1. Which of the following statements are correct? Explain your answers (25%).
   A. Desomosome connect the actin filaments of one cell to those of a neighboring cell or to the extracellular matrix.
   B. The following substances can spread from one cell to the next through gap junctions: (a) glutamic acid (b) mRNA (c) cyclic AMP (d) Ca^{2+} (e) G proteins and (f) plasma membrane phospholipids.
   C. Although stem cells are not differentiated, they are determined and therefore give rise only to specific cell types.
   D. The signal molecule acetylcholine has different effects on different cell types in an animal and binds to different receptor molecules on different cell types.
   E. Tyrosine phosphorylation serves to build binding sites for other proteins to bind to receptor tyrosine kinases.

2. Compare and contrast signaling by neurons to that carried by endocrine cells, which secrete hormones. Discuss the relative advantages of the two mechanisms. (15%)
3. Dr. Leland Hartwell, Dr. Paul Nurse and Dr. Timothy Hunt won Nobel Prize in Physiology/Medicine in 2001 for their contribution in the understanding of the regulation of cell cycle. Please describe their major findings. (10%)
4. In the post-genomic era, one of the challenges is to profile the pattern of gene expression in cells or tissues during development, differentiation or in response to different stimuli. Which of the following techniques will you use to do profiling? Explain the reason of your choice. (10%)
   (A) Northern blotting (B) Reverse transcriptase-polymerase chain reaction (C) DNA microarray
5. What is the polymerase chain reaction (10%)? How is it used in cDNA cloning? (5%)
6. In the control of gene activity, what distinguishes negative from positive regulation (5%)?
7. The following questions concern restriction endonuclease (20%).
   A. What is a restriction enzyme?
   B. What is the biological function of a restriction enzyme?
   C. For what main purpose do scientists use restriction enzymes?
   D. What common feature is present in every base-sequence recognized by a restriction enzyme?