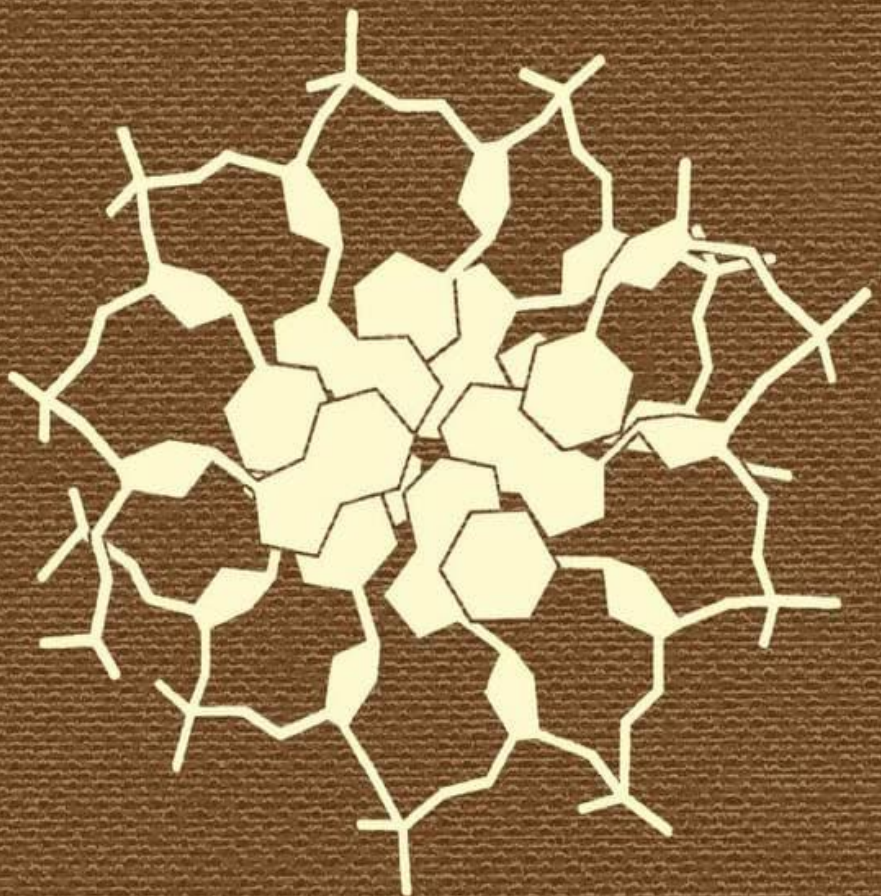


Biochemistry

Test Bank



DONE BY:

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INTRODUCTION TO ENZYMES

1) which of the following statements applies enzyme heme- dioxygenase?

- a) it's results in hydrogen peroxide production
- b) it results in oxygen reduction to water
- c) it usually catalyzes endergonic actions
- d) it is a transferase enzyme
- e) it incorporates molecular oxygen into substrate structure

answer: E

2) The following enzyme is lyase

- A) pyruvate carboxylase
- B) pyruvate kinase
- C) pyruvate dehydrogenase
- D) Pyruvate decarboxylase
- E) Pyruvate mutase

Answer: D

3) one of the following is a property of the active site of the enzyme:

- A) water is usually included as a key part of the active sites
- B) binding to substrate occur at the surface of the enzyme
- C) usually occupies a large area of the enzyme
- D) there should be two separate independent sites, catalytic and regulatory
- E) the specificity of substrate binding is determined initially by non-covalent interaction

Answer: E

4) 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.
- C) they change during the reaction
- D) some enzymes can work on more than one substrate

answer: A

5) One of these mechanisms is not employed by chymotrypsin during its action:

- a- proximity and orientation
- b- acid-base catalysis
- c- Nucleophilic attack
- d- The presence of Zn in the active site.
- e- Covalent intermediate formation

answer: D

BIOCHEM FINAL

6) 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".

7) an enzyme that converts alkene structure to alcohol maybe referred to as:

- A) 7.1.1.2
- B) 2.7.1.11
- C) 5.3.1.1
- D) 4.1.1.1.
- E) 3.4.23.1

Answer: D

8) which group of amino acids is likely to be found in the catalytic active site?

- A) Ala, Val, Thr
- B) Tyr, Thr, Leu
- C) Leu, Lys, Ala
- D) Ser, His, Asp
- E) Cys, Ile, Phe

Answer: D

9) one of the following statements is true:

- A) the transition state molecule has a lower free energy when complexed with the enzyme than uncomplexed transition state
- B) the enzyme is generally equally active on D and L isomers of substrates
- C) the enzyme makes reactions less endergonic
- D) the catalytic activity of enzymes is independent of pH
- E) to be effective, the enzyme must be present at the same concentration as their substrate

Answer: A

10) which type of enzyme does catalyze the conversion of a dipeptide into 2 separate amino acids:

- A) dehydrogenase
- B) oxidoreductase
- C) decarboxylase
- D) hydrolase

BIOCHEM FINAL

E) lyase

Answer: D

11) the active site of an enzyme:

A) remains rigid & doesn't change shape

B) is found at the center 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: C

