

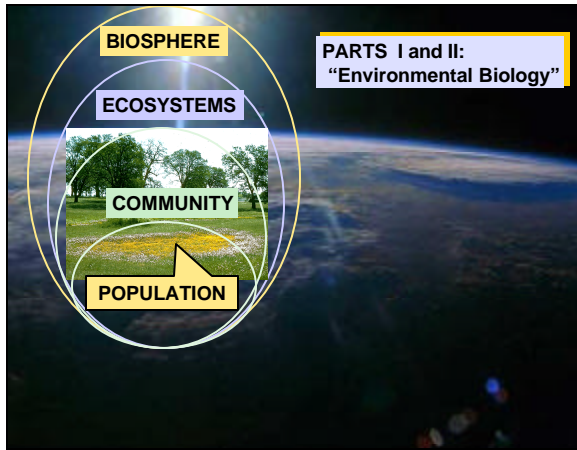
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Cell Structure and Function

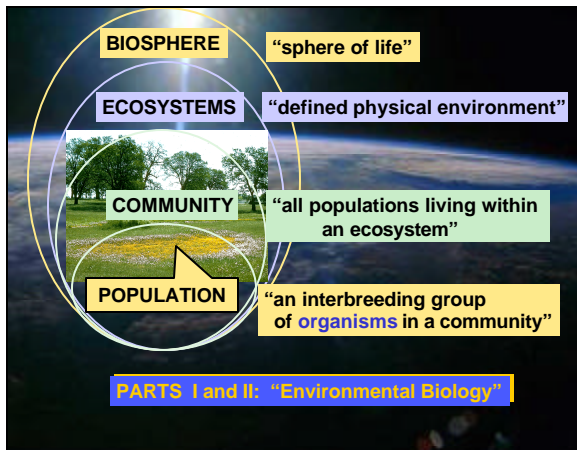
BIO 100 Principles of Biology

Cedarville University

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Slide 3



Slide 4

Basic Life Functions:

1. Nutrition
2. Reproduction
3. Coordination:

PART III:
"Organismic Biology"

ORGANISM

ORGAN e.g. leaf

TISSUE e.g. palisade

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PART IV:
"Cell Biology"

ORGANISM

ORGAN e.g. leaf

TISSUE e.g. palisade

CELL

Slide 6

PART IV:
"Cell Biology"

ORGANISM

ORGAN e.g. leaf

TISSUE e.g. palisade

CELL

PRINCIPLE:
"Since living matter is made of cells, ultimately all basic life processes involve what occurs in cells
– i.e. cellular metabolism:

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PART IV:
"Cell Biology"

CELLULAR METABOLISM:
"total of all the chemical and physical processes that occur in cells."

ORGANISM

ORGAN e.g. leaf

TISSUE e.g. palisade

CELL

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PART IV:
"Cell Biology"

CELLULAR METABOLISM:
Therefore:
To understand life processes,
we need to understand
cellular metabolism.

ORGANISM

ORGAN e.g. leaf

TISSUE e.g. palisade

CELL

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Exercise: Draw a Cell

INCLUDE:

- PLASMA MEMBRANE
- NUCLEUS (nuclear membrane)
- E. R. (endoplasmic reticulum)

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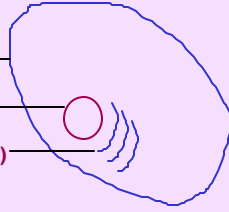
Exercise: Draw a PLASMA

LABEL:

PLASMA MEMBRANE

NUCLEUS

E. R. (endoplasmic reticulum)



RESULT:

All lines represent MEMBRANES

PRINCIPLE:

Cells are complex networks of membranes

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Membrane Functions:

Plasma Membrane

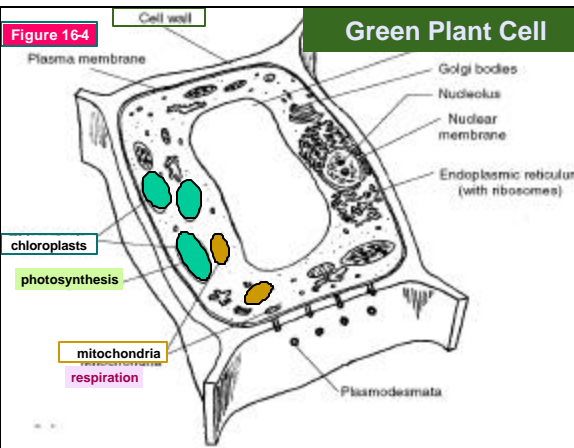
1. Regulate Movement

Organelles

2. Provide compartments



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Membrane Functions:

Figure 16-2 PLASMA Membrane

1. Regulate Movement
2. Provide compartments
3. Aid in Transport
4. Reactive Surfaces

Organelles

Endoplasmic Reticulum and Golgi Bodies

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What Controls Metabolism of Cells?

OR "What makes each cell subservient to the whole?"

Two aspects of metabolic control:

1. Control from inside the cell
esp. nucleus

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What Controls Metabolism of Cells?

OR "What makes each cell subservient to the whole?"

Two aspects of metabolic control:

1. Control from inside the cell
2. Control from outside cells
e.g.
a. hormones
b. impulses

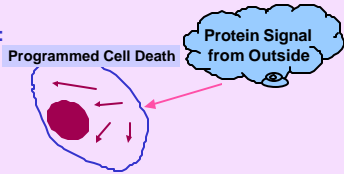
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What Controls Metabolism of Cells?

OR "What makes each cell subservient to the whole?"

Two aspects of metabolic control:

1. Control from inside the cell
2. Control from outside cells
e.g.
 - a. hormones
 - b. impulses
 - c. apoptosis



The diagram shows a cell with a nucleus. Red arrows point from the nucleus to various organelles, labeled 'Programmed Cell Death'. A blue cloud labeled 'Protein Signal from Outside' has a red arrow pointing into the cell.

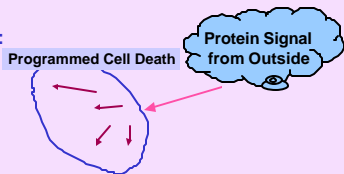
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What Controls Metabolism of Cells?

OR "What makes each cell subservient to the whole?"

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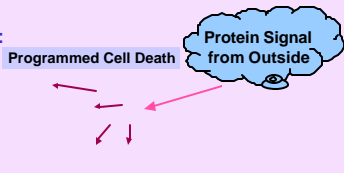
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What Controls Metabolism of Cells?

OR "What makes each cell subservient to the whole?"

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Makeup of a Membrane

Composed of two major molecules:

a) Proteins -- chains of amino acids

Figure 4-12

Secondary Structure (coil or pleat)
Primary Structure (chain of amino acids)
Gly, Glu, Arg, Gly, Phe
Peptide Bond
Ends of two different polypeptides composing the quaternary structure

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Makeup of a Membrane

Composed of:

a) Proteins

b) Phospholipids

CHARGED HEAD "HYDROPHILIC" **NEUTRAL TAILS "HYDROPHOBIC"**

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Makeup of a Membrane

Composed of:

