

30 天精通医学英语系列丛书

生 物 化 学

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内 容 简 介

本书是《30天精通医学英语系列丛书》的一本,按照最新中文版的《生物化学》教材章节结构,从美国著名医学院校的课堂笔记选择英语原文,经适当改编,作为本系列丛书的核心内容,并按照量的多少分成30天。在每页的原文后有公共英语词汇和医学英语词汇的精解。英语词汇的解释,是按照出现的先后顺序给予的。原文和词汇的解释按双单页排版,读者不用翻页便能找到词汇的解释,省时、省事。词汇的精解是本系列的另一个核心,几乎采用了所有的记忆词汇的方法,使记忆枯燥、复杂的词汇变得有趣、简单,而且采用“词中词”的形式,使读者对词汇的记忆起连锁反应。

本书内容和形式设计完全符合学习和记忆的规律,能帮助读者在最短时间内克服医学英语难关,达到词汇最多和能阅读医学英文的目的,并独创了利用医学学英语、结合英语掌握医学的一种方法。

本书可供医学生、研究生使用,也可供临床医护人员晋级、晋升考试,查房,进修,阅读文献,论文写作,国际交流等使用。

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引 言

三管齐下(融医学专业知识、医学英语和公共英语为一体)
滚动冲击式速效突破医学英语

在公共英语普遍提高的情况下,医学英语的水平正在成为衡量一个医学生、医护人员能力的最重要的指标之一。那么摆在我们面前的就是要如何学好它。《30天精通医学英语系列丛书》就是一套适合中国人的滚动冲击式速效突破医学英语的系列丛书,用来献给那些正在和将要迎接挑战医学英语的医学生和医护人员。

《30天精通医学英语系列丛书》能帮你在最短时间内克服医学英语难关、达到词汇最多和能阅读医学英文原版的目的。它是应时代和现实的要求,总结了无数成功和失败的学习经验后产生的;是一套弥补医学人员学公共英语和医学英语方法不足的丛书;是一套独创利用医学学英语、结合英语掌握医学方法的丛书,是每一个医学人的无价之宝。

1. 所有原文都精选自著名英美医学院校的课堂笔记和(或)医学原版著作,经适当改编,作为本系列丛书的核心内容,内容和形式设计完全符合学习和记忆的规律。其特点是:①保持英语“原”味,决无“中式”之嫌;②保持文章长度适中,既不太长以避免浪费读者的时间,又不太短而起不到作用;③每个分册基本按照我国教育部规划教材精选15~20个主题,按照量的多少和难易分成30天。

2. 应用现代科技,在每页的原文后有公共英语词汇和医学英语词汇的精解。医学英语词汇的解释,是按照出现的先后顺序给予的。原文和词汇的解释按双单页排版,读者不用翻页便能找到词汇的解释,省时、省事(原文部分都在双页)。因为有公共英语的解释,读者的公共英语水平可以是任何级别的,而且,医学知识的背景,将有助于公共词汇的加强记忆。

3. 词汇的精解是本系列的另一个核心,几乎采用了所有的记忆词汇的方法,使记忆枯燥、复杂的词汇变得有趣、简单,而且采用“词中词”的形式,使读者对词汇的记忆起连锁反应。

这里举些例子,这些例子都选自各个分册的词汇精解。

(1) 同形(易混词)同记

mortality 死亡率; mort 死[例, postmortem 死后的]+al 形容词后缀+ity 名词后缀

morbidity 发病率; mor 精神+bid→bite 咬→使人精神垮掉的+ity 名词后缀→发病率

perfume 香水; per 完全+fume 烟(味)→全是味→香水

presume 假定; pre 前 + sume 做〔例, assume 推测〕→前边做→前边认为→假定

detect 探测; de = dis 去掉 + tect 盖 → 揭了盖 → 探测

defect 缺陷; de 否定前缀 + fect = fact 做〔例, factory 工厂(做工的地方)〕→天生没有做好→缺陷

exercise 锻炼; exerc = exert 做 + ise 动词后缀 → 用劲做 → 锻炼

excise 切除; ex 外 + cise 切〔例, precise 准确的(预先切好)〕

scarce 缺少的, 不足的; scar 疤 + ce 后缀 → 疤是正常组织缺少 → 不足的

scare 恐吓; s(按发音记, 死) + care 照顾 → 用死来照顾 → 恐吓

(2) 词根共记

cardi 心脏

myocarditis 心肌炎; myo 肌肉〔例, myology 肌学〕 + cardi 心脏 + tis 炎症

cardiology 心脏病学; cardi 心脏 + ology 学科〔例, physiology 生理学〕

pericardium 心包; peri 周围〔例, peripheral 周围的〕 + cardi 心脏 + um 名词后缀〔例, epithelium 上皮〕

sist 坐

persist 坚持; per 完全〔例, perfect 完美的〕 + sist 坐 → 彻底的坐 → 坚持

assist 帮助; as → ad 加强前缀, 因第二个“s”把“d”同化了〔例, assume 推测〕 + sist 坐 → 与朋友同坐 → 帮助

resist 抵抗; re 反, 回〔例, return 归还〕 + sist 坐 → 反坐 → 顶着干 → 抵抗

consist 组成; con 共同〔例, confuse 混淆(fuse 流)〕 + sist 坐 → 共同坐在一起 → 构成, 组成

gno 知道

prognosis 预后; pro 前〔例, propose 计划(放到前面)〕 + gno 知道 + sis 名词后缀〔例, mitosis 有丝分裂〕 → 预先知道 → 预后

diagnosis 诊断; dia 对面〔例, diagram 图例(课文对面的图)〕 + gno 知道 + sis 名词后缀 → 医生在病人对面知道病情 → 诊断

cur 跑

recur 再发生; re 再〔例, recall 回忆起〕 + cur 跑 → 再跑来 → 再发生

occur 发生; oc → ob 加强前缀〔例, occupy 占有(cup 杯子 → 加满杯子 → 占有)〕 + cur 跑 → 跑来 → 发生

concur 同时发生; con 共同〔例, confront 遭遇(面对面)〕 + cur 跑 → 共同跑来 → 同时发生

uro(i) 尿

nocturia 夜尿; noct 夜〔例, noctambulation 夜游(ambul 行走)〕 + uria 尿症

polyuria 多尿; poly 多〔例, polymerase 多聚酶〕+ uria 尿症

(3) 同音共记

jail 监狱; gaol 监狱

(4) 趣味记忆

anus 肛门; 由 an+us 组成; an 一个+us 我们→我们一个人有一个→肛门

occupy 占有; oc→ob 加强前缀+cup 杯子+y 后缀→加满杯子→占有

person 人; per 完全+son 儿子→我们全是上帝的儿子→人

fatigue 疲劳; fat 胖+i+gue(按发音记,哥)→胖哥易累→疲劳

(5) 反义词同记

systolic 收缩压的; diastolic 舒张压的

acute 急性的; chronic 慢性的

dorsal 背侧的; ventral 腹侧的

deficiency 不足; sufficiency 充足

arterial 动脉的; venous 静脉的

tachycardia 心动过速; bradycardia 心动过缓

biopsy 活检; autopsy 尸检

superior 上边的; inferior 下边的

anterior 前边的; posterior 后边的

(6) 分解记忆

intramyocardial 心肌内的; intra 内〔例, intracellular 胞内的〕+ myo 肌〔例, myology 肌学〕+ card 心+ial 形容词后缀

conversion 转变; con 共同〔例, connect 联系〕+ vers 转变〔例, conversation 对话〕

(7) 前缀记忆

non 不, 非

nonfatal 非致命的; nonfunctional 非功能的

intra 内

intra lobular 叶内的; intravascular 血管内的; intracellular 细胞内的

dis 不, 分开, 加强前缀

distress 压抑(stress 压); dysfunctional 功能失调的; discriminate 分别; differentiate 区分

heter 异, 杂

heterosexual 异性的; heterogenous 异源的(genous 源的)

homo 同

homosexual 同性恋的(sexual 性的); homology 同源, 一致

de 加强前缀, 向下

delineate 描述; de 强调 + line 线 + ate 动词后缀 → 画线条 → 描述

decrease 降低; de 向下 + crease 缝 → 使缝缩小 [例, increase 升高] → 降低, 减少

delimit 定界; de 加强前缀 + limit 界限 → 划界 → 定界线

depress 压抑; de 向下 + press 压 [例, repress 压迫] → 向下压 → 压抑

(8) 后缀记忆

— **in** 素

insulin 胰岛素; **renin** 肾素; **endothelin** 内皮素

— **oma** 瘤

adenoma 腺瘤 (adeno 腺); **sarcoma** 肉瘤; **epithelioma** 上皮瘤 (癌)

— **thelial** 皮的

epithelial 上皮的 (epi 上); **endothelial** 内皮的 (endo 内); **mesothelial** 间皮的 (meso 中间)

(9) 同义同记

kidney 肾脏; **renal** 肾的; **nephro** 肾的

lung 肺; **pulmonary** 肺的; **pneumon** 肺的

liver 肝; **hepat** 肝的

blood 血; **hemat** 血的

brain 脑; **cerebral** 大脑的, 脑的; **cranial** 颅的; **encephalic** 脑的

(10) 构词法

en 使动词前缀或后缀; **enlarge** 扩大; **enlighten** 启发; **enclose** 包围; **shorten** 缩短

ize 使动词后缀; **realize** 实现; **materialize** 物质化

core 核心; **hardcore** 主打人物

ever 加强后缀; **however** 无论如何; **whatever** 无论何事; **wherever** 无论何地; **whenever** 无论何时