12) 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^{10} times faster

Answer: E

13) which of the following is false regarding active sites of enzymes

A) they are constituted from amino acids that are far from each other in the primary structure

B) the amino acids that make the active site are small group compared to the whole protein

C) it must bind to 3 sites with substrate and this gives it stereospecificity

D) catalysis is made through non-covalent interactions

E) it is internal in the protein's tertiary structure

Answer: D

14) Which of the following is not oxidoreductase

A) oxygenase

B) peroxidase

C) aldolase

D) dehydrogenase

E) oxidase

Answer: C

15) which of the following can be a model of a ligase enzymatic reaction

A) $X + Y + H_2O \rightarrow X-Y + H_2O$

B) $X+Y + H_2O \rightarrow X-Y$

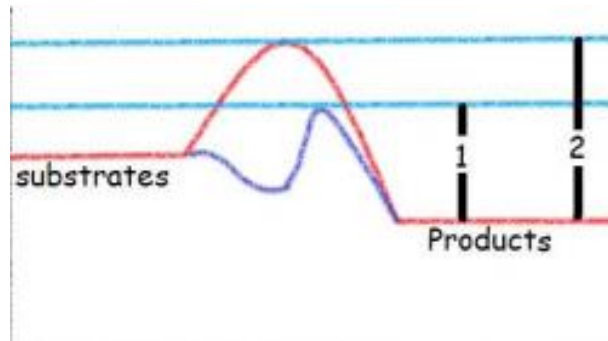
C) $X+ Y + ATP \rightarrow X-Y-P + ADP$

D) $X + Y + ATP \rightarrow X-Y + ADP + P_i$

E) $X-Y \rightarrow X + Y$

Answer: D

16) one of these is true about the graph representing an enzyme catalyzed reaction (blue line) and non-catalyzed reaction (red line):



- A) The reaction is exergonic
- B) It has more than one transition state
- C) (1) represent the activation energy for the forward reaction
- D) (2) represent Delta G

Answer: A

17) which is the major classification for decarboxylase?

- A) lyases
- B) ligases
- C) oxidoreductases
- D) translocases

Answer: A

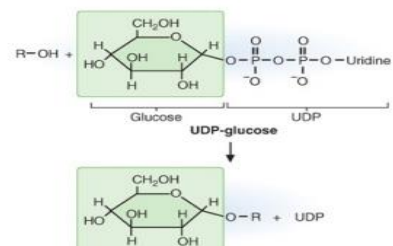
18) if reaction (a) has $\Delta G = -200$ and reaction (b) has $\Delta G = -10$:

- 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

19) UDP-glucose is a key intermediate in carbohydrate metabolism and serves as a precursor for glycogen synthesis and glycosylation of lipids and protein. 4. The type of reaction shown fits into which one of the following classifications?

- A) Group transfer
- B) Isomerization
- C) Carbon-carbon bond breaking
- D) Carbon-carbon bond formation
- E) Oxidation-reduction



Answer: a

20) The type of enzyme that catalyzes this reaction is which one of the following?

- A) Kinase
- B) Dehydrogenase
- C) Glycosyltransferase
- D) Transaminase
- E) Isomerase

Answer: c

COENZYMES AND REGULATION

1) one of the following regulatory mechanisms is physiological?

- A) penicillin binding to transpeptidase
- B) sarin binding to acetylcholinesterase
- C) GTP binding to RAS
- D) Methotrexate binding to DHFR
- E) Aspirin binding to cyclooxygenase

Answer: C

2) One of the reasons that allow liver to store excess glucose as glycogen compared to other tissues as RBCs is that:

- A) hexokinase 4 has lower V_{max} value
- B) hexokinase 4 has lower K_m value
- C) hexokinase 4 has higher V_{max} value
- D) hexokinase 4 has higher K_m value
- E) hexokinase 4 is not affected by Glucose-6-Phosphate

answer: E

3) When adding a competitive inhibitor to an enzyme catalyzed reaction solution, then (assume no change in volume):

- A) K_{-1} will increase accordingly
- B) Y-intercept on a lineweaver-burk plot will increase accordingly
- C) K_{cat} value will increase accordingly
- D) K_1 will increase accordingly
- E) K_D value will increase accordingly

Answer: A

4) assume that ATP and aspartate are effectors of aspartate transcarbamoylase enzyme, based in your knowledge of this enzyme, one of the following is TRUE:

- A) aspartate is an activator whereas ATP is an inhibitor

- B) aspartate and ATP binds to different regulatory sites
- C) aspartate affects $k_{0.5}$ of enzyme, whereas ATP affects v_{max}
- D) aspartate shifts ATcase from T to R, whereas ATP shifts enzyme from R to T
- E) aspartate is a homotopic effector, whereas ATP is a heterotopic effector

Answer: E

5) the following Coenzyme should be required during the action of the enzyme alanine transaminase:

- A) pyridoxal phosphate
- B) vitamin B6
- C) Biocytin
- D) TPP
- E) Pyridoxine

Answer: E

6) Choose the BEST statement that describes the effect of temperature on enzyme activity:

