I. Please describe the usefulness of the following materials or techniques in biochemical experiments. (20%)

1. Sodium dodecyl sulfate
2. DEAE-Cellulose
3. EDTA
4. Ethidium bromide
5. Isopycnic centrifugation
6. Southern blotting
7. Size exclusion chromatography
8. Ninhydrin
9. Edman degradation
10. Dideoxynucleotide

II. What is the main biochemical or physiological function of the following compounds. (20%)

1. Adenosine-5'-triphosphate
2. pyridoxal-5'-phosphate
3. Immunoglobin G
4. Coenzyme A
5. Reverse transcriptase
6. Biotin
7. Adenylate cyclase
8. Aminoacyl-tRNA synthase
9. Ribosome
10. Flavin adenine dinucleotide

III. Please define the following terms: (20%)

1. Turnover number
2. Avogadro's number
3. Michaelis constant
4. Sedimentation coefficient
5. Hyperchromic effect
6. Beer's law
7. Chargaff's rule
8. Svedberg unit
9. Lineweaver-Burk plot
10. Molar absorption coefficient

IV. The density of water at 4°C is 1.0. Please calculate the concentration (in molarity) of water under this condition. (5%)

V. The hydrochloric acid is a strong electrolyte. It exists almost in the ionic state in a dilute solution. What is the pH value of 1mM HCl in water ? (5%)

VI. The equilibrium constant (Keq) of transamination reaction is about 1.0 at 25°C. Please calculate the ΔG° values under this condition. (10%)

VII. Protein is made of 20 amino acids. Please give the name and the structure of the amino acid which contains no asymmetric carbon. (10%)

VIII. How do you define the pI ? The followings are pK$_a$s of L-lysine: pK$_a$ (α-COOH) = 2.2, pK$_a$ (α-NH$_2$) = 9.2 and pK$_a$ (ϵ-NH$_2$) = 10.8. Please estimate its pI value. (10%)