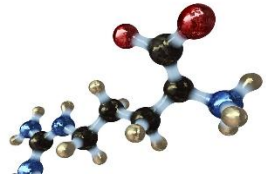
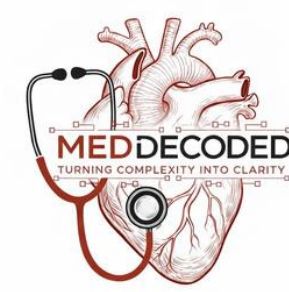


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



BioChemistry

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ وَنَعْلَمُ مَا تُوَسْوِسُ بِهِ نَفْسُهُ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ ﴿١٠٠﴾

Final

Past Papers

Reviewed by : Nizar Al-sabateen

Yamen Al-jarrah

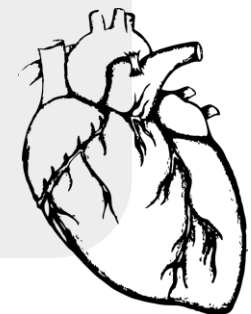
Yaman Khalil

Muhanad Barhoom

Raghad Farraj

Lamar Khorma

Reem Aldahamsheh



سبحان الله وبحمده، سبحان الله العظيم

Protein structure

- **In what structure are the CDR's found?**
 - A) Helical structure
 - B) Alpha helix
 - C) Loop
 - D) Beta sheet
 - E) Globular folding

Answer: C

- **disulfide bonds are most important in this type of structure :-**
 - A) tertiary structure
 - B) primary structure
 - C) secondary structure
 - D) quaternary structure
 - E) all of the above

Answer: A

- **which of the following forces are involved in maintaining the primary structure of protein :**
 - A) covalent bond
 - B) hydrogen bond
 - C) ionic bond
 - D) hydrophobic bond

Answer: A

- **which of the following amino acid is unlikely to be found in an alpha-helix due to its cyclic structure :**
- A) Phenylalanine
 - B) tryptophan
 - C) Proline
 - D) lysine

Answer: C

- **the overall folding of a single protein subunit is called :**
 - A) tertiary structure-
 - B) secondary structure
 - C) quaternary structure
 - D) all of the above

Answer: A

- **protein that aid in the correct and timely folding of other proteins are called :**

- A) motifs
- B) chaperone
- C) liposome
- D) cooperative

Answer: B

- **Amphipathic alpha-helices exist in:**
 - A) Conjugated, multimeric proteins
 - B) Ion channels
 - C) Extracellular proteins
 - D) Cysteine-rich proteins with disulfide bonds
 - E) Membrane receptor with a single transmembrane domain

Answer: B

- **This type of amino acids preferentially exist in beta-turns but not alpha helices:**
 - A) Polar amino acids
 - B) Aromatic amino acids
 - C) Amino acids with branching at the beta-carbon
 - D) Proline and Glycine
 - E) Non-polar, aliphatic amino acids

Answer: C

- **One of the following is TRUE in regards to prion disease:**
 - A) The defective prion protein disrupts protein synthesis
 - B) The disease is caused by defective chaperones
 - C) The prion protein does not have a tertiary structure
 - D) The disease can be inherited
 - E) It is a human-specific disease

Answer: D

- **The secondary structures that make up domains are stabilized by:**
 - A) Proline residues
 - B) Hydrogen bonds
 - C) R groups
 - D) Disulfide bonds
 - E) Prosthetic groups

Answer: B

- **The best discription of the primary structure is :**
- A) The localised organisation of parts of a polypeptide chain
- B) The three-dimensional structure of the protein
- C) The sequence and type of amino acid residues
- D) The number and relative positions of the subunits in a multimeric protein
- E) None of the above

Answer: C

• **The disease that does not result from misfolding :**

- A) Alzheimer
- B) Analbuminemia
- C) Creutzfeldt –Jacob
- D) Scrapie

Answer: B

- **The secondary structure is characterised by:**
 - A) The sequence of amino acids
 - B) The hydrogen bonds between R groups
 - C) The hydrophobic interactions between the amino acids
 - D) The hydrogen bonds between amine and carbonyl groups

Answer:D

• **Which of the following will be denatured by heat?**

- A) Immunoglobulin
- B) Elastin
- C) Myoglobin
- D) Keratin
- E) Collagen

Answer: C

- **The following are components of the secondary structure:**

- A) Motif
- B) Domain
- C) Amino acid sequence
- D) Prosthetic groups
- E) Turn

Answer: E

- **In secondary structure of a protein, there is:**
 - A) H bonds between amide group and carboxyl group in the backbone of amino acids.
 - B) interactions between subunits.
 - C) interactions through side chains of amino acids.

Answer: A

﴿وَمَا تَقْدِمُوا لِأَنْفُسِكُمْ مِنْ خَيْرٍ تَجِدُوهُ عِنْدَ اللَّهِ إِنَّ اللَّهَ بِمَا تَعْمَلُونَ بَصِيرٌ﴾ [البقرة: ١١٠]

Fibrous proteins

- **What gives keratin its characteristic strength?**
 - A) Hydrophobic interactions
 - B) Ionic bonds
 - C) Disulfide bridges
 - D) Hydrogen bonds

Answer: C

- **What is the correct sequence of structural units formed during collagen synthesis?**

- A) Alpha chains - tropocollagen - microfibril - fiber - fibril
- B) Tropocollagen - alpha chains - fibril – fiber
- C) Alpha chains - tropocollagen - microfibril - fibril - fiber
- D) Fiber - fibril - microfibril – tropocollagen
- E) Alpha chains - microfibril - tropocollagen - fiber

Answer: C

- **Collagen is bound to sugars due to what reaction?**
 - A) Carboxylation
 - B) Hydroxylation
 - C) Hydrogenation
 - D) Dehydration
 - E) Dehydroxylation

Answer: B

- **vitamin c (ascorbic acid) prevent survey because :**
 - A) it's involved in formation the proper beta sheet of collagen
 - B) it's involved in metabolism of heme used in hemoglobin
 - C) it encourages the formation of disulfide linkage in collagen
 - D) it's unusual amino acid found in primary structure of collagen
 - E) it's used to hydroxylate proline in the primary structure of the protein.

Answer: E

Reverse turns = Beta turns

- **the two amino acid frequently found in reverse turns are :**
 - A) tyrosin & tryptophan
 - B) serine & threonin
 - C) glycin & proline
 - D) leucine & isoleucin

Answer: C

- **The following residue of collagen is important in intracellular signaling**
 - A) Hydroxyproline
 - B) Glycine
 - C) Hydroxylysine
 - D) Allysine
 - E) Proline

Answer: C

- **Temporary hair styling involves:**
 - A) Reformation of covalent linkages
 - B) Dihydroxylation of amino acid residues
 - C) Reformation of non-covalent interactions
 - D) Removal of sugar attachments
 - E) Synthesis of more alpha keratins

Answer: C

- **Elastin fibers tend to aggregate back together after stretching due to**
 - A) The lysine crosslinks
 - B) The hydroxyproline residues
 - C) Their hydrophobic nature
 - D) The attached carbohydrates
 - E) The proline residues

Answer: C

- **The following is NOT important in packing collagen fibrils and fibers:**
 - A) Lysine
 - B) Allysine
 - C) Proline
 - D) Hydroxyproline
 - E) Hydroxylysine

Answer: C

• **Which of the following bonds is not found in fibrous proteins?**

- A) Hydrogen bonds
- B) Phosphodiester bonds
- C) Peptide bonds
- D) Disulfide bonds

Answer: B

• **One of the following is not true about fibrous proteins:**

- A) Glycine and proline residues are abundant in collagen, elastin and keratin proteins
- B) Disulfide bonds within keratin are the reason for curly hair
- C) Hydroxyproline in collagen is necessary for its stability
- D) Collagen is glycosylated at hydroxylysine residues
- E) Lysine is involved in cross linking elastin molecules

Answer: A

- **Protofibrils are composed of?**
 - A) Two protofilaments
 - B) Two alpha keratin chains
 - C) Two intermediate filaments
 - D) Two alpha keratin tetramers
 - E) Two coiled coil keratin dimers

Answer: A

- **What is the basic functional unit for collagen ?**

The answer is : Tropocollagen

- **What is the function of allysine ?**

Answer : cross linking

- **Lysine, allysine, and hydroxylysine are important in cross-linking collagen molecules, but in elastin, cross-linking occurs due to:**
 - A) Hydroxyproline
 - B) Lysine and allysine only.
 - C) All three molecules as well.
 - D) There is no cross-linking in elastin fibers.
 - E) Cysteine residues

Answer: B

أَسْتَغْفِرُ اللَّهَ الَّذِي لَا إِلَهَ إِلَّا هُوَ الْحَيُّ الْقَيُّومُ وَأَتُوبُ إِلَيْهِ

Globular proteins *(myoglobin and hemoglobin)*

- **One of the following statements is wrong according to myoglobin:**
 - A) The P50 for myoglobin is 2.8 torr
 - B) It contains 8 alpha helices
 - C) The ferrous ion within the heme group can form 6 bonds
 - D) It is an allosteric protein
 - E) It is a monomeric protein

Answer: D

- **Which statement about oxygen binding in hemoglobin is incorrect?**
 - A) Causes conformational change
 - B) Higher O₂ affinity in high O₂
 - C) O₂ binds to heme's iron
 - D) O₂ binds directly to His residues
 - E) O₂ doesn't bind to heme ferric ion

Answer: D

- **What is the main reason in which hemoglobin is considered as an allosteric protein?**
 - A) It has a quaternary structure
 - B) It has different structures
 - C) It has many electrostatic interactions
 - D) It can be regulated by effectors

Answer: D

- **Hemoglobin can transition between the R (relaxed) state and T (tense) state as part of its allosteric regulations. Which statement best describes the structural changes when hemoglobin transitions from the R state to the T state?**
 - A) The heme groups are oxidized
 - B) The alpha and beta subunits dissociate
 - C) The salt bridges between dimers are broken
 - D) The electrostatic interactions reform between dimers

Answer: D

- **A single point amino acid change from His143 in HbA to serine in fetal hemoglobin (HbF) results in higher affinity of HbF to oxygen. This is because:**
 - A) Reduced formation of carbamates
 - B) Stabilization of R form of hemoglobin
 - C) Reduced chloride shift
 - D) Reduced binding to 2,3-bisphosphoglycerate
 - E) Reduced Bohr effect

Answer: D

- **the structure of myoglobin consist of :**
 - A) almost entirely of alpha helix
 - B) almost entirely of beta sheet
 - C) mixture of alpha & beta
 - D) of unique secondary motif that is neither alpha helix or beta sheet .