- A) A temperature effect on enzymes is enzyme dependent
- B) the main effect of temperature is on ionic interaction within enzymes
- C) as temperature decreases, the reaction rate increase until Denaturation occurs
- D) temperature effect on enzyme is linked to pH
- E) as temperature increases, reaction rate increase until denaturation occurs

answer: E

7) cyclic AMP (cAMP) activates protein kinase A (PKA) via:

- A) release of regulatory subunits
- B) change of allosteric structure from T to R
- C) prevention of building of competitive inhibitors
- D) facilitation of phosphorylation
- E) removal of a peptide blocking the active site

Answer: A

8) 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

9) 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

10) The metal which is found in the active site of superoxide dismutase is:

- A) Magnesium
- B) Manganese
- C) iron
- D) Zinc
- E) Selenium

Answer: B

11) 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.
- C) this enzyme is classified as lyase

Answer: B

12) logically, one of the following factors does NOT affect the effect of diffusion in enzymatic reactions:

- A) membrane binding of enzyme and substrate
- B) formation of enzyme complex
- C) compartmentalization
- D) phosphorylation
- E) temperature

Answer: E

13) one of the following is not true regarding isozymes:

- A) they may be activated differently
- B) they may catalyze different reactions using the same substrate
- C) they may function in different tissues
- D) they may have different affinities for their substrate
- E) they are produced from different genes

Answer: B

14) the enzyme pyruvate decarboxylase depends on the following vitamin as a cofactor:

- A) B1 thiamin
- B) B5 pantothenic acid
- C) B3 niacin
- D) B2 flavin
- E) Biotin

Answer: A

15) allopurinol, a drug used to reduce level of uric acid in blood, is an analogue of the substrate of the enzyme xanthine oxidase (X.O). The drug undergoes partial reaction & remains tightly bounded to the enzyme. This mechanism of action is called:

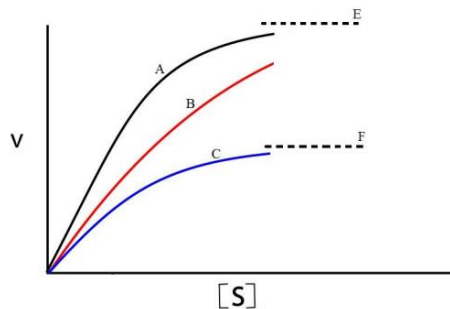
BIOCHEM FINAL

- A) feedback inhibition
- B) allosteric inhibition
- C) suicide inhibition
- D) decreasing subunit cooperativity
- E) non-competitive inhibition

Answer: C

16) 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:

- A) which letter represent the maximal reaction rate of enzyme activity under noncompetitive inhibition?? **F**
- B) which letter represent enzyme activity under no inhibition?? **A**
- C) which letter represent enzyme under competitive inhibition?? **B**



17) which of the following is not required for enzyme to display cooperative kinetics:

- A) multiple subunits
- B) a value for the Michaelis constant, K_m
- 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

1 2 3 4 5

M ----> N ----> O ----> P ----> Q ----> R

Use the above figure to answer 18,19,20

18) 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

BIOCHEM FINAL

19) 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

20) 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

21) 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 cooperatively

answer: D

22) 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

23) 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

24) protein kinase a is activated through

- A) phosphorylation
- B) dissociation of the quaternary structure all together
- C) binding of AMP

D) converting from T to R

Answer: C

25) glycogen phosphorylase can be converted from a to b through

A) binding of activator

B) dephosphorylation

C) binding of inhibitor

E) phosphorylation

Answer: B

26) What's wrong about LDH:

A) LDH1/LDH2 normally is more than 1

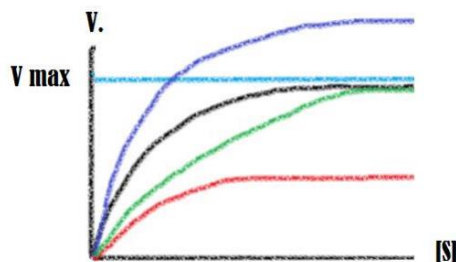
B) there are 5 isozymes

C) all LDH isozymes catalyze the same reactions

D) it's a tetramer

Answer: A

27) the black line represents an enzyme catalyzed reaction in its original state:



which of these is true:

A) The green line can result from irreversible inhibitor

B) K_m for the blue line is different from the original black line

C) The red line can result from reversible inhibitor

D) The red line can result from less enzyme concentration

Answer: C

28) function of Mg^{+2} in pyruvate dehydrogenase is

A) Binding to substrate covalently

B) Binding to pyrophosphate

C) Binding of cofactor to substrate

Answer: B

29) Which reaction is driven by PLP

A) Alanine to pyruvate

B) Alanine to oxaloacetate

C) pyruvate to acetyl Co-A

Answer: A

30) what is the product of deamination of adenine?

BIOCHEM FINAL

- A) hypoxanthine
- B) xanthine
- C) biotin
- D) pyridoxine

Answer: A

31) which vitamin that involved in decarboxylation reactions?

- A) thiamine
- B) pantothenic acid
- C) biotin
- D) pyridoxine

Answer: A

THESE TWO QUESTION ARE LINKED

32) Many chronic alcoholics develop thiamin deficiency because of a poor diet and an inability to absorb thiamin from the intestine in the presence of ethanol. Which one of the following cofactors, synthesized from a vitamin, or a vitamin itself, exhibits a mechanism of action similar to thiamin?

