

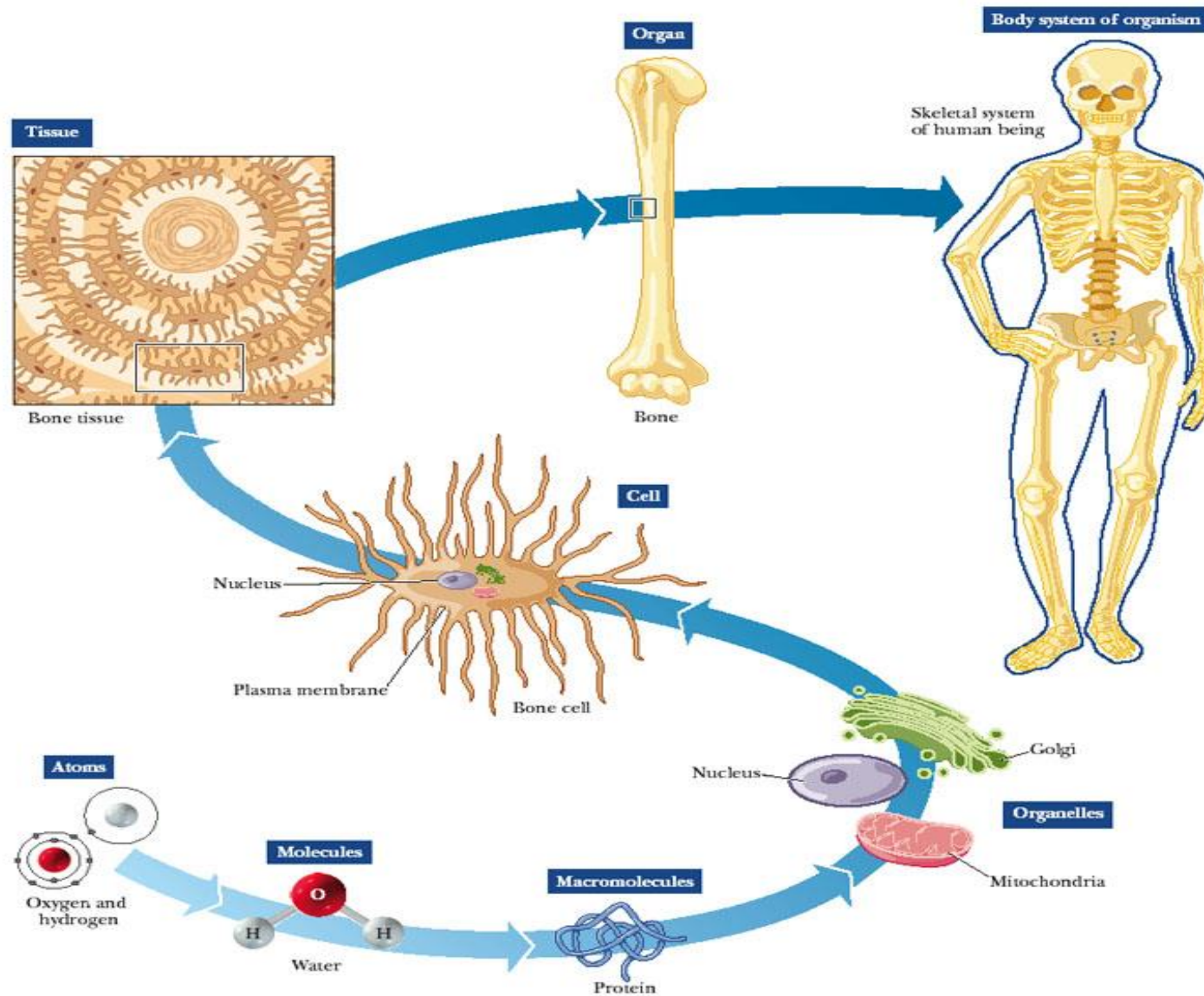
What is Biochemistry?

생화학은 생명현상을
설명하는 논리이다

What Are the Basic Themes of Biochemistry ?

- Biochemistry is a **multi-disciplinary field** that addresses questions about the molecular nature of life processes.
- 다학문분야 연구
 - 유기화학, 생물학, 미생물학, 화학, 물리학, 수학, 물리

생명체의 구성

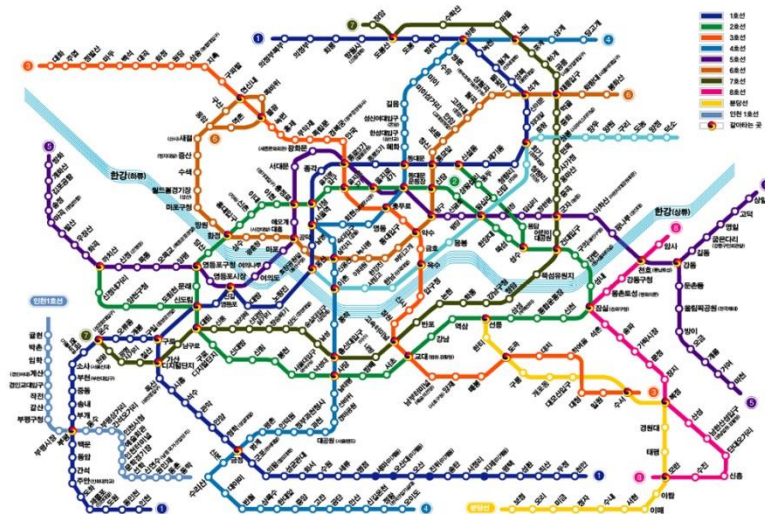


생명 현상은 도시의 운송체계와 유사하다.