Answer: A

- **why does the myoglobin have histidine that prevents CO from binding perpendicularly to the heme plane :**
 - A) this increase myoglobins affinity for O₂
 - B) this increase myoglobins affinity for CO₂
 - C) this lessens the difference in myoglobins affinity for CO₂ versus O₂
 - D) this prevents the iron of the heme from being oxidized

Answer: C

- **in what oxidation state must the iron atom be for heme to bind O_2 :**
 - A) -0 , Fe (0)
 - B) +1 , Fe (I)
 - C) +2 , Fe (II)
 - D) +3 , Fe (III)
 - E) there is no require oxidation state to use iron

Answer: C

- **which of the following is not a characteristic of hemoglobin :**
 - A) it contain two different type of subunits
 - B) it contain prosthetic group
 - C) it's an allosteric enzyme
 - D) all of these are true

Answer: D

- **in the bohr effect the binding of oxygen to hemoglobin**
:
 - A) is increased by the presence of Na^+ .
 - B) is increased by the presence of H^+/CO_2 .
 - C) is decreased by the presence of H^+/CO_2 .
 - D) is unchanged

Answer: C

- **the affinity of fetal hemoglobin for oxygen :**
 - A) has not been studied
 - B) the same as that of adult hemoglobin
 - C) is lower than that of maternal hemoglobin
 - D) is higher than that of maternal hemoglobin

Answer: D

- **The reason why myoglobin cannot be allosteric is because:**
 - A) Heme does not change shape when it binds oxygen
 - B) Myoglobin is a conjugated protein
 - C) Myoglobin binds with a strong affinity to oxygen
 - D) Myoglobin is a muscle-specific protein
 - E) Myoglobin is monomeric

Answer: E

- **The sigmoidal shape of the oxygen saturation curve of hemoglobin indicates that:**
 - A) Hemoglobin is a hetero-multimeric protein
 - B) Hemoglobin is a conjugated protein
 - C) Hemoglobin is a holoprotein
 - D) Hemoglobin is an allosteric protein
 - E) Hemoglobin has a prosthetic group

Answer: D

- **Distal histidine has this significant role in hemoglobin:**
 - A) It prevents the entry of carbon monoxide into the heme binding core
 - B) It covalently links the heme group to hemoglobin.
 - C) It reduces iron when oxygen is released and iron is oxidized.
 - D) It stabilizes oxygen binding to heme via the formation of hydrogen bonding with it.
 - E) A+D

• **The R conformation of hemoglobin always predominates in one of the following tissues:**

- A) Muscles
- B) Lungs
- C) Liver
- D) RBCs

Answer: B

• **Choose the wrong statement about the distal histidine in hemoglobin :**

- A) Works as a gate
- B) Stabilises the binding of oxygen
- C) Keep the Fe in the oxidised state

Answer: C

• **If the O_2 in a certain tissue is 2.8 mmHg ,what will happen ?**

- A) The myoglobin will be partially saturated
- B) The myoglobin will be fully saturated
- C) The hemoglobin will be fully saturated
- D) Can't be determined

Answer: A

- **This is how the propionate groups of heme molecules are positioned in both myoglobin and hemoglobin:**
- A) They are covalent linked to distal histidine.
 - B) They are oriented towards the exterior surface of the protein.
 - C) They are covalently linked to proximal histidine.
 - D) They are hidden inside the protein.
 - E) They are linked to one of the internal alpha helices

Answer: B

- **Both hemoglobin and myoglobin have all these characteristics in common EXCEPT:**
 - A) their subunits are held together by noncovalent interactions.
 - B) They bind on O₂ per heme.
 - C) They bind heme in a hydrophobic pocket.

Answer: A

﴿وَلَسَوْفَ يُعْطِيكَ رَبُّكَ فَتَرْضَى﴾ [الضحى: ٥]

Immunoglobulins

Which class of antibody appears as a pentamer in its secreted form?

- A. IgA
- B. IgD
- C. IgE
- D. IgG
- E. IgM

Answer: E

What is the function of CDR's?

- A. They regulate the binding between the antigen & the antibody
- B. They make the antibody more flexible
- C. They bind specifically to the antigen
- D. They have the same primary structure between idiotypes
- E. They are present in the hinge region of the antibody

Answer: C

Which statement that refers to the definition of allotypes?

- A. They differ in the constant region but possess the same variable region
- B. They differ in the variable region but possess the same constant region
- C. They are from different individuals
- D. They differ in the constant and the variable region
- E. None of the above

Answer: C

In order to immortalize a B cell to produce a monoclonal antibody:

- A. Mutations are created
- B. B cells are just activated by an antigen
- C. B cells with immunoglobulin M are selected
- D. B cells undergo class switching
- E. B cells are fused with cancer cells

Answer: E

Cystines play an important role in the formation of the quaternary structure of this protein:

- A. Myoglobin
- B. Collagen
- C. Carbonic anhydrase
- D. Hemoglobin
- E. Immunoglobulin

Answer: E

Exp! Because the structure is held together by disulfide bonds, which is made by cystine

The antigen binds specifically to which part of antibody:

2021

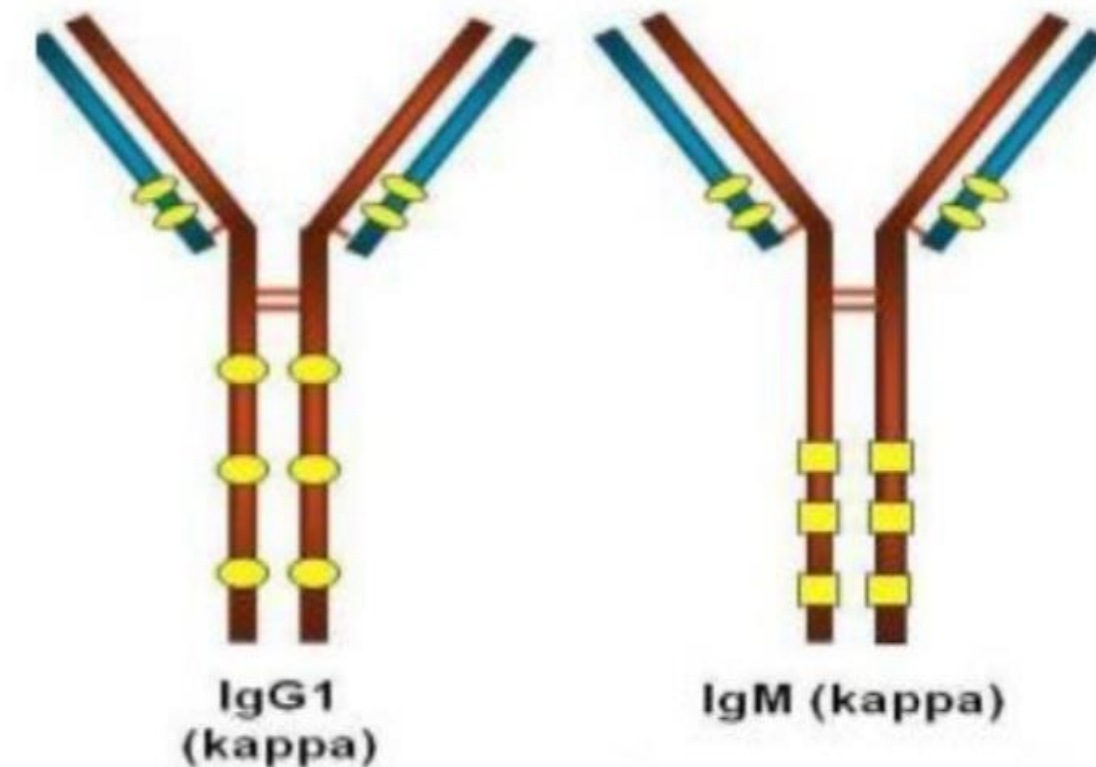
- A. Fc domain
- B. Fab domain
- C. CDR
- D. Hinge region

Answer: C

The relation between these two antibodies:

2021

- A. Idiotypes
- B. Isotopes
- C. Allotropes
- D. A+C
- E. There is no relationship



Answer: B

Exp! Same variable, different constant heavy chain

Class switching involves:

- A. Changing the hypervariable region of antibodies.
- B. Changing the constant region of antibodies only.
- C. Changing the variable region of antibodies only.
- D. Changing the B cells that produces the antibodies.
- E. Changing both the variable and constant regions of antibodies

Answer: B

Exp! Specifically, constant region of the heavy chain changes

One of following is false about the diversity of immunoglobulin?

- A. Gene segment recombination
- B. Addition and deletion of nucleotides at gene junctions
- C. Combinatorial pairing of heavy and light chains
- D. Mutations in variable-region genes
- E. Alternative splicing

Answer: E

Exp! The answer is correct, but the other options are AI generated

The main purpose of the hinge region of antibodies is:

- A. Antibody clearance
- B. Binding phagocytic cells
- C. Allowing better binding to antigen
- D. Site of sugar binding
- E. Binding to antigenic epitopes

Answer: C

Exp! Flexibility helps better adjustment

﴿إِنَّ اللَّهَ وَمَلَائِكَتَهُ يُصَلُّونَ عَلَى النَّبِيِّ يَا أَيُّهَا الَّذِينَ آمَنُوا صَلُّوا عَلَيْهِ وَسَلِّمُوا تَسْلِيمًا﴾ [الأحزاب: ٥٦]

Plasma Proteins

The best description of C-reactive protein?

2021

- A) Acute-phase inflammatory protein
- B) Help in the defense against bacteria
- C) It's level reaches a peak after 2 days
- D) Undetectable in healthy individuals
- E) All of the above

Answer : E

What is true about α 1 –antitrypsin?

