



國立臺灣大學 **數學發展中心**
Center for Teaching and Learning Development

教學工作坊

幫助學生。 **成就自己**

經營教學心得

教學歷程檔

國立臺灣大學

教學發展中心主任 莊榮輝

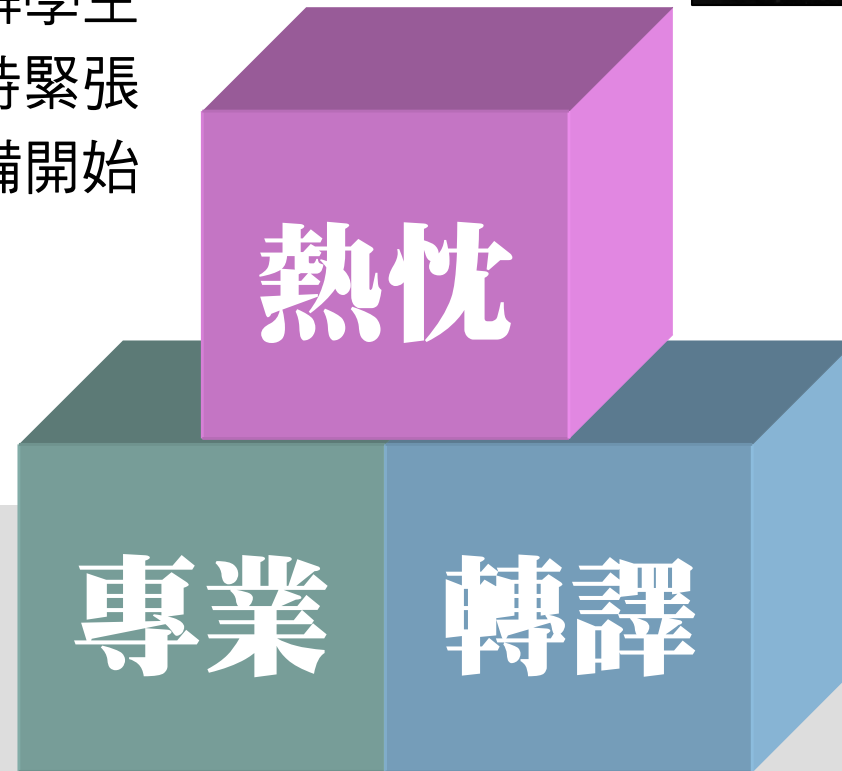
生命科學院 生化科技學系



- (1) 無熱忱易被識破
- (2) 主動去瞭解學生
- (3) 平常心看待緊張
- (4) 以專業準備開始



Great Mentors



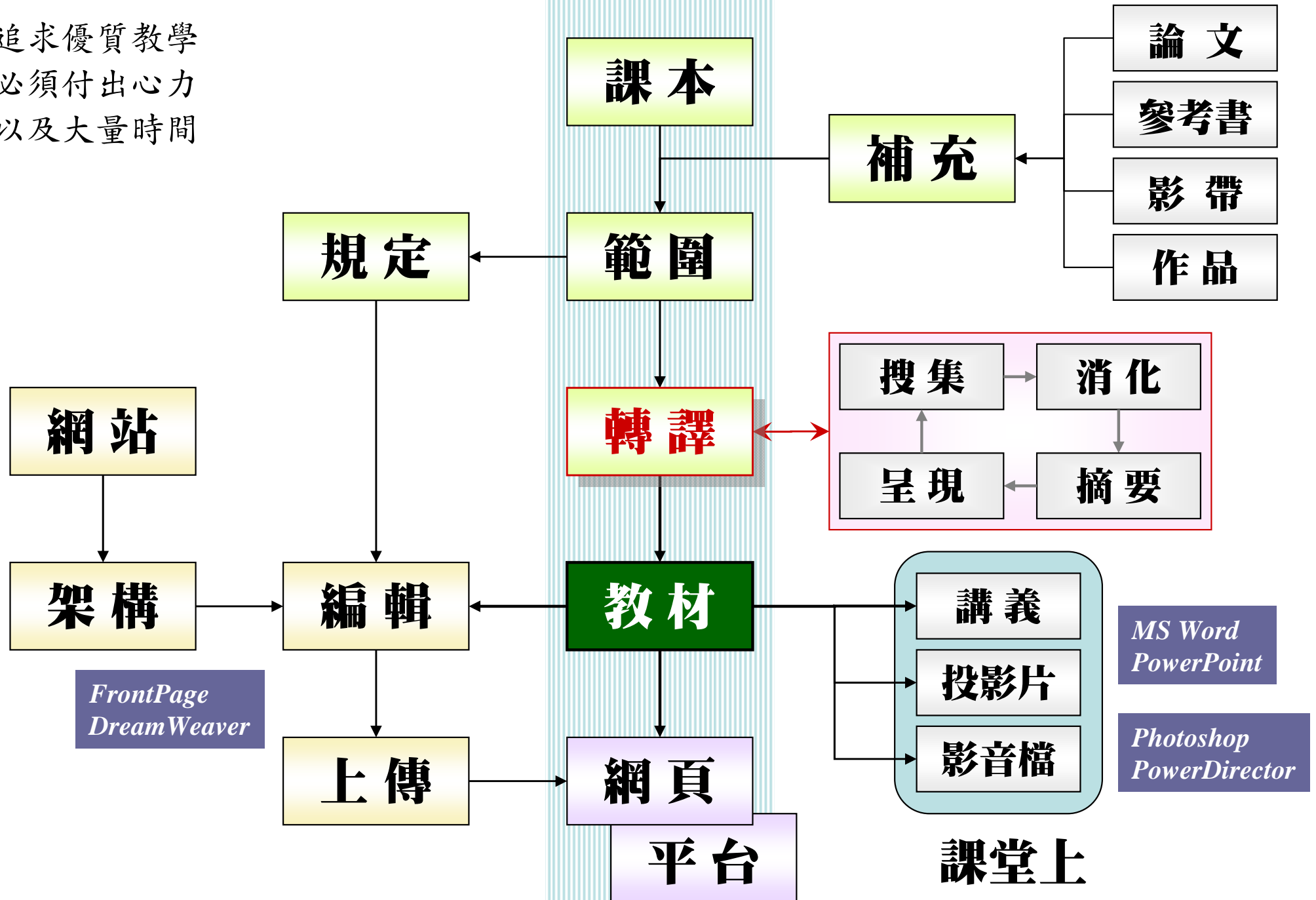
- (1) 專業素養要深厚
- (2) 自己先累積趣味
- (3) 要配合學生背景
- (4) 啟發知識與見識

- (1) 學識要經過轉譯
- (2) 以投影片為舞台
- (3) 充分預習與掌握
- (4) 利用問題與個案

以學生之立場與角度

準備課程之關鍵流程

追求優質教學
必須付出心力
以及大量時間



nature | Vol 463 14 January 2010 | 10.1038/nature08473

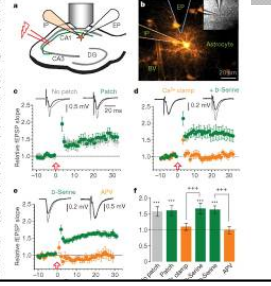
LETTERS

Long-term potentiation depends on release of D-serine from astrocytes

Christian Henneberger¹, Thomas Papouin¹, Stéphane H. R. Oliet^{1,2} & Dmitri A. Rusakov¹