- 승용차, 택시



- 전철, 기차



세포반응은 같은 경로를 동시에 사용한다.

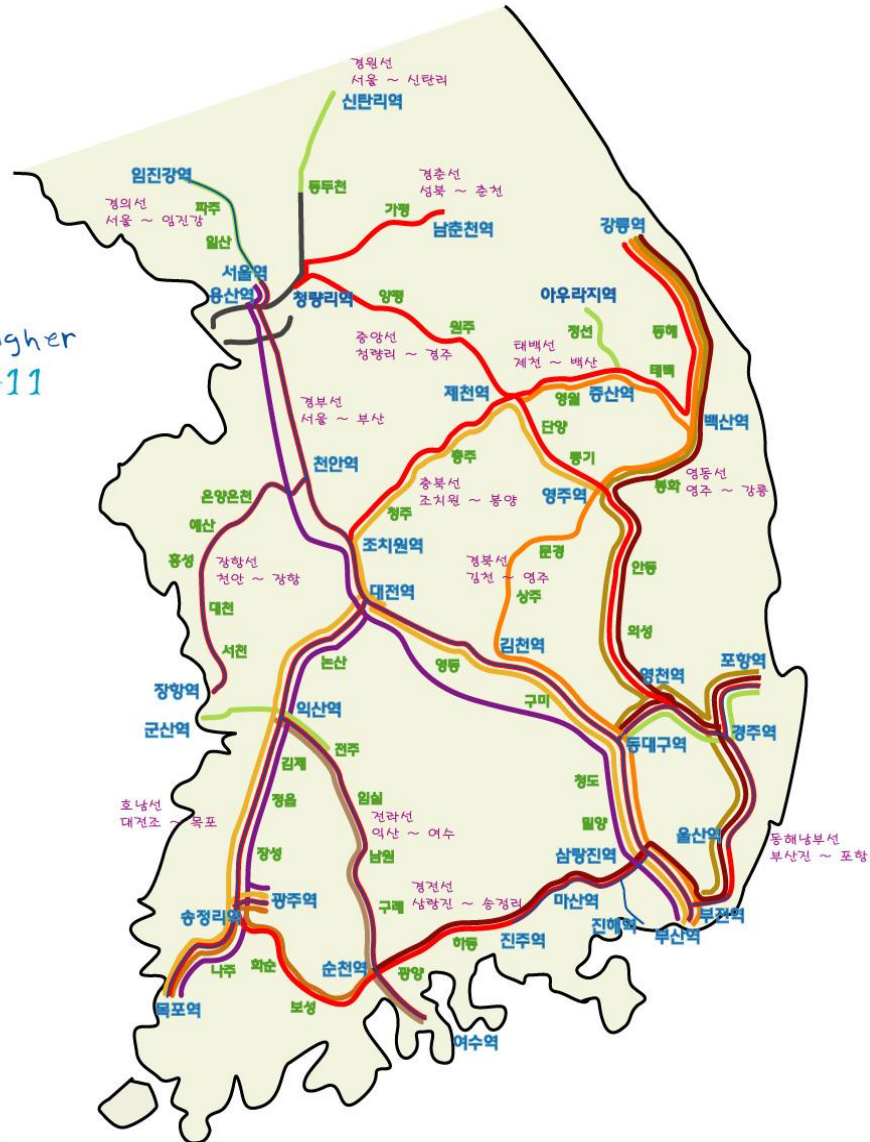
한눈에 보는..
전국 철도 노선도

제작 : 초격정

<http://blog.naver.com/kimsngher>

<http://blog.daum.net/dume411>

- KTX 운행구간
- 새마을호 운행구간
- 통근열차 CDC 운행구간
- 서울 착발 무궁화호 (서울, 용산, 청량리)
- 대전 착발 무궁화호
- 영주 착발 무궁화호
- 대구 착발 무궁화호 (동대구)
- 익산 착발 무궁화호
- 목포 착발 무궁화호
- 부산 착발 무궁화호 (부산)
- 수도권 전철구간 (경원, 경인, 과천, 안산선)

