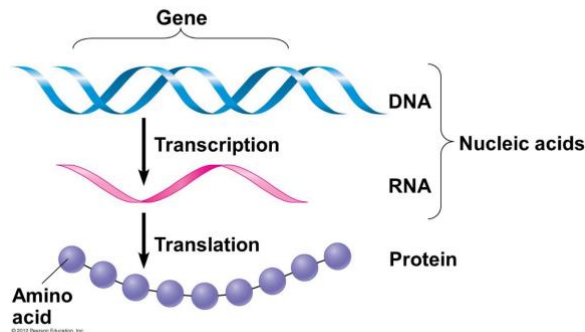


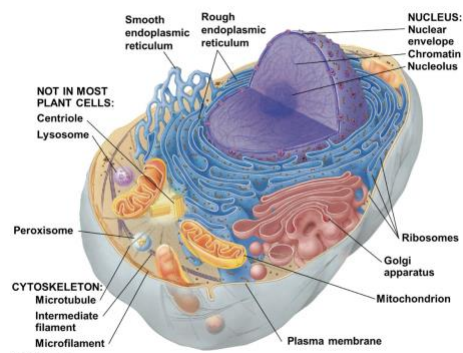
3-1-M AP Bio MCQ

1. Why are **carbon atoms** the lead players in the chemistry of life?
 - a. A carbon atom has 4 electrons in a valence shell that holds 8.
 - b. Carbon completes its outer shell by sharing electrons with other atoms in **four** covalent bonds.
2. **Hydrocarbon**
 - a. a type of molecule consisting of only carbon and hydrogen
 - b. CH_4 : one of the simplest organic molecules
 - c. can have very elaborate shapes: chain/branched/ring
 - d. a type of organic compound
3. Phospholipids
 - a. Hydrophilic heads (Glycerol + Phosphate Group) / Hydrophobic tail (Fatty Acids)
 - b. 물에 넣으면 물에 닿는 표면적을 줄이려고 spherical shape 으로 assemble
4. Central Dogma
 - a. A gene first directs the synthesis of an RNA molecule: DNA is transcribed into RNA
 - b. The RNA molecule then interacts with the protein-building machinery of the cell: RNA is translated into protein.
 - c. $\text{DNA} \rightarrow \text{RNA} \rightarrow \text{protein}$

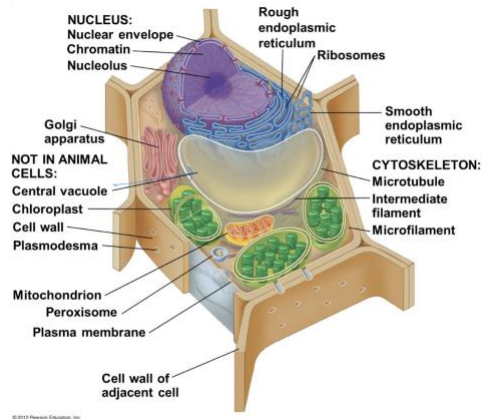


5. Functional Group
 - a. most of them are hydrophilic (except Methyl group)
 - b. **hydroxyl group**: OH
 - i. alcohols
 - c. **carbonyl group**: C=O
 - i. simple sugars: carbonyl + hydroxyl
 - d. **carboxyl group**: COOH

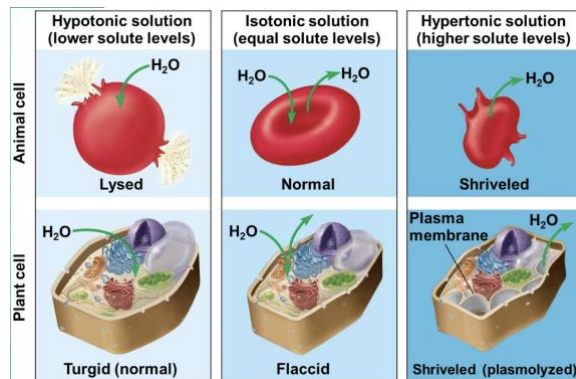
- i. can act as an acid by contributing an H^+ to the solution and thus becoming ionized
 - e. **amino group:** NH_2
 - i. can act as a base by picking up an H^+ from a solution and becoming ionized
 - ii. amino group 가진 organic compound: **amine**
 - iii. amino acids: amino + carboxyl group
 - f. **phosphate group:** OPO_3^{2-}
 - i. usually ionized.
 - ii. compounds with phosphate groups: **organic phosphates** (often involved in energy transfers)
 - g. **methyl group:** CH_3
 - i. methylated compound (DNA 의 구성물질) → expression of genes
6. 구성 원소
- a. Carbohydrates: Carbon, Hydrogen, Oxygen
 - b. Proteins: Carbon, Hydrogen, Oxygen, Nitrogen, (Sulfur)
 - c. Lipids: Carbon, Hydrogen, Oxygen, (Phosphate), (Nitrogen)
 - d. Nucleic Acids: Carbon, Hydrogen, Oxygen, Phosphate, Nitrogen
7. Cell Theory: All living things are composed of cells, and all cells come from other cells.
- a. Cells are the smallest units of life.
 - b. New cells come only from pre-existing cells by cell division.
8. Characteristics of Cells
- a. Selective permeability of the plasma membrane
 - b. Surface-to-Volume Ratio 가 클 수록 물질 교환에 유리 → small cells
9. Fluorescent antibody stains are used to enhance microscopy by selectively binding to specific cellular components. (Specific antigen 에 붙음)
10. Cell Organelles (4 문항)
- a. Animal Cells