- A) NAD⁺
- B) FAD
- C) Ascorbic acid
- D) γ -Tocopherol
- E) CoA

Answer: e

(Thiamin acts via an activation-transfer mechanism, as does CoA. All the other listed coenzymes are of the oxidation-reduction group (tocopherol is vitamin E, niacin is part of NAD⁺, riboflavin part of FAD, and ascorbic acid is vitamin C).

33) Which one of the following vitamins is the precursor for the correct answer to the previous question?

- A) Pantothenate
- B) Niacin
- C) Pyridoxine (vitamin B₆)
- D) Folate
- E) Biotin

Answer: a

34) Penicillin is an antibiotic used to treat certain infections. It is a transitionstate analog and suicide inhibitor. The use of penicillin affects which one of the following in susceptible targets?

- A) Viral cell wall

- B) Bacterial cell wall
- C) Viral nucleus
- D) Bacterial nucleus
- E) Protozoan nucleus.

Answer: b

35) Vitamins can act as coenzymes that participate in catalysis by providing functional groups. Therefore, vitamin deficiencies reflect the loss of specific enzyme activities that depend on those coenzymes. Coenzymes are best described by which one of the following:

- A) In humans, they are always synthesized from vitamins.
- B) They are proteins.
- C) They participate in only one reaction, like enzymes.
- D) They are complex, nonprotein organic molecules.
- E) They are all carbohydrates

Answer: d

36) A patient was born with a congenital mutation in an enzyme that severely affected its ability to bind an activation-transfer coenzyme. Therefore, which one of the following is most likely to occur?

- A) The enzyme will be unable to bind the substrate of the reaction.
- B) The enzyme will be unable to form the transition-state complex.
- C) The enzyme will normally use a different activation-transfer coenzyme.
- D) The enzyme will normally substitute the functional group of an activesite amino acid residue for the coenzyme.
- E) The reaction may be carried out by the free coenzyme, provided the diet carries an adequate amount of its vitamin precursor.

Answer: b

(In most reactions, the substrate binds to the enzyme before its reaction with the coenzyme occurs. Thus, the substrate may bind, but it cannot react with the coenzyme to form the transition-state complex. Each coenzyme carries out a single type of reaction, so no other coenzyme can substitute (thus, C is incorrect). The three-dimensional geometry of the reaction is so specific that functional groups on amino acid side chains cannot substitute (thus, D is incorrect). Free coenzymes are not very reactive because amino acid side chains in the active site are required to activate the coenzyme or the reactants (thus, E is incorrect). However, increasing the supply of vitamins to increase the amount of coenzyme bound to the enzyme can sometimes help).

Peptides and proteins

1) The following peptide contain D amino acids:

- a) Gama-aminobutyric acid
- b) Gramicidin S
- c) Glutathione
- d) Enkephalins
- e) Vasopressin

Answer: B

2) The hyperbolic O₂ binding curve of myoglobin implies:

- a) Myoglobin low affinity to oxygen in oxygen rich tissue
- b) Positive cooperativity in oxygen binding
- c) Myoglobin high affinity to oxygen in oxygen deprived tissues
- d) The presence of two states that have different affinities to myoglobin
- e) A high P₅₀ when compared to that of hemoglobin

Answer: C

3) The antibody recognizes the of the antigen:

- A) isotope
- B) isotype
- C) Epitopes
- D) idiotypes
- E) Allotypes

Answer: C

4) which of the following proteins does not possess a quaternary structure?

- A) myoglobin
- B) keratin
- C) hemoglobin
- D) immunoglobulin
- E) collagen

Answer: A

5) which sequence can be a part of an alpha Helix

- A) Gly- Val-Cys-Tyr
- B) Lys-Val-Gln-Pro
- C) Gln-Asp-Phe-Ser
- D) Lys-Arg-Asp-His
- E) Trp-Trp-Asp-Glu

Answer: C

6) if cysteine residues in immunoglobulin were replaced with methionine then:

- A) tertiary and quaternary structures are disrupted
- B) immunoglobulin's become polyclonal and monoclonal antibodies cannot form
- C) Immunoglobulin's cannot form pentamers
- D) class switching occurs
- E) reducing SDS-PAGE will reveal 4 bands

Answer: A

7) collagen and elastin share the following structural features:

- A) high concentration of proline residues

- B) high elasticity due to the presence of high hydrophobic segments
- C) The formation of desmosine cross links
- D) hydroxylation of proline introduces kinks in their structures
- E) hydroxylysine that acts as an attachment site for carbohydrates moiety

Answer: A

8) the following the statement is true regarding hemoglobin:

- A) each heme molecule can bind to two oxygen molecules
- B) heme group is attached to the surface of hemoglobin
- C) hemoglobin has high affinity to oxygen and peripheral tissues
- D) proximal histidine is non covalently bound to the iron of heme
- E) distal his interact with the bound oxygen

Answer: E

9) the correct statement about Myoglobin is:

- A) it is made of beta sheets completely
- B) its P50 towards oxygen is constant with changing oxygen pressure in muscle tissue
- C) it is an allosteric protein
- D) it has low affinity towards oxygen
- E) oxygen is released during light exercise

