Biochemistry Final 2022

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

A) IgA

B) IgD

C) IgE

D) IgG

E) IgM

Answer:

E

2- What is the CT for this DNA sample:

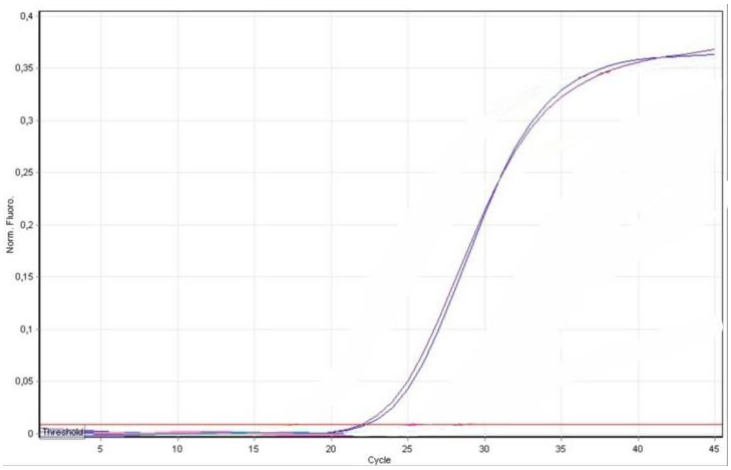
A) 15

B) 20

C) 23

D) 25

E) 30



Answer:

C

3- In what structure are the CDR's found?

A) Helical structure

B) Alpha helix

C) Loop

D) Beta sheet

E) Globular folding

Answer:

C

4- 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

5- What is the inactive form of an enzyme called?

A) Proenzyme

B) Apoenzyme

C) Hydrolyase

D) Lipoenzyme

Answer:

A

6- What is an apoenzyme bound to its cofactor called?

A) Holoenzyme

B) Cofactor enzyme

C) Zymogen

D) Proenzyme

Answer:

A

7- 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

8- 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

9- 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

10- What is the technique that reveals the structure and dynamics of proteins in a solution?

A) X-ray crystallography

B) PCR

C) Nuclear magnetic resonance

D) Electrophoresis

E) ELISA

Answer:

C

11- Collagen is bound to sugars due to what reaction?

A) Carboxylation

B) Hydroxylation

C) Hydrogenation

D) Dehydration

E) Dehydroxylation

Answer:

B

12- 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:

B

13- 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

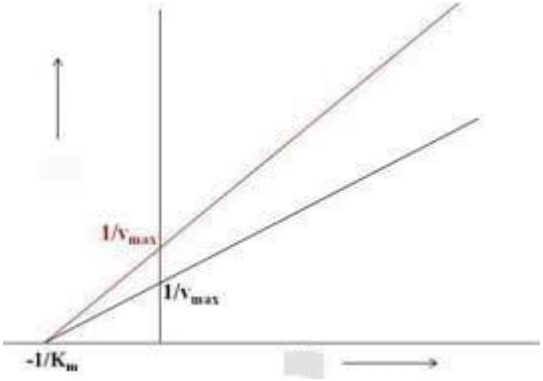
14- Select the right answer according to the type of inhibition that occurs to this enzyme (SMILE) depending on the change of its kinetics depicted by lineweaver-burk's plot:

A) Competitive inhibition

B) Uncompetitive inhibition

C) Non-competitive inhibition

D) Suicide inhibition



Answer:

C

15- Which of the following statements about Cas9 and endonucleases is incorrect?

A) Both Cas9 and endonucleases cleave DNA.

B) Both of them are considered defense mechanisms for bacteria

C) Cas9 and endonucleases both create blunt ends.

D) Cas9 and endonucleases both use Guided RNA.

E) Both are associated with an RNA molecule

Answer:

E

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

A) 25 kDa

B) 50 kDa

C) 145 kDa

D) 200 kDa

Answer:

C

17- What is the effect of the binding of ATP to the ATCase ?