2021

- A) High amount of it will active elastase
- B) Synthesised primarily by the fetal yolk sac
- C) A tetramer
- D) A polymorphic

Answer: D

Exp! α 1-antitrypsin inhibits elastase, and is a single polypeptide chain

﴿الَّذِينَ آمَنُوا وَتَطْمَئِنُّ قُلُوبُهُمْ بِذِكْرِ اللَّهِ أَلَا بِذِكْرِ اللَّهِ تَطْمَئِنُّ الْقُلُوبُ﴾ [الرعد: ٢٨]

Enzymes

(Introduction)

Which statement is true regarding the active site of an enzyme?

- A) It is always hydrophobic.
- B) It undergoes permanent changes as a result of the binding of a substrate
- C) It can distinguish stereoisomers.
- D) It forms irreversible bonds with the substrate.
- E) It is found on the surface of the enzyme to provide accessibility for the substrate

Answer: C

Exp! Active sites are **stereoselective**

Which one of the following is an example of a non-protein enzyme?

- A) Apozyme
- B) Ribozyme
- C) Chymotrypsin
- D) Pepsinogen

Answer: B

Exp! Non-protein enzymes are Ribozymes and Abzymes 😊

Digestive enzymes are:

2022

- A. Ligases
- B. Transferases
- C. Oxidoreductases
- D. Layases
- E. Hydrolases

Answer: E

Exp! Saccharidases, Lipases and Esterases are all hydrolases

Which of the following statements about enzyme catalysis is false?

2022

- A. Lowering the activation energy
- B. Increasing the reaction rate
- C. Reducing the change in free energy
- D. Stabilizing the transition state
- E. Lowering the energy of the transition state

Answer: C

Exp! Enzymes do NOT change ΔG , but changes the activation energy

What is an apoenzyme bound to its cofactor called?

- A) Holoenzyme
- B) Cofactor enzyme
- C) Zymogen
- D) Proenzyme

What is the inactive form of an enzyme called?

2022

- A. Proenzyme
- B. Apoenzyme
- C. Hydrolyase
- D. Lipoenzyme

Answer: A

Exp! proenzymes are inactive precursors of enzymes

Which one of these doesn't cause that effect on enzyme denaturation?

2016

- A- High temperature
- B- Low temperature
- C- 70% ethanol
- D- increasing PH

Answer: B

Exp! You can solve this question by excluding options

Which one of these is the reason for decreasing the rate of the reaction?

2016

- A. high concentration of the product
- B. high concentration of the substrate
- C. high concentration of the enzyme
- D. none of the above

Answer: A

Exp! It can because of Product or feedback inhibition

The following **DOES NOT** characterize enzymes' active sites: **2020**

- A. They possess a minimum of three binding points to substrate.
- B. Compared to the rest of the enzyme's structure, they are comparable in size.
- C. Typically, they look like a pocket, canal, or crevice.
- D. They possess multiple weak attraction forces to physiological substrates.
- E. Large active sites usually have two separate, independent sites, catalytic and binding.

Answer: B

Exp! The active site is small relative to the total structure of an enzyme

2020

If you were told that chymotrypsin action on a decapeptide does not result in hydrolysis of that peptide. Then, which of the following sequences might NOT be part of the decapeptide? (Edited)

- A. Ile-Tyr-Pro-His-Gly
- B. Arg-Ser-Cys-Asp
- C. Arg-Asp-Gln-Trp
- D. Ala-Thr-Asn-Phe
- E. Ser-Cys-Tyr-Pro

Answer: B

Exp! Chymotrypsin hydrolyzes peptide bonds involving bulky aromatic amino acids (Phe, Tyr, or Trp) so the only option available is B

Suppose you have 100 molecules of an enzyme (an aspartyl protease) that requires aspartate in the active site for catalysis. pKa of Asp side chain is 4.5 and you did your experiment in the presence of the proper substrate concentration and environment and at pH 4.5. then:

- A. Repeating the experiment at pH 7.5 results in achieving V_{max}
- B. V_{max} is decreased
- C. Repeating the experiment at pH 1.5 results in achieving V_{max}
- D. All enzyme molecules will be active
- E. V_{max} can be achieved

Answer: A

Considering the enzyme "Carbonic anhydrase". What is true? (choose the best answer)

- A. More than one answer is true
- B. Requires TPP
- C. Requires Se
- D. Requires Zn^{+2}
- E. May be referred to as 3.2.1.1

Answer: D

2020

You have the following sequence of a peptide “Arg-Pro-Asp-Lys-Arg-Cys-Trp-Tyr-Lys-Arg”. After treating this peptide with trypsin, how many peptide fragments would be generated?

- A. 3
- B. 1
- C. 2
- D. 4
- E. Cannot be guessed

Answer: D

Exp! Trypsin cleaves after Lys (K) and Arg (R)

What is wrong about the active site of enzymes?

2021

- A. Specific three-dimensional shape
- B. It's found on the surface of the enzyme
- C. Takes up a relatively small part of the total volume

Answer: B

Exp! It is internal relative to the enzyme and looks like a canal

• **The wrong mechanism of enzymes is :**

- A) Catalysis by bond strain
- B) Michaelis –Menten mechanism
- C) Acid –base catalysis
- D) Covalent catalysis
- E) Proximity effect

Answer: B

- **What is true about the active site of enzymes?**

Answer: There should be 3 points for binding

- **The specific function of enzymes is :**

Answer : Reducing the activation energy

• **Monooxygenases** are class of :

- A) Isomerase
- B) Lyases
- C) Transferases
- D) Hydrolyses
- E) Oxidoreductases

Answer:E

• **The major class of enzymes that catalyses intramolecular rearrangement is :**

- A) Ligases
- B) Transferases
- C) Oxidoreductases
- D) Mutases
- E) Translocases

Answer: D

- **An enzymatic reaction proceeds through 3 transition states. They have free energy (G) values of 2.3, 4.2, and 1.2 kcal/mol in order of appearance. If you know that G of substrate is 1.9 kcal/mol and G of product is 3.6 kcal/mol. What is the activation energy?**

- A) 8 kcal/mol
- B) 0.4 kcal/mol
- C) 2.3 kcal/mol
- D) 1.7 kcal/mol
- E) -0.7 kcal/mol

Answer: c

- **Which is the major classification for decarboxylase ?**

The answer is : lyases

- **What is the function of proteases ?**

The answer is : degradation of proteins

- **the active site of an enzyme:**
 - A) remains rigid & doesn't change shape
 - B) is found at the centre of globular enzyme
 - C) Is complementary to the rest of the molecule
 - D) contains amino acids without side chains
 - E) none of the above is correct

Answer: B

- **Treatment of a peptide with trypsin generates a dipeptide that is positively charged at pH 7. Further treatment of this peptide with chymotrypsin generates two single amino acids. The dipeptide is:**

- A) Asp- Lys
- B) Val- Met
- C) Arg- Trp
- D) Gly- Val
- E) Phe-Lys

Answer:E

- **To which class of enzyme does an enzyme that catalyzes this reaction ($A+B+ATP \rightarrow ADP + Pi$) belong:**
 - A) Oxidoreductase
 - B) Hydrolase
 - C) Ligase
 - D) Lyase
 - E) Transferase

Answer: C

- **The reason why enzymes need to bind to substrates at, at least, three points is:**
 - A) To ensure high affinity of binding.
 - B) To catalyze reaction faster.
 - C) To differentiate isomers of substrates.
 - D) To allow binding to more than one substrate.
 - E) To allow for electron rearrangement of substrates

Answer: C

- **Which of the following statements is not true about enzymes**
 - A) They are all proteins with no exceptions.
 - B) They are stereospecific to their substrates.

Answer: A

- Which of the following is true about the reaction that converts pyruvate to oxaloacetate, knowing that this reaction is catalyzed by pyruvate carboxylase enzyme :
- A) TPP is the coenzyme in the enzyme catalyzing this reaction.
- B) Consumption of raw eggs may affect the reaction.

Answer: B

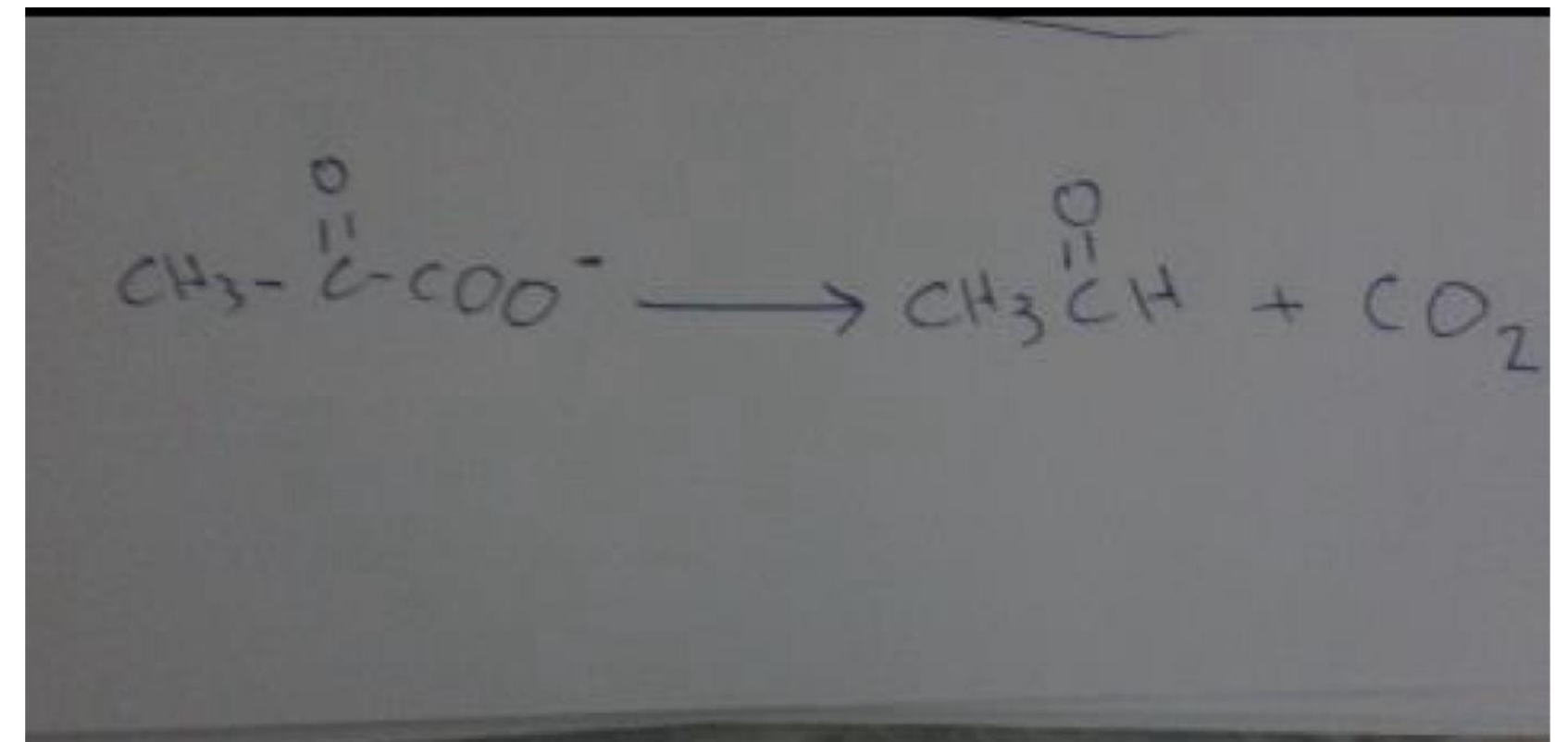
- **The oxide ion that participates in the first nucleophilic catalysis in the mechanism of action of chymotrypsin came from:**
 - A) Aspartate.
 - B) Histidine.
 - C) Serine.
 - D) Glycine.
 - E) Water.