(11) 同义词共记

skin 皮肤; **dermal** 皮肤的; **cutaneous** 皮肤的

decline 降低; **decrease** 减少

cluster 簇; **cohort** 群

inevitable 不可避免的; **unavoidable** 难免的

(12) 同类词同记

molecule 分子 → **cell** 细胞 → **tissue** 组织 → **organ** 器官 → **system** 系统 → **body** 人体

4. “学练”结合按照不同的学科特点, 安排适当的复习题和自测题, 使读者能够在应用中提高医学、英语和测试水平。

5. 通过正反馈和重复出现, 例如“metabolism”(新陈代谢)一词在“生物化学”分册中出现不下 30 次, 按照记忆规律, 一个单词在短期内重复 7 遍才能被记住, 那么 30 次的重复将足已使你牢记不忘。

6. 适应面广,尤其适用于短期内突击医学英语和面试。

7. 时间短,见效快。如果每天能花费 4~5 个小时来阅读,1 个月以后将能阅读医学专业的原版英语报刊和书籍。

8. 建立自信和培养兴趣。通过阅读这套丛书,将能把学英语花时长见效微的沮丧心情一扫而光,培养或重新建立起自信。

9. 精英编著者。原文均选自英美医学专家原著或医学名校高才生的笔记;词汇的解释是医学院校的留学生,对英语和医学皆有研究。

总之,该套丛书集医学、英语(公共和医学)、信息管理于一体,内容精练,形式独特,是同类书中的佼佼者。

希望通过阅读本系列丛书,使你的医学英语和公共英语的水平有所突破,达到新的高度。

如有问题和建议请 E-mail 至:wei_bs@yahoo.com

魏保生

2004 年 3 月于北京

Today is not yesterday. We ourselves change. How then can our works and thoughts, if they are always to be fittest, continue always the same (今天不同于昨天,我们自己也在改变,那么,我们的著作和思想,如果想永远不过时,怎么能始终不改变呢)



蛋白质的结构与功能 (1)

Protein Structure and Function(1)

Protein Structure

Protein Primary Structure

The primary structure of peptides and proteins refers to the linear number and order of the amino acids present. The convention for the designation of the order of amino acids is that the N-terminal end (i.e. the end bearing the residue with the free α -amino group) is to the left (and the number 1 amino acid) and the C-terminal end (i.e. the end with the residue containing a free α -carboxyl group) is to the right.

1. Amino acids with aliphatic R-groups: ① Glycine(Gly, G); ② Alanine(Ala, A); ③ Valine(Val, V); ④ Leucine(Leu, L); ⑤ Isoleucine(Ile, I).

2. Non-aromatic amino acids with hydroxyl R-groups: ① Serine(Ser, S); ② Threonine(Thr, T).

3. Amino acids with sulfur-containing R-groups: ① Cysteine(Cys, C); ② Methionine(Met, M).

4. Acidic amino acids and their amides: ① Aspartic acid(Asp, P); ② Asparagine(Asn, N); ③ Glutamic acid(Glu, E); ④ Glutamine(Gln, Q).

5. Basic amino acids: ① Arginine(Arg, R); ② Lysine(Lys, K); ③ Histidine(His, H).

6. Amino acids with aromatic rings: ① Phenylalanine(Phe, F); ② Tyrosine(Tyr, Y); ③ Tryptophan(Trp, W).

7. Imino acids: Proline(Pro, P).

Protein Secondary Structure

The ordered array of amino acids in a protein confers regular conformational forms upon that protein. These conformations constitute the secondary structures of a protein. In general proteins fold into two broad classes of structure termed, globular proteins or fibrous proteins. Globular proteins are compactly folded and coiled, whereas, fibrous proteins are more filamen-

tous or elongated. It is the partial double-bond character of the peptide bond that defines the conformations a polypeptide chain may assume.

Vocabulary

- protein** [ˌprəʊtiːn] *n.* 蛋白质; fat 脂肪; sugar 糖; 为能量的三大来源
- primary** [ˌpraɪməri] *adj.* 原发的; prim 最初的, 第一的〔例, primate 类人猿, primer 引物〕
+ary 形容词后缀
- structure** [ˌstrʌktʃə] *n.* 结构; 〔例, construct 建造〕; 反义词: destruction 毁灭
- linear** [ˌliːniə] *adj.* 线性的; line 线 + ar 的
- amino** [ˌæmiːnəʊ] *adj.* 氨基的; 〈注〉 ammonia 氨, 氨水; amine [化]胺; amnio 羊膜〔例, amnioembryonic 羊膜胚的〕
- present** [ˌpriːznt] *n.* ①现在, ②出席, ③礼物; pre 前 + sent 送 → 前边送来 → 现在或出席
- designation** [ˌdeziɡˌneɪʃən] *n.* 指示, 指定, 选派, 名称; de 加强前缀 + sign 签名 + ation 名词后缀
- residue** [ˌrezɪdjuː] *n.* 滤渣, 残数, 剩余物; re 再, 又〔例, renounce 斥责(re 再 + nounce 说 → 说了又说 → 斥责)〕 + sid 坐 + ue 后缀 → 再坐下 → 残余的 → 剩余的
- group** [gruːp] *n.* 群体; 同义词: class, cohort, mass
- secondary** [ˌsekəndəri] *adj.* 继发的; second 第二 + ary 形容词后缀 → 第二的 → 继发的(第一之后)
- regular** [ˌregjələ] *adj.* 规律的, 平常的; 反义词: irregular 不规律的
- constitute** [ˌkɒnstɪtjuːt] *vt.* 制定(法律), 建立(政府), 组成; con 共同 + st → stand 站 + itue 后缀 → 共同站到一起 → 组成
- general** [ˌdʒenərə] *n.* ①一般的, ②全身的
- broad** [brɔːd] *adj.* 宽广的; b + road → 像路一样 → 宽广的; 与 board(板)区别; aboard (a + board)在一块板上 → 坐船
- global** [ˌɡləʊbjələ] *adj.* 球的; 同义词: spherical 球的
- fibrous** [ˌfaɪbrəs] *adj.* 纤维的; fibro 纤维〔例, fibrocyte 纤维细胞〕 + ous 形容词后缀
- compactly** *adv.* 细密地, 简洁地; com 共同〔例, common 共同的〕 + pact 拍(im → in 内 + pact 拍 → 内拍 → 影响) + ly 副词后缀〔例, freely 随意地〕
- whereas** [(h)weəɪəz] *conj.* 然而; where + as 形成的一个新词
- filamentous** [ˌfɪləˈmentəs] *adj.* 细丝状的, 纤维所成的, 如丝的
- partial** [ˌpɑːʃəl] *adj.* 部分的; part 部分 + ial 的; 〈注〉: portion 部分
- character** [ˌkærɪktə] *n.* 特征; 同义词: feature, property, attribution
- peptide** [ˌpeptaid] *n.* 肽段; 〈注〉 pepsin 胃蛋白酶, 胃液素; pepsinogen 胃蛋白酶原
- polypeptide** [ˌpɒlɪˈpeptaid] *n.* 多肽; poly 多〔例, polyacid 多元酸〕 + peptide 肽
- chain** [tʃeɪn] *n.* 链; food chain 食物链
- assume** [əˈsjʊːm] *vt.* 假定; 〈注〉 presume 推测, resume 恢复, consume 消费

Within a single protein different regions of the polypeptide chain may assume different conformations determined by the primary sequence of the amino acids(See Figure 1, Figure 2).

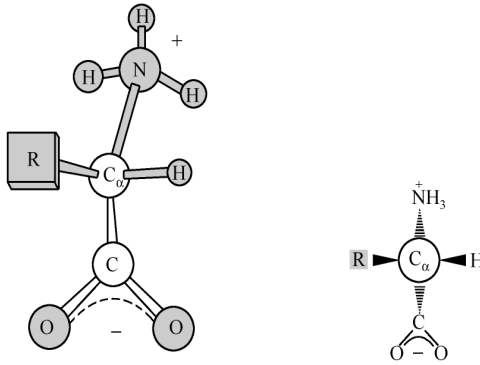


Figure 1 Three-dimensional representations of amino acids

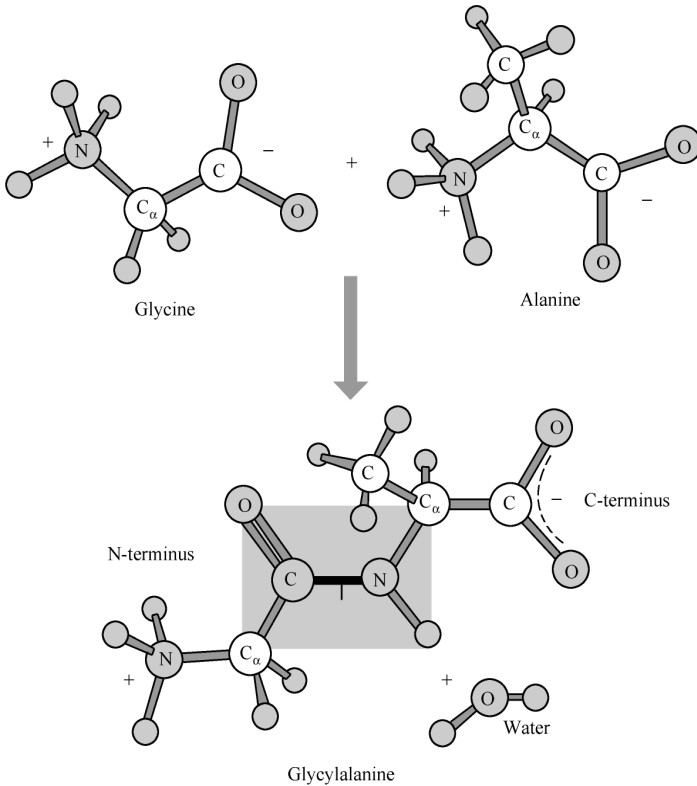


Figure 2 Formation of a peptide

The α -helix is a common secondary structure encountered in proteins of the globular class.