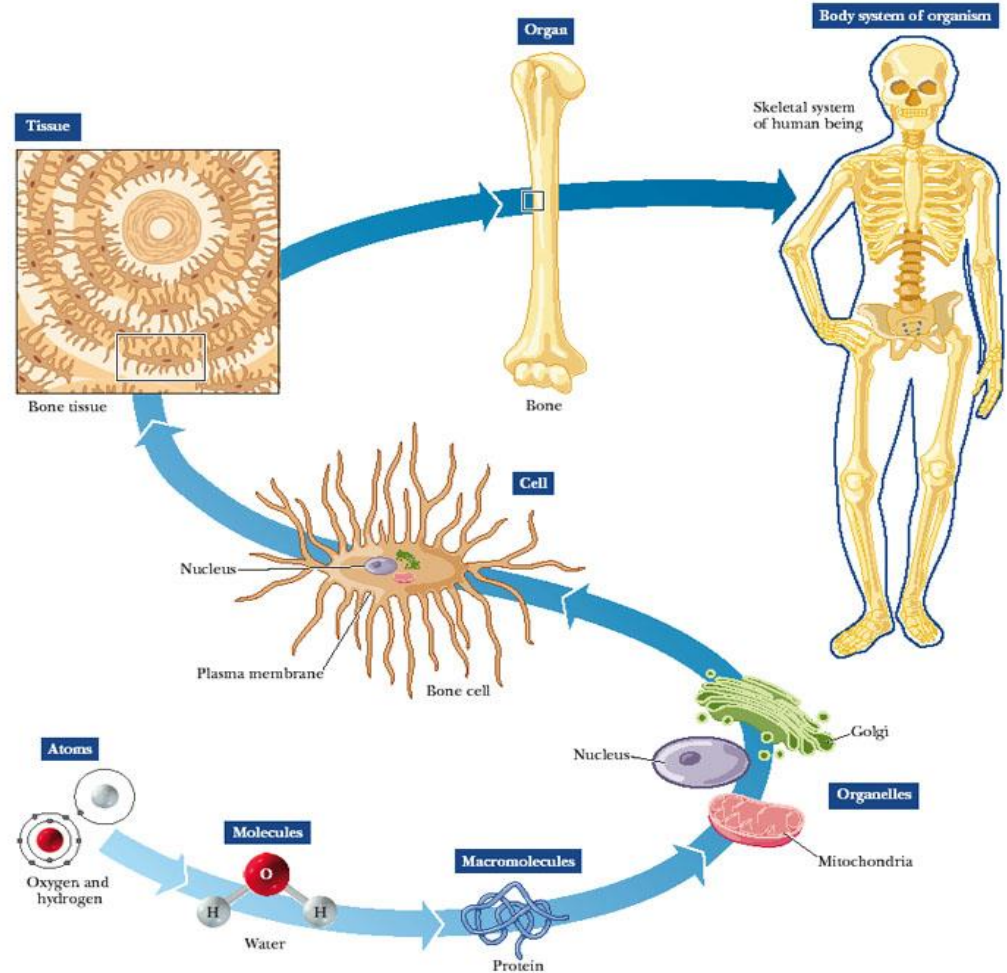


생명체의 특성

1. 복잡성과 조직성
2. 재생능력(Reproduction)
3. 다양한 변화를 능동적으로 만들어내는 존재
4. 생화학적인 구조가 생체의 기능을 결정

생명체의 특성

1. 복잡하지만
조직적이다.



