

注意：考試開始鈴響前，不得翻閱試題，  
並不得書寫、畫記、作答。


國立清華大學 113 學年度碩士班考試入學試題

系所班組別：分析與環境科學研究所

科目代碼：2804

考試科目：生物化學

### —作答注意事項—

1. 請核對答案卷（卡）上之准考證號、科目名稱是否正確。
2. 考試開始後，請於作答前先翻閱整份試題，是否有污損或試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
3. 考生限在答案卷上標記「由此開始作答」區內作答，且不可書寫姓名、准考證號或與作答無關之其他文字或符號。
4. 答案卷用盡不得要求加頁。
5. 答案卷可用任何書寫工具作答，惟為方便閱卷辨識，請儘量使用藍色或黑色書寫；答案卡限用 2B 鉛筆畫記；如畫記不清（含未依範例畫記）致光學閱讀機無法辨識答案者，其後果一律由考生自行負責。
6. 其他應考規則、違規處理及扣分方式，請自行詳閱准考證明上「國立清華大學試場規則及違規處理辦法」，無法因本試題封面作答注意事項中未列明而稱未知悉。

# 國立清華大學 113 學年度碩士班考試入學試題

系所班組別：分析與環境科學研究所碩士班

考試科目（代碼）：生物化學(2804)

共 2 頁，第 1 頁

\*請在【答案卷】作答

1~10 題為簡答題 (每題 10 分)

1. Please describe the principles of MALDI-TOF MS and tandem MS/MS? and their differential applications in analyzing biological samples?
2. The primary step in adherent-cell-subculture is to detach cells from the substratum as the cells reach high confluence and both EDTA and trypsin are frequently applied for this purpose. Trypsinized cells are subsequently subdivided and reseeded into fresh cultures. Do you think will the trypsinization damage cell membrane proteins or disturb cell signaling? Please design an experiment to examine the trypsin-induced cell / membrane protein damages?
3. What are differences between Diabetes mellitus type 1 and Diabetes mellitus type 2?
4. What is peptide finger printing in mass spectrometry analysis? How can it be used for protein identification in proteomics?
5. Describe the N-containing molecules and pathways in nitrogen cycle?
6. How glycerol phosphate shuttle and malate aspartate shuttle works in cellular energy transfer? What are roles of these two shuttles in cells?
7. Which pathway is responsible for the biosynthesis of Aromatic Amino Acids (Phe, Tyr, Trp)? Which intermediate molecule is a branch point and responsible for the biosynthesis of aromatic amino acid? Apart from aromatic amino acid, what kind of bioactive / nutrition molecules can be synthesized through this pathway (please list 3 derivatives)?
8. What are the biological significances of pentose phosphate pathway? Please describe how the Cori cycle works?

國立清華大學 113 學年度碩士班考試入學試題

系所班組別：分析與環境科學研究所碩士班

考試科目（代碼）：生物化學(2804)

共 2 頁，第 2 頁

\*請在【答案卷】作答

9. Please calculate the absolute ratio of drug available for a protein in a cell biology experiment according to the following parameters? (ie. Calculate how many drug molecules surround a cellular protein molecule?). (parameters: drug can completely penetrate plasma membrane; suppose the cultured cells has ball-like morphology with a diameter of 10  $\mu\text{m}$ ; the volume of a ball is  $(4/3)\pi r^3$ ; the concentration of treated drug is 1 mM; the average protein molecular weight in the cell is 53 kDa; the density of cytoplasm is 1  $\text{g}/\text{cm}^3$ ; Avogadro constant is  $6 \times 10^{23}$ )
10. Please draw the molecular structures of L-lysine, Isoleucine, tyrosine and cysteine?