The formation of the α -helix is spontaneous and is stabilized by H-bonding between amide nitrogen and carbonyl carbons of peptide bonds spaced four residues apart.

This orientation of H-bonding produces a helical coiling of the peptide backbone such that the R-groups lie on the exterior of the helix and perpendicular to its axis.

Not all amino acids favor the formation of the α -helix due to steric constraints of the R-groups. Amino acids such as A, D, E, I, L and M favor the formation of α -helices, whereas,

Vocabulary

- within** [wiðin] *n.* 内部, 里头; 反义词: without 外边
- single** [ˌsɪŋɡl] *adj.* 单一的; bi 两〔例, bipolar 双极的〕; tri 三〔例, triple 三倍的〕; multi 多个的〔例, multiply 繁殖, 乘〕
- different** [ˌdɪfrənt] *adj.* 不同的; dif→dis 分开〔例, dismiss 解散(dis 分开+miss→mit 送→分开送→解散)〕+fer 带〔例, defer 推迟(de 不+fer 带→不愿带→推迟)〕
- sequence** [ˌsɪkwəns] *n.* 顺序, 序列; seq 跟〔例, consequence 后果〕+ence 名词后缀→跟着→按照顺序
- figure** [ˌfɪɡə] *n.* 图形, 轮廓; 同义词: diagram
- formation** [ˌfɔːmeɪʃən] *n.* 形成; form(形成)的名词形式
- common** [ˌkɒmən] *adj.* 共同的; com 共同+mon 单一→共同一致→共同的; commonly 共同地; 同义词: generally; 反义词: rarely, unusually
- class** [kla:s] *n.* 类; 同义词: type, sort, category; 〈注〉classification 分类; classify 把……分类(class 类+ify 使→使分成类)→变为名词 classification
- spontaneous** [spɒnˌteɪnjəs] *adj.* 当即的; 同义词: immediate
- nitrogen** [ˌnaɪtrədʒən] *n.* 氮; nitro 硝基+gen 原〔例, oxygen 氧气(oxy 氧)〕
- carbonyl** [ˌkɑːbənɪl] *n.* 碳酰基, 羰基; carbon 碳〔例, carbon dioxide 二氧化碳〕
- apart** [əˌpɑ:t] *adv.* 分离, 分成零件, 分别地, 分离着; a 一个+part 部分→分成一部分→分离
- orientation** [ˌɔː(ː)riənˌteɪʃən] *n.* 方向, 方位, 定位, 倾向性, 向东方; orient 东方+ation 名词后缀
- helical** [ˌhelɪkəl] *adj.* 螺旋状的; helic 螺旋, 螺旋状物+al 的
- exterior** [ˌeksˌtɪəriə] *adj.* 外部的; ex 向外〔例, exhibit 展览(ex 外+hibit 拿→向外拿→展示)〕; 反义词: interior 内部的; 〈注〉inferior 下边的, superior 上边的
- helix** [ˌhiːlɪks] *n.* 螺旋, 螺旋状物; 〈注〉helicase 螺旋酶; helical 螺旋状的; helix 螺旋
- favor** [ˌfeɪvə] *n.* 喜欢; 〈注〉flavor 味道
- steric** [ˌsterɪk] *adj.* (原子的)空间(排列)的, 位的; sterile 无菌的, 枯燥的

G and P favor disruption of the helix. This is particularly true for P since it is a pyrrolidine based amino acid whose structure significantly restricts movement about the peptide bond in which it is present, thereby, interfering with extension of the helix. The disruption of the helix is important as it introduces additional folding of the polypeptide backbone to allow the formation of globular proteins.

Whereas an α -helix is composed of a single linear array of helically disposed amino acids, β -sheets are composed of 2 or more different regions of stretches of at least 5—10 amino acids. The folding and alignment of stretches of the polypeptide backbone aside one another to form β -sheets is stabilized by H-bonding between amide nitrogen and carbonyl carbons. However, the H-bonding residues are present in adjacently opposed stretches of the polypeptide backbone as opposed to a linearly contiguous region of the backbone in the α -helix.

β -Sheets are said to be pleated. This is due to positioning of the α -carbons of the peptide bond which alternates above and below the plane of the sheet.

β -Sheets are either parallel or antiparallel. In parallel sheets adjacent peptide chains proceed in the same direction (i. e. the direction of N-terminal to C-terminal ends is the same), whereas, in antiparallel sheets adjacent chains are aligned in opposite directions.

Super-Secondary Structure

Some proteins contain an ordered organization of secondary structures that form distinct functional domains or structural motifs. Examples include the helix-turn-helix domain of bacterial proteins that regulate transcription and the leucine zipper, helix-loop-helix and zinc finger domains of eukaryotic transcriptional regulators. These domains are termed super-secondary structures.

Tertiary Structure

Tertiary structure refers to the complete three-dimensional structure of the polypeptide units of a given protein. Included in this description is the spatial relationship of different secondary structures to one another within a polypeptide chain and how these secondary structures

Vocabulary

significant [sigˌnɪfɪkənt] *adj.* 有意义的, 重大的; sign 标记; signify 使标记, 有意义; significantly 非常地

movement [ˌmuːvmənt] *n.* 运动; move 移动〔例, remove 去掉(re 往回→往回移→撤回, 去掉)〕

thereby [ˌðeəˌbaɪ] *adv.* 因此; there 那里+by 通过→通过那里→因此; there 可与别的词组成复合词〔例, therefore 因此; thereafter 此后〕

extension [ɪksˌtɛnʃən] *n.* 广泛; ex 向外〔例, exclude 排除(ex 外+clude 围→向外围→排除)〕+tense 拉〔例, intense 紧张的(in 内+tense 拉→向内用力拉→紧张的)〕+sion 名词后缀→向外拉→延伸→广泛

important [ɪmˌpɔːtənt] *adj.* 重要的; im 向内+port 带+ant 东西的→向内带进的东西→

- 进口的→缺的东西→重要的; 反义词: unimportant; 〈注〉import 进口(im 内+port 港口)
- additional** [əˌdɪʃənəl] *adj.* 另外的, 附加的; add 加+itional 的→另加的
- allow** [əˌlaʊ] *vt.* 允许; 〈记〉all+low 全部降低使通过→允许
- compose** [kəmˌpəʊz] *vt.* 组成; com 共同〔例, common 共同的〕+pose 放〔例, expose 暴露(ex 向外)〕→放在一起→组成
- alignment** [əˌlaɪnmənt] *n.* 排列, 对齐; align→aline 排列成直线, 排列+ment 名词后缀
- another** [əˌnʌðə] *adj.* 另一个; an 一个+other 另外→另外一个
- however** [haʊˌevə] *adv.* 然而; how+ever 加强后缀〔例, whatever 无论如何, wherever 无论何地〕→不论如何→然而
- contiguous** [kənˌtɪɡjuəs] *adj.* 相邻的; con 共同+tig 接触+uous 的; 〈注〉contagious 接触传染的
- region** [ˌrɪ:dʒən] *n.* 区域, 地方; 同义词: zone, area, range
- plane** [pleɪn] *n.* 平面, 飞机, 水平, 程度
- sheet** [ʃi:t] *n.* (一)片, (一)张, 薄片, 被单, 被褥
- parallel** [ˌpærəlel] *adj.* 平行; para 并列+llel(像两条平行线)
- adjacent** [əˌdʒeɪsənt] *adj.* 邻近的, 相邻的; ad 加强前缀〔例, addiction 成瘾(ad+diction 统治)〕+jacent 接触的→接近的→邻近的
- proceed** [prəˌsi:d] *vi.* 进行; pro 向前+ceed→ced 走〔例, concede 让步〕
- direction** [dɪˌrekʃən, daɪˌrekʃən] *n.* 方向; direct 直接+ion 名词后缀→直接→直→方向
- opposite** [ˌɒpəzɪt] *adj.* 对面的; op→ob 相反+pos 放+ite 后缀→放在反向→对面的
- contain** [kənˌteɪn] *vt.* 包含; con 共同+tain 拿〔例, retain 保持〕→共同拿住→包含
- distinct** [dɪˌstɪŋkt] *adj.* 清楚的, 明显的, 截然不同的, 独特的; distinction 区别(名词); distinguish 区别(动词)
- functional** [ˌfʌŋkʃənəl] *adj.* 功能上的; 反义词: physical 器质上的
- include** [ɪnˌklu:d] *vt.* 包括; in 向内〔例, inmate 监狱的同室〕+clude 包围〔例, preclude 预防(预先包围→防止)〕
- domain** [dəʊˌmeɪn] *n.* 领土, 领地, (活动、学问等的)范围, 领域
- bacterial** [bækˌtɪəriəl] *adj.* 细菌的, 杆菌的; bacterium 细菌
- regulate** [ˌregjuleɪt] *vt.* 调节; 同义词: modulate 调节, control 控制; 〈记〉deregulate 下调
- leucine** [ˌlu:si:n] *n.* 亮氨酸, 白氨酸; leu 亮, 白〔例, leukemia 白血病〕
- zipper** [ˌzɪpə] *n.* 拉链; zip 拉+per 后缀
- finger** [ˌfɪŋɡə] *n.* 手指; fin 鳍+ger 物→鳍状物→手指
- eukaryotic** *adj.* 真核的; 〈记〉eukaryote 真核细胞
- tertiary** [ˌte:ʃəri] *adj.* 第三的, 第三位的, 第三世纪的; 〈记〉quaternary 四, 四个一组; binary 二重的, 二进制的
- complete** [kəmˌplɪt] *adj.* 完全的; com 共同+plete 填〔例, deplete 弄空〕→完全的
- description** [dɪsˌkrɪpʃən] *n.* 描述; de 加强+scrip 写〔例, prescribe 开处方(提前写)〕+tion 名词后缀; describe 描述(动词)

themselves fold into the three-dimensional form of the protein. Secondary structures of proteins often constitute distinct domains. Therefore, tertiary structure also describes the relationship of different domains to one another within a protein. The interactions of different domains are governed by several forces; These include hydrogen bonding, hydrophobic interactions, electrostatic interactions and van der Waals forces.

