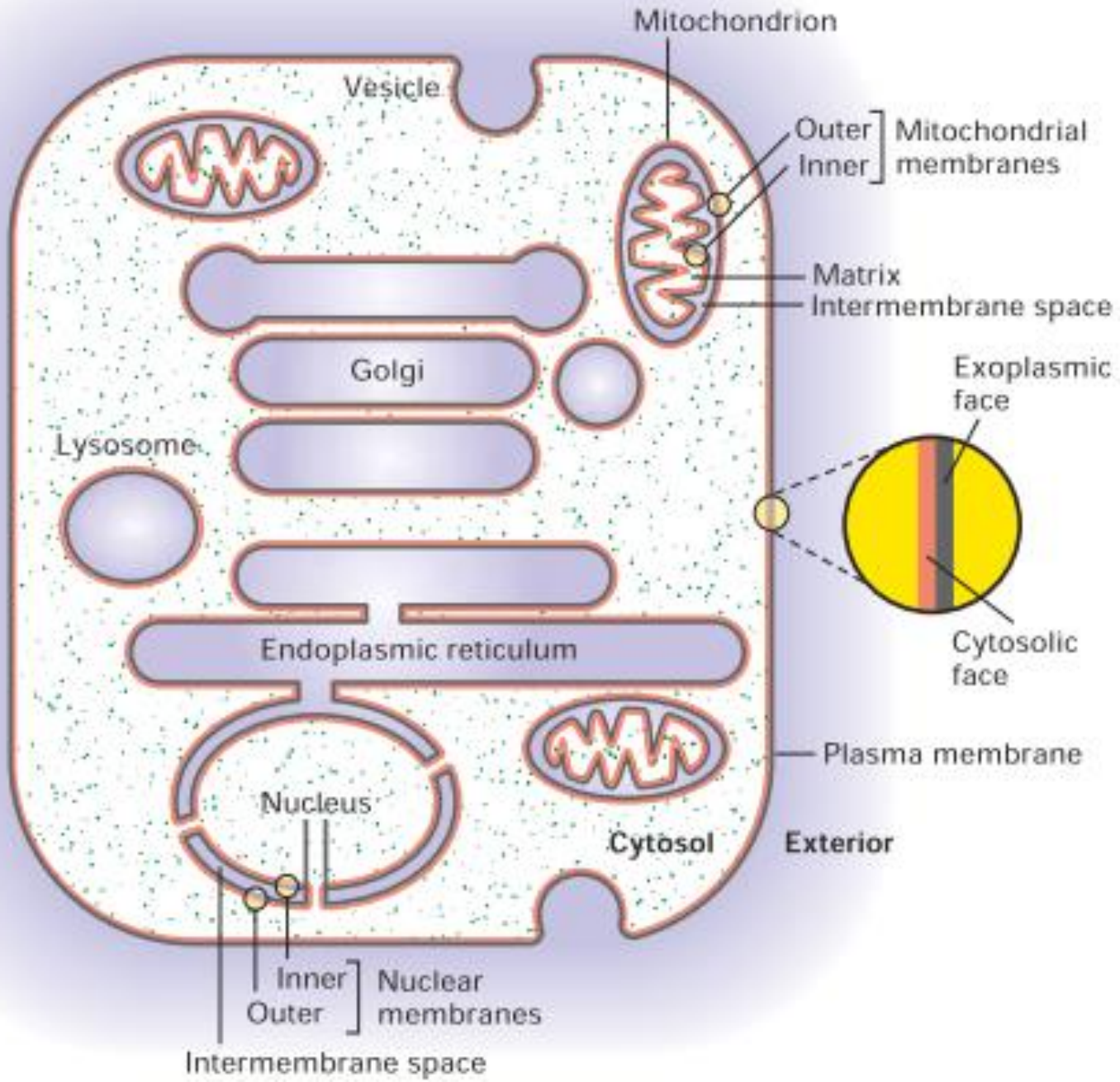
BIOLOGI SEL DAN MOLEKULER (Biomembran)

TYAS PUTRI UTAMI

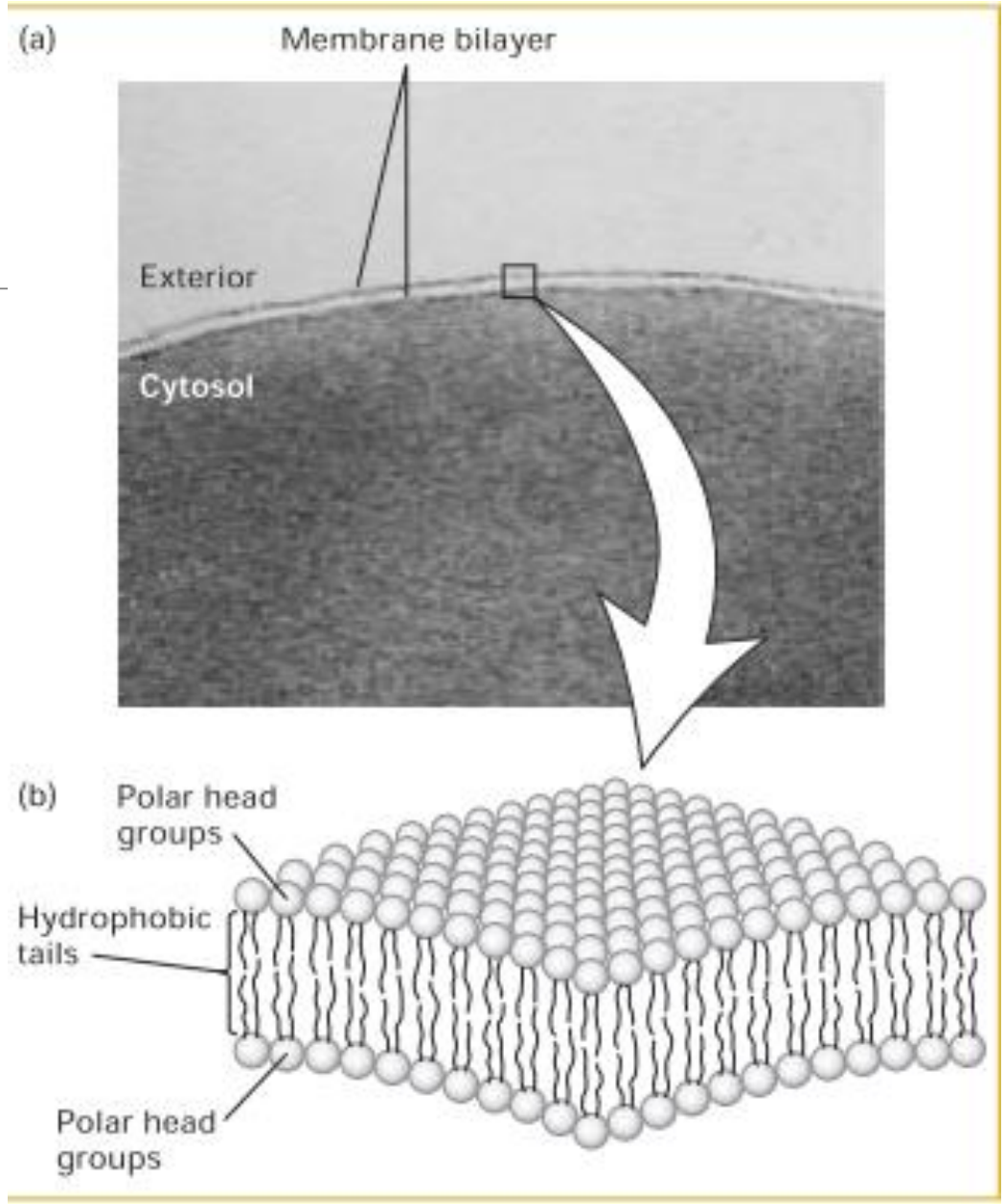
Biomembran

Membran sel → penting untuk kehidupan sel