b. Plant Cells



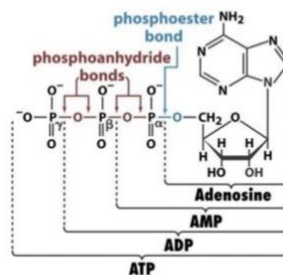
11. Tonicity



12. Cell Transport

- Passive Transport: Does not use ATP to move a solute
 - Simple Diffusion: 막 그대로 통과. Small, nonpolar molecules, gases.
 - Facilitated Diffusion: Uses transport proteins (Channel / Carrier). Polar, Charged substances.
- Active Transport: Uses ATP to move a solute against its concentration gradient.
 - ex) Sodium-Potassium Pump

13. ATP Structure (FRQ 도)



14. How does ATP drive cellular work?

a. Reduces Gibbs Free Energy to Negative

- $\text{Glucose} + \text{Phosphate} \rightarrow \text{Glucose-6-phosphate} + \text{H}_2\text{O}$
 - $\Delta G = +3.3$ kcal/mole (endergonic)
- $\text{ATP} + \text{H}_2\text{O} \rightarrow \text{ADP} + \text{P}_i$
 - $\Delta G = -7.3$ kcal/mole (exergonic)

Coupled reaction:

- $\text{Glucose} + \text{ATP} \rightarrow \text{Glucose-6-phosphate} + \text{ADP}$
 - $\Delta G = -4.0$ kcal/mole (exergonic)
 - spontaneous
 - phosphorylation

→ ATP 한 개 필요하구나!

b. Phosphorylation: Transferring its third phosphate from ATP to some other molecule.

- Changes the shape of the protein by attaching its phosphate to the protein.

15. Sodium-Potassium ATPase (AP Classroom 문제 출제 예상)

Some membrane proteins help maintain the concentrations of ions inside a cell by transporting the ions across the cell's plasma membrane. Other membrane proteins form pores in the plasma membrane through which the ions can diffuse. A model showing the influence of membrane proteins on the movement of sodium (Na^+) and potassium (K^+) ions across a plasma membrane is presented in Figure 1.

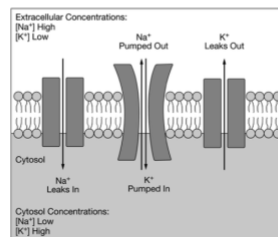


Figure 1. Section of a cell's plasma membrane, showing ion concentrations and membrane proteins

18. Based on the model presented in Figure 1, which of the following changes will most likely result from a depletion of available ATP stores inside the cell?

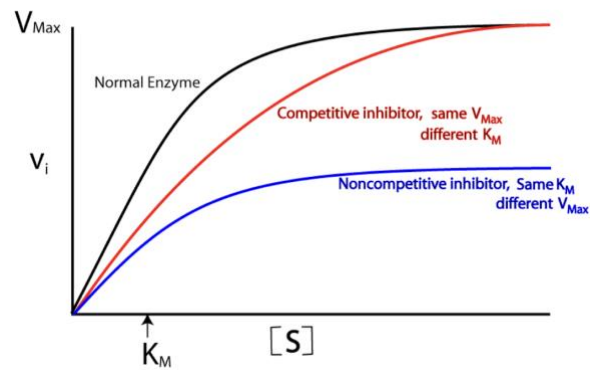
- The Na^+ concentration outside the cell will increase.
- The Na^+ concentration inside the cell will increase.
- The K^+ concentration inside the cell will increase.
- The K^+ concentration outside the cell will decrease.

16. Enzyme

- Biological Catalyst → reduces activation energy
- Not consumed by reaction → reusable
- active site/substrate → specificity
- induced fit
- most are proteins → denaturation, optimal conditions exist

17. Inhibitors

- a. Competitive Inhibitors: blocking substrate molecules from entering the active site
 - i. substrate 농도 올리면 해결 가능
- b. Noncompetitive Inhibitors: binds to a site elsewhere (allosteric site) on the enzyme, changing the enzyme's shape so that the active site no longer fits the substrate.
 - i. enzyme 농도 올리면 해결 가능
- c. 그래프 출제 예상



- i. $K_M = V_{Max} * \frac{1}{2}$ 해당하는 Substrate Concentration