Answer: B

10) denaturation does not disrupt:

- A) primary structures
- B) secondary structure
- C) tertiary structure
- D) quaternary structure
- E) protein function

Answer: A

11) which of the following statements is true regarding modified amino acids and shorts peptides:

- A) enkephalins are pentapeptide that regulates smooth muscle contraction
- B) carnosine is a tripeptide that function as antioxidants
- C) both ends of oxytocin and vasopressin are composed of methyl groups
- D) gramicidin and tyrocidin A are peptide ends linked by disulfide bonds
- E) aspartame is unsuitable for consumption by phenylketonuria patients

Answer: E

12) the amino acid that disrupts a beta sheet is

- A) Pro
- B) Lys
- C) Gly

D) Glu

E) Trp

Answer: A

13) immunoglobulin structure has the following feature:

A) non-covalent interactions connect the heavy chains to light ones

B) all immunoglobulin types are found as dimers

C) differences in the constant regions make isotypes

D) the hypervariable regions are present on the tips of the heavy chains but not the light chains

E) the carbohydrates moiety is linked to the Fc domain of the light chains

Answer: C

14) the overall folding of a single protein subunit is called:

A) tertiary structure

B) primary structure

C) secondary structure

D) quaternary structure

E) all the above

Answer: A

15) disulfide bonds are most important in this type of structure:

A) tertiary structure

B) primary structure

C) secondary structure

D) quaternary structure

E) all the above

Answer: A

16) scurvy is a deficiency in

A) prolyl hydroxylase

B) proline hydroxylation

C) lysine residues

Answer: B

17) keratin is unique from collagen and elastin in

A) being globular

B) having numerous cysteine residues

C) no need for cross linking

Answer: B

18) one of the following is false regarding oxygen binding to heme of Hb

A) the proximal his moves closer to heme

B) non-covalent interactions between subunits are broken

BIOCHEM FINAL

- C) iron is oxidized
 - D) the tertiary structure of subunit is altered
- Answer: C

19) affinity between oxygen or CO and heme is weakened through

- A) electrostatic repulsion
 - B) distal his
- Answer: B

20) what is wrong regarding immunoglobulins

- A) have motifs to help bind to other molecules
 - B) can be used to detect antigens
 - C) have disulfide bonds
 - D) lipoproteins
 - E) have quaternary structure
- Answer: D

21) which of the following best defines a domain:

- A) super-secondary region, often shared by proteins that has aspect function.
 - B) repetitive super-secondary structure
 - C) double bond layered arrangement formed so that the polar group face the aqueous environment while the nonpolar region is kept away from the aqueous environment
 - D) an unfolded region of protein
- Answer: A

22) 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 hemi 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

23) in what oxidation state must the iron atom be for hemi to bind O₂:

- 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

24) protein that aid in the correct and timely folding of other proteins are called:

- A) motifs

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

Answer: B

25) Monoclonal antibodies produced in the laboratory

- A) lack the constant regions of IgG.
- B) cannot be used for disease diagnosis yet.
- C) derive from human cancer patients.
- D) can be selected to bind to almost any known molecule.

Answer: D

26) Most effective antibody is

- A) IgM
- B) IgE
- C) IgG
- D) IgA

Answer: A

27) The antibody recognizes the of the antigen

- a. Isotype
- b. Isotopes
- c. idiotyoe
- d. epitope

Ans. d

Kinetics

1) An enzyme-catalyzed reaction was carried out with the substrate concentration initially 4000 times greater than the K_m for that substrate. After 1 minute, 1% of the substrate had been converted to product and the amount of product formed in the reaction mixture was 8 micromoles. If, in a separate experiment, 2 folds of the enzyme and 2 folds of the substrate had been added, how long would it take for the same amount (8 micromoles) of product to be formed?

- A) 30 S
- B) 40 S
- C) 1 MIN
- D) 20 S
- E) 3 MIN

Answer: A

2) You performed an experiment on an enzyme that follows the Michaelis-Menten behavior with a K_m value of 0.3 micromolar. The velocity of this enzyme at substrate concentration of 60 micromolar is approximately:

- A) 33% V_{max}
- B) 70% V_{max}
- C) 99% V_{max}
- D) 0.001 V_{max}
- E) 50% V_{max}

Answer: C

3) If enzyme A has higher V_{max} than enzyme B at similar concentration in the reaction $X \leftrightarrow Y$, then:

- A) Enzyme B has higher K_m towards X than enzyme A
- B) Enzyme A has higher turnover number
- C) More Y can be produced by enzyme A than B at any time point
- D) Enzyme A has higher V_0 than enzyme B at the same concentration of X
- E) Enzyme B can reach same V_{max} as enzyme A at high concentration of X

Answer: B

4) You have purified 100 mg of an enzyme with a molecular weight of 65Kda and measured its rate of reaction in 2.5 L and found it to be 5×10^{-4} M/sec. what is the specific activity

- A) 8.125×10^{-2} mol/sec.g
- B) 12.5×10^{-3} mol/sec.g
- C) 1.25×10^{-3} mol/sec.g
- D) 8.125×10^5 mol/sec.g
- E) 8.125 mol/sec.g

Answer: B

5) Which of the following statements does best describe an allosteric binding site

