10. Collagen, a major component of skin and bone, is a fibrous protein with repeating units of Pro-Gly-X or Hyp-Gly-X. Collagen has strength because the structure is:
A) Web like　B) Three interlaced helices forming a rope
C) An α-helix　D) A β-sheet　E) A β-barrel

11. Allosteric effects that occur in hemoglobin
A) only occur in humans.　B) are important for maintaining Fe in the Fe^{2+} state.
C) minimize oxygen delivery to the tissues.　D) optimize oxygen delivery to the tissues.
E) can also be observed in myglobin.

12. Which of the statements regarding enzymes is **false**?
A) Enzymes are proteins that function as catalysts.　B) Enzymes are specific.
C) Enzymes provide activation energy for reactions.　D) Enzyme activity can be regulated.
E) Enzymes may be used many times for a specific reaction.

13. 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) $0.9*V_{max.}$

14. A competitive inhibitor of an enzyme is usually:
A) a highly reactive compound.　B) a metal ion such as Hg^{2+} or Pb^{2+}.
C) structurally similar to the substrate.　D) water insoluble.　E) a poison.

15. The void volume of the gel filtration column, V_o, is 30 mL. A monomeric protein with a known molecular weight of 25 kDa elutes at a volume of 45 mL. The protein that you are trying to purify elutes at a volume of 35 mLs. Which of the following is most likely to be true:
A) Your protein is repelled by the gel filtration material.　B) Your protein is not monomeric in solution.
C) Your lab partner mixed up the tubes.　D) Your protein is monomeric also.
E) Your protein has been digested by proteases during the purification.

16. For an enzyme that displays Michaelis-Menten kinetics, the reaction velocity (as a fraction of V_{max}) observed at [S] = 2 K_M will be
A) 0.09　B) 0.33　C) 0.66　D) 0.91

17. 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.

18. Ribozymes behave like protein enzymes except that they:
A) Work solely on nucleotide　B) Have no tertiary structure
C) Probably have less substrate selectivity than protein enzymes　D) Do not require cofactors

19. The peptide, Val-Lys-Glu-Met-Ser-Trp-Arg-Ala, was digested with cyanogen bromide (CNBr) to produce
A) Val-Lys + Glu-Met-Ser + Trp-Arg-Ala.　B) Val-Lys-Glu-Met-Ser-Trp + Arg-Ala.
C) Val-Lys-Glu-Met + Ser-Trp-Arg-Ala.　D) Val-Lys-Glu + Met-Ser-Trp-Arg-Ala.
E) Val-Lys-Glu-Met-Ser + Trp-Arg-Ala.

20. A monoclonal antibody (Mab) specific for the 2,4-dinitrophenyl (DNP) hapten might also bind one of these pairs of amino acids:
A) Leu or Ile　B) His or Pro　C) Tyr or Phe　D) Ser or Thr　E) Cys or Met

I. Multiple Choice (2% each, 20 questions, total 40%)

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

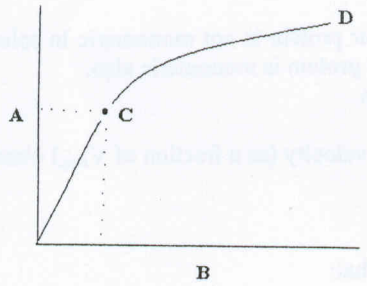
2. At which level of protein structure are interactions between R groups **most** important?
   A) primary　　B) secondary　　C) tertiary
   D) quaternary　　E) They are equally important at all levels.

3. Which pair of amino acids absorbs the most UV light at 280 nm?
   A) Thr & His.　　B) Trp & Tyr.　　C) Cys & Asp.
   D) Phe & Pro.　　E) None of the above.

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

5. Allosteric enzymes are large, oligomeric proteins that have catalytic sites for binding substrates and regulatory sites that bind effectors. The separate oligomers influence one another; they work cooperatively. This is evidenced by the characteristic rate curves for allosteric enzymes which have:
   A) Michaelis-Menten kinetics　　B) Hyperbolic kinetics　　C) Sigmoidal kinetics
   D) Regulatory kinetics　　E) Concerted kinetics

The Michaelis-Menten equation is $v_o = Vmax\,[S]/(Km+[S])$.
Fill in the blanks (questions 6, 7) with the letters shown to correctly label each part of the graph.



6. _____ V_{max}
7. _____ [S]

8. 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

9. Proteins have regularly repeating structures called secondary structures. One of these is a β-sheet. Which statements are **true** of β-sheets?
   A) β-sheets exist in either parallel (both N → C) directions; not in antiparallel (one C → N and one N → C) directions.　　B) β-sheets contain almost no alanine or glycine residues.
   C) Hydrogen bonds are formed between intrachain and interchain amino acid side chains.
   D) The size and charge of R group side chains is unimportant.