Hydrogen Bonding

Polypeptides contain numerous proton donors and acceptors both in their backbone and in the R-groups of the amino acids. The environment in which proteins are found also contains the ample H-bond donors and acceptors of the water molecule. H-bonding, therefore, occurs not only within and between polypeptide chains but with the surrounding aqueous medium.

Hydrophobic Forces

Proteins are composed of amino acids that contain either hydrophilic or hydrophobic Rgroups. It is the nature of the interaction of the different R-groups with the aqueous environment that plays the major role in shaping protein structure. The spontaneous folded state of globular proteins is a reflection of a balance between the opposing energetics of H-bonding between hydrophilic R-groups and the aqueous environment and the repulsion from the aqueous environment by the hydrophobic R-groups. The hydrophobicity of certain amino acid R-groups tends to drive them away from the exterior of proteins and into the interior. This driving force restricts the available conformations into which a protein may fold.

Electrostatic Forces

Electrostatic forces are mainly of three types; charge-charge, charge-dipole and dipole-dipole. Typical charge-charge interactions that favor protein folding are those between oppositely charged R-groups such as K or R and D or E. A substantial component of the energy involved in protein folding is charge-dipole interactions. ☞

Vocabulary

spatial [ˌspeɪʃəl] *adj.* 占据空间的;〈记〉space 空间; spacious 宽敞的

therefore [ˌðeəfɔː] *adv.* 因此; 同义词: thus

interaction [ˌɪntərˈæktʃən] *n.* 相互作用; inter 相互〔例, interstate 州际间的(state 州)〕+ act 行动, 作用

several [ˌsevərəl] *adj.* 几个; 近义词: couple 一对

hydrogen [ˌhaɪdrədʒən] *n.* 氢; hydro 水〔例, hydrology 水文学〕+ gen 原→水原→氢(水由氢和氧组成)

hydrophilic [ˌhaɪdrəʊˈfɪlək] *adj.* 亲水的; hydro 水〔例, hydrogel 水凝胶〕+ philic 亲……的; 〈注〉phobe 恨, 反

numerous [ˌnjuːmərəs] *adj.* 大量的; numer 数=number〔例, enumerate 列举〕→许多→大量的

- proton** [ˌprəʊtɒn] *n.* 质子; pro=proto 原始,第一〔例,prototype 原型〕+ on 子〔记〕 photon 光子
- environment** [ˌɪnvaɪənmənt] *n.* 环境; en 包围+viron 围困+ment→环境
- molecule** [ˌmɒlɪkjʊl, ˌmɔː-] *n.* 分子; mole(按发音记,摩尔)+cule 小→小东西→分子; molecule 分子→cell 细胞→tissue 组织→organ 器官→system 系统→body 人体
- surrounding** [səˈraʊndɪŋ] *n.* 围绕物,环境; sur→sub 次,亚〔例,suburb 郊区;surplus 剩余〕+round 圆+ing 动名词后缀→圆的外围→周围→围绕
- aqueous** [ˌeɪkwɪəs] *adj.* 水的,水成的;aque 水〔例,aquiculture 水产养殖〕+ous 的
- medium** [ˌmiːdɪəm] *n.* 培养基,媒体; med 中间,中介+ium 基,体;〈注〉medical 医学的
- hydrophilic** [ˌhaɪdrəʊˈfɪlɪk] *adj.* 亲水的; hydro 水〔例,hydrogel 水凝胶〕+philic 亲……的;〈注〉phobe 恨,反
- nature** [ˌneɪtʃə] *n.* 自然,自然界,大自然;natural 自然的
- major** [ˌmeɪdʒə] *n.* 主要的; 反义词:minor 次要的
- state** [steɪt] *n.* 状态; 同义词:status 状态
- reflection** [rɪˈfleksjən] *n.* 反射,映象,倒影; re 再+flect 折,曲〔例,inflection 向内弯曲〕+ion 名词后缀
- balance** [ˌbæləns] *n.* 平衡; 反义词:imbalance 不平衡
- energetics** [ˌenəˈdʒetiks] *n.* 动能学,力能学; en 使〔例,enlighten 启发,开导(en 使+light 光+en→使发光→启发)〕+erg(et) 尔格,能量+ics 学科(physics 物理学)
- repulsion** [rɪˈpʌlʃ(ə)n] *n.* 排斥,排斥,严拒,厌恶,反驳; re 再,又〔例,renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+pul (l)拉〔例,pull-up 拉动作用〕+sion 名词后缀
- certain** [ˌsəːtən] *adj.* 确定的;〔例,certify 证明,保证〕;sure 确定的(只能用人作主语)
- drive** [draɪv] *n.* 开车,驱赶,推动;〈注〉driver license 驾驶执照
- interior** [ˌɪntɪəriə] *adj.* 内部的,内的; inter 两者之间〔例,interplay 相互作用〕+ior 后缀〔例,exterior 外部的; superior 超级的; prior 前边的; posterior 后边的; inferior 下面的〕
- force** [fɔːs] *n.* 力量,武力,精力;〈注〉reinforce 加强
- available** [əˈveɪəbl] *adj.* 可用的;同义词:suitable;反义词:unavailable
- mainly** [ˌmeɪnli] *adv.* 主要地;main 主要〔例,mainstream 主流(main 主+stream 流)〕+ly 副词后缀〔例,gladly 高兴地〕
- typical** [ˌtɪpɪkəl] *adj.* 典型的; 反义词:atypical 不典型的
- oppositely** *adv.* 对面地; op→ob 相反+pos 放+ite 后缀+ly 副词后缀→放在反向→对面地
- substantial** [səbˌstænʃəl] *adj.* ①物质的,②多的;substance 物质
- component** [kəmˌpəʊnənt] *n.* 成分; com 共同〔例,common 共同的〕+pon→pose 放+ent 后缀→共同放在一起→成分〔例,opponent 敌手〕
- energy** [ˌenədʒi] *n.* 精力,精神,活力; en 使〔例,enlighten 启发,开导(en 使+light 光+en→使发光→启发)〕+erg 尔格,能量+y 后缀
- dipole** [ˌdaɪpəʊl] *n.* 双极子,偶极; di 二〔例,dioxide 二氧化物〕+pole 极,杆〔例,bipolar 两极的〕

This refers to the interaction of ionized R-groups of amino acids with the dipole of the water molecule. The slight dipole moment that exists in the polar R-groups of amino acid also influences their interaction with water. It is, therefore, understandable that the majority of the amino acids found on the exterior surfaces of globular proteins contain charged or polar R-groups.

Van der Waals Forces

There are both attractive and repulsive van der Waals forces that control protein folding. Attractive van der Waals forces involve the interactions among induced dipoles that arise from fluctuations in the charge densities that occur between adjacent uncharged non-bonded atoms. Repulsive van der Waals forces involve the interactions that occur when uncharged non-bonded atoms come very close together but do not induce dipoles. The repulsion is the result of the electron-electron repulsion that occurs as two clouds of electrons begin to overlap.

Although van der Waals forces are extremely weak, relative to other forces governing conformation, it is the huge number of such interactions that occur in large protein molecules that make them significant to the folding of proteins.

Quaternary Structure

Many proteins contain 2 or more different polypeptide chains that are held in association by the same non-covalent forces that stabilize the tertiary structures of proteins. Proteins with multiple polypeptide chains are termed oligomeric proteins. The structure formed by monomer-monomer interaction in an oligomeric protein is known as quaternary structure.

Oligomeric proteins can be composed of multiple identical polypeptide chains or multiple distinct polypeptide chains. Proteins with identical subunits are termed homooligomers. Proteins containing several distinct polypeptide chains are termed heterooligomers.