A) It will become in the T state

B) K0.5 will increase

C) K0.5 will decrease

D) The effect will be like the binding of CTP

E) Nothing will happen

Answer:

C

18- 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

Answer:

C

19- Which of the following is a correct match of a vitamin & its active form:

A) NAD+ , Vitamin B3

B) FMN, Vitamin B7

C) Coenzyme A, Vitamin B6

D) Acetyl CoA, Vitamin B9

Answer:

A

20- 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

21- Which form of glycogen phosphorylase predominates when glycogen degradation is actively occurring?

A) T form & phosphrylated phosphorylase

B) R form & phosphorylase A

C) T form & phosphorylase A

D) R form & phosphorylase B

Answer:

B

22- Digestive enzymes are :

A) Ligases

B) Transferases

C) Oxidoreductases

D) Layases

E) Hydrolases

Answer:

E

23-What gives keratin its characteristic strength?

A) Hydrophobic interactions

B) Ionic bonds

C) Disulfide bridges

D) Hydrogen bonds

Answer:

C

24-Which statement is true about the fluorescent dye SYBR Green?

A) It binds to Single strand DNA

B) It is used in taqman real time quantitative PCR

C) It binds to double stranded DNA

D) It binds when the primer is bound

Answer:

C

25-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

26-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

27-What step in PCR has different temperatures between different DNA's (or different PCR processes)?

A) The step at which the DNA is denatured

B) The step at which the polymerase functions

C) The step at which the primers anneal to the part of the DNA intended to be regulated

D) The step at which SYBR green fluoresces

E) Thw step at which the reporter fluoresces in taqman QPCR

Answer:

C

28-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

Answer:

D

29-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

30-A 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

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

A) Apozyme

B) Ribozyme

C) Chymotrypsin

D) Pepsinogen

Answer:

B

32- One of the following is true about base editing with Cas9. Which statement is correct?

A) Base editing with Cas9 involves the use of the CRISPR-Cas9 system alone.

B) Base editing with Cas9 is carried out using a modifying enzyme other than Cas9.

C) Base editing with Cas9 does not require any enzymatic modification.

D) Base editing with Cas9 primarily relies on RNA interference

Answer:

B

33- 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:

D

34- What is the first step in the diagnostic procedure of detecting SARS-CoV-2 virus from a patient sample?

A) Degrade viral RNA into fragments

B) Isolate viral genetic material from the patient's DNA

C) Use reverse transcriptase

D) Sequence amplified cDNA fragments

Answer:

C

35- What does each spot on a DNA microarray contain?

A) Gene-specific primer

B) Gene-specific probe

C) Fluorescently-tagged cDNA

D) Amplified DNA sample

E) RNA-bound probes

Answer:

B

36- 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) Km value

B) Enzyme efficiency

C) Specific activity

D) Isoelectric point

E) Turnover number

Answer:

C

37- 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

38- 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

39- Enzymatic activity is regulated by:

A) Allostery

B) Non-specific regulation

C) Reversible covalent modification

D) Modulators

E) All of the above

Answer:

E

40- Thiamin pyrophosphate is involved in what reactions?

A) Decarboxylation

B) Phosphorylation

C) Carboxylation

D) Dehydrogenation

Answer:

A

41- What enzyme is involved in molecular rearrangement?

A) Oxidoreductases

B) Isomerases

C) Ligases

D) Transferases

E) Lyases

Answer:

B

42- what is the function of DNA ligase?

A) Build new DNA strand

B) Formation of sticky ends

C) Reformation of phosphodiester bonds

D) Formation of RNA

E) Formation of blunt ends

Answer:

C

43- If you know that Km 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 Vmax

D) The enzymes are fully saturated with the substrate

E) None of the above

Answer:

B

44- A biochemist obtains the following set of data for an enzyme that is known to follow Michaelis-Menten kinetics. Approximately, Vmax of this enzyme is……& the Km is…….