a) Proteins

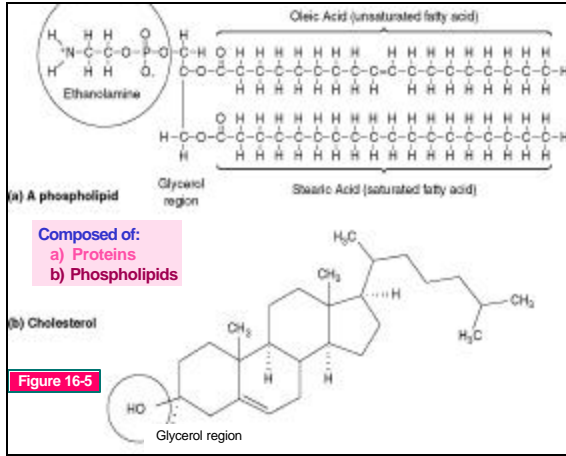
b) Phospholipids

CHARGED HEAD "HYDROPHILIC" **NEUTRAL TAILS "HYDROPHOBIC"**

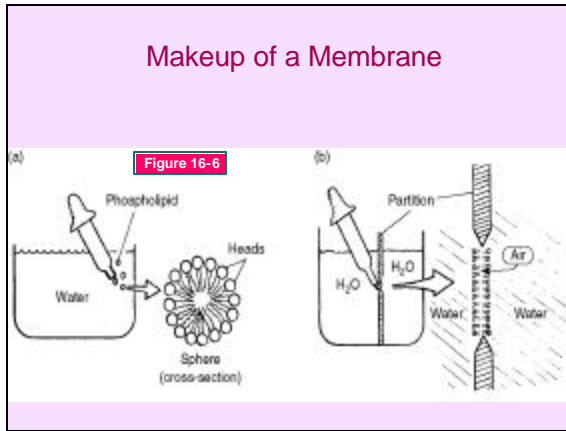
Ethanolamine
Glycerol region
Oleic Acid (unsaturated fatty acid)
Stearic Acid (saturated fatty acid)

Figure 16-5

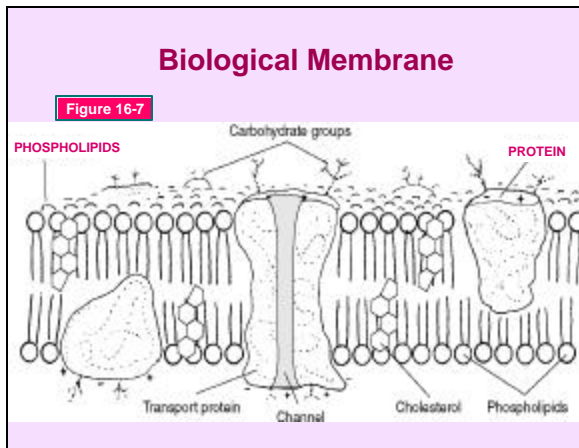
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Slide 23




Slide 24



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Water and Membranes

TENDENCY OF DIFFUSION:




TENDS TOWARD EQUILIBRIUM

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Water and Membranes

TENDENCY OF DIFFUSION:



TENDS TOWARD EQUILIBRIUM

ACTIVE TRANSPORT:
TRANSPORT OF SUBSTANCES ACROSS A MEMBRANE AGAINST THE TENDENCY OF DIFFUSION

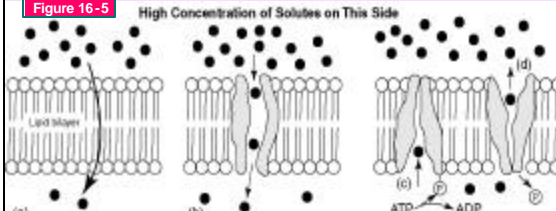


e.g. TRYPAN BLUE cannot enter living cells

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Comparing Diffusion with Active Transport As Explained by Membrane Models

Figure 16-5 High Concentration of Solute on This Side

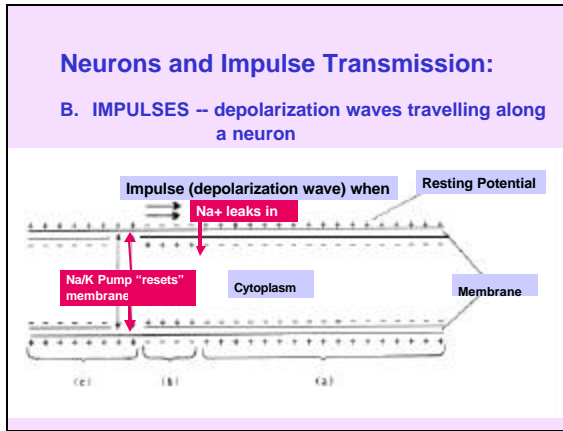


(a) **Diffusion** of water and lipid-soluble substances down a concentration gradient.

(b) **Passive transport** of water and water-soluble solutes is facilitated by protein channels. A prior gradient is necessary.

(c) **Active transport**—protein is activated and opens (c) to bind solute. Solute binding causes change of shape so that solute is released to opposite side (d).

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