

1. Please 1) describe the major biological roles of cytoskeleton in eukaryotic cells and the major three types of cytoskeleton., 2) please give an example to illustrate the importance for each type of cytoskeleton. 3) Taxol is now being used as an anti-cancer drug, please briefly describe how this drug inhibit cancer cell growth. (10%)
2. A variety of hormones bind to plasma membrane receptors with seven transmembrane domains which activate GTP-binding proteins (G proteins) and several second effector systems. Please describe "three" major second effector systems that are utilized by this group of hormones and the second messengers involved in the signal transduction pathways. (10%)
3. 在中央山脈 3000 公尺的高山湖泊中可分離出一種 "X" 菌就細胞生物點，此菌至少需要何種細胞組成物才能在高山上生存。(10%)
4. What is Human Genome Project (HGP)? (3%) What is the importance of HGP? (3%) What other genome projects have been completed so far; give an example (2%) and what do we learn from the project (2%).
5. 在一次國際性微生物會議上有一組研究人員在大腸桿菌中發現到一個新的 Sigma 因子。
  - (a) 簡述何謂 Sigma 因子 (3%)
  - (b) 如何證實它是一個新的 Sigma 因子 (7%)

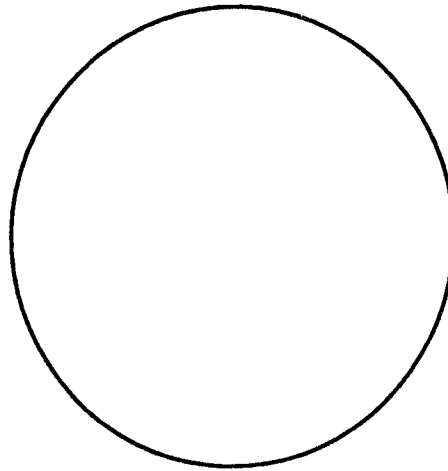
(背面仍有題目,請繼續作答)

6. What are the functions of eukaryotic RNA Polymerase I, II and III ? (10%)
7. Please draw a simple diagram to show the structure of an idealized gene, including various promoters, an enhancer, and the transcribed region of the gene (10%)
8. Telomeres are the tip of chromosomes. The biology of telomere and its associated components has been the subject of intensive investigated since it became evident that they play a significant role in several biological processes.
- 1) Please illustrate the molecular structure and the components required for maintaining telomere structure during DNA replication (3%).
- 2) Please illustrate how telomeres and their associated components affect genome stability and the life span of each cell (3%)
- 3) Please propose the mechanism (s) of telomere involvement in carcinogenesis (4%)..
9. A novel cDNA clone has been recently cloned from a human brain library. The DNA sequence was as follows. The number on the left of the DNA sequence are the nucleotide position numbers.

```
1 TGAATAAGAG AGACACCAGA ACAAAGTGAA CGAACTCGAA AATACGAAAG CAAAGTGTGT
61 GCGCCAGTAA CAAAGAACTA ACTCGATAAA TATTCATTGT GCAGAAGAGA AAGTTATTGA
121 GTCACTACCA GTTGTGTAAT TCCGAACGAG AAGAAAGATA AACCAACAAC AATGGCAGTG
181 GCATTCTACA TACCCGATCA GCGACTCTG TTGCGGGAGG CGGAGCAGAA GGAGCAGCAG
241 ATTCTCCGCT TCGGGGAGTC ACAGTGGAGA TTCCTGGCCA CCGTCGTCCT GGAACCCTG
301 CGCCAGTACA CTTCATGTCA TCCGAAGACC GGAAGAAAGT CCGGCAAATA TCGCAAGCCA
361 TCGCAATGAG GATTTCGAGTA ACTAACAAAT ACGGGGAAAA CCAATAGTCC AGTCCAAAAT
421 CCAGAGTACA AAGGAAATAA GCATGAGCCA ACCCAAACC CAAACACGTC ACCACTCATC
481 AGCCGACGGC ACTCGATTTC TACAATAAAT GCAGTCAGCA CTCATAAAC AAAAAAAAAA
```

- 1) Please describe the nucleotide sequences for the initiation codon (s), stop codon(s) and polyadenylation sequence which are most representative of most eukaryotic genes?. (2%)
  - 2) Please underline the initiation codon and stop codon of the longest open reading frame encoded by this cDNA (3%)
  - 3) Please underline the putative polyadenylation signal on this cDNA clone (2%).
  - 4) If the average weight of each amino acid is 110 dalton, please calculate the estimated molecular weight of the protein encoded by this cDNA in kilo-Daltons (3%).
10. Draw a picture of an animal cell and indicate all organelles with their English names. Please also define their functions as clear as possible. (10%)

Please draw:



This is a cell from \_\_\_\_\_