

# 東吳大學 104 學年度碩士班研究生招生考試試題

第 1 頁，共 1 頁

系級	微生物學系碩士班 B、C 組	考試時間	100 分鐘
科目	生物化學	本科總分	100 分
<p>1. Draw the basic building block structure of the following compounds. (15 points)</p> <p style="margin-left: 40px;">a) protein                      b) starch                      c) nucleic acid</p> <p>2. We can categorize the molecular organization in a cell into 4 levels, they are: level 1 monomeric units, level 2 macromolecules, level 3 supramolecular complexes, and level 4 the cell and its organelles. Please describe the chemical interaction(s) in each level and explain their biological meanings. (20 points)</p> <p>3. 1) What is Henderson-Hasselbalch equation? (5 points)                  2) By using H-H equation, please explain how a phosphate system can keep the cytoplasmic pH in the range of 5.9 to 7.9. The pKa of phosphate is 6.68. (10 points)</p> <p>4. 1) Please define the following terms: <b>genetic code; codon; anticodon</b>. (10 points)                  2) Explain the detail relationship among the bases in DNA, the codons of mRNA and the anticodons of tRNA? (5 points)</p> <p>5. Explain how mutations in the following proteins might result in either loss of responsiveness to a given hormone or production of a continuous signal even in the absence of the hormone:</p> <p style="margin-left: 40px;">1) a mutation in the regulatory (R) subunit of cAMP-dependent protein kinase, making R incapable of binding to the catalytic (C) subunit (5 points)                  2) a mutation in a growth factor receptor with protein kinase activity (5 points)                  3) a defect in a G protein that renders the GTPase activity inactive (5 points)</p> <p>6. A scientist wishes to produce a mammalian protein in <i>E. coli</i>. The properties of this mammalian protein are: 1) a glycoprotein with molecular weight of 40,000; 2) approximately 20% of its mass is polysaccharide; 3) contains 3 disulfide bonds; 4) the biological active form is phosphorylated                  Please answer the following questions:</p> <p style="margin-left: 40px;">1) What sequences or elements will be required in the vector to get the gene of this protein to be transcribed and translated successively in <i>E. coli</i>? (5 points)                  2) What is the approximate size of the cDNA of this mammalian protein to be cloned? (5 points)                  3) Can this scientist produce this protein in its active form in <i>E. coli</i> system successfully? Explain your reasoning. (10 points)</p>			