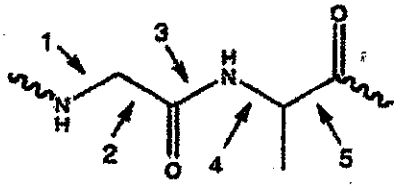
I. Multiple Choice (2% each, total 50%, choose the best answer)

1. Which of the following bonds has partial double bond character?



A) 1　B) 2　C) 3　D) 4　E) 5

2. Ubiquitination of proteins modifies the side chain of _____ residue.
A) Asn　B) Lys　C) Arg　D) Cys　E) Ser

3. Hydrophobicity profile of a protein can be calculated from its _____ protein structure.
A) primary　B) secondary　C) tertiary　D) quaternary

4. The tertiary structure of a protein is stabilized by
A) hydrogen bond　B) ionic bond　C) hydrophobic interaction　D) acid-base interaction

5. The binding of oxygen to hemoglobin is said to be _____.
A) high affinity　B) low affinity　C) sigmoidal　D) cooperative　E) sequential

6. Zwitterions are　A) amino acids.　B) ionic molecules that are racemic.
C) ions that bear both negatively and positively charged groups.
D) side chain carboxylate anions.　E) delocalized ions.

7. The quantitation of proteins due to their absorbance at ~280 nm (UV region) is due to the large absorbtivity of the _____ amino acids.
A) anionic　B) dansylated　C) cleaved　D) polar　E) aromatic

8. The amino acid that would disrupt the ordered structure of a folded α-helix is
A) Proline　B) Tyrosine　C) Histidine　D) Lysine　E) Isoleucine

9. Hydrogen bond lengths in α-helices are about
A) 2 Å.　B) 3 Å.　C) 4 Å.　D) 5 Å.

10. The genetic information of viruses is contained within _____ .

A) DNA　B) DNA or RNA　C) specialized carbohydrates with defined sequence
D) specialized proteins with defined amino acid sequence　E) none of the above

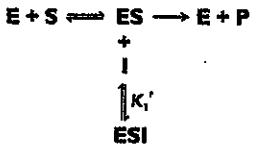
11. Given a unireactant enzyme reaction where a plot of 1/v versus 1/[S] gives a straight line. It was found in three additional experiments each using a different inhibitor concentration that the lines were parallel. This is an example of :

A) competitive inhibition.　B) uncompetitive inhibition.
C) mixed inhibition.　D) a ping-pong reaction.

12. Buffer solutions

A) will always have a pH of 7　B) are rarely found in living systems
C) cause a decrease in pH when acids are added to them
D) tend to maintain a relatively constant pH

13.



The enzyme reaction scheme above most closely depicts

A) noncompetitive inhibition　B) mixed inhibition　C) uncompetitive inhibition
D) competitive inhibition　E) concerted feedback inhibition

14. On the x and y axes of a Lineweaver-Burk plot, the largest values of substrate concentration will be found:　A) At the top of the y axis　B) At the intercept on the y axis
C) At the right end of the x axis　D) At the intercept on the x axis　E) At the origin

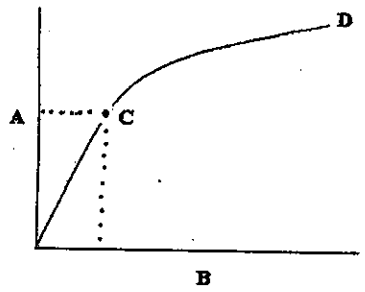
15. In glycoproteins, the carbohydrate moiety always gets attached through which of the following amino acids?　A) Glycine or alanine
B) Tryptophan or phenylalanine　C) Aspartate or glutamate
D) Glutamine or arginine　E) Asparagine, serine, or threonine

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

A) 0.1*V_{max}.　B) 0.2*V_{max}.　C) 0.3*V_{max}.　D) 0.5*V_{max}.　E) 0.9*V_{max}.

The Michaelis-Menten equation is $v_0=Vmax\ [S]/(Km+[S])$.

Fill in the blanks (questions 17, 18) with the letters shown to correctly label each part of the graph.



17. _____ V_{max}

18. _____ [S]

19. Which of the statements regarding enzymes is **false**?

A) Enzyme activity can be regulated.　　B) Enzymes are specific.

C) Enzymes provide activation energy for reactions.

D) Enzymes are proteins that function as catalysts.

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

20. The important generalization from Anfinsen's work on RNaseA was that:

A) 100% enzyme activity corresponds to the native conformation.

B) Cys-SH groups are not found *in vivo*.

C) disulfide bonds (S-S) in proteins can be reduced *in vitro*.

D) the sequence of a protein determines its structure.

21. A pore that simultaneously transports two different molecules in different directions is called

A) a symport.　　B) a uniport .　　C) a gap junction.

D) an equilibrium channel.　　E) an antiport.

22. Which of the following macromolecules is considered a homopolymer?

A) polypeptides　　B) ribonucleic acids　　C) deoxyribonucleic acids

D) starch　　E) all of the above

23. If the ΔG value for a given biochemical reaction is a relatively large, positive value, which of the following is true?

A) the reaction is said to be exergonic　　B) the reaction is freely reversible
C) the reverse reaction is thermodynamically favorable
D) the reaction is thermodynamically favorable　　E) the reaction is at equilibrium

24. Which of the following is LEAST soluble in aqueous solution?

A) Sucrose　B) KCl　C) Ethanol　D) Palmitic acid　E) Oxaloacetic acid

25. Disulfide bonds can be cleaved using

A) iodoacetate.　B) dansyl chloride.　C) 2-mercaptoethanol (β-ME).
D) trypsin.　E) phenylisothiocyanate.

II. Essays

1. Draw the structure of the following amino acids:

(A) glycine (2%)　(B) phenylalanine (2%)　(C) valine (2%)　(D) serine (2%)
(E) lysine (2%)

2. Why is it important to recycle NADH produced during glycolysis to NAD^+ in glucose metabolism? (5%)

3. Draw and describe the compositions and structure of LDL. (10%)

4. Animals cannot convert fatty acids to glucose. Why? (5%)

5. Describe the flow of electrons from NADH to O_2 in mitochondria. (5%)

6. How can a high concentration of ammonia alter the citric acid cycle? (5%)

7. Why must the DNA polymerase used in the polymerase chain reaction (PCR) be heat stable? (2%)

8. Defects in protein folding are the molecular basis for the development of human serious disease. Give two human diseases arisen from protein misfolding and indicate which of protein misfolding. (8%)