中國文化大學94　學年度　碩士班入學考試

所(組)別：生物科技研究所碩士班　考試科目：分子生物學　93

問答題：(共 10 題)

1. 何謂 Okazaki fragments？請說明 Okazaki fragments 於 DNA 複製時扮演何種角色。(10 分)
2. Frederick Sanger 於 1980 年獲得諾貝爾化學獎，其貢獻在於核酸定序的方法，請說明此方法所應用之原理。(10 分)
3. 原核生物細胞以 Operon 調控其基因之表現，何謂 attenuation？*trp* operon 如何利用 attenuation 機制進行調控？(10 分)
4. 原核或真核生物細胞中，遺傳訊息如何由 RNA 傳遞至蛋白質？genetic code 有何特性？(提示：RNA 為核酸，蛋白由胺基酸所組成，RNA 如何轉譯成蛋白。) 請說明。(10 分)
5. DNA 複製過程中可能會發生錯誤，而造成突變，請解釋下列名詞，(a) point mutation (b) nonsense mutation (c) transition mutation (d) silent mutation (e) frameshift mutation，並分別說明這些突變對細胞所造成的影響。(10 分)
6. 當細胞受到激素刺激時，會促使細胞內的某些基因表現增加或減少，可用何種方式全面性偵測細胞中，RNA 的改變情形？(10 分)
7. 何謂 transposon？有哪些必要部份為構成 transposon 的基本要素？試說明之。(5 分)
8. 如果想要設計一個可在小鼠細胞株中表現外來基因的載體，需考慮哪些因素？載體上需要包含哪些元件？請列出並加以說明。(15 分)
9. 真核細胞中 rRNA 如何進行 processing，使 rRNA 由前驅物(precursor)變成熟(mature)形式？(5 分)
10. 何謂基因改造食品？說明你對基因改造產品的看法及接受程度。(15 分)

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（一）請回答下列有關胺基酸的問題：(共14%)
(1) 含有S的胺基酸(4%)
(2) 不具有α-amino group (2%)
(3) 不具有chiral carbon(2%)
(4) 構成Aspartame的胺基酸(4%)
(5) zwitterion的net charge (2%)

（二）請說明下列技術：(每小題4%，共16%)
(1) SDS-PAGE
(2) Gel filtration
(3) Southern blotting
(4) Biosensor

（三）當「s」=4 K_m時，v/V_{max}的比例為何？(4%)

（四）請說明在下列細胞中葡萄糖的最終代謝產物為何？請寫出反應之代謝方程式。(每小題2%，共6%)
(1) 氧氣充足的代謝細胞
(2) 激烈運動後的肌肉細胞
(3)在厭氧狀況下的酵母細胞

(伍) 配合題：(每小題2%，共14%)

a. Cellulose	1. Retinol; involved in vision
b. Vitamin E	2. Modified polysaccharide used as an anticoagulant
c. Heparin	3. Linear homopolysaccharide of D-glucose
d. Vitamin A	4. Contains a bicyclic ring with two carbonyls (aquinone); involved in blood coagulation
e. Glycogen	5. Antioxidant; reacts with free radicals
f. Vitamin K	6. Found in exoskeleton of insects
g. Chitin	7. Main storage polymer for carbohydrates in animals

(六) 細胞膜的脂質雙層能避免離子（如Cl^-，Mg^{2+}等）從細胞內快速移出。為甚麼？(4%)

（七）是非題，若敘述錯誤請訂正。(每小題2%，共22%)
a. The B vitamins are essential nutrients since they cannot be synthesized in humans and are the precursors for metabolically important coenzymes.
b. Hybridomas are derived from fusing lymphocytes, which produce antibodies with normal mouse cells.
c. Every "replication bubble" contains two replication forks.
d. DNA synthesis requires a 5-hydroxyl group on the primer strand.
e. Discontinuous DNA synthesis occurs on the leading strand of DNA.
f. DNA polymerase β in eukaryotic cells is thought to be a repair enzyme.
g. The V_{max} value for an enzyme is independent of substrate and enzyme concentration.
h. Enzymes which conform to Michaelis-Menten kinetics are not involved in any feedback regulation.
i. Enzymes reduce the value of ΔG° for a reaction.
j. Allosteric enzymes always exhibit sigmoidal plots of V versus S.
k. The greater the association constant, Km, for the ES complex, the stronger the interactions between the enzyme and the substrate.

（八）有一段未知序列的peptide，經由chymotrypsin作用後產生數段的小peptide其序列（從N端到C端）為Asn-Glu-Ser-Arg-Val-Ile-Trp，Thr-Leu-Met-Ile，Met-Val-Ser-Thr-Lys-Leu-Phe，若由trypsin作用後產生數段小peptide其序列（從N端到C端）為Met-Val-Ser-Thr-Lys，Val-Ile-Trp-Thr-Leu-Met-Ile，Leu-Phe-Asn-Glu-Ser-Arg。(1)請寫出此peptide原本之序列（從N端到C端）(7%)。(2)經Cyanogen bromide(CNBr)作用後，會產生何種peptide？(3%)

（九）DNA can be denatured by increasing the temperature of DNA solution. (1) What is the definition of Tm in a DNA denaturation experiment? (4%) (2) The melting profile for the same DNA was obtained under two different solution conditions. In one case, the NaCl concentration was 0.001 M, while the other condition was at 0.01 M NaCl. What effect would the different NaCl concentrations have on the Tm value? (6%)