A) 5000 & 699

B) 699 & 5000

C) 621 & 50

D) 94 & 1

E)700 & 8

Substrate Concentration (μM)	Initial velocity (μmol/min)
1	49
2	96
8	349
50	621
100	676
1000	698
5000	699

Answer:

E

45- One of the following statements is wrong according to myoglobin:

A) The P_{50} 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

46- You have the following unordered steps of ELISA, choose the correct order of them:

i- We add a solution of the enzyme's substrate to the wells.

ii- We put the primary antigen in the well & attach it to the surface there.

iii- We pour a solution of a secondary antibody which is specific for the antigen & also is bound to an enzyme by its Fc region.

iiii- We add a solution containing the antigen to the wells.

A) i,iii,ii,iiii

B) ii,iii,iiii,i

C) ii,iiii,iii,i

D) ii,iiii,i,iii

E) ii,i,iiii,iii

Answer:

C

47- How do we know the quantity of sequenced RNA's?

A) By knowing the quantity of sequenced cDNA's

B) By knowing the quantity of the probes

C) By knowing the quantity of the primers

D) By knowing the quantity of the mRNA's

Answer:

A

48- Choose the wrong statement about next-generation sequencing:

A) We use unique adapters for different DNA fragments

B) We use the same primer for all fragments

C) We take advantage of the overlapping DNA fragments to combine them

D) We use DNA polymerase in the process

E) The terminal added nucleotide must be modified to add another one

Answer:

A

49- In fluorescent DNA sequencing, fluorescent labels are added to:

A) Deoxyribonucleotides (dNTPs)

B) Dideoxyribonucleotides (ddNTPs)

C) Primers

D) DNA polymerase

E) Ribonucleotides (NTPs)

Answer:

B

50- Which statement about oxygen binding in hemoglobin is incorrect?

A) Causes conformational change

B) Higher O_2 affinity in high O_2

C) O_2 binds to heme's iron

D) O_2 binds directly to His residues

E) O_2 doesn't bind to heme ferric ion

Answer:

D

51- In a yeast two-hybrid experiment, a known gene X is fused to the DNA binding domain (BD) and an unknown gene Y is fused to the activation domain (AD). When X-BD and Y-AD are coexpressed in yeast,

the colonies turn blue in the presence of X-gal. What can be concluded about the result of the technique?

A) The X and Y proteins do not interact

B) The LacZ reporter gene is non-functional

C) The X and Y proteins interact with each other

D) The BD and AD are far away from each other

E) The AD protein is able to function when it is free in the solution

Answer:

C

52- Which of the following statements about enzyme catalysis is false?

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

53- What is a distinct advantage of mature human-mRNA compared to other types of RNA?

A) It contains shine-dalgarno sequence

B) It has a 3’-cap

C) It has a poly-A tail

D) It contains introns

E) It contains the promoter region

Answer:

C

54- What is the natural function of Cas9 in bacteria?

A) Recognizes and cleaves bacteriophages' DNA

B) Cleaves bacterial DNA in the interspaced regions in CRISPR

C) Is involved in the cleavage of the centromere in the anaphase of cell division

D) Assists in the transcription of the guide RNA

E) Cleaves bacteriophages' DNA only at palindromic sequences

Answer:

A

55- 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

56- Which of the following statements is true about

co-immunoprecipitation?

A) We use different types of antibodies for more than one antigen

B) The used antibodies are free rather than attached to a surface

C) The protein bound to the bead is precipitated with other proteins attached to it

D) The antibodies are of the same idiotype but are specific for different types of proteins

E) The proteins precipitated may or may not have the ability to interact with each other

Answer:

C

57- What concept does the yeast two-hybrid system take advantage of?

A) Domains are self-stabilizing

B) Domains fold independently

C) Domains have defined 3d structure

D) Domains can be separated from proteins and mantain their functions

Answer:

B

58- Which statement about luciferase reporter assays is true?