Answer:c

if the question was about the second nucleophilic catalysis, the answer would be "e"

You can see it in the last slide of Enzymes 1

- **The process of this reaction is:**
 - A) carboxylation
 - B) hydrolysis
 - C) oxidation
 - D) decarboxylation



Answer: D

- **About transition state analog:**

Answer is more stable than transition state

الله أكبر والله الحمد

Enzymes *(Kinetics)*

- **how much faster is a reaction with the fastest enzyme than without the catalyst :**
 - A) about 10 times faster
 - B) about 100 times faster
 - C) About 1000 times faster
 - D) About 100,000 times faster
 - E) About 10^{20} times faster

Answer: E

- **If you know that K_m is equal to $[S]$, it means that:**
 - A) The enzyme kinetics follow K system
 - B) Half of the enzymes are bound to substrates
 - C) The reaction velocity is equivalent to V_{max}
 - D) The enzymes are fully saturated with the substrate
 - E) None of the above

Answer: B

- A biochemist obtains the following set of data for an enzyme that is Known to follow Michaelis-Menten kinetics. Approximately, V_{max} of this Enzyme is.....& the K_m is.....

- A) 5000 & 699
- B) 699 & 5000
- C) 621 & 50
- D) 94 & 1
- E) 700 & 8

Substrate Concentration (μM)	Initial velocity ($\mu\text{mol/min}$)
1	49
2	96
8	349
50	621
100	676
1000	698
5000	699

Answer: E

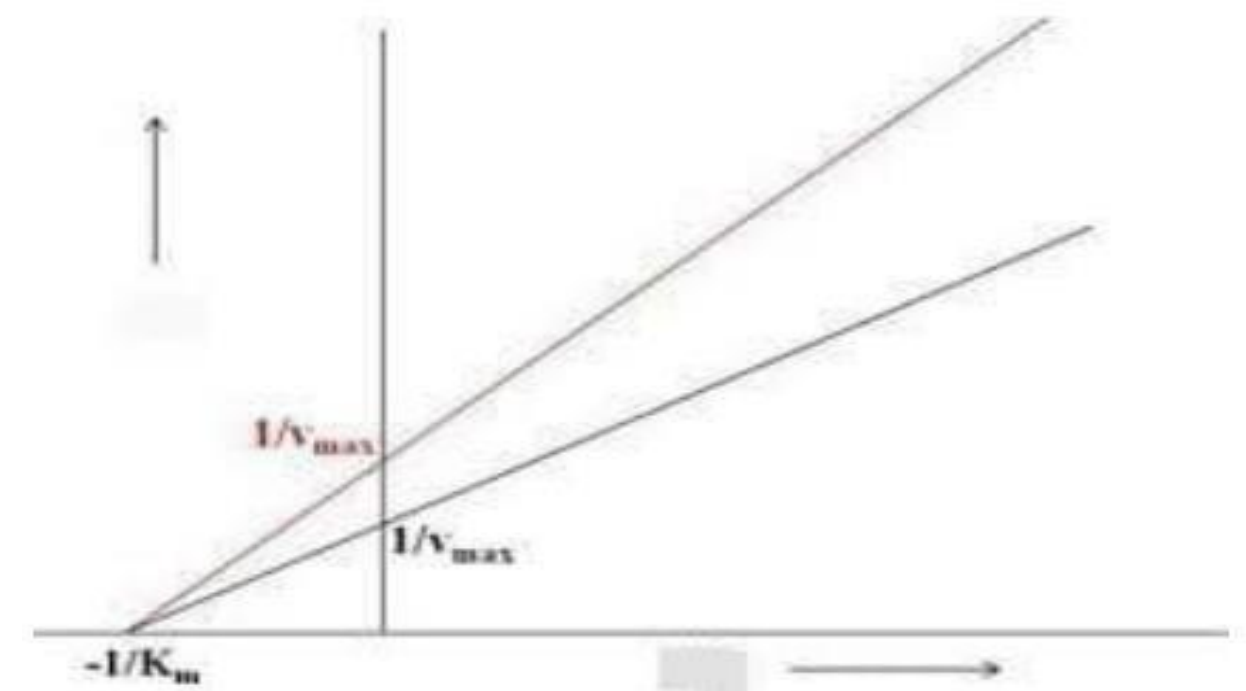
- **With a substrate concentration of 0.03, the velocity of the catalyzed reaction is 1.5. Knowing that the substrate concentration at a velocity which is half the maximum velocity of the catalyzed reaction is 0.06, find the velocity by which the turnover number can be calculated:**
 - A) 0.2025
 - B) 4.5
 - C) 2
 - D) 2.25
 - E) 3.5

Answer: B

- **What value is most important to calculate to measure the purity & quality of an enzyme in a sample to potentially use it as a therapeutic treatment?**
- A) K_m value
 - B) Enzyme efficiency
 - C) Specific activity
 - D) Isoelectric point
 - E) Turnover number

Answer: C

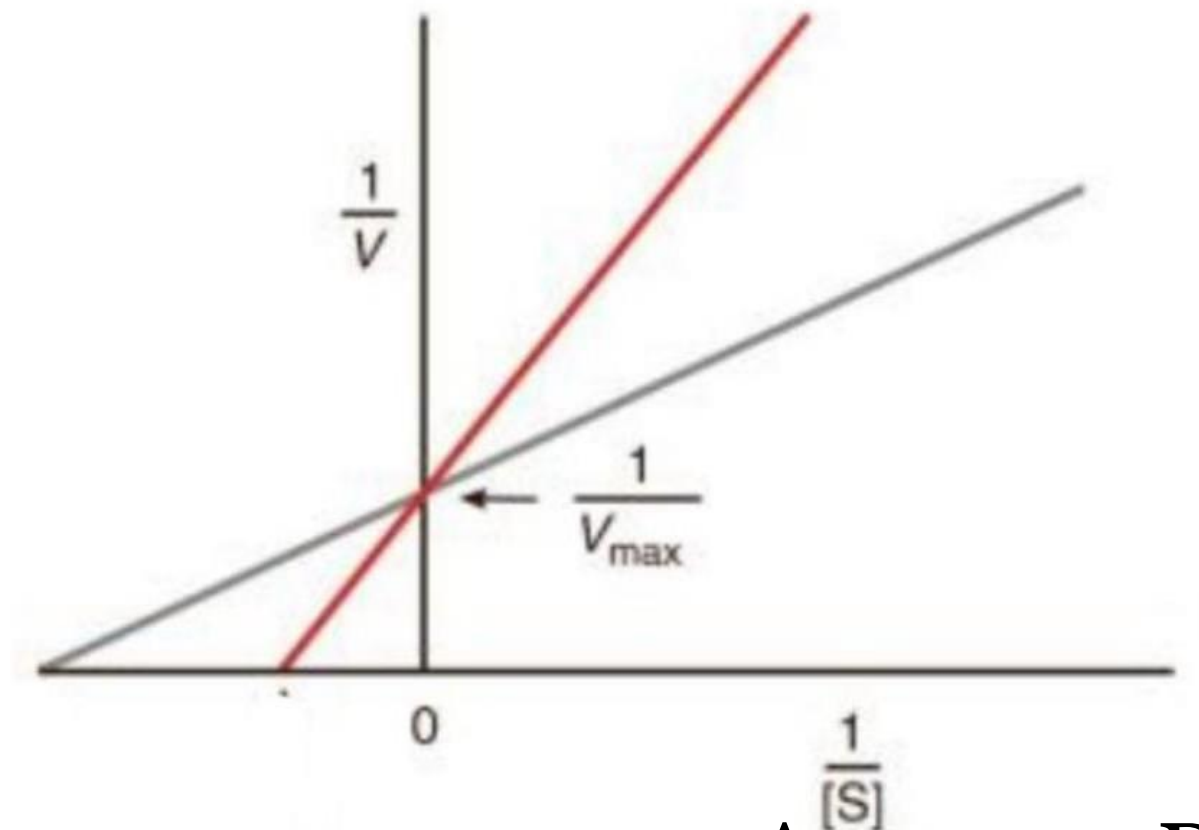
- **Select the right answer according to the type of inhibition that occurs to this enzyme (SMILE) depending on the change of its kinetics depicted by lineweaver-burk's plot:**
 - A) Competitive inhibition
 - B) Uncompetitive inhibition
 - C) Non-competitive inhibition
 - D) Suicide inhibition



Answer: B

• Which of the following inhibitors act as the following blot ?