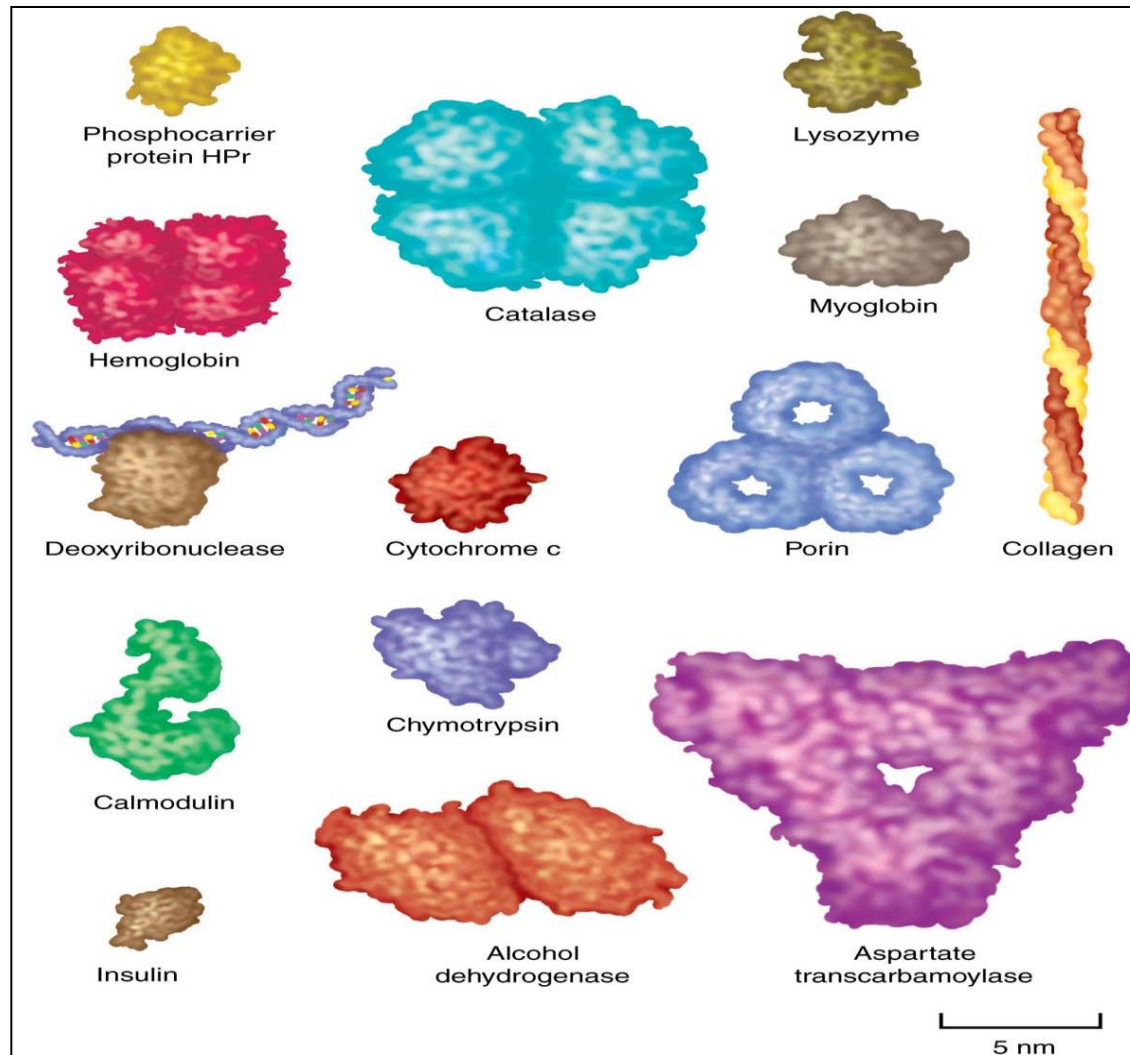
생명체의 특성

2. 재생능력(Reproduction)

3. 다양한 변화를 능동적으로 만들어내는 존재
- Homeostasis (동적 평형)

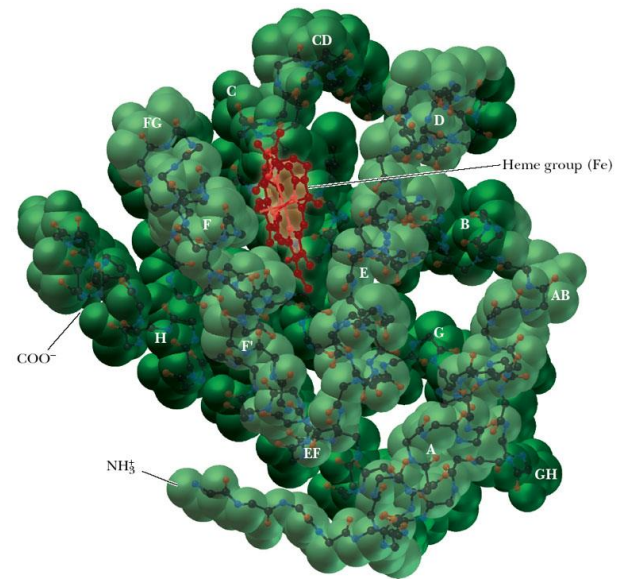
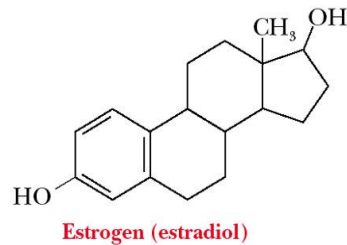
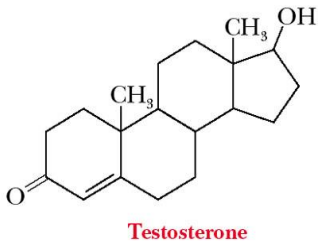
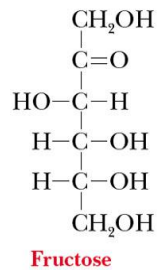
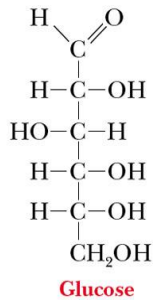
생명체의 특성

4. 생화학적인 구조가 생체의 기능을 결정



구조

- 화학식 (Chemical structure)
- 입체적 구조 (Conformation) : 생긴 모양



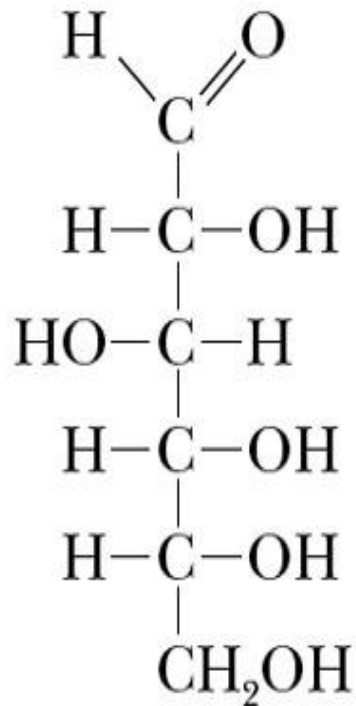
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헤모글로빈의 입체구조

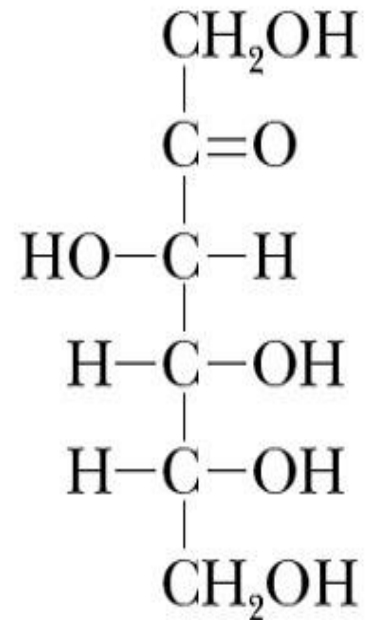
구조식은 왜 중요한가?

구조가 달라지면 기능도 달라진다.

