants such that they are positioned correctly and can attain their transition-state configurations

c) an enzyme allows the reaction to go through a more stable transition state than would normally be the case

d) an enzyme can weaken bonds in reactants through the binding process

Some enzymes require the presence of a non-protein substance if they are to catalyse a reaction. Which of the following terms is the best general term for such a substance?

a) prosthetic group

b) cofactor

c) co-enzyme

d) modulator

What term is used for a non-protein organic molecule that is required by some enzymes in order to catalyse a reaction on a substrate?

a) prosthetic group

b) cofactor

c) co-enzyme

d) modulator

Some enzymes covalently bind a non-protein organic molecule to the active site. The organic molecule concerned is required if the enzyme is to catalyse a reaction on a substrate. What is the term used for such a molecule?

a) prosthetic group

b) cofactor

c) co-enzyme

d) modulator

Which of the following molecules is involved in the feedback control of the enzyme phosphorylase a?

a) glucose-1-phosphate

b) adrenaline

c) glycogen

d) AMP

What secondary messenger is generated as a result of the action of nitrous oxide?

a) GTP

b) cyclic GMP

c) ATP

d) cyclic AMP

From which amino acid is nitrous oxide generated?

a) arginine

b) aspartic acid

c) asparagine

d) lysine

The Michaelis-Menton equation relates the rate of an enzyme-catalysed reaction to which of the following?

a) Substrate concentration

b) Product concentration

c) Activation energy

d) Inhibitor concentration

3. Multiple-choice

Q. In the Michaelis-Menton equation, the Km [s] is described in what about the substrate?

Amount in liters

Concentration in grams/liter

Quantity in grams

Concentration in moles/liter

Amount in moles

4. Multiple-choice

Q. During a chemical reaction catalyzed by an enzyme, the enzyme is consumed to form the product from the substrate and the enzyme?

True

False

5. Multiple-choice

$$v = \frac{v_{max}[S]}{[S] + K_m}$$

Q. This equation is used to describe the kinetics of an enzymatic reaction. The equation is called the

Inhibitor Equation

Activation energy equation

Velocity equation

Michaelis-Menten equation

Double-reciprocal plot

6. Multiple-choice

Q. What would a chemical equation of two substrates going to produce one product? (select all that apply)

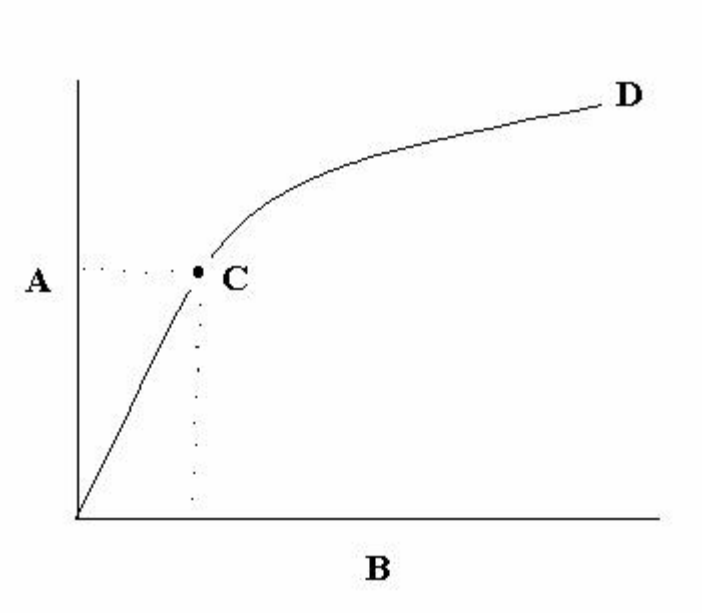
A + B + E \leftrightarrow ABE \leftrightarrow E + P

A + B + E \leftrightarrow ABE \leftrightarrow E + P + Q

2A + E \leftrightarrow 2AE \leftrightarrow E + P

All of the equations above are correct

7. Multiple-choice



Q. What is "C" on the graph?

Vmax

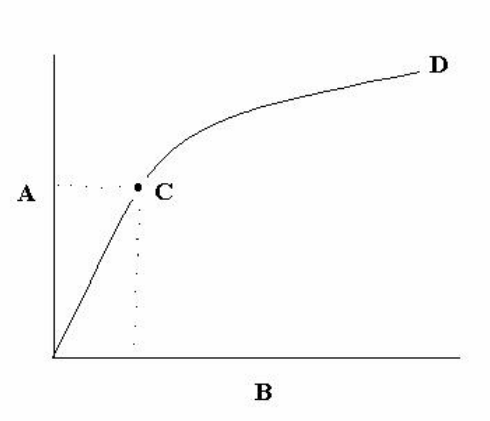
Km

Vi

[S]