Long-term potentiation (LTP) of synaptic transmission provides an experimental model for studying mechanisms of memory¹. The classical form of LTP relies on N-methyl-D-aspartate receptors (NMDARs), and it has been shown that astroglia can regulate their activation through Ca²⁺-dependent release of the NMDAR co-agonist D-serine². Release of D-serine from glia enables LTP in cultured³ and explains a correlation between glial coverage of synapses and LTP in the hippocampal dentate gyrus⁴. However, increases in Ca²⁺ concentration in astroglia can also release other signalling molecules, most prominently glutamate⁵. ATP and tumour necrosis factor- α ^{6,7}, whereas neurons themselves can synthesize and supply D-serine⁸. Furthermore, loading an astrocyte with exogenous Ca²⁺ buffers does not suppress LTP in hippocampal area CA1 (refs 1–10), and the physiological relevance of experiments in cultured or strong exogenous stimuli applied to astrocytes has been questioned¹¹. The involvement of glia in LTP induction therefore remains controversial. Here we show that clamping internal Ca²⁺ in individual CA1 astrocytes blocks LTP induction at nearby excitatory synapses by decreasing the occupancy of the NMDAR co-agonist site. This LTP blockade can be reversed by exogenous D-serine or glycine, whereas depletion of D-serine or disruption of exocytosis in an individual astrocyte blocks LTP. We therefore demonstrate that Ca²⁺-dependent release of D-serine from an astrocyte controls NMDAR-dependent plasticity in many thousands of excitatory synapses nearby.

To investigate the role of calcium in NMDAR-dependent LTP, we focused on Schaffer collateral (SC)-CA1 pyramidal cell synapses, a classical subject of LTP studies. We patched positive astrocytes in the stratum radiatum and monitored SC-mediated field excitatory post-

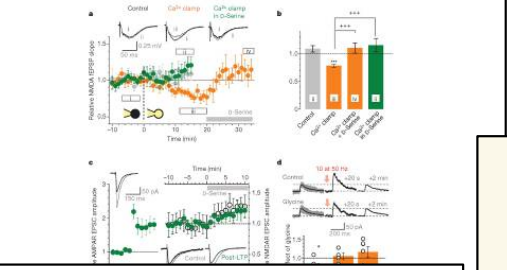


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LETTERS

Collecting → Digesting → Abstracting → Presenting

subsequent application of neuronal NO 2–9% relative to baseline, and synaptic transmission was unaffected by the presence of D-serine from the same cell blocked the inhibitory effect of Ca²⁺ clamp (66.1 ± 1.2%, n = 7; Fig. 2a,b). Ca²⁺-dependent LTP

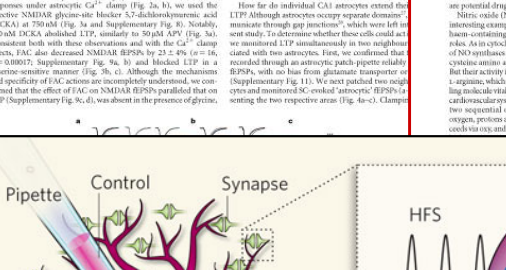


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LETTERS

Collecting → Digesting → Abstracting → Presenting

to boost the cognitive ability transiently short-term potentiation of the NMDAR-mediated EPSC component 20 s after the train



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NEWS & VIEWS

Collecting → Digesting → Abstracting → Presenting

of one oxygen atom — derived from the oxygen from its 2H₂O — a biological puzzle. Cytochrome P450 enzymes have various catalytic functions such as the biosynthesis of steroid hormones, vitamins and antibiotics, and the crucial first step in the removal of toxic drugs from the body (Crosby¹). One subgroup of the cytochrome P450s is the aromatases, which convert the steroid androstenedione to the oestrogen oestrone. This involves three oxidative oxidations, each requiring oxygen and NADPH (a naturally occurring reducing agent). The first two oxidations are thought to be catalysed by a cytochrome enzyme, whereas the third involves a ferric peroxide complex². Because oxidizing activity and redox levels are elevated in most breast cancers, the enzymes are potential drug targets.