Vocabulary

slight [slait] *adj.* 轻微的;〈记〉s+light 轻

polar [ˌpəʊlə] *adj.* 极;〔例, bipolar 两极的(bi 两)〕; main point 要点, 要旨

majority [məˌdʒɔːrɪti] *n.* 多数, 大半; major 主要的+ity 名词后缀

repulsive [riˌpʌlsɪv] *adj.* 排斥的, 排斥的, 严拒的, 令人厌恶的; re 再, 又〔例, renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+pul (1)拉〔例, pull-up 拉动作用〕+sive 形容词后缀

control [kənˌtrɒl] *n.* ①控制, ②对照; con 共同+trɒl 走→共同走→控制住

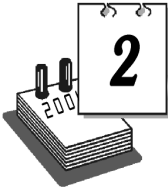
involve [ɪnˌvɒlv] *vt.* 参与; in 在内〔例, inbound 向内的〕+volve 转〔例, revolve 左轮手抢〕→卷入内部→参与

arise [əˌraɪz] *vi.* 出现, 来(及物动词); a+rise 升→一个(太阳)升起来→出现; 同义词: rise(不及物动词)

fluctuation [ˌflʌktjuˌeɪʃən] *n.* 波动, 起伏; 同义词: wave, undulation

- charge** [tʃɑ:dʒ] *n.* 负荷, 电荷, 费用; discharge 分泌, 出院; positive(negative) charge 正负电荷
- occur** [əˌkɜː] *vi.* 出现, 发生; oc 来自 ob, 由于第二个“c”同化了“b”, 加强前缀〔例, object 物体〕+cur 跑〔例, concur 同时发生(con 共同+cur 跑→共同跟来→同时发生)〕
- uncharged** *adj.* 没有负荷的, 无(负)载的; un 不〔例, unknown 不明的〕+charge 电荷+ed 后缀
- together** [təˌgeðə] *adv.* 一起; 〈注〉altogether 完全地
- induce** [ɪnˌdjuːs] *vt.* 引导; in 内〔例, inside 内部〕+duc 引, 导〔例, seduce 勾引(se 离去+duc 引→引导去→诱惑→勾引)〕+向内部引导→引导
- result** [rɪˌzʌlt] *n.* 结果(名词), 来自(动词); result from 来自(因); result in 导致(果); insult 侮辱; consult 协商
- begin** [bɪˌɡɪn] *v.* 开始; 同义词: start, commence, initiate; 〈记〉benign 良性的
- overlap** [ˌoʊvəˌlæp] *v.* (与……)交叠; over 在上+lap 放→在一个东西上放另一个→重叠, 交替
- extremely** [ɪksˌtriːmli] *adv.* 极度地; extrem 极〔例, extremity 肢体〕+ly 副词后缀; 同义词: ultimately 最终地
- relative** [ˌrelatɪv] *adj.* 相对的; re 再, 又〔例, renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+lat 放+ive 形容词后缀→再放→联系→相对的; 〈记〉absolute 绝对的
- large** [lɑːdʒ] *adj.* 大量的; 同义词: huge, big; 反义词: small, little
- quaternary** *n.* 四, 四个一组; 〈记〉quarter = quarter 四分之一; ternary 三重的; binary 二重的, 二进制的
- association** [əˌsəʊsiˌeɪʃən] *n.* 联合; as→ad 加强词义(因第二个“s”把“d”同化了)+soci(al)(社会的+ation 名词后缀→结合的)→联合
- stabilize** [ˌstəɪbalaɪz] *v.* 使稳定; st→stand 站+able 可……的+ize 使动词后缀→使站稳→使稳定
- multiple** [ˌmʌltɪpl] *adj.* 多重的, 多倍的; multi 多〔例, multipara 多产妇, multipage 多页的〕+ple 折
- identical** [aɪˌdentɪkəl] *adj.* 同样的; 同义词: same 一样的

Life is long if you know how to use it (如能善于
利用,生命乃长)



蛋白质的结构与功能 (2)

Protein Structure and Function(2)

Hemoglobin, the oxygen carrying protein of the blood, contains two α and two β subunits arranged with a quaternary structure in the form, $\alpha_2\beta_2$. Hemoglobin is, therefore, a hetero-oligomeric protein.

Complex Protein Structures

Proteins also are found to be covalently conjugated with carbohydrates. These modifications occur following the synthesis (translation) of proteins and are, therefore, termed post-translational modifications. These forms of modification impart specialized functions upon the resultant proteins. Proteins covalently associated with carbohydrates are termed glycoproteins. Glycoproteins are of two classes, N-linked and O-linked, referring to the site of covalent attachment of the sugar moieties. N-linked sugars are attached to the amide nitrogen of the R-group of asparagine; O-linked sugars are attached to the hydroxyl groups of either serine or threonine and occasionally to the hydroxyl group of the modified amino acid, hydroxylysine.

There are extremely important glycoproteins found on the surface of erythrocytes. It is the variability in the composition of the carbohydrate portions of many glycoproteins and glycolipids of erythrocytes that determines blood group specificities. There are at least 100 blood group determinants, most of which are due to carbohydrate differences. The most common blood groups, A, B, and O, are specified by the activity of specific gene products whose activities are to incorporate distinct sugar groups onto RBC membrane glycosphingolipids as well as secreted glycoproteins.

Structural complexes involving protein associated with lipid via noncovalent interactions are termed lipoproteins. Their major function in the body is to aid in the storage transport of lipid and cholesterol.

Vocabulary

hemoglobin [ˈhi:məʊˌgləʊbɪn] *n.* 血色素; heme 血〔例, hemeprotein 血红蛋白〕+ protein 蛋白质

oxygen [ˌɒksɪdʒən] *n.* 氧; 例如, oxygenase (加)氧酶

- blood** [blʌd] *n.* 血;〈记〉hemo 血的〔例, hemoglobin 血红蛋白〕;〈注〉flood 洪水
- complex** [ˌkɒmpleks] *adj.* 复杂;com 共〔例, common 共同的〕+plex 折→共折→乱折到一起→复杂的;同义词:sophisticated
- synthesis** [ˌsɪnθɪsɪs] *n.* 综合,合成;synthesize 合成(动词);syn 共同〔例, synchronize 同时〕+the+size 尺寸→共做成一样的尺寸→合成
- impart** [ɪmˌpaɪt] *vt.* 给予,传授,告知,透露;im=in 内+part 部分→进入内部→给予,传授,告知
- resultant** [rɪˌzʌltənt] *n.* 结果,反应产物;result 结果+ant 物
- covalent** [ˌkəʊveɪlənt] *adj.* 共有化合价的,共价的;co 共同+valent 价的〔例, monovalent 单价的, bivalent 二价的, trivalent 三价的〕
- attachment** [əˌtætʃmənt] *n.* 附件,附加装置,配属;at→ad 加强前缀〔例, attest 验证〕+tach→tact 触〔例, contact 接触〕+ment 名词后缀→把某东西接触另一东西→系于,附件
- sugar** [ˌʃʊɡə] *n.* 糖,食糖;〈注〉saccharid 糖;glycogen 糖原;glucose 葡萄糖
- hydroxyl** [haɪˌdrɒksɪl] *n.* 羟(基),氢氧基
- serine** [ˌseriːn] *n.* 丝氨酸;〈记〉alanine 丙氨酸;cystine 胱氨酸;tyrosine 酪氨酸;proline 脯氨酸
- threonine** [ˌθriːniːn] *n.* 苏氨酸;〈记〉serine 丝氨酸;alanine 丙氨酸;cystine 胱氨酸;tyrosine 酪氨酸;proline 脯氨酸
- surface** [ˌsɜːfɪs] *n.* 表面;sur 在上〔例, surplus 剩余〕+face 面→在上面→表面
- erythrocyte** [ɪˌrɪθrəʊsaɪt] *n.* 红细胞;eryth(ro)红〔例, erythromycin 红霉素〕+cyte 细胞
- variability** [ˌveəriəˌbɪləti] *n.* 可变性;vary 变化(动词);variation 变化(名词);various 各种各样的(形容词)
- composition** [ˌkɒmpəˌzɪʃən] *n.* 组成;com 共同〔例, common 共同的〕+pos 放+ition 名词后缀→放到一块→组成,作文
- activity** [ækˌtɪvɪti] *n.* 活动;act 行动(动词)+ivity 名词后缀→活动
- specific** [spiˌsɪfɪk] *n.* 特殊的;同义词:unique
- incorporate** [ɪnˌkɔːpəreɪt] *adj.* 合并的,结社的,一体化的
- membrane** [ˌmembreɪn] *n.* 膜;〈注〉member 成员
- lipid** [ˌlɪpɪd, ˌlaɪpɪd] *n.* 脂类;lip(o)脂〔例, lipase 脂肪酶〕+id 后缀;〈注〉fat 脂肪;adipose 脂肪的
- lipoprotein** [ˌlɪpəˌprəʊtiːn] *n.* 脂蛋白;lipo 脂〔例, lipocyte 脂肪细胞(lipo 脂肪+cyte 细胞)〕+protein 蛋白质
- function** [ˌfʌŋkʃən] *n.* 功能;反义词:dysfunction 功能失调(dys 反常的)
- storage** [ˌstɔːrɪdʒ] *n.* 储存;store 的名词形式+age 名词后缀〔例, heritage 遗传〕
- transport** [ˌtrænsˌpɔːt] *n.* 运输;trans 穿过〔例, transfuse 输血(trans 穿+fuse 灌注→从一个灌注到另一个人→输血)〕+port 带〔例, export 出口(ex 外+port 带→外带→出口)〕
- cholesterol** [ˌkɒləstəˈrɔːl] *n.* 胆固醇;chole 胆的〔例, cholecyst 胆囊〕+ster 固体的〔例, steroid 固醇类的〕+ol 后缀

Clinical Significances

The substitution of a hydrophobic amino acid (V) for an acidic amino acid (E) in the β -chain of hemoglobin results in sickle cell anemia (HbS). This change of a single amino acid alters the structure of hemoglobin molecules in such a way that the deoxygenated proteins polymerize and precipitate within the erythrocyte, leading to their characteristic sickle shape.