Rate of reaction

8. Multiple-choice



Q. What is "D" on the graph

Vmax

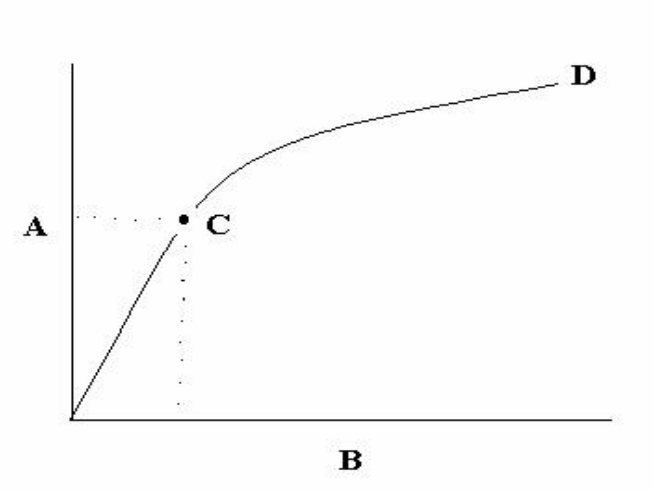
Km

Vi

Rate of reaction

[S]

9. Multiple-choice



Q. What is "A" on the graph? (Select all that may apply)

Km

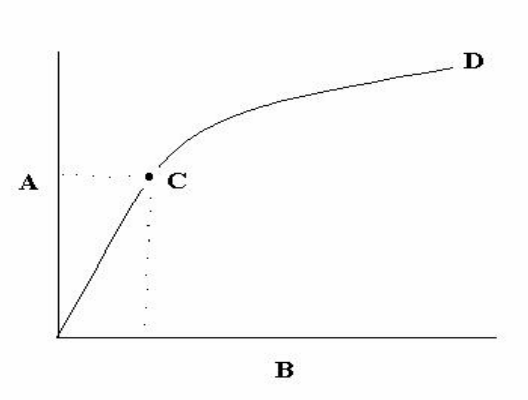
Vmax

Rate of reaction

[S]

Vi

10. Multiple-choice



Q. What is "B" on the graph?

Km

[S]

Vmax

Rate of reaction

Vman

11. Multiple-choice

Q. Why is the Km affected in the presence of a competitive inhibitor?

Because it requires less substrate to achieve the same max as without the inhibitor

Because it requires more substrate to achieve the same max as without the inhibitor

Km will change because no matter how much substrate is added, the maximum effect will not be reached in the presence of a competitive inhibitor

Km is not affected in competitive inhibition, only in non-competitive inhibition

12. Multiple-choice

Q. Michaelis-menten equation does not apply to allosteric binding/multiple binding sites

True

False

13. Multiple-choice

Q. Enzymes DO NOT affect Keq

True

False

14. Multiple-choice

Q. Vmax = (choose best answer)

The concentration of substrate that = 1/2 of the Km

The concentration specified in moles/liter

The maximum velocity at which all the enzyme's active sites are saturated

The initial velocity before the enzyme produces a product

15. Multiple-choice

Q. What factors would affect the reaction rate?

Temperature

pH

Concentration of inhibitors

All of the above

16. Multiple-choice

Q. Km = (choose best answer)

The initial velocity prior to enzymatic activity

The concentration of substrate (moles/liter) needed to achieve 50% of the maximum

The concentration of substrate at which all enzymes are being used (saturated) and it is producing at maximum effect.

It represents the first order portion of the graph

17. Multiple-choice

Q. The Michaelis-Menten graph is more accurate in determining the Vmax and Km.

True

False

18. Multiple-choice

$$v_i = \frac{V_{max}[S]}{K_m + [S]} \quad v_i \approx \frac{V_{max}[S]}{K_m} \approx \left(\frac{V_{max}}{K_m}\right)[S]$$

Q.

What does this photo represent in terms of Km and [S]?

