1. (6%) A quantitative amino acid analysis reveals that bovine serum albumin (BSA) contains 0.58% tryptophan (*Mr 204*) by weight.
   (a) Calculate the minimum molecular weight of BSA (i.e., assuming there is only one tryptophan residue per protein molecule.)
   (b) Gel filtration of BSA gives a molecular weight estimate of 70,000. How many tryptophan residues are present in a molecule of serum albumin?

2. (14%)

```
 1  2   3   4    5   6   7   8   9   10
Ile-Ala-His-Thr-Tyr-Gly-Pro-Phe-Glu-Ala-

 11  12  13  14   15  16  17  18  19   20
Ala-Met-Cys-Lys-Trp-Glu-Ala-Gln-Pro-Asp-

 21  22  23  24  25  26  27  28
Gly-Met-Glu-Cys-Ala-Phe-His-Arg
```

   (a) In the amino acid sequence above, where would you predict that bends or β turns would occur?
   (b) Where might intrachain disulfide cross-linkages be formed?
   (c) Assuming that this sequence is part of a larger globular protein, indicate the probable location (the external surface or interior of the protein) of the following amino acid residues: Asp, Ile, Thr, Ala, Gln, Lys. (Hint: see the hydropathy index in Table)

Table:

Amino Acid	Hydropathy index
Alanine	1.8
Isoleucine	4.5
Threonine	-0.7
Glutamine	-3.5
Lysine	-3.9
Aspartate	-3.5

接背面

3. (10%) With the identification of an increasing number of disease-associated genes, the importance of "chromatin structure" in human diseases including cancers has become increasing clear. Recently, many clinical studies have reported that alteration and regulation in chromatin structure often causes complex multi-system diseases and neoplasia. What is " **chromatin** "? What is "**nucleosome**"? What kind of bonds occurs predominantly in the interactions between histones and eukaryotic DNA? Explain why these interactions are not sequence-dependent. Describe ALL kinds of the **chromatin modification activities** that can alter the chromatin structure. (hint: such as covalent modification on histone tail)

4.(10%) Ubiquitin-dependent proteolysis has been shown to respond to glucocorticoids during fasting, to metabolic acidosis, to interferon gamma elicited by viral infection, to cell programmed death, to cell cycle control, to stress response.....and etc. Thus, ubiquitin-dependent processes are important in a large number of basic regulatory and repair processes. The overall process of **ubiquitin-dependent metabolism** can be thought of as involving FOUR separate reactions. Describe them.

5. (10%) Please describe the major components of basement membrane.(4 points) what are the biological functions of the basement membrane (3 points)? What are the major enzymes involved in basement membrane degradation (3 points)?

6. (10%) During the DNA homologous recombinant replication repair, How does cells overcome the single strand DNA break during DNA repair replication? (5 points) and how does cells overcome the double strand DNA break during the DNA repair replication? (5 points) (Please describe the key enzymes are involved in the process and draw a diagram will be welcome)

7. (10%) What are the DNA damages generated when mammalian cells are treated with an akylating agent? What are the likely outcomes of the cells after the treatment?

8. (10%) What does a protein kinase do to its substrate? Give two examples of this enzyme and indicate their biological significances?

9. (10%) Please write **three** antioxidant scavenger reactions which include substrates, enzymes, cofactors and products.

10. (10%) What are the functions of GSK-3 (glycogen synthase kinase-3) and STAT (signal transducers and activators of transcription) proteins in signal transduction?