- A) Penicillin
- B) Sarin
- C) Aspirin
- D) Glucose 6 phosphate
- E) Alop



Answer: D

It acts as a competitive inhibitor for the enzyme hexokinase. It binds to the active site competing with glucose and thus inhibiting the enzyme.¹³⁵

- **What is the velocity if the concentration of the substrate is 60microM and the km 3microM?**
- A) 0.95 V_{max}
B) 0.85 V_{max}
C) 0.75 V_{max}

Answer: A

- A solution initially a saturating concentration of (0.0025 mol/L) of a peptide substrate and 25 μg chymotrypsin in a volume of 1 ml. after 6 minutes, 0.0019 mol/L of peptide substrate remain. The molar mass of chymotrypsin is 25,000 g/mol. Accordingly, what can be deduced?
 - A) No answer is can be deduced
 - B) K_M equals 0.2 μM
 - C) The substrate contains Arg and/or Lys residues not followed by Pro
 - D) K_{cat} equals 100/min
 - E) The reaction rate equals 0.01 M/min

Answer: D

$$[S]_i = 0.0025$$

$$[S]_f = 0.0019$$

$$\Rightarrow [E] = \frac{n}{V} = \frac{m}{Mr \cdot V}$$

$$= \frac{25 \times 10^{-6}}{25000 \times 10^3}$$

$$= \underline{\underline{1 \times 10^{-6}}} \rightarrow V_{max} \simeq V_0$$

Since $[S] \gg [E]$ we can say the $V^0 = V_{max}$

$$V_0 = \frac{0.0025 - 0.0019}{6}$$

$$= \frac{0.0006}{6} = \underline{\underline{1 \times 10^{-4} = V_{max}}}$$

$$K_{cat} = \frac{V_{max}}{[E]} = \frac{10^{-4}}{10^{-6}} = \underline{\underline{10^2}}$$

- **Which of the following statements considering hexokinases is TRUE?**

A) K_m value is identical for hexokinase I and IV under high substrate concentration.

B) No answer is true.

C) The main mechanism of regulation of hexokinase IV (glucokinase) is feedback inhibition.

D) Hexokinase I efficiency will decrease dramatically in fasting e.

E) Increasing hexokinase I or IV concentration increases their K_{cat} value

Answer: B

- You performed an experiment on an enzyme that follows Michaelis-Menten kinetics with a K_m value of 0.01 μM . The velocity of the enzyme at a substrate concentration of 10 μM is approximately at:
 - A) 50% of V_{max}
 - B) 0.001 of V_{max}
 - C) Its V_{max}
 - D) 33% of V_{max}
 - E) 99% of V_{max}

Answer: E

- **An imaginary reaction catalyzed by the enzyme "medicinase" has the following values: the association rate constant of E and S into ES is $4 / \mu\text{M}\cdot\text{s}$, the dissociation rate constant of ES into E and S is $6/\text{s}$, and the dissociation rate constant of ES into E and P is $14/\text{s}$. Accordingly:**
 - A) K_{cat} value is closed to the catalase enzyme
 - B) The K_{m} value is close to the physiological range
 - C) None of the answers is true
 - D) The actual affinity is very high
 - E) The specificity constant is larger than one

Answer: D

• What is the ratio of V to $V_{\max}$ if $[S] = 9 K_m$?

A) 1.11

B) 0.09

C) 1

D) 0.9

Answer: D

- **A 1 μM solution of glutathione peroxidase is present in solution with its proper substrate and at saturating conditions. The product formed at a rate of 0.5 M/s. if the reaction is gone to completion, then:**
 - A) K_{cat} equals 0.5 million per second
 - B) K_{cat} equals 0.000002 per second
 - C) The product is reduced and water is formed
 - D) The product concentration is half of that of the substrate
 - E) Oxygen is incorporated into the substrate

Answer: both A & C are correct

- **Reducing enzymes concentration in a reaction by half results in:**
 - A) Increasing K_m of enzyme by double.
 - B) No effect on K_{cat} , V_{max} or K_m .
 - C) Decreasing V_{max} of the reaction by half.
 - D) Decreasing K_{cat} of the enzyme by half.
 - E) Decreasing K_m of the enzyme by half.

Answer: C

- You are working on the enzyme dentistry which has a molecular weight = 1 g/mol , you have used 30 μg (microgram) of the enzyme in an experiment , and the results show that the enzyme - at best - converts 1 micro mol/ min at 25 °C. The turn over number (Kcat) of the enzyme is:
 - A) can't be defined
 - B) 0.5 1/s
 - C) 2 1/s
 - D) 5.5×10^{-4} 1/s

Answer: D

- **If reaction (a) has $\Delta G = -200$ and reaction (b) has $\Delta G = -10$:**
 - A) Reaction (a) is faster than reaction (b).
 - B) Reaction (b) is faster than reaction (a).
 - C) (a) and (b) have the same speed .
 - D) We can't decide from this information.

Answer : D

- if the Y-intercept of a line weaver-burk plot = 1.91 second/milimole and the slope = 75.3 L/sec V max equals:
 - A) 0.0254 miilimoles/second
 - B) 0.523 millimoles/second
 - C) 5.23 millimoles/second
 - D) 39.4 millimoles/second
 - E) 75.3 millimoles/second

Answer: B

Y-intercept = $1/V_{\max}$
 $V_{\max} = 1/1.91$
 $V_{\max} = 0.523$

- if the Y intercept of a line weaver bulk plot = 1.91 sec/mmol and the slope = 75.3 L/sec then K_m equal:
 - A) 0.0254 millimoles per second
 - B) 0.523 millimoles per second
 - C) 5023 millimoles per second
 - D) 39.4 millimoles per second
 - E) 75.3 millimoles per second

Answer: D

Y-intercept = $1/V_{\max} = 1.91$
Slope = $K_m / V_{\max} = 75.3$
 $K_m = 75.3 / 1.91 = 39.4$

- **the value of V_{max} changes in:**
 - A) competitive inhibition
 - B) noncompetitive inhibition
 - C) Both forms of inhibition
 - D) neither form of inhibition

Answer: B

- when $[S] = K_m$ the velocity of an enzyme catalyzed reaction is about:
 - A) $0.1 \cdot V_{\max}$
 - B) $0.2 \cdot V_{\max}$
 - C) $0.3 \cdot V_{\max}$
 - D) $0.5 \cdot V_{\max}$
 - E) $0.9 \cdot V_{\max}$

Answer: D

$$V_0 = \frac{V_{\max} \cdot K_m}{K_m + K_m} = \frac{V_{\max} \cdot K_m}{2K_m} = \frac{V_{\max}}{2} = 0.5 \cdot V_{\max}$$

- **Use this table to answer 4 questions**:**

M	→	N	→	O	→	P	→	Q	→	R
	1		2		3		4		5	

- which 2 enzymes would be the most likely ones to regulate this pathway is Dedicated to the formation of only one product:**

- A) 2,4
- B) 1,3
- C) 1,5
- D) 1,2
- E) 4,5

Answer: D

The first and final enzymes in a pathway dedicated to a single product .

- **Use this table to answer 4 questions**:**

M	→	N	→	O	→	P	→	Q	→	R
	1		2		3		4		5	

- which 2 enzymes would be the most likely ones to regulate if this pathway is freely reversible and can go both ways:**

- A) 2,4
- B) 1,3
- C) 1,5
- D) 1,2
- E) 4,5

Answer: C

By tightly regulating the terminal enzymes at both ends (1 and 5)

- ****Use this table to answer 4 questions**:**

M	⇒	N	⇒	O	⇒	P	⇒	Q	⇒	R
	1		2		3		4		5	

- **the final product R will most likely inhibit which reaction:**

- A) 1,2
- B) 1,3
- C) 1,5
- D) 2,4
- E) 4,5

Answer: C

- ****Use this table to answer 4 questions**:**

M	→	N	→	O	→	P	→	Q	→	R
	1		2		3		4		5	

- **which of the following is not required for enzyme to display cooperative kinetics:**
 - A) multiple subunits
 - B) a value for the Michaels constant ,Km
 - C) Allosteric sites which effect the binding of substrate to the active site
 - D) Ability to display a V max
 - E) all of these are characteristic of cooperative enzymes

Answer: B

- **What is the turnover number for an enzyme knowing that 3 ug of the enzyme (molecularweight = 3,000,000) gives a Vmax of 1 umol of product per second:**
- A) 3 million per micro-second
B) 30 million per second
C) 1 million per second
D) 9 million per second
E) 3 million per second

Answer: C

$$k_{cat} = \frac{V_{max}}{[E]_T} = \frac{V_{max}}{\frac{\text{Mass}}{\text{MW}}} = \frac{1 \times 10^{-6} \text{ mol/s}}{\frac{3 \times 10^{-6} \text{ g}}{3 \times 10^6 \text{ g/mol}}} = \frac{1 \times 10^{-6} \text{ mol/s}}{1 \times 10^{-12} \text{ mol}} = 1,000,000 \text{ s}^{-1}$$

2014&2015

- In an experiment, a biochemist uses an enzyme with highly concentrated substrate ($[S] = 10000 \text{ Km}$). After 5 minutes, 100 micromolar of the product were formed. In another experiment, he used 0.2 of the enzyme concentration that was used in the first experiment and the same substrate concentration. Expect the time needed to form the same amount of the product (100 micromolar).

