

國立屏東教育大學 100 學年度研究所碩士班入學考試

科學文獻判讀 試題

(化學生物系碩士班)

※請注意：1.本試題共二頁。

2.答案須寫在答案卷上，否則不予計分。

問答題 (共 100 分)

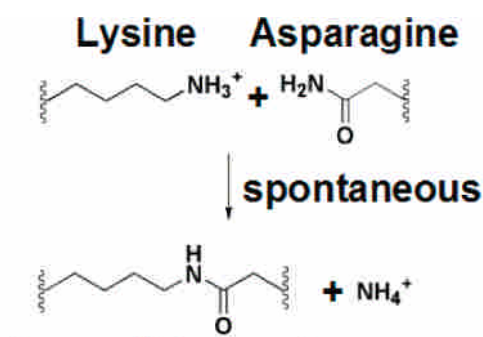
一、

Spontaneous Intermolecular Amide Bond Formation between Side Chains for Irreversible Peptide Targeting

Bijan Zakeri and Mark Howarth

J. AM. CHEM. SOC. 2010, 132, 4526–4527

Peptides and synthetic peptide-like molecules are powerful tools for analysis and control of biological function. One major problem with the use of peptides is the instability of their interactions with biomolecules, with typically micromolar affinity relating to the limited accessible surface area and the intrinsic flexibility of peptides. However, appending a short peptide tag is the most common way to allow a protein of interest to be isolated or detected, giving minimum perturbation to protein function. Here we have designed a way to bind a peptide tag irreversibly, by adapting a recently discovered feature of amino acid chemistry: the spontaneous formation of an amide bond between a Lys and an Asn side chain in the appropriate environment.



參考說明：

peptide：縮氨酸；	biomolecule：生化分子；	micromolar：微分子；
append：附加	perturbation：擾動	irreversible：不可逆性
adapt：改造	spontaneous：自發的	Ly：lysine 離氨酸
As：asparagine 天門冬酸	limited accessible surface area：最小有效面積	

閱讀上文後，請回答下列問題：

- (一) 縮氨酸之應用存在何種問題？其起因為何？(25分)
- (二) 此篇論文在分離與檢測蛋白質方面，具什麼特殊性？(25分)

二、

Biochemical reactions, this is, the chemical reactions that comprise the metabolism of all living cells, need to be catalyzed to proceed at the pace required to sustain life. Such life catalysts are the enzymes. Each one of the biochemical reactions of the cell metabolism requires to be catalyzed by one specific enzyme. Enzymes are protein molecules that have evolved to perform efficiently under the mild conditions required to preserve the functionality and integrity of the biological systems.

Enzymes can be considered then as catalysts that have been optimized through evolution to perform their physiological task upon which all forms of life depend. No wonder why enzymes are capable of performing a wide range of chemical reactions, many of which extremely complex to perform by chemical synthesis. It is not presumptuous to state that any chemical reaction already described might have an enzyme able to catalyze it. In fact, the possible primary structures of an enzyme protein composed of n amino acid residues is 20^n so that for a rather small protein molecule containing 100 amino acid residues, there are 20^{100} or 10^{130} possible amino acid sequences, which is a fabulous number, higher even than the number of molecules in the whole universe.

閱讀上文後，請回答下列問題：

- (一) 請定義生物化學反應，並說明酵素對於生物化學反應的影響？(25分)
- (二) 為何酵素具有廣泛執行各式各樣化學反應的能力？(25分)