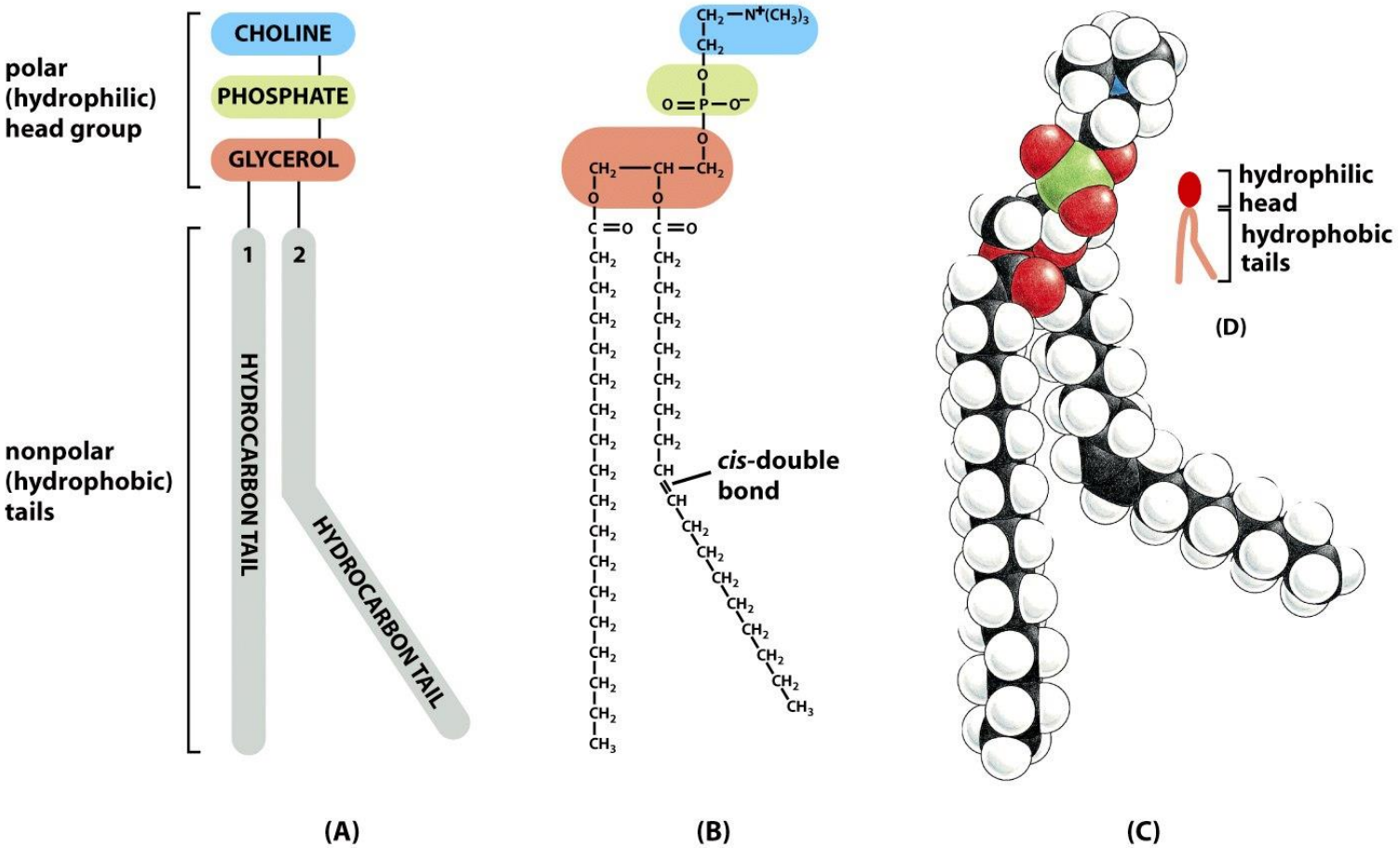
- Membungkus sel dan membatasi sel dari lingkungan sehingga memelihara perbedaan esential antara sitoplasma dan lingkungan ekstraseluler
- Membungkus organel-organel sel, spt retikulum endoplasma, badan Golgi, mitokondria, dll; memelihara perbedaan karakteristiknya dengan sitoplasma.