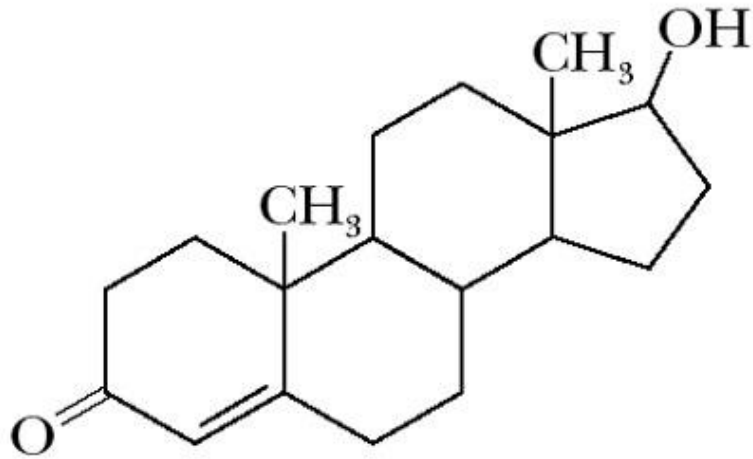
포도당과 과당의 차이
분자식은 $C_6H_{12}O_6$ 로 같으나 기능이 다르다.



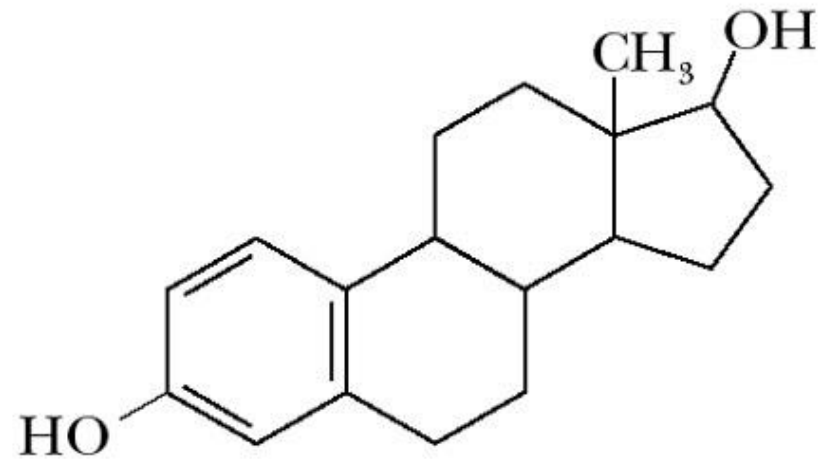
Glucose



Fructose



Testosterone



Estrogen (estradiol)

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구조가 달라지면 기능도 달라진다.