Answer : 25 minutes

Since the enzyme concentration was reduced to one-fifth, the required time will increase by 5-fold

- Suppose that you have $[s] = 10K_m$, then the velocity of reaction as a fraction of V_{Max} is:

- A) 0.091
- B) 0.31
- C) 0.01
- D) 0.1
- E) 0.909

Answer: E

$$v = \frac{V_{max} \cdot 10K_m}{K_m + 10K_m} = \frac{10 \cdot V_{max} \cdot K_m}{11K_m} = \frac{10}{11} \cdot V_{max} \approx 0.909 \cdot V_{max}$$

- You have two enzymes, the first (1) acts on substrate A with $K_m = 0.05$ and $V_{Max} = 100$, the other (2) acts on substrate B with $K_m = 0.1$ and $V_{Max} = 50$, which of the following is true:
 - A) enzyme 2 has catalytic activity higher than enzyme 1
 - B) substrate A binds faster than B
 - C) you can increase V_{max} of enzyme 2 by increasing in [B]
 - D) affinity of B is higher than A
 - E) None of the above

Answer: B

﴿وَاصْبِرْ لِحُكْمِ رَبِّكَ فَإِنَّكَ بِأَعْيُنِنَا وَسَبِّحْ بِحَمْدِ رَبِّكَ حِينَ تَقُومُ﴾ [الطور: ٤٨]

Enzymes *(regulation)*

- **Which cardiac enzyme is typically tested in the laboratory to diagnose myocardial reinfarction ?**
- A) Troponin
B) Creatine kinase MB isoenzyme (CK-MB)
C) Lactate dehydrogenase (LDH-1)
D) Aspartate aminotransferase (AS)

Answer: B

• **Which statement is true about the rate limiting step of a metabolic pathway?**

- A) It is reversible
- B) It releases the most energy
- C) It has the fastest rate constant
- D) It is highly regulated
- E) It is always the committed step

Answer: D

- **What type of regulation does phosphorylation provide for controlling enzyme activity and function?**

- A) Irreversible regulation
- B) reversible covalent
- C) Non-competitive regulation
- D) Reversible regulation
- E) irreversible covalent

Answer: B

- **One of the following does NOT favor R- to T-state transition of glycogen phosphorylase:**
 - A) ATP
 - B) Phosphorylation
 - C) Glucose-6-phosphate
 - D) AMP
 - E) Glucose

Answer: D

- **Which form of glycogen phosphorylase predominates when glycogen degradation is actively occurring?**
- A) T form & phosphorylated phosphorylase
B) R form & phosphorylase A
C) T form & phosphorylase A
D) R form & phosphorylase B

Answer: B

- **Enzymatic activity is regulated by:**
 - A) Allostery
 - B) Non-specific regulation
 - C) Reversible covalent modification
 - D) Modulators
 - E) All of the above

Answer: E

- **What is the effect of the binding of ATP to the ATCase ?**
 - A) It will become in the T state
 - B) $K_{0.5}$ will increase
 - C) $K_{0.5}$ will decrease
 - D) The effect will be like the binding of CTP
 - E) Nothing will happen

Answer: C

• **One of the following is a suicide inhibitor:**

- A) Aspirin
- B) Parathion
- C) Sarin
- D) Malathion
- E) Penicillin

Answer: E

- **According to what you have studied, the best enzyme to investigate within 24 hours of the incidence of infarction is:**
 - A) Total LDH
 - B) LDH₁/LDH₂
 - C) LDH₁
 - D) Total CK
 - E) CK-MB

Answer: E

- If you are shown a figure that illustrates the behavior of a simple enzyme where: (1) the x-axis represents substrate concentration and the y-axis represents initial reaction rate and (2) shown in the figure are 2 hyperbolic plots, both of which reach the same V_{max} value. Then, the figure represents the enzyme:(choose the best answer)
- A) Under normal and non-competitive inhibition effect
 - B) With more than one substrate
 - C) Under normal and competitive inhibition effect
 - D) Using different enzyme concentrations
 - E) More than one answer is true

Answer: C

Which one of these doesn't cause that effect on enzyme denaturation?

2016

- A- High temperature
- B- Low temperature
- C- 70% ethanol
- D- increasing PH

Answer: B

Exp! You can solve this question by excluding options

- **Rate limiting steps are:**
 - A) Usually, not a committed step
 - B) Characterized by a low affinity of the substrate toward the enzyme's active site
 - C) Usually requiring a high amount of energy
 - D) Usually, a reversible step
 - E) B + C

Answer: E

- **A carbon atom within a molecule does not have a hydroxyl group bound to it. This molecule is considered a substrate for an enzyme. The enzyme results in binding of a hydroxyl group to that carbon atom. Accordingly, the enzyme might be:**
 - A) A lyase
 - B) A hydrolase
 - C) Any choice might be true
 - D) An oxidoreductase
 - E) An isomerase

Answer: C

- **Although creatine phosphokinase MB (CPK-MB) is not the predominant enzyme in cardiac muscle cells, it is an excellent biomarker of myocardial infarction because:**
 - A) It is a zymogen.
 - B) It is exclusively present in cardiac muscle cells and not in other cell types.
 - C) It is released in large quantities.
 - D) It lasts in blood for a relatively long time.
 - E) The ration CPK-MB/CPK-MM is flipped and becomes more than 11.

Answer: C

- **One of the following is TRUE in regard to covalent inhibitors.**
- A) They are transition analogs.
- B) They allow enzymes to start reactions then they bind to their active sites.
- C) They compete with substrates in binding to active sites of enzymes.
- D) They chemically modify active sites of enzymes.
- E) They bind to and chemically modify regulatory sites of enzymes.

Answer: D

- **One of the following is NOT true in regard to aspartate transcarbamoylase (AtCase):**

- A) Binding of an inhibitor shuts off enzyme activity completely.
- B) Regulation occurs through altering affinity of binding, not maximal activity.
- C) CTP is a homotropic allosteric inhibitor.
- D) ATP is a homotropic allosteric activator.
- E) It is composed of multiple active sites.

Answer: D

- **One of the following is NOT true in regard to rate-limiting reactions:**
 - A) They are reversible.
 - B) They are driven by highly regulated enzymes.
 - C) They are driven by consuming energy.
 - D) They are slow reactions.
 - E) They are driven by enzymes with relatively low affinity to their substrates.

Answer: A

- **One of these is a difference between competitive and non-competitive inhibition?**

Answer : The way of inhibitor binding.

- **Which one of these sentence is wrong?**
 - A) As pH value increases, the enzyme activity increases.
 - B) As temperature increases, the enzyme activity increases.
 - C) The enzyme activity doesn't depend on pH value.

Answer : C

- **Irreversible inhibitors of enzymatic reactions:**
 - A) Bind to the enzyme only at low temperature.
 - B) Affect only serine side chains.
 - C) React with the enzyme to produce protein that is not enzymatically active & form which the original enzyme can't be regenerated.
 - D) Bound to the enzyme by the lock-&-key mechanism.

Answer: C

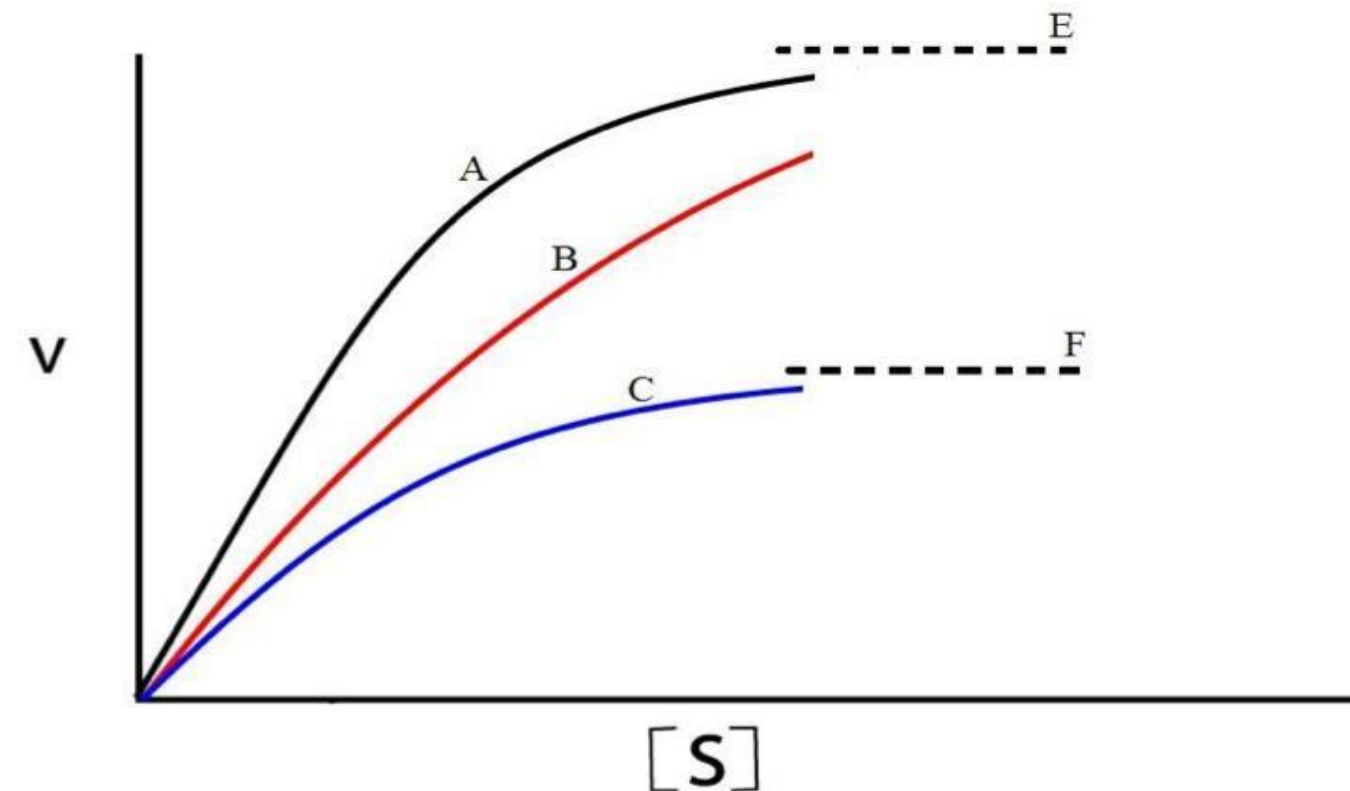
- **CTP is a known inhibitor of ATCase the enzyme that catalyzes the first reaction in the pathway for the synthesis of this compound this is an example of:**
 - A) Irreversible inhibition.
 - B) Feedback inhibition.
 - C) Zymogene inhibition.
 - D) Negative cooperativity.

Answer: B

- **Which is the first product result from zymogen?**

Answer: Chymotrypsin.

- Consider the following graph to represent an enzyme that works on its substrate under inhibition & no inhibition, according to this, answer the following three questions:



- 1)) Which letter represent the maximal reaction rate of enzyme activity under noncompetitive inhibition?? **F**
- 2)) Which letter represent enzyme activity under no inhibition?? **A**
- 3)) Which letter represent enzyme under competitive inhibition?? **B**

- **An enzyme inhibitor binds to a regulatory site and alters the active site preventing the substrate from binding. What is true about this inhibitor:**
- A) It decreases both K_m and V_{max} .
 - B) It is a non-competitive inhibitor.
 - C) It increases K_m and decreases V_{max} .
 - D) It is a suicide inhibitor.
 - E) It is an uncompetitive inhibitor.