Collagens are the most abundant proteins in the body. Alterations in collagen structure arising from abnormal genes or abnormal processing of collagen proteins results in numerous diseases, including Larsen syndrome, scurvy, osteogenesis imperfecta and Ehlers-Danlos syndrome.

Ehlers-Danlos syndrome is actually the name associated with at least ten distinct disorders that are biochemically and clinically distinct yet all manifest structural weakness in connective tissue as a result of defective collagen structure. Osteogenesis imperfecta also encompasses more than one disorder. At least four biochemically and clinically distinguishable maladies have been identified as osteogenesis imperfecta, all of which are characterized by multiple fractures and resultant bone deformities. Marfan's syndrome manifests itself as a disorder of the connective tissue and was originally believed to be the result of abnormal collagens. However, recent evidence has shown that Marfan's syndrome results from mutations in the extracellular protein, fibrillin, which is an integral constituent of the non-collagenous microfibrils of the extracellular matrix.

Several forms of familial hypercholesterolemia are the result of genetic defects in the gene

Vocabulary

clinical [ˌklinikəl] *adj.* 临床的; 反义词: basic 基础的; 〈注〉 clinic 诊所

acidic [əˈsɪdɪk] *adj.* 酸的; acid 酸; 与 base(碱)相对

sickle [ˈsɪkl] *n.* 镰刀; 〈注〉 sick 病的

anemia [əˈniːmiə] *n.* 贫血; an 无〔例, anandria 男征缺失 (andria 男征)] + emia 血症

change [tʃeɪndʒ] *n.* 改变, 变化, 转变; exchange 交换

deoxygenate [diːɒksɪdʒɪneɪt] *vt.* 去氧; de 去掉〔例, dehydrate 脱水〕+ oxygen 氧气 + ate 动词后缀

polymerize [ˌpɒlɪməraɪz] *v.* 使聚合; polymer 多聚物〔例, polyacid 多元酸〕+ ize 使动词后缀

precipitate [priˈsɪpɪteɪt] *n.* 沉淀; pre 前 + cip 下降 + it 走 + ate 后缀 → 提前下走 → 沉淀; 〈记〉 participate 参加

shape [ʃeɪp] *n.* 形状, 形成; 〈记〉 form 形成, 形式

abundant [əˈbʌndənt] *adj.* 丰富的; a 没有, 否定前缀〔例, acelia 无腹畸形〕+ bund = bond 捆绑 + ant 形容词后缀〔例, redundant 多余的〕→ 没有限制, 到处都是 → 丰富的, 充裕的; 〈注〉 abandon 放弃

- collagen** [ˌkɒləˈdʒɪn] *n.* 胶原(蛋白); colla 阿胶 + gen 原〔例, pathogen 病原体〕
- abnormal** [ˌæbˌnɔːmə] *adj.* 反常的, 变态的; ab 脱离, 表示否定的前缀〔例, abscond 逃避 (scond 跑掉), absurd 荒谬的〕 + norm 正常, 标准 + al 形容词后缀 → 不正常的 → 异常的, 反常的
- syndrome** [ˌsɪndrəʊm] *n.* 综合征; syn 共同 + drome 机场, 屋 → 在同一场 → 在同一疾病下 → 综合征
- scurvy** [ˌskɜːvi] *adj.* ① 下流的, 卑鄙的, 无礼的, ② 维生素 C 缺乏病
- imperfecta** [ɪmˌpɛfɛktə] *n.* 发育不全; im 不〔例, impossible 不可能的〕 + perfect 完美的 + a 拉丁后缀
- actually** [ˌæktʃuəli] *adv.* 实际上; actual 实际的, 真实的 + ly 副词后缀; 同义词: in fact
- biochemical** [ˌbaɪəʊˌkɛmɪkəl] *adj.* 生物化学的; bio 生物〔例, biology 生物学〕 + chemo 化学〔例, chemosmosis 化学渗透〕 + al 形容词后缀
- clinically** [ˌklɪnɪkəli] *adv.* 临床上; clinical 临床的 + ly 副词后缀
- manifest** [ˌmænɪfɛst] *vt.* 表明, 显现; mani 许多 + fest 庆祝 → 许多庆祝 → 表明
- weakness** [ˌwiːknɪs] *n.* 微弱; weak 弱的 + ness 抽象名词 → 微弱, 弱点
- connective** [ˌkɒnɛktɪv] *adj.* 结缔的, 连接的; con 共同〔例, continue 继续〕 + nect 接 + ive 的 → 共同接的 → 连接的, 结缔的
- tissue** [ˌtɪʃuː] *n.* ① 卫生纸, ② 组织; molecule 分子 → cell 细胞 → tissue → organ 器官 → system 系统
- defective** [dɪˌfɛktɪv] *adj.* 有缺陷的, (智商或行为有) 欠缺的; de 不 + fect → fact 做〔例, manufacture 制造〕 + ive 形容词后缀 → 没做好 → 没造好 → 缺陷
- disorder** [dɪsˌɔːdə] *n.* 不适; dis 不 + order 有序 → 没有序 → 混乱 → 疾病(与正常区别); 同义词: disease, illness, sickness
- distinguish** [dɪsˌtɪŋɡwɪʃ] *v.* 鉴别, 区别; 同义词: differentiate; distinguishable 可以鉴别的
- originally** [əˌrɪdʒənəli] *adv.* 最初, 原先; original 原来的(形容词); ori 起源
- recent** [ˌriːsənt] *adj.* 最近的; 同义词: lately
- evidence** [ˌeɪdɪns] *n.* 证据; evident 明显的; 反义词: covert 隐藏的
- fibrillin** [ˌfɪbrɪlɪn] *n.* 纤维素; fibr(o) 纤维〔例, fibrocyte 纤维细胞〕 + llin 素
- constituent** [ˌkɒnˌstɪtjuənt] *adj.* 组成的, 有选举权的; con 共同 + st → stand 站 + ituent 后缀 → 共同站到一起的 → 组成的
- microfibril** [ˌmaɪkrəʊˌfaɪbrɪl] *n.* 微纤维(尤指普通显微镜下看不见的构成植物细胞壁的微纤维)
- matrix** [ˌmeɪtrɪks] *n.* 基质; matr 母〔例, maternal 母亲的〕 + ix 后缀
- familial** [ˌfæmɪljəl] *adj.* 家系的; family 家庭 → 变为形容词 → 家系的; 〈注〉familiar 熟悉的, 常见的
- genetic** [dʒɪˌnetɪk] *adj.* 遗传的; 〈注〉inherit 遗传(动词)

encoding the receptor for low-density lipoprotein (LDL). These defects result in the synthesis of abnormal LDL receptors that are incapable of binding to LDLs, or that bind LDLs but the receptor/LDL complexes are not properly internalized and degraded. The outcome is an elevation in serum cholesterol levels and increased propensity toward the development of atherosclerosis.

A number of proteins can contribute to cellular transformation and carcinogenesis when their basic structure is disrupted by mutations in their genes. These genes are termed proto-oncogenes. For some of these proteins, all that is required to convert them to the oncogenic form is a single amino acid substitution. The cellular gene, *c-ras*, is observed to sustain single amino acid substitutions at positions 12 or 61 with high frequency in colon carcinomas. Mutations in *c-ras* are most frequently observed genetic alterations in colon cancer.

Amino-Terminal Sequence Determination

Prior to sequencing peptides it is necessary to eliminate disulfide bonds within peptides and between peptides. Several different chemical reactions can be used in order to permit separation of peptide strands and prevent protein conformations that are dependent upon disulfide bonds. The most common treatments are to use either 2-mercaptoethanol or dithiothreitol. Both of these chemicals reduce disulfide bonds. To prevent reformation of the disulfide bonds the peptides are treated with iodoacetic acid in order to alkylate the free sulfhydryls.

There are three major chemical techniques for sequencing peptides and proteins from the N-terminus. These are the Sanger, Dansyl chloride and Edman techniques.