예: 여성호르몬과 남성호르몬

생화학의 관심분야

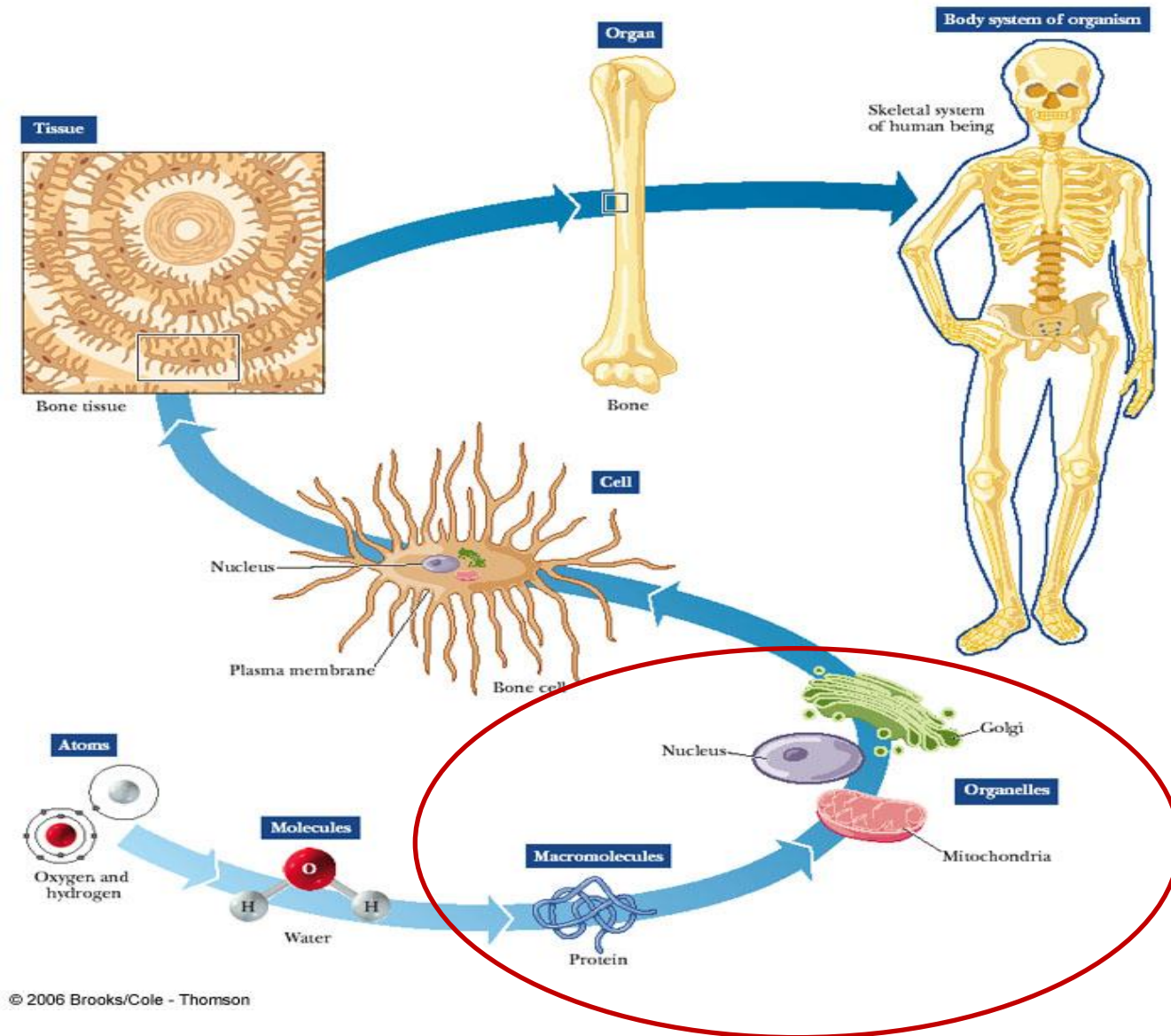


Fig. 1-1, p.3

생명체를 구성하는 화학물질

Life is based on compounds of carbon.

생명체는 유기물이다.

생체분자는 6종류의 원소로 주로 구성된다

생명체를 구성하는 물질의 96%가 C(탄소), H(수소), O(산소), N(질소) 원소로 이루어져 있다.

황S과 인P이 일부 화합물에 함유되어 있다.

Table 1.2**Abundance of Important Elements Relative to Carbon***

Element	Abundance in Organisms	Abundance in Universe
Hydrogen	80–250	10,000,000
Carbon	1,000	1,000
Nitrogen	60–300	1,600
Oxygen	500–800	5,000
Sodium	10–20	12
Magnesium	2–8	200
Phosphorus	8–50	3
Sulfur	4–20	80
Potassium	6–40	0.6
Calcium	25–50	10
Manganese	0.25–0.8	1.6
Iron	0.25–0.8	100
Zinc	0.1–0.4	0.12

macromolecule

- Most molecules are far too small to be seen with the naked eye, but there are exceptions. DNA, a macromolecule, can reach macroscopic sizes.

- 단백질
- 지방
- 글리코겐, 녹말

생체분자가 특별한 이유는?

- 분자들끼리 반응을 한다.
- 분자들끼리의 반응에는 작용기가 필요하다.
- 작용기(functional groups)의 특성:
 - 산소와 질소를 포함하여 극성을 띈다.

생화학에서 중요한 작용기 (functional groups)

Table 1.1

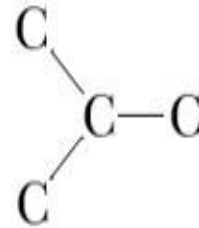
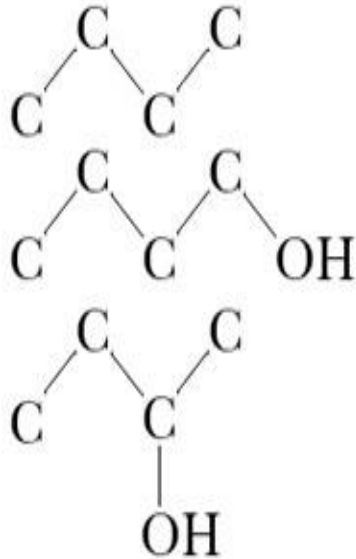
Functional Groups of Biochemical Importance

Class of Compound	General Structure	Characteristic Functional Group	Name of Functional Group	Example
Alkenes	$\text{RCH}=\text{CH}_2$ $\text{RCH}=\text{CHR}$ $\text{R}_2\text{C}=\text{CHR}$ $\text{R}_2\text{C}=\text{CR}_2$	$\text{C}=\text{C}$	Double bond	$\text{CH}_2=\text{CH}_2$
Alcohols	ROH	$-\text{OH}$	Hydroxyl group	$\text{CH}_3\text{CH}_2\text{OH}$
Ethers	ROR	$-\text{O}-$	Ether group	CH_3OCH_3
Amines	RNH_2 R_2NH R_3N	$-\text{N} \begin{array}{l} \diagup \\ \diagdown \end{array}$	Amino group	CH_3NH_2
Thiols	RSH	$-\text{SH}$	Sulfhydryl group	CH_3SH
Aldehydes	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H}$	$-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-$	Carbonyl group	$\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H}$
Ketones	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{R}$	$-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-$	Carbonyl group	$\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{CH}_3$
Carboxylic acids	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$	$-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$	Carboxyl group	$\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$
Esters	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OR}$	$-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OR}$	Ester group	$\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OCH}_3$
Amides	$\text{R}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{NR}_2$	$-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{N} \begin{array}{l} \diagup \\ \diagdown \end{array}$	Amide group	$\text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{N}(\text{CH}_3)_2$

작용기 알아보기

C₄

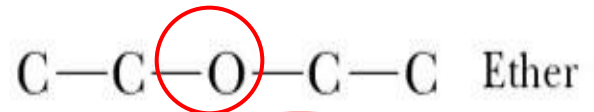
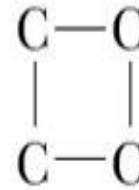
Add one oxygen