Answer: B

- **Lactate dehydrogenases 1 (all H) and 5 (all M) differ in all of the following EXCEPT:**
 - A) Tissue distribution.
 - B) Isoelectric point.
 - C) Regulation.
 - D) Substrate preference.
 - E) Overall quaternary structure.

Answer: E

- **Which of the following types of regulation is not a physiological way of regulation:**
 - A) Isozymes.
 - B) Competitive inhibition.
 - C) Irreversible inhibition.
 - D) Through conformational changes.
 - E) Allosteric activation.

Answer: C

- **Which of the following is true about protein kinase A:**
 - A) Composed of one regulatory subunit and two catalytic subunits.
 - B) Binding of cAMP phosphorylates it.
 - C) Can be activated by adrenaline.

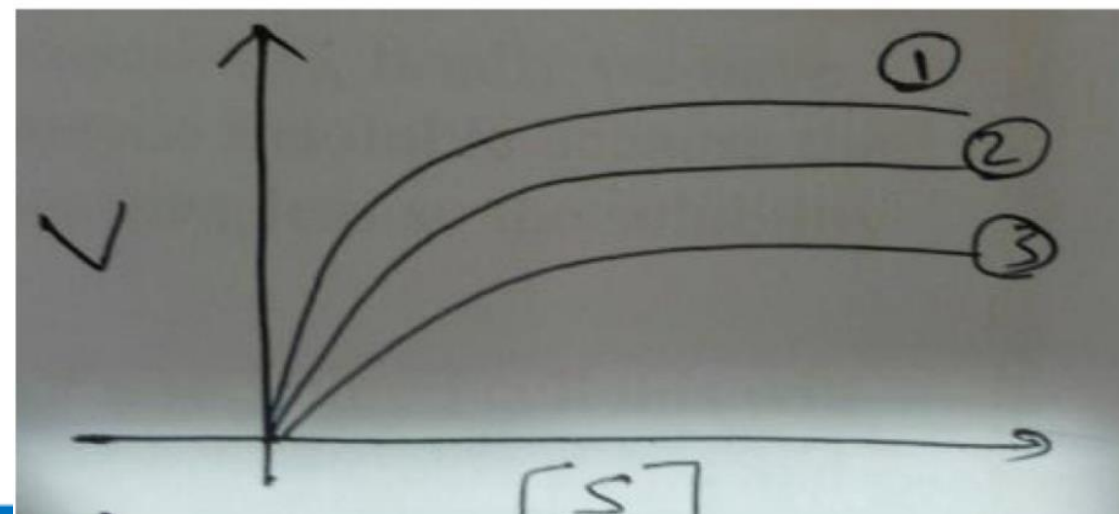
Answer: C

- **Which of the following is true about G-proteins:**
 - A) Present as either dimeric or trimeric G-proteins.
 - B) GTP is exchanged by GDP to inhibit it.
 - C) The more alpha subunits are dissociated, the more targets are activated.
 - D) None of the above.

Answer: C

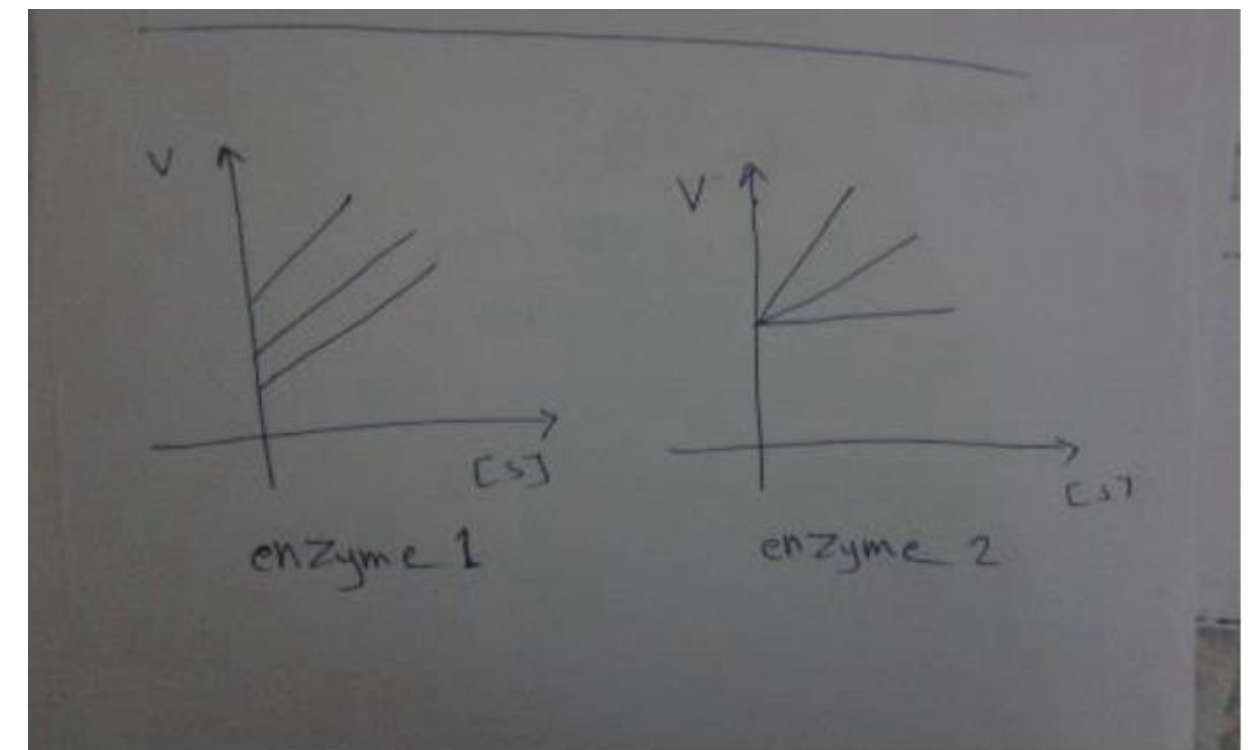
- **Which of the following statements is true about the enzyme Aspartate transcarbamoylase:**
 - A) It's composed of one subunit.
 - B) It exhibits cooperative binding to the substrate.
 - C) CTP is an inhibitor and binds to the active site.
 - D) ATP is an activator and binds to the active site.

- This figure shows you three Michaelis-Menten curves of an enzyme. Curve 1 represents the enzyme without inhibition, while curves 2 and 3 show you the enzyme with different concentrations of an inhibitor. Reaction velocity is plotted on the y-axis and the substrate concentration on the x-axis. Which of the following statements is correct about it:
 - A) The inhibitor is competitive.
 - B) In Lineweaver-Burk plot, the three curves intersect in the y-axis.
 - C) In Lineweaver-Burk plot, the three curves have no intersections.
 - D) The three curves have the same V_{max} value.
 - E) None of the above.



Answer: E

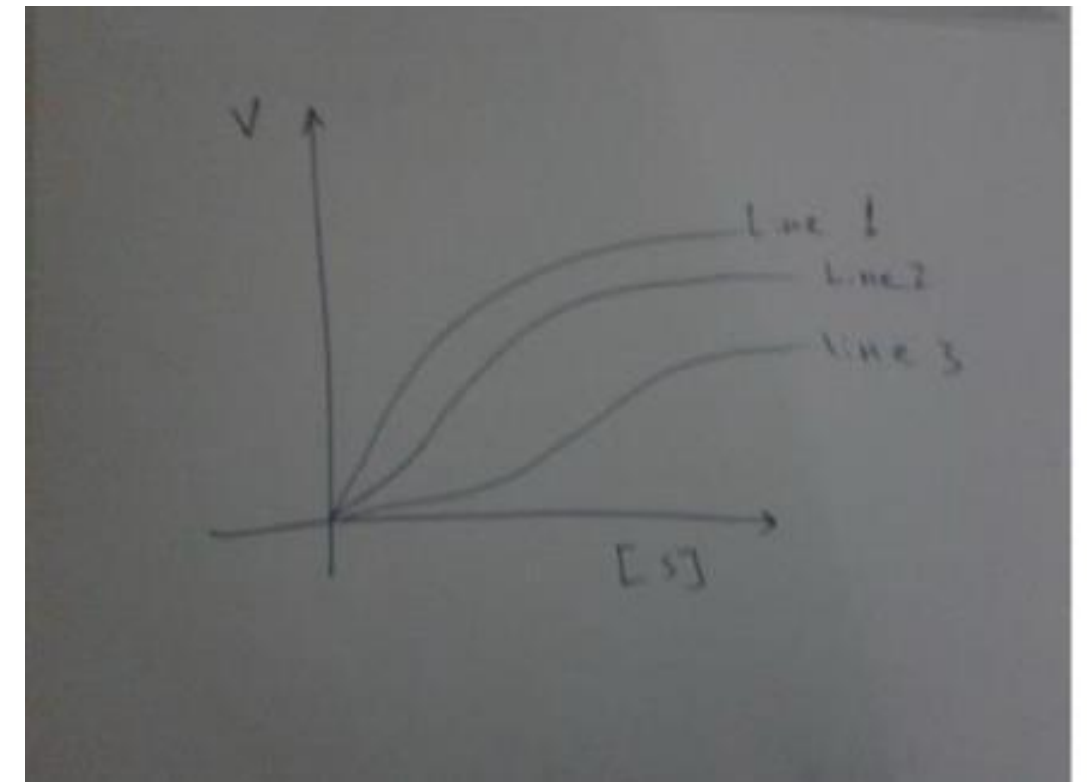
- You have two enzymes without inhibition, the enzyme(s) that follow Michalis equation when you change the concentration of the two enzymes in three experiments with different values is:
 - A) Enzyme 1.
 - B) Enzyme 2.
 - C) Both of them.
 - D) Neither 1 nor 2.
 - E) I can't determine.



Answer: A

- Which line represents an allosteric enzyme in a normal condition (without inhibition or activation):

- A) Line 1.
- B) Line 2.
- C) Line 3.
- D) Can be line 1 or 2.
- E) Can be line 2 or 3.



Answer: B

- **The catalytic effect of the enzyme occurs through:**
 - A) Lowering the energy level of products.
 - B) Lowering the energy level of transition state.