- A) It is binding site that can accept a wide variety of different shaped molecules
- B) It is a binding site, that is separate from the active site and affects the activity of an enzyme when it is occupied by a ligand
- C) It is a binding site containing amino acids with aliphatic side chains
- D) It is an active site with 2 subsites: binding and catalytic
- E) It is a description of an active site that has undergone an induced fit

Answer: B

6) activation of protein kinase A involves all the following except:

- A) Dissociation of subunits
- B) Changing the quaternary structure of the whole protein
- C) Binding to its substrate
- D) Binding to cAMP

BIOCHEM FINAL

E) Binding to a small modifier

Answer: A

7) 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: C

8) 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

9) If we used 1mg of an enzyme and a saturating amount of substrate and it gives products within 3min of 360mM. What will the value of $V_{max}(\text{mM/min})$ be when increasing the $[E]$ to 3mg and keeping a saturating level of the substrate?

A) 120 mM/min

B) 360 mM/min

C) 240 mM/min

D) 180 mM/min

E) 480 mM/min

Answer: B

10) if we have a mechalis-menten enzyme and $[s] = 3K_m$. what is v/v_{max} ?

A) 0.75

B) 0.25

C) 1

D) 1.25

E) 0.5

Answer: A

11) A Lineweaver-Burk graph. the plot intercept y at 0.4 and with x at -2 Find the V_{max}

A) 2

B) 0.4

C) 2.5

D) 0.5

Answer: C

12) you have enzymes A, B AND C when put with a substrate S. what is the correct statement?

Enzyme	A	B	C
K _m	0.06	0.1	0.015
K _{cat}	2	3	5

- A) Enzyme B has highest affinity
- B) Enzyme A has best catalytic efficiency
- C) Enzyme C has highest specificity constant
- D) All enzymes have same v_{max}

Answer: C

13) An enzyme has K_M for the substrate S = 10 and V_{max} of 1nM of the enzyme = 5 μmol/L.s. If [S] equals 10 mM. what is K_{cat}?

- A) 2500M/s
- B) 500M/s
- C) 5000M/s
- D) 5000per s
- E) 2500per s

Answer: D

14) 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 turnover number (K_{cat}) 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

15) Salivary amylase is an enzyme that digests dietary starch. Assume that salivary amylase follows Michaelis-Menten kinetics. Which one of the following best describes a characteristic feature of salivary amylase?

- A. The enzyme velocity is at one-half the maximal rate when 100% of the enzyme molecules contain bound substrate.
- B. The enzyme velocity is at one-half the maximal rate when 50% of the enzyme molecules contain bound substrate.
- C. The enzyme velocity is at its maximal rate when 50% of the enzyme molecules contain bound substrate.
- D. The enzyme velocity is at its maximal rate when all of the substrate molecules in solution are bound by the enzyme.
- E. The velocity of the reaction is independent of the concentration of enzyme.

Answer : b

(The rate of an enzyme-catalyzed reaction is directly proportional to the proportion of enzyme molecules that contain bound substrate. Thus, it is at 50% of its maximal rate when 50% of the molecules contain bound substrate (thus, A, C, and D are incorrect). The rate of the reaction is directly proportional to the amount of enzyme present, which is incorporated into the term V_{max} (where $V_{max} = k[\text{total enzyme}]$) (thus, E is incorrect).

16) Methanol (CH_3OH) is converted by ADHs to formaldehyde (CH_2O), a compound that is highly toxic to humans. Patients who have ingested toxic levels of methanol are sometimes treated with ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) to inhibit methanol oxidation by ADH. Which one of the following statements provides the best rationale for this treatment?

- A. Ethanol is a structural analog of methanol and might therefore be an effective noncompetitive inhibitor.
- B. Ethanol is a structural analog of methanol that can be expected to compete with methanol for its binding site on the enzyme.
- C. Ethanol can be expected to alter the V_{max} of ADH for the oxidation of methanol to formaldehyde.
- D. Ethanol is an effective inhibitor of methanol oxidation regardless of the concentration of methanol.
- E. Ethanol can be expected to inhibit the enzyme by binding to the formaldehyde-binding site on the enzyme, even though it cannot bind at the substrate-binding site for methanol.

Answer : b

17) The pancreatic glucokinase of a patient with MODY had a mutation replacing a leucine with a proline. The result was that the K_m for glucose was decreased from a normal value of 6 mM to a value of 2.2 mM, and the V_{max} was changed from 93 U/mg protein to 0.2 U/mg protein. Which one of the following best describes the patient's glucokinase compared with the normal enzyme?

- A. The patient's enzyme requires a lower concentration of glucose to reach $\frac{1}{2}V_{max}$.
- B. The patient's enzyme is faster than the normal enzyme at concentrations of glucose 2.2 mM.
- C. The patient's enzyme is faster than the normal enzyme at concentrations of glucose >2.2 mM.
- D. At near-saturating glucose concentration, the patient would need 90 to 100 times more enzyme than normal to achieve normal rates of glucose phosphorylation.
- E. As blood glucose levels increase after a meal from a fasting value of 5 to 10 mM, the rate of the patient's enzyme will increase more than the rate of the normal enzyme.