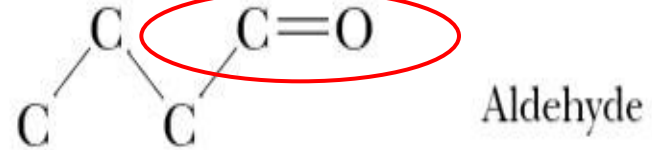
Primary alcohol

Secondary alcohol

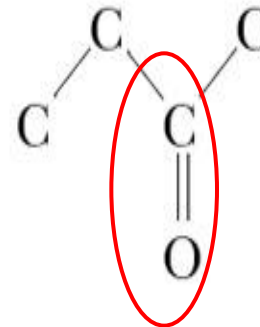
Tertiary alcohol



Ether



Aldehyde



Ketone

에스테르 결합

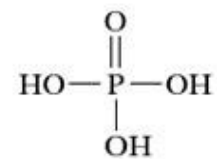
- 카르복실기와 알코올기가 물분자가 빠지면서 반응하여 생기는 결합



- 인산에스테르 결합

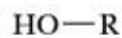


(a)

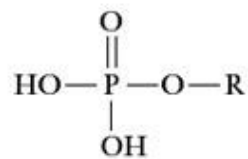
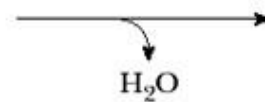


Phosphoric acid

+



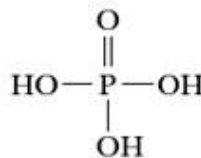
Alcohol



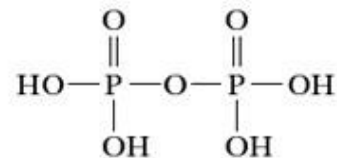
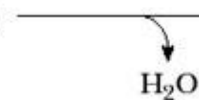
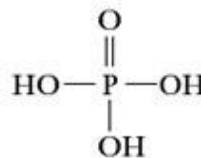
An ester of phosphoric acid



(b)



+



Anhydride of phosphoric acid



(c)

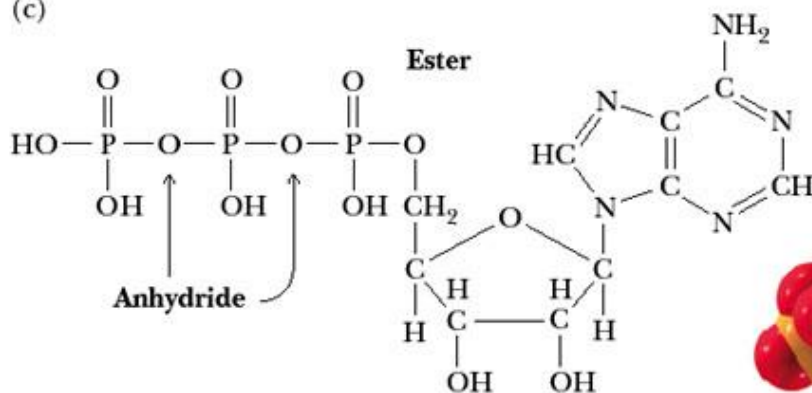


Fig. 1-2, p.5

1.2 생화학의 화학적 본질

2. 생화학과의 접목 a 열의 각 용어에 해당되는 것을 b 열에서 골라보라. a 열은 일부 중요한 작용기의 이름을 나타낸 것이고, b 열은 그 구조식을 나타낸 것이다.

a 열

아미노기
카보닐기(케톤)

수산기
카복실기

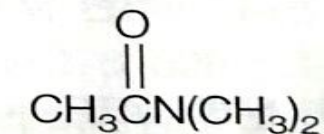
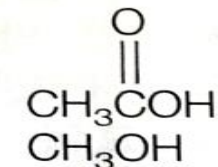
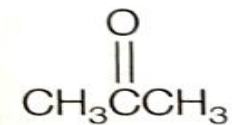
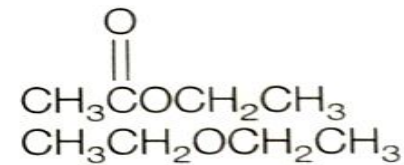
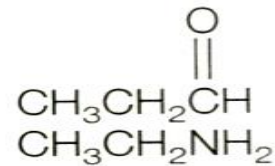
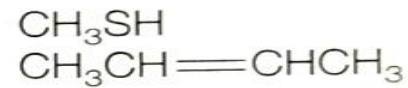
카보닐기(알데하이드)
싸이올기

