- 1) (1 point) What is the most common form of double-stranded DNA in biological systems?
 - a) A-DNA
 - b) B-DNA
 - c) Z-DNA
- 2) (4 points) List two ways in which the secondary structure of RNA differs from that of DNA.
- 3) (5 points) Explain how Type I and Type II topoisomerases alter DNA topology.

4) (5 points) How is the melting curve of DNA affected by decreasing the ionic strength of the solution?

5) (5 points) Two different species of bacteria have been isolated from two very different environments: one, a hot spring with an average water temperature of 40°C, and the other a glacial lake with an average water temperature of -4°C. Which of the two bacterial species would be expected to have a higher percentage of G and C in its genomic DNA? **Explain your reasoning.**

b)

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6)	(3 points) Draw a Fisher projection of L-alanine.
7)	(2 points) Why is alanine optically active, while glycine is not?
8)	(3 points) List three amino acids whose side chains can form hydrogen bonds with water
9)	(3 points) List three amino acids whose side chains can participate in hydrophobic interactions.
10)	(1 point) Which (one) amino acid allows the most flexibility when found in a protein?
11)	(1 point) Which (one) amino acid allows the least flexibility when found in a protein?
12)	(1 point) What do the amino acids threonine and tyrosine have in common?
13)	(6 points) State whether each of the following amino acids is L or D.
	a) c)

d)

14) (9 points) Name t	he following amino	acids. Also	give their	one-letter a	and three-l	etter
abbreviations.						

<u>Structure</u>	<u>Name</u>	1-letter	3-letter
			

15) (1 point) Low levels of the neurotransimitter serotonin cause depression. The structure of serotonin is shown below. What amino acid is serotonin derived from?

- 16) (5 points) Mark each of the following statements about <u>peptide bonds</u> as true (T) or false (F).
 - a) They are planar.
 - b) The carbonyl oxygen and the amine hydrogen are *cis* to each other.
 - c) They are formed by the condensation of two amino acids.
 - d) They are important in the primary structure of proteins
 - e) They can occur between polypeptides and RNA.
- 17) (5 points) What is the biological significance of invariant residues of homologous proteins?
- 18) (5 points) What constitutes a conservative substitution for an amino acid residue in a protein?

19) Use this table to answer questions (a) through (c).

Amino Acid	pK _{NH3+}	pK_{COOH}	pK_R	
Aspartic Acid	9.90	1.99	3.90	
Glutamic Acid	9.47	2.10	4.09	
Serine	9.21	2.19		

a) (10 points) Draw the tripeptide Asp-Glu-Ser at pH 1, showing each amino acid in its L-configuration.

b) (5 points) Calculate the isoelectric point for Asp-Glu-Ser. **Show your work for credit!**

c) (5 points) Estimate the charge (in whole numbers) on the tripeptide Asp-Glu-Ser at pH 7.0.

- 20) (5 points) Which of the following amino acids would be likely to be in a protein that interacts ionically with DNA at physiological pH?
 - a) Tryptophan
 - b) Aspartic acid
 - c) Glutamine
 - d) Arginine
 - e) Histidine
- 21) (10 points) What is the amino acid sequence of the polypeptide that gives the following fragments when cleaved by the chymotrypsin and V8 protease?
 - a) Chymotrypsin
 - i) CN
 - ii) NLQNY
 - iii) GIVEQCCHKRSEY
 - b) S. aureus V8 protease
 - i) GIVE
 - ii) YNLQNYCN
 - iii) QCCHKRCSE