NEUROSCIENCE

Mirko Santello and Andrea Volterra

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NEWS & VIEWS

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of NO synthases contain a haem bound to a cysteine amino acid (the base, B, in Fig. 1b). But their activity is confined to the amino acid L-arginine, which it converts to NO — a signalling molecule vital to the nervous, immune and cardiovascular systems. The chemistry involves two sequential oxidations, each requiring oxygen, protons and NADPH. Each step proceeds via oxy, and follows on to either peroxy³, hydroperoxy or cpd I intermediates.

In some enzymes, such as haem oxygenases (HOs), ferric hydroperoxide is the oxidizing species⁴, and the substrate is the haem itself. HOs are found in many organisms, and in mammals the oxidation products are biologically vital: biliverdin, which acts as an antioxidant; liberated iron(II) ions, which are recycled for use elsewhere (primarily in haems); and carbon monoxide, which is used as a neurotransmitter. Reactions mediated by the enzyme cytochrome c oxidase, a member of the haem-copper oxidase (HCO) superfamily, probably also proceed through a ferric hydroperoxy complex, which then undergoes O–O cleavage and formation of cpd II (ref. 15). HCOs facilitate proton pumping across mitochondrial membranes, which generates a proton

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the first direct evidence for this proposal. The authors induce long-term potentiation (LTP) of excitatory synapses in the hippocampus using a high-frequency-stimulation protocol, which involves applying repetitive electrical stimuli to the presynaptic fibres. LTP is the sustained increase in synaptic strength associated with memory formation, and the authors monitored this synaptic potentiation locally, in domains roughly corresponding to the territories of individual astrocytes. They did this by recording the electrical signal generated by the ensemble of synapses in the territory, using an extracellular electrode or, alternatively, directly through the astrocyte.

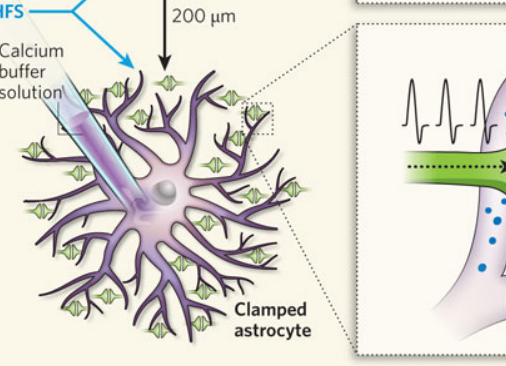
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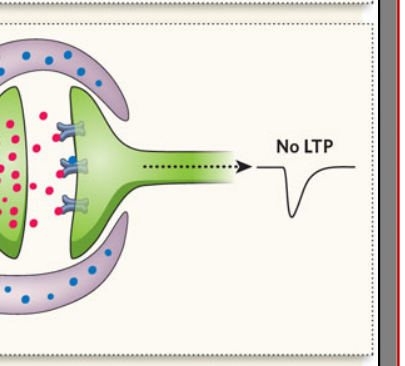
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astrocyte expressed LTP at nearby synapses but not at synapses near the neighbouring control cell (Fig. 1b). Synaptic responses were evoked by intracellular stimulation of the axon of Schaffer collateral (SC) cells and recorded in the stratum radiatum using a patch pipette. The pipette was inserted into the stratum radiatum more than 200 μm from the astrocyte. The pipette was inserted into the stratum radiatum more than 200 μm from the astrocyte.

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Nature: News & Views

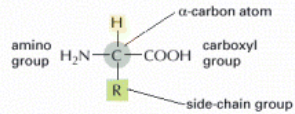
Science: Perspectives

Scientific American

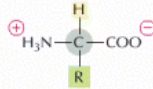
二十種基本胺基酸

THE AMINO ACID

The general formula of an amino acid is

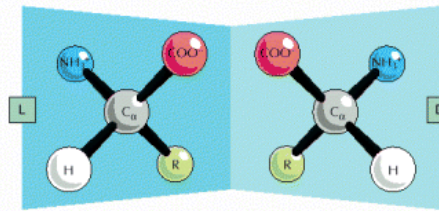


R is commonly one of 20 different side chains. At pH 7 both the amino and carboxyl groups are ionized.