This represents when the [S] is greater than the Km value

This represents when the [S] is equal to the Km value

This represents when the [S] is less than the Km value

19. Multiple-choice

$$v_i = \frac{V_{max}[S]}{K_m + [S]} \quad v_i \approx \frac{V_{max}[S]}{[S]} \approx V_{max}$$

Q. What does this photo represent in terms of [S] and Km?

The [S] is much greater than the value of Km

The [S] is less than than the value of Km

The [S] is equal to the value of Km

20. Multiple-choice

$$v_i = \frac{V_{max}[S]}{K_m + [S]} = \frac{V_{max}[S]}{2[S]} = \frac{V_{max}}{2}$$

Q. What does this photo represent in terms of [S] and Km?

The [S] is much less than the Km value

The [S] is greater than the Km value

The [S] is equal to the Km value

21. Multiple-choice

Q. What equation is used to exhibit cooperative binding like that in the binding of oxygen to hemoglobin?

Michaelis-Menten equation

Lineweaver-Burk plot

Hill equation

Velocity equation

22. Multiple-choice

Q. The quantitative measurement of the rates of enzyme-catalyzed reactions and the systematic study of factors that affect these rates of reactions.

Intrinsic activity

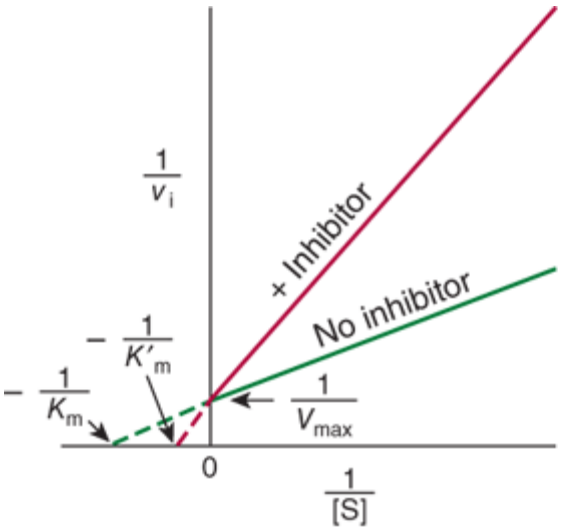
Frequency of collision

Enzyme kinetics

Michaelis-Menten

None of the above

23. Multiple-choice



Q. What kind of inhibition does this graph represent?

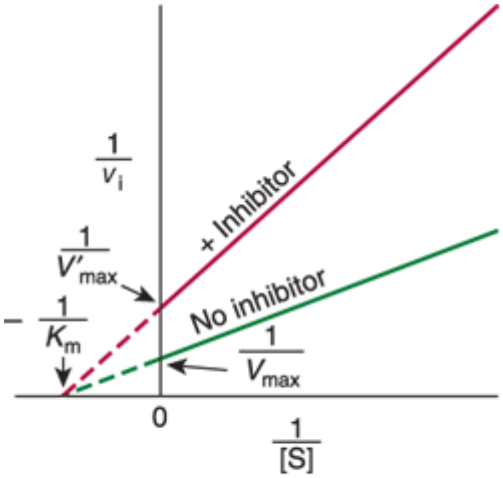
Non-competitive inhibition

Allosteric binding

Competitive inhibition

None of the above

24. Multiple-choice



Q. Which type of inhibition does this photo represent?

Irreversible inhibitor

Competitive inhibitor

Mechanism-based inhibition

Non-competitive inhibition

25. Multiple-choice

Q. What type of inhibitor binds to the enzyme-substrate and stops the enzyme from reacting with the substrate?

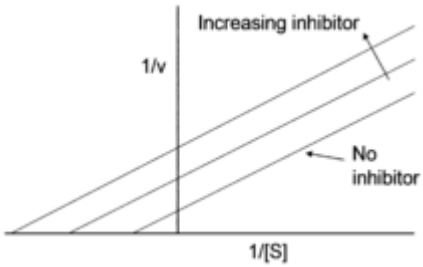
Non-competitive

Competitive

Uncompetitive

None of the above

26. Multiple-choice



Q. What type of inhibition is being represented?

Uncompetitive

Competitive

Non-competitive

27. Multiple-choice

Q. What happens to Km in the presence of a non-competitive inhibitor?

Km will shift to the right meaning that is takes more substrate to reach the max

Km will shift to the left meaning that it takes less substrate to reach the max

Km will not be affected in the presence of a non-competitive inhibitor

None of the above are correct

28. Multiple-choice

Q. How does the Sigmoidal shape of the Hill equation describe the cooperative binding of a substrate?

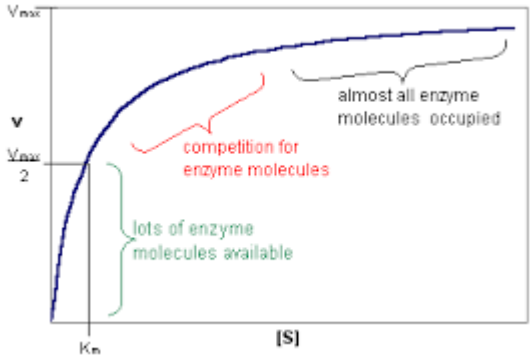
The first to bind is the easiest while those after are difficult

The first to bind is difficult but gets easier until the enzymes become saturated, then it becomes difficult

The first to bind is easy but gets more difficult until the enzymes become saturated, then it becomes easier again