에스터결합

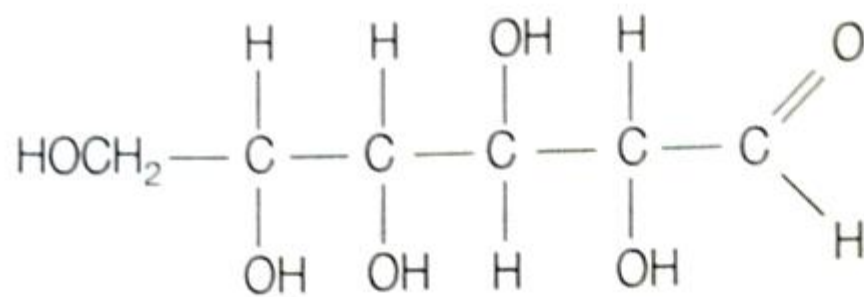
이중결합
아마이드결합

에터

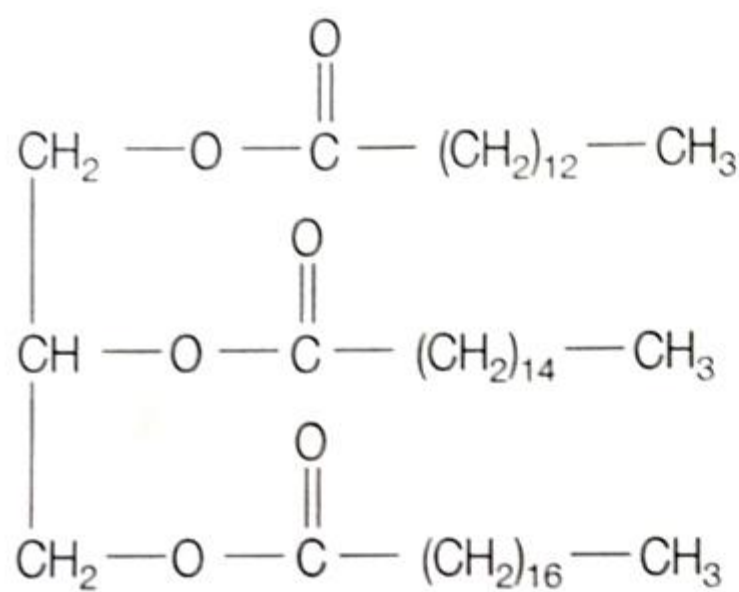
b 열



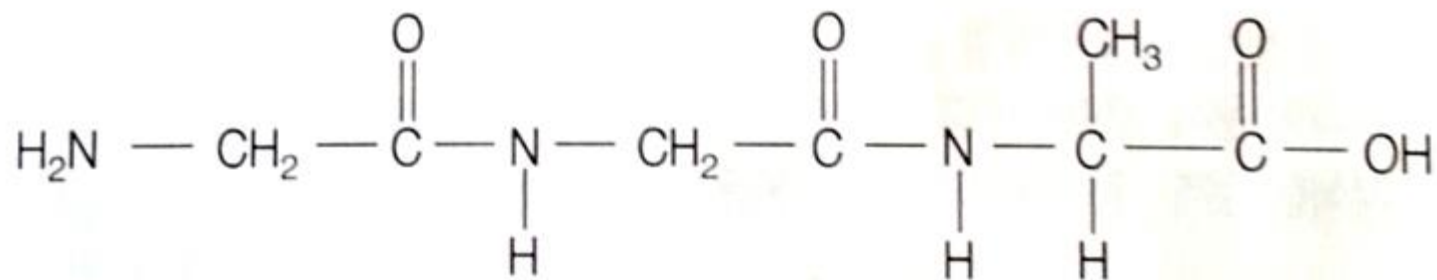
3. 지식형 문제 다음 화합물에 어떤 작용기가 있는지 확인하라.



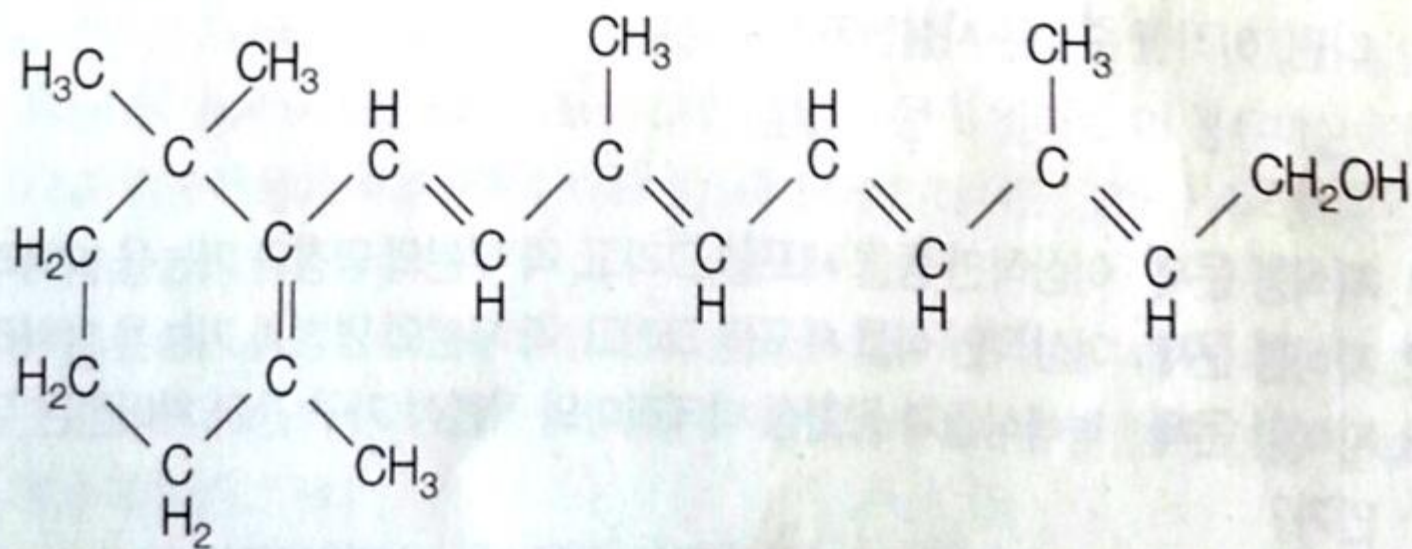
글루코오스



트라이글리세라이드



펩타이드



비타민 A