OPTICAL ISOMERS

The α -carbon atom is asymmetric, which allows for two mirror image (or stereo-) isomers, L and D.

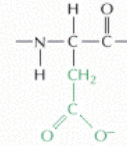


Proteins consist exclusively of L-amino acids.

ACIDIC SIDE CHAINS

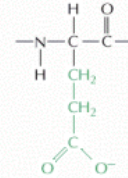
aspartic acid

(Asp, or D)



glutamic acid

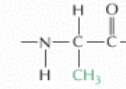
(Glu, or E)



NONPOLAR SIDE CHAINS

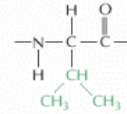
alanine

(Ala, or A)



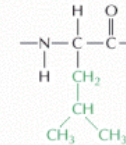
valine

(Val, or V)



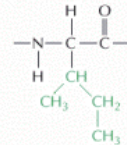
leucine

(Leu, or L)



isoleucine

(Ile, or I)



FAMILIES OF AMINO ACIDS

The common amino acids are grouped according to whether their side chains are

- acidic
- basic
- uncharged polar
- nonpolar

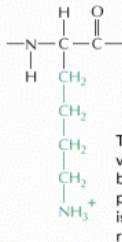
These 20 amino acids are given both three-letter and one-letter abbreviations.

Thus: alanine = Ala = A

BASIC SIDE CHAINS

lysine

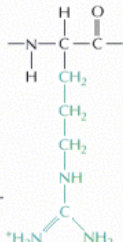
(Lys, or K)



This group is very basic because its positive charge is stabilized by resonance.

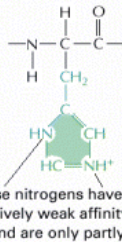
arginine

(Arg, or R)



histidine

(His, or H)

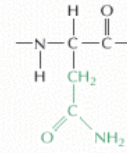


These nitrogens have a relatively weak affinity for an H⁺ and are only partly positive at neutral pH.

UNCHARGED POLAR SIDE CHAINS

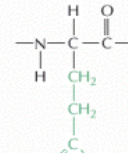
asparagine

(Asn, or N)



glutamine

(Gln, or Q)

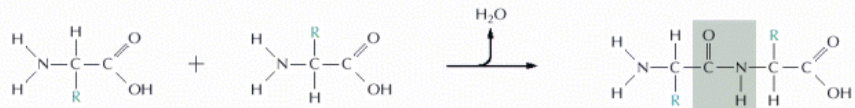


Although the amide N is not charged at neutral pH, it is polar.

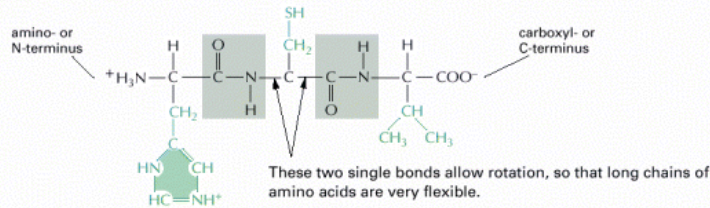
PEPTIDE BONDS

Amino acids are commonly joined together by an amide linkage, called a peptide bond.

Peptide bond: The four atoms in each gray box form a rigid planar unit. There is no rotation around the C-N bond.

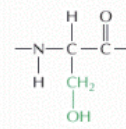


Proteins are long polymers of amino acids linked by peptide bonds, and they are always written with the N-terminus toward the left. The sequence of this tripeptide is histidine-cysteine-valine.



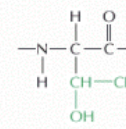
serine

(Ser, or S)



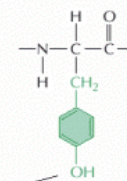
threonine

(Thr, or T)



tyrosine

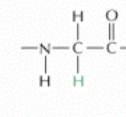
(Tyr, or Y)



The -OH group is polar.