Answer: B

- **False about inhibition:**

- A) DEP binds on hydroxyl group of serine in acetylcholinesterase.
- B) Allopurinol >>>>> (Mo-S) complex.
- C) Lead inhibits enzyme through replacing the normal functional metal.
- D) Mercury binds to enzyme often at reactive hydroxyl group of Serine.

NOTE: DEP is the same as DFP.

Answer: D

- **The best description of pH and temperature effect on enzyme is:**
 - A) As pH increases, the rate increases until we reach the maximum.
 - B) As temp. Increases, the rate increases until we reach the maximum

Answer : Both are correct

لا اله الا الله وحده لا شريك له، له الملك وله الحمد، يحيي ويميت وهو على كل شيء قدير

Enzymes *(cofactors)*

- **Why are metal ions useful as cofactors for many enzymes?**
 - A) They stabilize tertiary structure.
 - B) They allow enzymes to work at extreme pH.
 - C) They facilitate the binding of multiple ligands.
 - D) They increase the rate of diffusion.

Answer: C

• **The cofactor which doesn't bind covalently is:**

- A) CoA
- B) PLP
- C) Biotin
- D) TTP
- E) NAD⁺

Answer: E

- **One of the following is a precursor for the synthesis of CoA:**
 - A) None of the answers is a precursor.
 - B) Pantothenic acid.
 - C) Acetyl group.
 - D) Niacin.
 - E) Biotin.

Answer: B

- **One of the following is NOT true in regard to flavin adenine dinucleotide (FAD):**
 - A) It is needed for the function of lactate dehydrogenase.
 - B) It forms a radical during reactions.
 - C) It can bind covalently to enzymes.
 - D) It accepts two electrons sequentially.
 - E) It works with oxidoreductase enzymes.

Answer: A

- **The phosphate groups of thiamin pyrophosphate and ATP requires this to bind to active sites of enzymes:**
 - A) They do not need a mediator.
 - B) Coenzyme A.
 - C) Zinc ion.
 - D) FADH₂ or NADH.
 - E) Magnesium ion.

Answer: E

- **One of these enzymes is synthesized first as a zymogen:**
Answer: Chymotrypsin.

- **One of these mechanisms is not employed by chymotrypsin during its action:**
 - A) acid-base catalysis.
 - B) Nucleophilic attack.
 - C) The presence of Zn in the active site.
 - D) Covalent intermediate formation.
 - E) Proximity and orientation.

It is not included directly, but can be analyzed

Answer: C

﴿فَنَادَى فِي الظُّلُمَاتِ أَنْ لَا إِلَهَ إِلَّا أَنْتَ سُبْحَانَكَ إِنِّي كُنْتُ مِنَ الظَّالِمِينَ﴾ [الأنبياء: ٨٧]

Biochemical Techniques

- **What is the function of the sodium dodecyl sulfate in polyacrylamide Gel-electrophoresis?**
- A) It separates the fragments based on their shape
- B) It makes the protein fragments positively charged
- C) It separates the fragments depending on their solubility
- D) It breaks disulfide bridges but not amide bonds
- E) It separates fragments depending on their molecular weight

Answer:E

- **protein has a molecular weight of 60 kDa in its native state. Firstly, we purified a sample containing the protein by molecular-sieve chromatography, then we used SDS-PAGE to analyze the protein with urea-containing SDS-gel, the observed band had a weight of 30 kDa. When using an SDS-gel which contains urea & Beta-mercaptoethanol, a single band was observed at 15 kDa. What can you conclude about the structure of this protein under native conditions?**
 - A) It is a heterodimer with 1 disulfide bridge between the subunits
 - B) It is a homodimer with 1 disulfide bridge between the subunits
 - C) It is a homotetramer with electrostatic interactions between its subunits
 - D) It is a homotetramer with disulfide bridges between two of its subunits
 - E) It is a homotetramer with disulfide bridges between all of its subunits

Answer:D

- **You have the following peptide, choose the correct statement: Val-Met-Arg-Gly-Phe-Glu-Asn-Tyr-Asp-Cys-Arg-Leu-Ser-Ile-Pro-Lys-Phe**
 - A) Using trypsin yields 4 peptide fragments
 - B) Using pepsinogen yields 4 peptide fragments
 - C) Using elastase yields 4 peptide fragments
 - D) Using chymotrypsin yields 3 peptide fragments

Its written peptide fragment, so the answer is not A

Answer: D

- **What two properties does 2D SDS-PAGE separate proteins according to?**
 - A) Size and shape
 - B) Size and solubility
 - C) Size and charge
 - D) Shape and charge

The doctor said that it only separates according to size, but it is a pastpaper question (read only)

Answer: C

- You have 5 different proteins (A, B, C, D and E), with different isoelectric points (pI's). pI for A = 5.1 / pI for B = 6.8 / pI for C = 8.2 / pI for D = 9.5 / pI for E = 11.3
Starting the column at pH 1, the sample is added and then washed to remove unbound molecules. What is the order of protein elution when gradually increasing the pH in cationic-exchange chromatography?
- A) a,b,c,d,e
B) b,c,d,e,a
C) a,d,c,b,e
D) e,d,c,b,a

Answer: A

- **Which of the following techniques involve the fractionation of proteins with high salt concentration?**
 - A) Salting in
 - B) Ion-exchange chromatography
 - C) Gel filtration chromatography
 - D) Salting out
 - E) dialysis

Answer: D

• **The stronger binding between the stationary phase and proteins :**

- A) Earlier the elution
- B) When we increase the concentration of salt
- C) During the elution
- D) Later the elution

Answer: D

- **The typical order for the major steps of enzyme Isolation would be from first to last :**
 - A) homogenization / salt fractionation / electrophoresis / column chromatography
 - B) homogenization / column chromatography / salt fractionation / electrophoresis
 - C) homogenization / salt fractionation / column chromatography / electrophoresis
 - D) homogenization / electrophoresis / salt fractionation / column chromatography

It is not included but can be analyzed

Answer: C

- **which separate on the basis of molecular weight :**
 - A) gel filtration
 - B) affinity chromatography
 - C) cation exchange
 - D) anion exchange
 - E) cation or anion exchange

Answer: A

- In cationic exchange chromatography, if the pH of the mobile phase is 8. Which of the following amino acids would be fully eluted?
 - A) Arginine
 - B) Aspartic acid
 - C) Tyrosine
 - D) Histidine
 - E) Cysteine

Memorize the pI from the last lecture in the mid term exam (I put them down) in case it is not given (at least comparison not exact numbers)

Here are all of them

Arg: 12.5

Lys: 11

Tyr: 10

His: 6

Cys: 8

Asp: 4

Glu: 4

Answer: B

- **In molecular sieve chromatography:**
 - A) The protein to be purified is originally included in the stationary phase
 - B) The output of elution is very crude
 - C) The higher the molecular weight of the protein is, the later it elutes
 - D) The molecular weight of the eluted protein can be estimated
 - E) The higher the solubility of the protein is, the later it elutes

Answer: D

- **Starting from a crude sample, you have purified an enzyme using dialysis. Upon running SDS-PAGE electrophoresis, there were 2 bands; one at 60 KDa and the other was at 20 KDa. Under reducing conditions, there were also two bands, one at 40 KDa and the other at 20 KDa. What does that tell you about the structure of the enzyme?**
 - A) The enzyme might be composed of a single subunit of 20 KDa
 - B) The enzyme might be a heterotrimer
 - C) The enzyme might be a homodimer
 - D) The enzyme might be composed of a single subunit of 60 KDa
 - E) The enzyme might be a heterotetramer

Answer: B

- **which would be best to separate a protein that binds strongly to X substrate :**
 - A) gel filtration
 - B) Affinity chromatography
 - C) Cation exchange
 - D) Anion exchange
 - E) cation or anion exchange

Answer: B

- **in the chromatography the experimental setup always requires:**
 - A) stationary phase & mobile phase
 - B) Spectrophotometric detecting device
 - C) Sample in which components differ in charge
 - D) sample in which components differ in polarity

Answer: A

- **the degree of separation in molecular sieve chromatography depend on:**
 - A) the polarity of the mobile phase
 - B) The pKa of the buffer material in mobile phase
 - C) The chemical nature of the sieve material
 - D) the size of the pores in sieve material

Answer: D

- **in the SDS-PAGE method separation takes place on the basis of:**
 - A) charge only , because all particles have different charges but the same mass
 - B) the sieving action of the gel , because all particles have the same charges , but different masses
 - C) the sieving action of the gel , because all peptide have approximately the same charge/mass ratio but different masses
 - D) the chemical nature of the buffer used as the electrolyte

Answer: C

- **how many bands would be produced when hemoglobin is subjected to SDS-PAGE:**
 - A) 1
 - B) 2
 - C) 3
 - D) 4

Answer: B

- **This technique is NOT dependent on size of molecules:**
 - A) Polyacrylamide gel electrophoresis
 - B) Dialysis
 - C) Two-dimensional gel electrophoresis
 - D) Isoelectric focusing
 - E) Gel filtration chromatography

Answer: D

- **The use of reducing agents will NOT affect the bonding pattern in SDS-PAGE of the following protein:**
- A) Immunoglobulin G
 - B) Keratin
 - C) Immunoglobulin M
 - D) Hemoglobin
 - E) Oxidized glutathione

Answer: D

In size-exclusion chromatography, which protein size would elute second from a column? 2022

- A) 25 kDa
- B) 50 kDa
- C) 145 kDa
- D) 200 kDa

Answer: C

Under non reducing condition a protein exist as 40KD band and after reducing condition it will appear as 30KD and 10KD bands this represent?

Answer: This protein is a heterodimer

- **You have the following molecules: glycine, aspartate, sucrose, collagen, and hemoglobin. One of these statements is NOT correct:**
 - A) Aspartate is eluted first from anionic exchange chromatography.
 - B) Concanavalin A- bound beads in affinity chromatography can be used to purify sucrose.
 - C) Dialysis can be used to isolate collagen and hemoglobin from the other molecules.
 - D) Sucrose does not bind to beads of cationic exchange chromatography.
 - E) Glycine comes out last in size exclusion chromatography

Answer: A

رسالة من الفريق العلمي:

اعمل لدنياك كأنك تعيش أبداً
واعمل لآخرتك كأنك تموت غداً

For any feedback, scan the code or click on it.



Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			