



所別：基礎醫學研究所

科目：生物化學 【考生不可攜帶電子計算機應試】

考生注意：答案必須寫在答案卷上，否則不予計分。

### 第一部份

- 1-1、對一位因 estrogen receptor gene overexpression 所造成之乳癌病人，您認為未來可以嘗試那些療法治療(5%)?
- 1-2、舉出兩個分別需經磷酸化及去磷酸化的 transcriptional factors 並比較其進出核之機轉(10%)!
- 1-3、請比較細胞中 steroid nuclear receptors 訊息傳遞與 peptide hormone receptors 訊息傳遞之差異(10%)

### 第二部份

- 2-1、The Nobel Prize in Chemistry 2008 "for the discovery and development of the green fluorescent protein, GFP".  
What is the significance of GFP requirement in contemporary biochemistry? (8pts)
- 2-2、What are the major difference between the mechanisms of protein import into endoplasmic reticulum and those of protein import into mitochondria?(8pts)
- 2-3、Standard conditions for hydrolyzing RNA to nucleotides are 0.3N NaOH at 37°C for 16h.  
Draw a chemical reaction mechanism for this hydrolysis.(5pts)  
Why is the DNA not hydrolyzed under these conditions?(4pts)

### 第三部份

- 3-1、人體在 fasting state 時，adipose tissue 會釋放出 free fatty acid，請詳細說明如何經由 Triacylglycerol/Fatty acid cycle 將 65~75%的 free fatty acid 再脂化形成 triacylglycerol，儲存於 adipose tissue。(10分)
- 3-2、為什麼人體內新合成出來的脂肪酸不會馬上被分解？請說明其調控機制。(5分)
- 3-3、請說明一個健康成人在 well-fed state 時，high blood glucose level 如何調控 Pancreatic  $\beta$  cell 分泌 Insulin?(10分)

### 第四部份

- 4-1、Carbonic anhydrase of erythrocytes ( $M_r$  30,000) has one of the highest turnover numbers we know of. It catalyzes the reversible hydration of  $\text{CO}_2$ :
- $$\text{H}_2\text{O} + \text{CO}_2 \rightleftharpoons \text{H}_2\text{CO}_3$$
- This is an important process in the transport of  $\text{CO}_2$  from the tissues to the lungs. If 10.0  $\mu\text{g}$  of pure carbonic anhydrase catalyzes the hydration of 0.30 g of  $\text{CO}_2$  in 1 min at 37°C at  $V_{\text{max}}$ , what is the turnover number ( $K_{\text{cat}}$ ) of carbonic anhydrase (in units of  $\text{min}^{-1}$ )? (5%)

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4-2、Estimate the  $V_{\max}$  and  $K_m$  of the enzyme-catalyzed reaction for which the following data were obtained. (5%)

[S] (M)	$V_0$ ( $\mu\text{M}/\text{min}$ )
$2.5 \times 10^{-6}$	28
$4.0 \times 10^{-6}$	40
$1 \times 10^{-5}$	70
$2 \times 10^{-5}$	95
$4 \times 10^{-5}$	112
$1 \times 10^{-4}$	128
$2 \times 10^{-3}$	139
$1 \times 10^{-2}$	140

4-3、One critical function of chondroitin sulfate is to act as a lubricant in skeletal joints by creating a gel-like medium that is resilient to friction and shock. This function seems to be related to a distinctive property of chondroitin sulfate: the volume occupied by the molecule is much greater in solution than in the dehydrated solid. Why is the volume so much larger in solution? (5%)

4-4、A congenital defect in the liver enzyme fructose 1,6-bisphosphatase results in abnormally high levels of lactate in the blood plasma. Explain. (5%)

4-5、The  $V_{\max}$  of the glycogen phosphorylase from skeletal muscle is much greater than the  $V_{\max}$  of the same enzyme from liver tissue. (5%)

(a) What is the physiological function of glycogen phosphorylase in skeletal muscle? In liver tissue?

(b) Why does the  $V_{\max}$  of the muscle enzyme need to be greater than that of the liver enzyme?