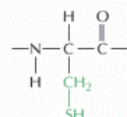
glycine

(Gly, or G)



cysteine

(Cys, or C)

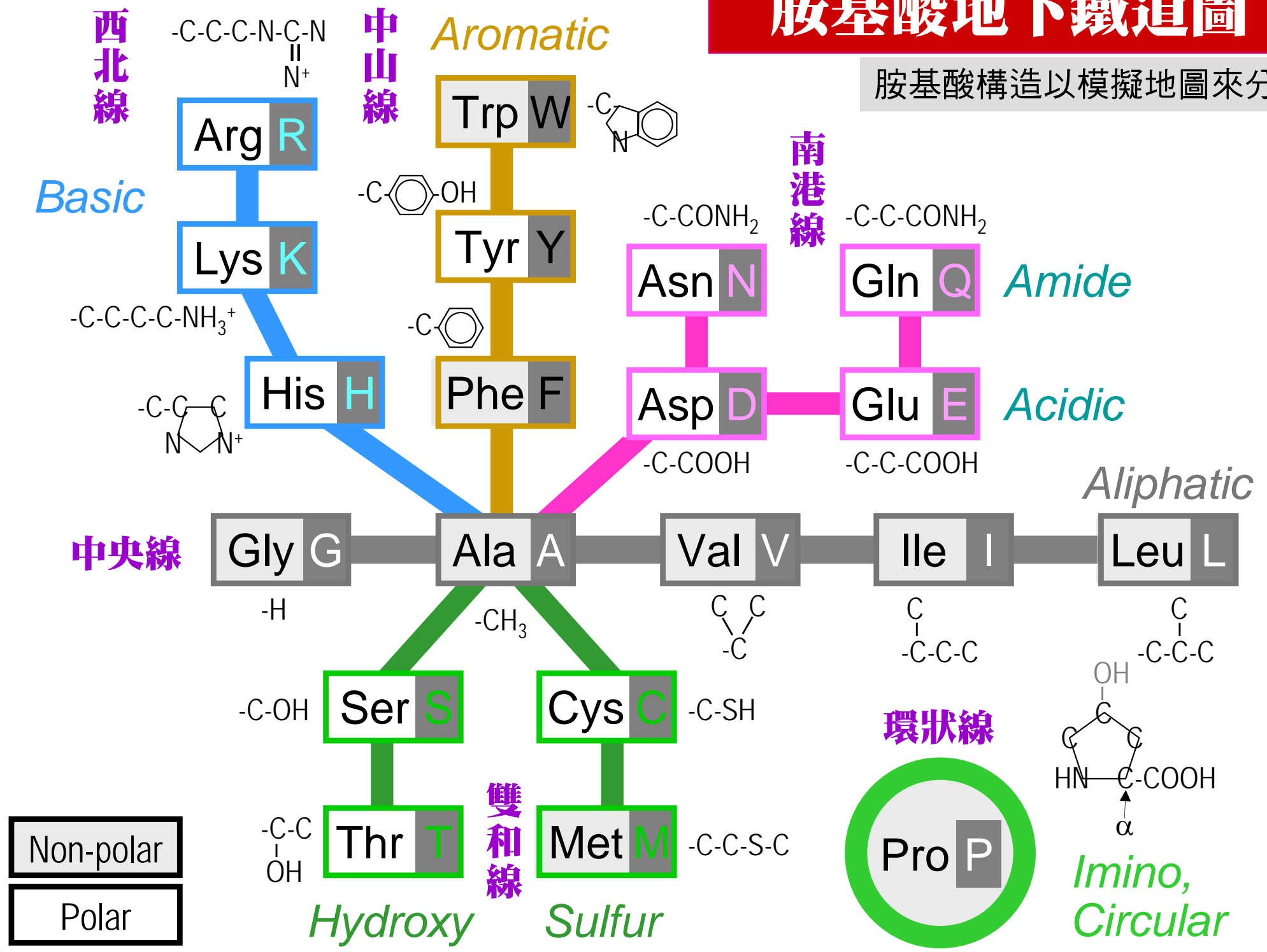


Disulfide bonds can form between two cysteine side chains in proteins.



