1. Some of the following statements are FALSE. Correct them and explain your answers briefly. (5% each, 50% in total)

a) None covalent bonds are too weak to influence the conformation of macromolecules.

b) All mRNAs are folded into 3-dimensional structures that are required for their translation.

c) Of the major control points in gene expression, the transcription initiation is used most often to conserve energy.

d) In multicellular organisms, the production of different gene regulatory proteins in different cell types ensures the expression of only those appropriate genes.

e) It is possible for a coding region of a gene to be present in a tissue's genomic library, but absent in the cDNA library prepared from the same tissue.

f) RNAs in cells are synthesized as single-stranded molecules, which often fold up into precise three-dimensional shapes.

g) Lysosomes digest only substances that have been taken up by cells via endocytosis.

h) Both pH gradient and electric potential, the two components of electrochemical proton gradient across the mitochondria inner membrane, are energetically favorable for H^+ to flow back into the matrix under normal conditions.

i) Since a cell must maintain its heritage faithfully, it rarely changes the expression of its genes in response to external signals.

j) The transverse tubules in muscle cells are an extension of the plasma membrane, with which they are continuous, and likewise, the sarcoplasmic reticulum is an extension of the endoplasmic reticulum.

2. Use an example to illustrate how intracellular signaling cascades can achieve astonishing speed, sensitivity, and adaptability. (15%)

3. How can a cell generate and maintain asymmetrical distribution of lipids, proteins, and carbohydrates in the plasma membrane? (15%)

4. Cell culture has been a popular research tool recently. However, both freshly isolated cells and cells maintained in culture for long periods of time could be substantially different from cells in the tissue in terms of their basic characteristics. Please give your comments about this aspect. (20%)