The first to bind is the hardest while those after are easier

29. Multiple-choice



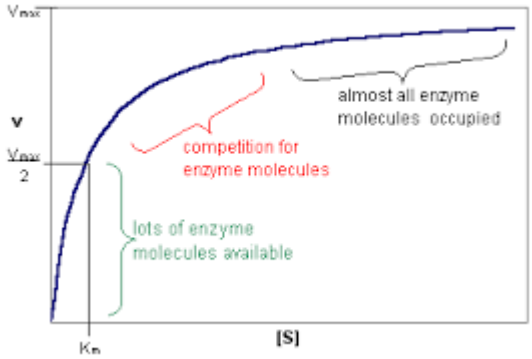
Q. Which of the following represents the first order?

Lost of enzyme molecules available

Competition for enzyme molecules

Almost all enzyme molecule occupied

30. Multiple-choice



Q. Which of the following represent zero-order

Lots of enzyme molecules available

Competition for enzyme molecules

Almost all enzyme molecules occupied

31. Multiple-choice

Q. Some inhibitors bind to enzymes with such high affinity, *K*i ≤ 10–9 M, that the concentration of inhibitor required to measure *K*i falls below the concentration of enzyme typically present in an assay. What type of inhibitor is this?

Non-competitive inhibitors

Competitive inhibitors

Tightly bound inhibitors

Low-affinity inhibitors

32. Multiple-choice

Q. Which type of inhibitor "poisons" an enzyme?

Non-competitive inhibitor

Competitive inhibitor

Tightly bound inhibitor

Irreversible inhibitor

33. Multiple-choice

Q. The relationship between Vo and [S] of a single binding site is explained in which equation?

Hill equation

Michaelis-Menten equation

Velocity equation

[S] equation

34. Multiple-choice

Q. Enzymes accelerate reaction rates by lowering:

answer choices

Vmax

Vi

delta Gf

None of the above

35. Multiple-choice

$$\frac{1}{v_i} = \left(\frac{K_m}{V_{max}}\right)\frac{1}{[S]} + \frac{1}{V_{max}}$$

Q. What equation is represented?

Michaelis-Menten

Lineweaver-Burk Plot

Hill Equation

1. Which of the statements regarding enzymes is false?

   a) Enzymes are proteins that function as catalysts.

   b) Enzymes are specific.

   c) Enzymes provide activation energy for reactions.

   d) Enzyme activity can be regulated.

   e) Enzymes may be used many times for a specific reaction.

2. The relationship between an enzyme and a reactant molecule can best be described as:

   a) a temporary association.

   b) an association stabilized by a covalent bond.

   c) one in which the enzyme is changed permanently.

   d) a permanent mutual alteration of structure.

   e) noncomplementary binding.

3. The active site of an enzyme

   a) remains rigid and does not change shape.

   b) is found at the center of globular enzymes.

   c) is complementary to the rest of the molecule.

   d) contains amino acids without sidechains.

   e) None of the above choices are correct.

4. The active site of an enzyme differs from an antibody-antigen binding site in that the enzyme active site

   a) contains modified amino acids.

   b) catalyzes a chemical reaction.

   c) is complementary to a specific ligand.

   d) contains amino acids without sidechains.

   e) None of the above are correct.