胺基酸地下鐵道圖 6

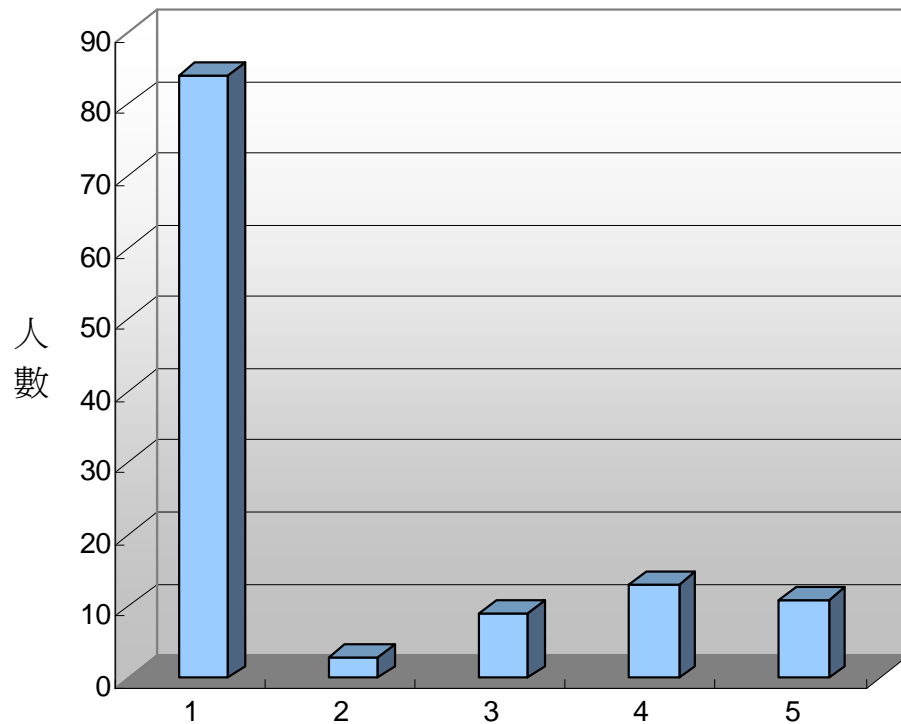
胺基酸構造以模擬地圖來分類



上課前	工作提要
基本	(1) 儘早決定課程範圍，預留足夠 時間 ，以充分準備上課資料。 (2) 把課程內容一一 轉換 成教材，記得要以學生的觀點為出發。 (3) 至少完成所負責課程範圍的 講義 ，可以是文字檔或投影片。 (4) 儘早完成講義 第一版 (first draft) ，並不時修改內容及格式。 (5) 把上課資料公佈在 課程平台 ，並讓學生知道所有 重要規定 。
進階	(6) 建立自己的 課程網頁 ，適時加入影音資料，提升學習印象。 (7) 申請教學助理，帶領 TA 團隊 ，與學生對話，共同經營班級。
上課時	工作提要
基本	(1) 每堂課前 充分預習 ，熟悉每一張投影片，並條列記下重點。 (2) 一定要控制好 時間 ，不要在規定時間內，塞入太多投影片。 (3) 開始上課就簡要描述當日 重點 ，讓學生預知將要學到什麼。 (4) 難免 焦慮緊張 ，充分備課並熱忱講授，就能得到學生肯定。
進階	(5) 必要時，可自行在課堂中進行教學效果之 回饋問卷 (KQS) 。 (6) 每上課段落，對關鍵性概念提出問題，以 表決器 帶動討論。

有關生命源起的看法？

(我的通識課上課實例)