A) Luciferase degrades the reporter protein over time

B) The light intensity represents natural (typical) luciferase gene activity

C) Luciferase activity directly represents gene expression levels

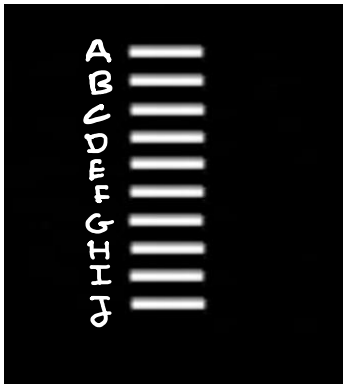
D) The light intensity represents promoter activity

E) Luciferase catalyzes the conversion of oxyluciferin to luciferin

Answer:

D

59-What statement is true about the C & H band in the following fluorescent DNA-sequencing SDS-PAGE print:



A) There is a difference of 5 nucleotides between them

B) One of them contains more disulfide bridges than the other

C) They possess the same amount of negative charges

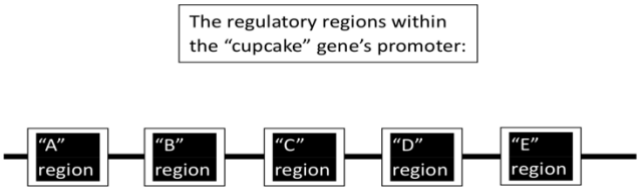
D) Their 3'-terminal nucleotide is 2',5'-dideoxyribonucleotide

E) The gel must contain a reducing agent for them to be separated

Answer:

A

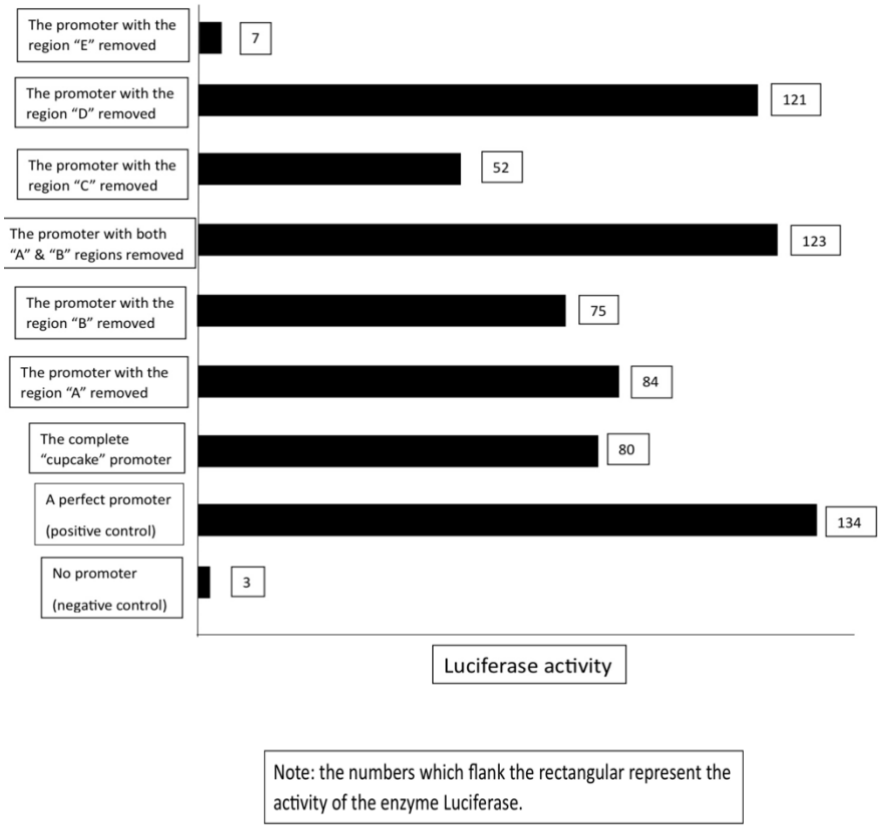
60- You have the following luciferase reporter assay of the gene "cupcake" which you want to study. Depending on the results in the assay, choose the statement which is most likely to be incorrect:



A) The sequence “E” is the core promoter

B) The sequence “C” is an enhancer

C) The sequences of “A” & “B” are both significant together



Note: the numbers which flank the rectangular represent the activity of the enzyme Luciferase.

D) The sequence “A” alone is a repressor

E) The results of the assay are insufficient to decide

Answer:

D