Vocabulary

receptor [ˈriˌseptə] *n.* 受体; re 再,又〔例,renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+cept 接受+or 物→再接受物→受体

density [ˈdensiti] *n.* low-density 低密度;high-density 高密度

incapable [ɪnˈkeɪpəbl] *adj.* 无能力的,不能的; in 不〔例,inactive 失活的〕+capable 有能力的

properly [ˈprɒpəli] *adv.* 合适地;同义词:suitably;反义词:inappropriately

internalize [ɪnˈtɜːnəlaɪz] *vt.* 使内在化;inter 两者之间〔例,interplay 相互作用〕+nal 的+ize 使动词后缀;反义词:externalize 给以外形,使外在化

outcome [ˌaʊtkʌm] *n.* 结果;out 出+come 来→出来→结果;〈记〉income 收入(进来)

elevation [ˌiːliˈveɪʃən] *n.* 升高,抬高;e 向外,向上〔例,evolve 进化(e 外+volve 转→向外转→进化)〕+lev 水平〔例,levy 收税(收入水平之外的额外付出)〕+ation 名词后缀〔例,navigation 浏览〕

serum [ˈsɪərəm] *n.* 血清;blood plasma 血浆;serology 血清学

propensity [ˈprɒpensiti] *n.* 倾向性,癖好;pro 向前〔例,progress 前进(gress 走)〕+pens→pend 挂→向前挂→倾向

- toward** [tə'wɔ:d] *prep.* 朝向; to+ward 方位后缀〔例, upward 向上〕
- development** [di'veləpmənt] *n.* 发育; deve→de 加强词义+lop 跑→跑来→发生→发育+ment 名词后缀; develop 发展, 发育; 〈记〉developing country 发展中国家; developed country 发达国家; underdevelop 发育不足; 〈注〉depend 依靠
- contribute** [kən'tribju:t] *v.* 贡献, 有助于; con 共同+tribue 贡物→共同贡献→贡献
- cellular** [ˌseljʊlə] *adj.* 细胞的; 〔例, extracellular 胞外的, intracellular 胞内的〕; 〈记〉molecule 分子→cell→tissue 组织→organ 器官→system 系统→body 人体
- basic** [ˌbeisik] *n.* 基础的; base 基础〔例, basement 地下室〕; base(基础)的形容词形式
- convert** [kən'vɔ:t] *n.* 转化; con 共同〔例, constriction 收缩(con 共同+strict 限制+tion 名词后缀)〕+vert 转〔例, conversation 对话〕→共转→转化
- sustain** [sə'steɪn] *vt.* 维持; sus→sub 下〔例, subway 地铁〕+tain 握, 持〔例, maintain 保持(main→man 拿+tain 持→保持)〕→在下面支持→支持, 供养
- frequency** [ˌfri:kwənsi] *n.* 频率, 周率, 发生次数; 〈注〉frequent 频繁的; frequently 频繁地; 反义词: infrequent 不经常的
- colon** [kəʊ'lən] *n.* 结肠; colonization 克隆化, 异地发育; colon 克隆; 〈记〉按发音记
- frequently** [ˌfri:kwəntli] *adv.* 经常地; 同义词: often; 反义词: rare
- cancer** [ˌkænsə] *n.* 癌症; 〈记〉sarcoma 肉瘤; carcinoma 癌; adenoma 腺瘤
- prior** [ˌpraɪə] *adj.* 预先的; 〈注〉posterior 后边的; anterior 前边的; superior 上面的
- necessary** [ˌnesisəri] *adj.* 必要的; 同义词: indispensable; 反义词: trivial 微不足道的
- eliminate** [i'limineɪt] *vt.* 消除; 同义词: eradicate 根除; 反义词: produce
- disulfide** [daɪ'sʌlfaid] *n.* 二硫化物; di 二〔例, dioxide 二氧化物〕+ sulf 硫 + ide 物
- chemical** [ˌkemɪkəl] *adj.* 化学的; chemisty 化学; chem(o) 化学〔例, chemosmosis 化学渗透〕+al 形容词后缀
- permit** [pə(:)mɪt] *vt.* 允许; per 完全〔例, perfume 香水(per 全+fume(烟)味→全是味→全是(烟)味→全是香味→香水)〕+mit 送〔例, transmit 传送(trans 横过+mit 送)〕
- separation** [sepə'reɪʃən] *n.* 分离, 分开; se 分〔例, segregate 隔离〕+par-part 部分+ation 名词后缀
- prevent** [prɪ'vent] *v.* 防止; pre 在前+vent 来〔例, convene 集合(con 共同+ven 来→来到一块→召集, 集合)〕; 同义词: prohibit 阻止
- dependent** [dɪ'pendənt] *adj.* 从属的, 依赖的; 反义词: independent 独立的
- reduce** [ri'dju:s] *vt.* 减轻; re 回〔例, return 归还〕+duce 引导〔例, introduce 介绍(intro 向内+duce 引导)〕→往回引→减少; 同义词: decrease 减少
- reformation** [ˌrefə'meɪʃən] *n.* 改革, 革新; re 再, 又〔例, renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+form 形成+ation 名词后缀
- alkylate** [ˌælkileɪt] *n.* 烷基化物; alkyl 烷基+ate 后缀
- chloride** [ˌklɔ:raɪd] *n.* 氯化物; chlor(o) 氯〔例, chloroform 氯仿〕+ide 后缀
- reagent** [ri:'eɪdʒənt] *n.* 反应力, 反应物, 试剂; re 再, 又〔例, renounce 斥责(re 再+nounce 说→说了又说→斥责)〕+agent 剂

Sanger's Reagent: This sequencing technique utilizes the compound, 2, 4-dinitrofluorobenzene (DNF) which reacts with the N-terminal residue under alkaline conditions. The derivative amino acid can be hydrolyzed and will be labeled with a dinitrobenzene group that imparts a yellow color to the amino acid. Separation of the modified amino acids (DNP-derivative) by electrophoresis and comparison with the migration of DNP-derivative standards allows for the identification of the N-terminal amino acid.

Dansyl chloride: Like DNF, dansyl chloride reacts with the N-terminal residue under alkaline conditions. Analysis of the modified amino acids is carried out similarly to the Sanger method except that the dansylated amino acids are detected by fluorescence. This imparts a higher sensitivity into this technique over that of the Sanger method.

Edman degradation: The utility of the Edman degradation technique is that it allows for additional amino acid sequence to be obtained from the N-terminus inward. Using this method it is possible to obtain the entire sequence of peptides. This method utilizes phenylisothiocyanate to react with the N-terminal residue under alkaline conditions. The resultant phenylthiocarbonyl derivative amino acid is hydrolyzed in anhydrous acid. The hydrolysis reaction results in a rearrangement of the released N-terminal residue to a phenylthiohydantoin derivative. As in the Sanger and Dansyl chloride methods, the N-terminal residue is tagged with an identifiable marker, however, the added advantage of the Edman process is that the remainder of the peptide is intact. The entire sequence of reactions can be repeated over and over to obtain the sequences of the peptide. This process has subsequently been automated to allow rapid and efficient sequencing of even extremely small quantities of peptide.

Carboxyl-Terminal Sequence Determination

No reliable chemical techniques exist for sequencing the C-terminal amino acid of peptides. However, there are enzymes, exopeptidases that have been identified that cleave peptides at the

Vocabulary

technique [tek₁nik] *n.* 技术;〈记〉technic 技巧的;technical 技术上的

compound [kɒmpaʊnd] *n.* 复合剂;com 共同〔例,common 共同的〕+pound 捣烂→共放一起捣烂→复合剂

alkaline [ælkəleɪn] *adj.* 碱的,碱性的;alkal 碱〔例,alkaloid 生物碱〕+ine 后缀;alkalinization 碱化

derivative [dɪrɪvətɪv] *adj.* 衍生物;derive 来自,起源;〈注〉deprive 剥夺

color [kʌlə] *n.* 颜色;〈注〉hue 色彩;colorful 五颜六色的

comparison [kəmˌpærɪsn] *n.* 比较;com 共+pare→pair 对+ison 名词后缀→放成对→比较相同的地方;〈注〉contrast 对照(比较不同的地方)

migration [maɪˌɡreɪʃən] *n.* 移行,移动;migr 移动〔例,immigrate 移(入)民,emigrate 移居国外〕+ation 名词后缀

- analysis** [əˈnæləsɪs] *n.* 分析; ana 类似〔例, anatomy 解剖(ana 类似 + tomy 切 → 把类似的切开 → 解剖)〕 + lys 分解〔例, hydrolysis 水解(hydro 水 + lysis 解)〕
- similarly** [ˌsɪmɪləli] *adv.* 同样地, 类似于; similar 相似的 + ly 副词后缀
- method** [ˌmeθəd] *n.* 方法; 同义词: way, approach, path
- except** [ɪkˈsept] *vt.* 除外; 〈注〉besides 另外; ex 外 + cept 接受 cept 接受〔例, receipt 收到〕 → 不接受 → 例外
- sensitivity** [ˌsensɪˈtɪvɪti] *n.* 敏感性; sens 感觉〔例, sensor 传感器〕 + itivity 名词后缀〔例, captivity 监禁, 束缚〕
- degradation** [ˌdeɡrəˈdeɪʃən] *n.* 降解; de 降低, 向下〔例, deflate 跑气〕 + grade 走〔例, graduate 毕业(走出引申为毕业)〕 + ation 名词后缀〔例, graduation 毕业〕 → 向下走 → 降级 → 降解
- utility** [juːˈtɪlɪti] *n.* 效用, 有用; 同义词: usefulness, usage
- inward** [ˌɪnwəd] *adv.* 向内; in 内〔例, inhale 吸入〕 + ward 向(方位后缀)〔例, outward 向外〕
- possible** [ˌpɒsəbl] *adj.* 可能的; 同义词: maybe, perhaps
- obtain** [əbˈteɪn] *vt.* 获得; ob 前缀 + tain 拿 → 拿住了 → 获得; 同义词: attain 获得, retain 保持
- entire** [ɪnˈtaɪə] *adj.* 全部的; en 使 + tire 轮胎 → 使像个轮胎 → 全部(入内)的
- react** [riːˈækt] *vi.* 起反应, 起作用, 反抗, 起反作用; re 再, 又〔例, renounce 斥责(re 再 + nounce 说 → 说了又说 → 斥责)〕 + act 行动
- hydrolysis** *n.* 水解(名词); hydro 水〔例, hydrology 水文学〕 + lysis 溶解(名词)
- reaction** [ri(:)ˈækʃən] *n.* 反应; re 再, 又〔例, renounce 斥责(re 再 + nounce 说 → 说了又说 → 斥责)〕 + action 活动 → 再活动 → 反应
- marker** [ˌmɑːkə] *n.* 标记物; mark 标记 + er 物(或人)
- advantage** [ədˌvɑːntɪdʒ] *n.* 优势; ad 加强前缀 + vantage 优势〔例, disadvantage 劣势〕
- process** [ˌprɒˈses] *n.* 过程; pro 前 + ces → ced 走 → 向前走 → 过程, 行进
- remainder** [ˌriːmeɪndə] *n.* 残余, 剩余物; re 再, 又〔例, renounce 斥责(re 再 + nounce 说 → 说了又说 → 斥责)〕 + main = man 留〔例, permanent 永久的(per 全 + man 保留 → 一直留下来 → 常住的 → 永久的)〕 + er 人或物 → 再留下 → 残余, 剩余物
- intact** [ɪnˈtækt] *adj.* 未动的, 完好的; in 不〔例, inactive 不活跃的〕 + tact 触〔例, contact 接触, 联系〕 → 未接触 → 未动, 完好的
- rapid** [ˌræpɪd] *adj.* 迅速的; 同义词: immediate, swift, prompt
- efficient** [ɪˈfɪʃənt] *adj.* 有效率的; ef → ex 外(因第二个“f”把“x”同化了) + fic → fact 做〔例, manufacture 制造〕 → 把外面的都做了 → 有效率的; 〈注〉sufficient 充足的
- reliable** [riˈlaɪəb(ə)l] *adj.* 可靠的; rely(可靠)的变形 = dependable; rely 依靠(re 再 + lie 躺 → 再躺 → 靠着 → rely 依靠)
- exist** [ɪɡˈzɪst] *vi.* 存在; existence 存在(名词)
- cleave** [kliːv] *v.* 剪切; cleavage 卵裂; 〈注〉cleft 裂缝