Answer : a

18) A runner's muscles use glucose as a source of energy. Muscle contains glycogen stores that are degraded into glucose 1-phosphate via glycogen phosphorylase, which is an allosteric enzyme. Assume that an allosteric enzyme has the following kinetic properties: a V_{max} of 25

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U/mg enzyme and a $K_{m,app}$ of 1.0 mM. These kinetic parameters were then measured in the presence of an allosteric activator. Which one of the following would best describe the findings of that experiment?

- A. A V_{max} of 25 U/mg enzyme and a $K_{m,app}$ of 0.2 mM
- B. A V_{max} of 15 U/mg enzyme with a $K_{m,app}$ of 2.0 mM
- C. A V_{max} of 25 U/mg enzyme with a $K_{m,app}$ of 2.0 mM
- D. A V_{max} of 50 U/mg enzyme with a $K_{m,app}$ of 5.0 mM
- E. A V_{max} of 50 U/mg enzyme with a $K_{m,app}$ of 10.0 mM

Answer: a

(Allosteric activators will shift the sigmoidal kinetic curve for the enzyme to the left, thereby reducing the $K_{m,app}$ (so $\frac{1}{2}V_{max}$ will be reached at a lower substrate concentration) without affecting the maximum velocity (although in some cases, V_{max} can also be increased). Allosteric inhibitors will shift the curve to the right, increasing the $K_{m,app}$ and sometimes also decreasing the V_{max}).

19) Pathway regulation can occur via the expression of tissue-specific isozymes. Glucose metabolism differs in red blood cells and liver in that red blood cells need to metabolize glucose, whereas the liver prefers to store glucose. The first step of glucose metabolism requires either glucokinase (liver) or hexokinase I (red blood cells), which are isozymes. Which one of the following best describes these different isozymes and their K_m for glucose?

- A. The K_m of hexokinase I is higher than the K_m of glucokinase.
- B. The K_m of hexokinase I is lower than the K_m of glucokinase.
- C. The K_m of hexokinase I is the same as the K_m of glucokinase.
- D. Hexokinase I is found in liver. E. Glucokinase is found in red blood cells.

Answer: b

THESE TWO QUESTIONS ARE LINKED

20) An antibiotic is developed that is a close structural analog of a substrate of an enzyme that participates in cell wall synthesis in bacteria. This binding of the antibiotic reduces overall enzyme activity, but such activity can be restored if more substrate is added. The binding of the antibiotic to the enzyme is not via a covalent bond, nor does the enzyme alter the structure of the antibiotic. Which one of the following would best describe this antibiotic?

- A. It is a suicide inhibitor.
- B. It is an irreversible inhibitor.
- C. It is a competitive inhibitor.
- D. It is a noncompetitive inhibitor.
- E. It is an uncompetitive inhibitor.

Answer: c

21. Which one of the following is true for the inhibitor described in the previous question?

- A. It increases the apparent K_m of the enzyme.
- B. It decreases the apparent K_m of the enzyme.
- C. It has no effect on the apparent K_m of the enzyme.

- D. It increases the V_{max} of the enzyme.
- E. It decreases the V_{max} of the enzyme.

Protein Purification And Enzymes In Medical Diagnosis

1) One of the following enzymes is most specific for liver disease:

- A) AST
 - B) LDH1/LDH2
 - C) ALT
 - D) LDH
 - E) CPK
- ANSWER:C

2) in any form of chromatography, how will a compound that interact more strongly with the stationary phase elute compared to one that interact less strongly:

- A) a compound interacting more strongly will elute later
 - B) a compound interacting more strongly will elute earlier
 - C) none of the answers is it true
 - D) we weaker the binding , the higher concentration of salts in the buffer being used
 - E) the order of elution has nothing to do with the interactions with the stationary phase
- Answer: A

3) treatments of the pentapeptide with cyanogen bromide generate two fragments, a tripeptide that is positively charged at pH 7 and dipeptide that is negatively charged at pH 7. based on this, one of the following is valid prediction of the peptide:

- A) Lys-Phe-Met-Asp-Val
 - B) Phe-Lys-Val-Met-Asp
 - C) Phe-Pro-Met-Val-Asp
 - D) Lys-Asp-Met-Phe-Val
 - E) Val-Met-Asp-phe-Lys
- Answer: a

5) dialysis is dependent on:

- A) protein charge
 - B) protein- protein interaction
 - C) protein solubility
 - D) protein hydrophobicity
 - E) protein size
- Answer: e

6) which on the basis of molecular weight:

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- A) gel filtration
- B) affinity chromatography
- C) cation exchange
- D) anion exchange

Answer: a

7) the typical order for major steps of enzyme isolation would be formed first to last:

- A) homogenization / salt fractionation / column chromatography / electrophoresis

8) what tends to happen to the percent recovery during the protein purification:

- A) the number usually increases during the purification
- B) the number usually decreases during the purification
- C) that number stays the same

Answer: B

9) which would be best to separate a protein that binds strongly to X substrate:

- A) affinity chromatography
- B) cation exchange
- C) anion exchange
- D) gel filtration

Answer: a

10) elution of a protein by means of pH gradient would work best with this type of column:

- A) gel filtration
- B) affinity chromatography
- C) cation exchange
- D) anion exchange
- E) cation or anion exchange

Answer: B+E (NOT SURE)

11) in fact, the experimental setup in chromatography always requires:

- A) stationary phase and mobile phase
- B) sample in which components differ in charge
- C) sample in which components differ in polarity

Answer: a

12) the degree of separation in molecular sieve chromatography depends on:

the size of the pores and sieve material

13) how many bonds would be produced when hemoglobin is subjected to SDS-PAGE:

- A) 1
- b)2
- c)3
- d)4

Answer: b

14) in the reduced SDS-PAGE method separation takes place on the basis of:

- A) charge only because all particles have the different charge but the same mass
- B) the sieve action of the gel, because all particles have the different charges and different masses
- C) the seive action of the gel, because all peptides have approximately the same charge and shape but different masses

Answer: c

15) what is sequence of elution (Lys-His-Arg) in cationic exchange chromatography made at PH=6?

- A) His- Arg-Lys
- B) His-Lys-Arg
- C) Lys-His-Arg
- D) Arg-His-Lys
- E) Lys-Arg-His

Answer: b

16) salting out is a result of:

- A) electrostatic interactions
- B) hydrophobic interaction
- C) van der waal interaction
- D) covalent links between proteins

Answer : a

17) if you want to separate a cationic protein from other proteins in the solution, which purification technique will you use:

- A) affinity chromatography
- B) salting in
- C) anion exchange
- D) cation exchange

Answer: d

18) about Gel electrophoresis is false:

- A) acrylamide offers more resistance large molecules
- B) native gel separate proteins according to their size, shape and charge
- C) agarose is used to separate nucleic acids
- D) reduced SDS-PAGE separate proteins according to their size only
- E) none of the above

Answer: e

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19)) You have the following sequence of peptide "Tyr-Pro-Phe -Gly-Val -Pro-Cys- Try-Ile-Leu-Lys-Arg-Leu". After treating this peptide with chymotrypsin, how many peptide fragments would be generated?

- A) 1
 - B) 3
 - C) 4
 - D) 2
 - More than 4
- Answer: C

THESE TWO QUESTIONS ARE FROM DOCTOR MAMOUN FOR MORE ANDERSTANDING

20) Based on the observations below, determine the sequence of the peptide knowing that it is composed of gly, lys, glu, phe, and met (not in order).

Experiment 1: cleavage of the pentapeptide with trypsin generates a tripeptide and a dipeptide. The dipeptide is positively charged and the tripeptide is negatively charged.

Experiment 2: cleavage of the pentapeptide with cyanogen bromide generates a single amino acid and a tetrapeptide that is neutrally charged.

Experiment 3: cleavage of the pentapeptide with chymotrypsin generates a dipeptide that is negatively charged and a tripeptide that is positively charged.

Experiment 4: cleavage of the pentapeptide with elastase results in no cleavage.

Experiment 5: cleavage of the pentapeptide with pepsin generates a negatively charged tripeptide and a positively charged dipeptide.

ANSWER

Note: you need to know the amino acid abbreviations and their properties. Note: you need to know the enzymes and chemicals, their recognized amino acids, and their cleavage sites Hint: all peptides will have an amino group and a carboxyl group.

Experiment 1: Cleavage occurs at a lysine. The dipeptide contains lys and the tripeptide contains glu. The amino acid order of the peptide is (1-lys-3 -4-5).

Experiment 2: The single amino acid is met and it is at the N-terminus. The tetrapeptide contains all other four amino acids. The order of the amino acids is (met-lys-3-4-5).

Experiment 3: Cleavage occurs at the C-terminus of phe. The dipeptide contains glu and the tripeptide contains lys and phe. The order of the amino acids is (met-lys-phe-4-5)

Experiment 4: Gly is at the C-terminus. The order of the amino acids is (met-lys-phe-4-gly). You should know by now what amino acid 4 is. Anyhow, go on.

Experiment 5: Cleavage occurs at the N-terminus of phe. The order of the amino acids is (met-lys-phe-glu-gly)

21) You have performed chromatographic techniques on 4 proteins (W, X, Y, and Z). Based on the experiments below, answer the questions

Technique	Order of elution (after washing out unbound proteins)
Gel-filtration chromatography	Y, W, Z, then X
Cationic-exchange chromatography	Z then Y
Anionic exchange chromatography	W then X

- A) Which protein has the highest pI?
- B) Which protein has the lowest pI?
- C) If SDS-PAGE is performed, what is the order of proteins (from top to bottom)?
- D) If two-dimensional SDS-PAGE is performed, which protein will be located at the leftmost bottom of the gel?
- E) You performed an immunoblot for a mix of the four proteins. You got a single band representing Y. Can you use the same antibody in affinity chromatography?

ANSWER:

- A) Y, since it is the one eluted last with the cationic-exchange chromatography.
- B) X, since it is the one eluted last with the anionic-exchange chromatography
- C) Top has highest molecular weight and vice versa.
The order in the SDS-PAGE is Y, W, Z, and finally X.
- D) Leftmost bottom: a smaller MW with lowest pI. It is X.
- E) Yes, because the antibody is specific for protein Y

ALLAH M3KOM

GOOD LUCK

ED30LNA