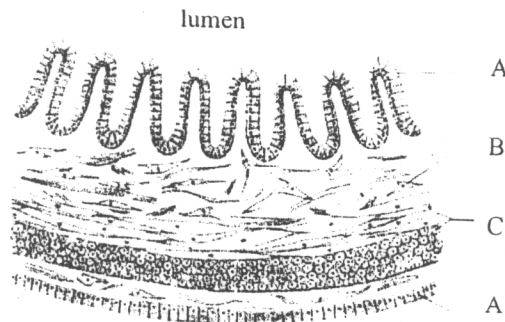
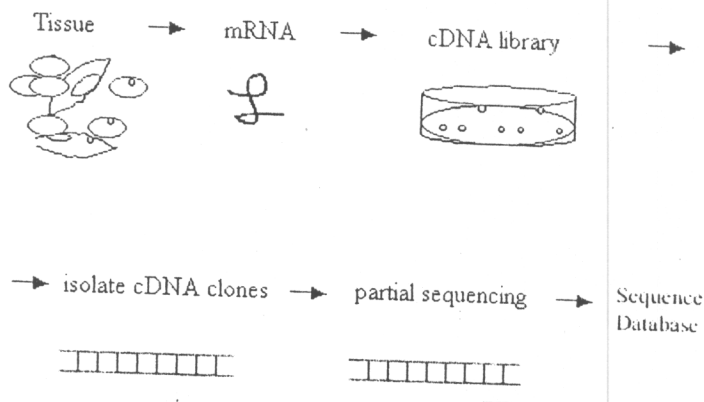


1. Please propose all possible genetic mechanisms involved in the conversion of a proto-oncogene into an oncogenic protein and provide an example for each mechanism found in human diseases (10%).
2. Please name three major cell types (A, B, and C) found in the cross-section of the intestine wall then elaborate their physiological function (10%).



3. Viruses in particular HIV and Ebola virus have a way of mutating and adapting. Please explain the major molecular mechanism why viral diseases like AIDS can pose serious problems in generating vaccines or curing these diseases (10%).
4. What is full-length cDNA? How is it different from its corresponding functional genomic DNA? What is alternative splicing? How can it increase the genetic complexity? Please give a detail description. You may want to draw a gene structure to help you explain your idea (10%).
5. DNA methylation is mostly commonly observed modification in vertebrate DNA. Where and how does it occur? And what are their biological functions and significance in normal cell and cancer cell? (10%)
6. 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%)
7. 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
8. 請列表概略比較下列四者之功能、主要組成分子及其相連之 cytoskeleton :
1) desmosomes; 2) hemidesmosomes; 3) cell-cell adherens junctions; 4) focal adhesion plaques. (10%)

9.



上圖顯示的是如下的實驗步驟：

- 1) 切取所要的組織（例如肝癌組織）。
- 2) 粹取組織細胞的 mRNA。
- 3) 將粹取所得的 mRNA 反轉成 cDNA，並且做成 cDNA library（例如有 3 萬個菌落，一個菌落對應到一個 cDNA clone，簡單而言也就是一條 mRNA）。
- 4) 將所有的菌落（例如 3 萬個）一個一個 pick up，純化其所含之 cDNA clone（例如 3 萬個 cDNA clones）。
- 5) 將所有 cDNA clones 做部分的定序（例如從帶有 polyA tail 的 3'端做 sequencing，定序的平均長度約 400bp，一般並無法涵蓋 cDNA 的全長，因此只是 partial sequencing；當然也可以從 cDNA clone 的 5'端做 sequencing）
- 6) 將定序所得之一筆一筆 sequence，存入 sequence database（例如 3 萬條序列，3 萬筆記錄）。

以人類組織為例，經由類似方法所得到的 sequence，目前已有四百萬筆之多，來自各式各樣的人體組織，有的是正常組織，有的則是不正常的組織（例如各式各樣的癌症）。

請問：

- A) 以上述方式所得到的 sequence，其統稱叫做什麼？
 - B) 這些 sequences 有什麼用處？否則為什麼要花那麼大力氣去得到四百萬筆 sequences，而且這個數目還在不斷增加之中？（若你從未聽過這種實驗，請根據上述資料，發揮你的推理及想像力。(10%)
10. 荷爾蒙可概分為 peptide hormone 與 steroid hormone，請舉例說明兩者之作用方式（請畫出其 signal transduction pathway），並指出其**主要差異**在哪裡。(10%)