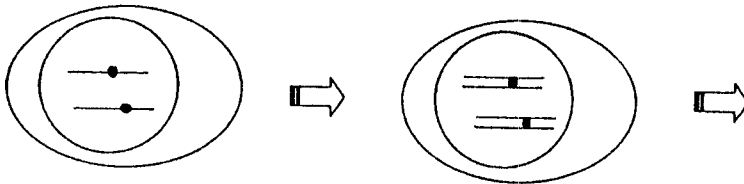


(每題 10 分, 共 100 分)

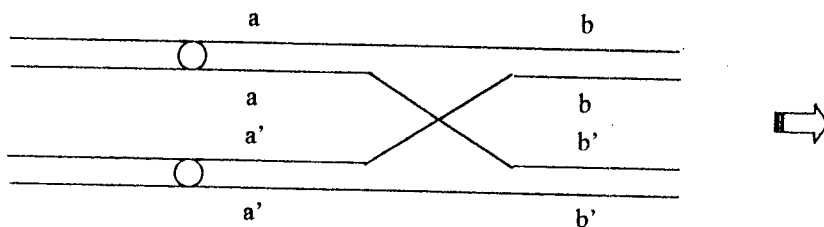
1. 典型的 Mammalian cell 含有哪些構造? 試列舉之, 並簡單敘述其功能。(10 分)
2. Plasmid DNA pX purified from bacterial host cells was dissolved in 100  $\mu$ l TE (10mM Tris-HCl, 1mM EDTA; pH 8.0). Diluted 2  $\mu$ l of this DNA solution into 100  $\mu$ l of water gave OD<sub>260</sub> reading of 0.50 and the OD 260/280 ratio of 1.72. How much pX DNA was totally isolated? (子題 5 分) Is this DNA preparation free of protein contamination? Please explain. (子題 5 分)
3. A number of mutations have been shown to affect the structure and function of genes in general. Please describe them briefly. (10 分)
4. Chronic infection of human hepatitis virus (HBV) often leads to hepatoma, when HBV DNA genome integrated into chromosomes of liver cells. How can you use molecular biology tools to demonstrate the integration of the viral DNA into liver chromosome; please explain. (10 分)
5. A: 試繪圖簡單說明減數分裂(Meiosis)與有絲分裂(mitosis)。(子題 2 分)

提示:



- B: 試繪圖簡單說明 Meiotic recombination, 並略述其生物意義。(子題 3 分)

提示:



- C: Mitotic recombination (注意, 不是上述的 Meiotic recombination!) 可以造成 Loss of

heterozygosity, 試繪圖說明之。並略述 Loss of heterozygosity 在癌症形成上的意義。(子題 5 分)

提示: (起始圖同 B)

(背面仍有題目, 請繼續作答)

6. Please describe the similarities and differences between a prototypical prokaryotic gene and eukaryotic genes. (10 分)

7. An *E. coli* DNA fragment (80-bp) has been isolated and sequenced:

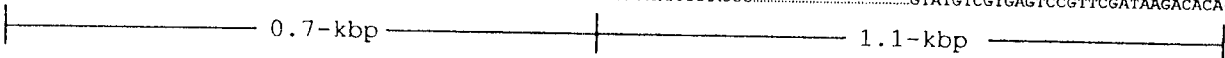
TAAAATTTAGACAACACTAGTGTGGTTTCACATTCCCGGGTCTTACTTTGACAAGAGATCTTGTCTTGAGTATAATCGGCC

Please indicate the possible promoter region and type II restriction enzyme sites. (10 分)

8. Polymerase chain reaction (PCR) can be used for diagnosis of pathogenic viruses, such as infection by human immunodeficiency virus (HIV-1). Describe the principle of PCR in detail. Use the following sequence to demonstrate how to detect the HIV-1 specific gene (*env*) in lymphocytes' chromosomal DNA isolated from AIDS (acquired immunodeficiency syndrome) patients. (10 分)

The HIV-1 *env* gene:

5' - CCTAATCATCTCATGTTTCATGTCTACTGT ..... AGCTTCTGTGGAGTTACTCTCTTTTTTGCC ..... CATACAGCACTCAGGCAAGCTATTCTGTGT - 3'  
3' - GGATTAGTAGAGTACAAGTACAGGATGACA ..... TCGAAGACACCTCAATGAGAGAAAAACGG ..... GTATGTCGTGAGTCCGTTTCGATAAGACACA - 5'



The diagram shows a horizontal line representing the DNA sequence. Two vertical tick marks are placed on the line. The first tick mark is at the start of the sequence, and the second is at the end of the 0.7-kbp region. The distance between these two tick marks is labeled '0.7-kbp'. The second tick mark is also at the start of the 1.1-kbp region, and the distance from this tick mark to the end of the sequence is labeled '1.1-kbp'.

9. The plasmids have versatile applications in molecular biology. A number of vectors (e.g., pUC18, pBluescript, etc.) have utilized the blue-white color to select insert-containing plasmid. Please describe its underlying principle in the context of *lac* operon. (10 分)

10. 何謂 Apoptosis? 其特色為何? 與 Necrosis 有何不同? Apoptosis 與器官發生(Development)有何關聯? 與癌症的形成又有何關聯? 試簡述之。(共 5 子題, 每子題 2 分)