5. The transition state of a catalyzed reaction is

   a) a highly-populated intermediate on the reaction pathway.

   b) higher in energy than that of an uncatalyzed reaction.

   c) lower in energy than that of an uncatalyzed reaction.

   d) lower in energy than the reaction substrate.

   e) bound very weakly to the catalyst.

6. The transtion state of a catalyzed reaction is lower in energy than that of the uncatalyzed reaction

   a) because of enthalpic interactions between the enzyme and the transition state.

   b) because of favorable interactions with the substrate.

   c) because of a smaller delta S between the [ES] and [EX] complex.

   d) because enzymes only work at low temperatures.

   e) both a and c are correct.

1. A competitive inhibitor of an enzyme is usually:

   a highly reactive compound.

   a metal ion such as Hg2+ or Pb2+.

   structurally similar to the substrate.

   water insoluble.

   a poison.

2. A non-competitive inhibitor of an enzyme catalyzed reaction

   binds to the Michaelis complex (ES).

   decreases Vmax.

   is without effect at saturating substrate concentrations.

   can actually increase reaction velocity in rare cases.

   The first and second choices are both correct.

3. A competitive inhibitor has the following effect on a Limeweaver-Burke (double reciprocal) Plot.

   It moves the entire curve to the right.

   It moves the entire curve to the left.

   It changes the y-intercept.

   It changes the x-intercept.

   It hs no effect on the slope.

4. The degree of inhibition α by a competitive inhibitor is obtained from

   measurement of Vmax.

   measurement of the y-intercept on a Limeweaver-Burke Plot.

   measurement of KM.

   crystallographic studies.

   is unrelated to the binding affinity of the inhibitor to the enzyme.

5. An allosteric inhibitor of an enzyme usually

   binds to the active site.

   participates in feedback regulation.

   denatures the enzyme.

   causes the enzyme to work faster.

   is a hydrophobic compound.

1. Which of the following best describes the assumption made in steady state kinetic analysis?

   a) The concentration of [S] is decreasing.

   b) The concentration of [ES] is constant.

   c) Both a and b are correct.

   d) Neither a nor b are correct.

   e) The total amount of enzyme decreases.

2. When [S]=KM, the velocity of an enzyme catalyzed reaction is about:

   a) 0.1*VMAX.

   b) 0.2*VMAX.

   c) 0.3*VMAX.

   d) 0.5*VMAX.

   e) 0.9*VMAX.

3. The substrate KM in an enzyme-catalyzed reaction

   a) is usually less than Kd, the dissociation constant.

   b) is never less than Kd.

   c) cannot be equal to Kd.

   d) is estimated from the Y-intercept of a Lineweaver-Burk plot.

   e) cannot be derived from simple rate equations.

4. In an enzyme catalyzed reaction, __ provides information on __ and __ provides information on

   a) KM, chemical step, VMAX, substrate binding.

   b) VMAX, chemical step, kCAT, substrate binding.

   c) KD, substrate binding, kCAT, chemical step.

   d) KM, substrate binding, VMAX, chemical step.

   e) kCAT, substrate binding, VMAX, chemical step.

5. The initial velocity, vo, of an enzyme catalyzed reaction reaches Vmax

   a) at [S] = KM.

   b) at [S] = 10*KM.

   c) at 1/[S] = 1/KM.

   d) only as 1/[S] --> 0.

   e) The third and fourth choices are both correct.

6. The __ of a double reciprocal plot equals __ and the __ equals __.

   a) slope, VMAX, y-intercept, KM.

   b) slope, KM, y-intercept, 1/VMAX.

   c) slope, KM/VMAX, y-intercept, 1/VMAX.

   d) slope, KM/VMAX, y-intercept, VMAX.

   e) slope, KM/VMAX, x-intercept, VMAX.

7. When [S] = 0.1*KM, the velocity of an enzyme catalyzed reaction is about:

   a) 0.1*Vmax.

   b) 0.3*Vmax.

   c) 0.5*Vmax.

   d) 0.7*Vmax.

   e) 0.9*Vmax.

8. When [S] = 10*KM, the velocity of an enzyme catalyzed reaction is about:

a) 0.1*Vmax.

b) 0.3*Vmax.

c) 0.5*Vmax.

d) 0.7*Vmax.

e) 0.9*Vmax.