1. A transcription factor "X" is thought to play important role in regulating multiple gene expression. Please design an experiment to characterize potential genes that is directly under the regulation of this transcription factor "X". (20%)

2. What is K_M? What is V_{max}? Describe the relationship between K_M and V_{max} of a given enzyme. (15%)

3. Lipids are oily or greasy water-insoluble components of cells. Please give 5 examples and describe their functions of lipid or lipoprotein in human cell. (20%)

4. **Part A.** Please classify the following amino acids into one of the four groups. (15%)
   Amino acids: Alanine (Ala), Asparagine (Asn), Glutamic acid (Glu), Histidine (His), Lysine (Lys), Methionine (Met), Proline (Pro), Serine (Ser), Tryptophan (Trp), Tyrosine (Tyr)
   Groups:
   A) Nonpolar-uncharged R group
   B) Polar but uncharged R group
   C) Negatively charged R group
   D) Positively charged R group

   Part B. Usually, certain amino acids are used to substitute for the other. For example, Ser→Ala and Ser →Glu. Please explain what is the purpose of making such change (Ser→Ala and Ser→Glu). (10%)

5. Water is the most abundant substance in living systems and makes up 70 percent or more of the weight of most forms of life. Please describe the unique functions of water in a living cell. (20%)