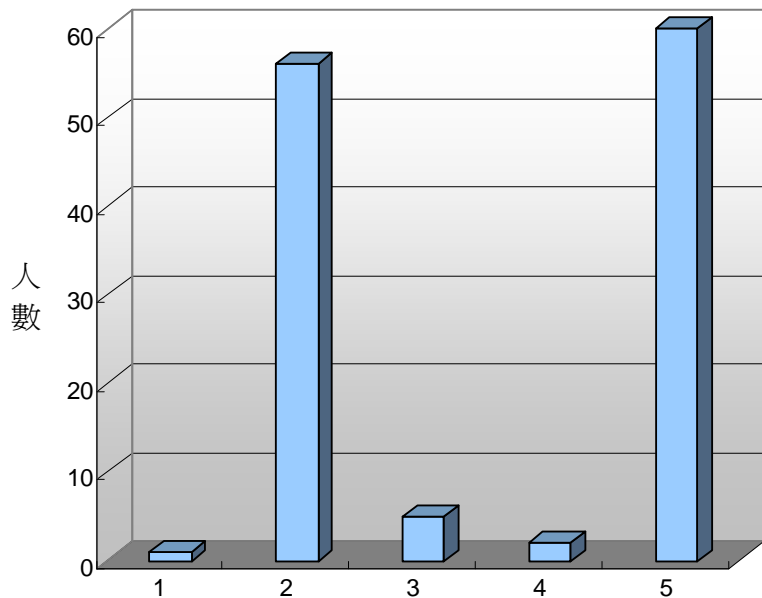
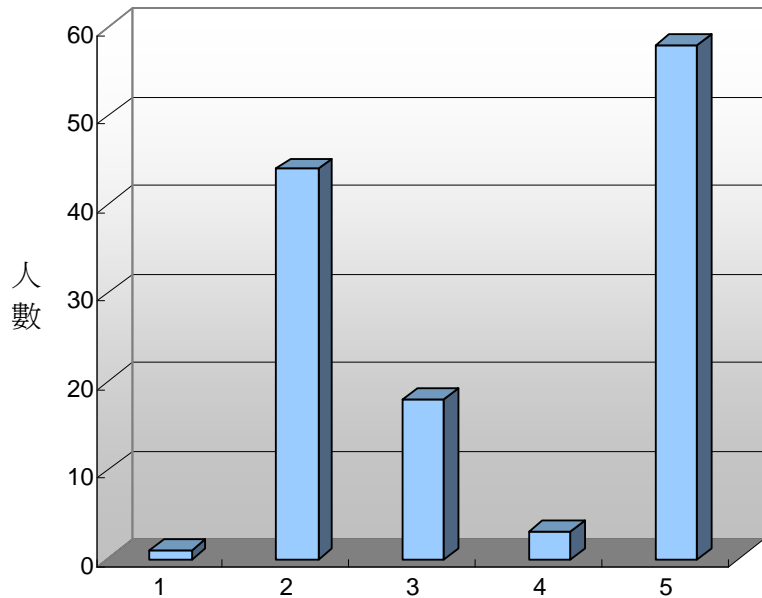
- (1) 我支持演化論
- (2) 我支持創造論
- (3) 我支持智慧設計
- (4) 我都可以接受
- (5) 都不接受

學生很想知道全班表決結果

考試不能考這種題目 利用 clicker 即時回應



有關遺傳基因何者正確？



- (1) 遺傳學理論最早由摩根提出
- (2) 基因貯藏在細胞核的染色體
- (3) 細胞所有基因表現能力相同
- (4) 基因複製不容許有任何錯誤
- (5) 基因是由密碼 A,T,C,G 組成

可促進大班級之師生互動



把自己的舞台經營好

影音水雷空

高亮度**投**影機



自我評估

成功特質	預期	我
1 自信	10	
2	10	
3	10	
4	10	

溫度適中的**空**調
(注意空氣是否清新)



清晰且方便的**擴**音器

善用**雷**射筆



飲水有時很重要



階梯教室



潛在因素：有效維護影音設備，環境影響上課品質！