C-terminal residue which can then be analyzed chromatographically and compared to standard amino acids. This class of exopeptidases is called, carboxypeptidases.

Chemical Digestion of Proteins

The most commonly utilized chemical reagent that cleaves peptide bonds by recognition of specific amino acid residues is cyanogen bromide (CNBr). This reagent causes specific cleavage at the C-terminal side of M residues. The number of peptide fragments that result from CNBr cleavage is equivalent to one more than the number of M residues in a protein.

The most reliable chemical technique for C-terminal residue identification is hydrazinolysis. A peptide is treated with hydrazine, $\text{NH}_2\text{-NH}_2$, at high temperature (90°C) for an extended length of time (20—100h). This treatment cleaves all of the peptide bonds yielding aminoacyl hydrazides of all the amino acids excluding the C-terminal residue which can be identified chromatographically compared to amino acid standards. Due to the high percentage of hydrazine induced side reactions this technique is only used on carboxypeptidase resistant peptides.

Size Exclusion Chromatography

This chromatographic technique is based upon the use of a porous gel in the form of insoluble beads placed into a column. As a solution of proteins is passed through the column, small proteins can penetrate into the pores of the beads and, therefore, are retarded in their rate of travel through the column. The larger a protein is, the less likely it will enter the pores. Different beads with different pore sizes can be used depending upon the desired protein size separation profile.

Vocabulary

standard [ˌstændəd] *n.* 标准的; stand 站+ard 后缀→站在那儿作对比→标准的

digestion [diˌdʒestʃən] *n.* 消化力, 领悟; di-dis 分开+gest 吞 (congest 充血, 填塞)+ion 名词后缀→分开吞下→消化, 分类

commonly [ˌkɒmənli] *adv.* 共同地; 同义词: generally; 反义词: rarely, unusually

recognition [ˌrekəɡniʃ(ə)n] *n.* 识别; re 再+cogni 知+tion 名词后缀→再知→识别, 认出

cyanogen [saiˌænədʒin] *n.* 氰; cyano 青蓝〔例, cyanite 蓝晶石〕+gen 原(例, antigen 抗原)

bromide [ˌbrəʊmaɪd] *n.* 溴化物; 〈注〉brominate 用溴(或溴化物)处理, 使溴化

cleavage [ˌkliˌviːdʒ] *n.* 剪切; cleave 卵裂+age 名词后缀; 〈注〉cleft 裂缝

equivalent [iˌkwɪvələnt] *adj.* 相等的; equi 相等, 相同〔例, equicenter 等心〕+valent 价→价值相等→相等的

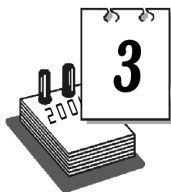
hydrazine [ˌhaɪdrəziːn] *n.* 肼, 联氨

temperature [ˌtemprɪtʃə] *n.* 温度; 〈注〉temper 回火, 脾气

length [lɛŋθ] *n.* 长度; long 的名词形式; 再如 wide→width

- treatment** [ˌtri:tmənt] *n.* 治疗; 同义词: cure, therapy, heal
- percentage** [ˌpɜːsentɪdʒ] *n.* 百分率; per 完全〔例, persist 坚持(per 完全 + sist 坐 → 完全坐 → 一直坐 → 坚持)〕+ cent 百〔例, century 世纪, 一百年〕+ age 名词后缀〔例, leakage 漏〕
- resistant** [rɪˈzɪstənt] *adj.* 抵抗的; re 再, 回〔例, rewind 倒带(wind 上表)〕+ sist 坐〔例, consist 由……组成(con 共同 + sis 坐 → 坐在一起 → 组成)〕反坐 → 顶着干 → 抵抗的
- porous** [ˌpɔːrəs] *adj.* 孔; pore 孔 + us 后缀; 同义词: hole
- insoluble** [ɪnˌsɒljubl(ə)] *adj.* 不能溶解的, 不能解决的; in 不〔例, inactive 不活跃的〕+ soluble 可以溶解的
- column** [ˌkɒləm] *n.* 柱, 栏; 〈注〉row 列
- solution** [səˈljʊ:ʃən] *n.* 溶液; 〈记〉solute 溶质; solvent 溶剂
- penetrate** [ˌpenɪtreɪt] *vt.* 刺入, 渗透; 〔例, penetrating ulcer 穿透性溃疡〕; 〈注〉impene-
trate 进入, 贯穿
- travel** [ˌtrævl] *v.* 传播, 旅游; 同义词: transmit
- likely** [ˌlaɪkli] *adj.* 可能地; unlikely 不可能; impossibly 不可能
- enter** [ˌentə] *vt.* 进入; 〈注〉enterology 肠病学(因肠子在肚中)
- profile** [ˌprəʊfaɪl] *n.* 档案, 案情; pro 在前 + file 档案
- exchange** [ɪksˌtʃeɪndʒ] *vt.* 交换, 调换, 兑换 = interchange; ex 向外〔例, explicit 明显的〕
+ change 换, 变化
- individual** [ɪˌɪndɪˈvɪdʒjuəl] *n.* 个人的; in 内 + divid 分 + ual 后缀 → 把(人群)分开成 → 一个
一个的 → 个人的
- overall** [ˌəʊvəɹə:l] *adj.* 总的, 全部; over 超 + all 全部 → 超过全部 → 总的; 同义词: total,
whole
- property** [ˌprɒpəti] *n.* 特性; proper 主体 + ty 名词后缀 → 主体的东西 → 特性, 特点; 同
义词: feature, characteristics
- basis** [ˌbeɪsɪs] *n.* 基础; base 基础〔例, basement 地下室〕+ sis 名词后缀〔例, diagnosis 诊
断〕
- cellulose** [ˌseljʊləʊs] *n.* 纤维素; 〈注〉cellular 细胞的
- exchanger** 交换器机(剂); ex 向外〔例, explicit 明显的〕+ change 换, 变化 + (e)r 人或物

The greatest friend of truth is time, her greatest enemy is prejudice, and her constant companion is humility (真理最伟大的朋友是时间,其最大的敌人是偏见,其永远的同伴是谦逊)



蛋白质的结构与功能 (3)和酶 (1)

Protein Structure and Function(3) and Enzyme(1)

Ion Exchange Chromatography

Each individual protein exhibits a distinct overall net charge at a given pH. Some proteins will be negatively charged and some will be positively charged at the same pH. This property of proteins is the basis for ion exchange chromatography. Fine cellulose resins are used that are either negatively (cation exchanger) or positively (anion exchanger) charged. Proteins of opposite charge to the resin are retained as a solution of proteins is passed through the column. The bound proteins are then eluted by passing a solution of ions bearing a charge opposite to that of the column. By utilizing a gradient of increasing ionic strength, proteins with increasing affinity for the resin are progressively eluted.

Affinity Chromatography

Proteins have high affinities for their substrates or co-factors or prosthetic groups or receptors or antibodies raised against them. This affinity can be exploited in the purification of proteins. A column of beads bearing the high affinity compound can be prepared and a solution of protein passed through the column. The bound proteins are then eluted by passing a solution of unbound soluble high affinity compound through the column.

High Performance Liquid Chromatography (HPLC)

In column chromatography the smaller and more tightly packed a resin is, the greater the separation capability of the column. In gravity flow columns the limitation column packing is the time it takes to pass the solution of proteins through the column. HPLC utilizes tightly packed fine diameter resins to impart increased resolution and overcomes the flow limitations by pumping the solution of proteins through the column under high pressure. Like standard column chromatography, HPLC columns can be used for size exclusion or charge separation. An additional separation technique commonly used with HPLC is to utilize hydrophobic resins to retard the movement of nonpolar proteins. The proteins are then eluted from the column with a gradient of increasing concentration of an organic solvent. This latter form of HPLC is termed