

1. Mitochondria genome is small and very compact in terms of gene density, codon usage and nucleotide sequence (16, 569 bases) and nuclear genome is about  $3 \times 10^9$  bases. And recently it is estimated that the nuclear genome contains about  $3 \times 10^4$  genes. It is conceivable, there is a lot of differences between mitochondria and nuclear genomes. Please describe them briefly. (10%)
2. One researcher found that one sequence motif within a sequence is important for the gene activity from reporter gene assay and transfection study, what techniques can he/she can use to identify that a protein factor or transcriptional factor that is bound to the sequence motif, given that you have yeast host strains, reporter gene, etc, available for use. Also describe its principle behind it. (10%).
3. There are a number of ways to identify the mutation(s) or polymorphisms within a gene or the disease gene. Please list them and give a brief description of them. (10%).
4. In genetic linkage analysis to search a disease gene locus, one often has to identify a clone or subclone from a candidate region that contains exon(s) which presumably may contain important sequence information. Please list ways to identify that an insert containing an exon(s). (10%).
5. 試簡單說明 Microsatellite 及其生物技術上的操作方法與用途。(10%)。
6. 簡述 Fluorescence in situ hybridization(FISH) 的原理。(10%)。
7. 簡述幾種方法，如何從一塊臨床送來的皮膚癌組織中分離上皮與皮下結締組織。(10%)。
8. 請說明 confocal microscope 或是 fluorescent microscope 之原理。重點圖解尤佳。(二者擇一作答。若二者皆答，則閱卷者將擲銅板擇一評分而完全忽略另一答題，請勿浪費時間)。(10%)。
9. 假設有一 DNA binding protein X，一 DNA 片段 Y。現在研究者強烈懷疑 X 是 Y 的 binding protein。請設計兩種實驗，運用不同原理來顯示 X、Y 之間的 binding 是 specific 的，而不是 non-specific binding。(原理為主，不要描

(背面仍有題目,請繼續作答)

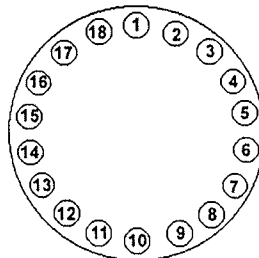
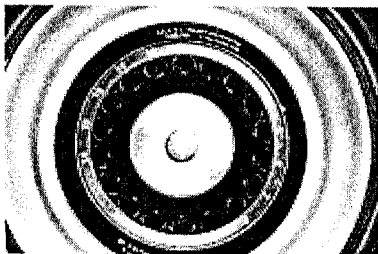
述一堆操作細節)。(10%)

10. 現有一微量離心機，其轉盤(rotor)可裝載 18 支微量離心管(如圖)。假設現在要離 7 支離心管，各含 20 $\mu$ l 的待離液體(也就是 7 支等重)，一般習慣會再加一支離心管，注入 20 $\mu$ l 水使 8 支離心管等重，以便平衡離心。(10%)

問題一：其實 7 支等重離心管本身就可以平衡離心，請繪圖說明之。(注意！請畫在答案卷上！千萬不要畫在這張試題上。以 18 洞轉盤為準)。

問題二：7 支可以平衡，那麼 11 支如何平衡？

(提示：從 3 支想起。即使畫出來的圖看起來不怎麼平衡，請你相信你的推論。此外，標上洞號可能會有幫助)



(示意圖。注意！請答在答案卷上，千萬不要答在這張試題上！)