Mitochondrion
Vesicle
Outer
Inner
Mitochondrial membranes
Matrix
Intermembrane space
Golgi
Exoplasmic face
Lysosome
Endoplasmic reticulum
Cytosolic face
Plasma membrane
Nucleus
Cytosol
Exterior
Inner
Outer
Nuclear membranes
Intermembrane space

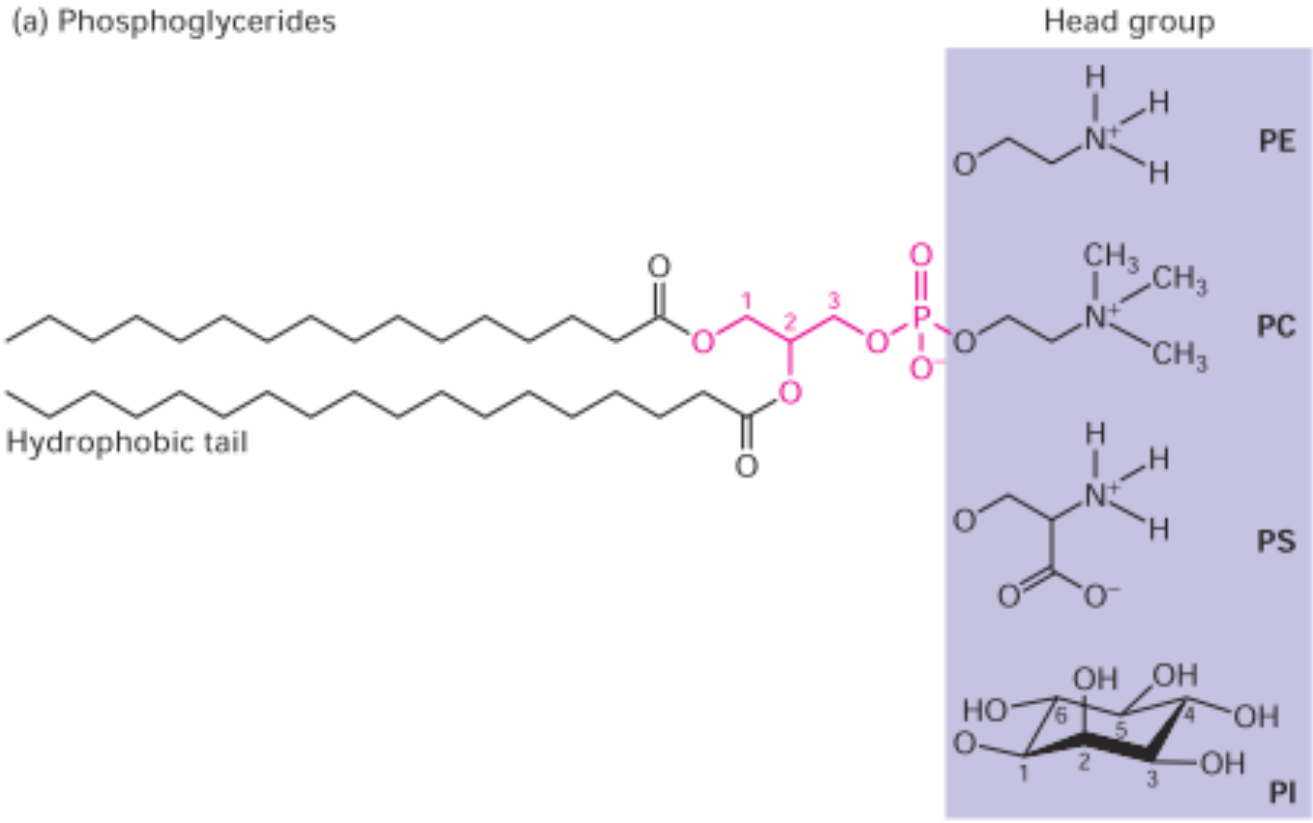
Membran: Bilayer



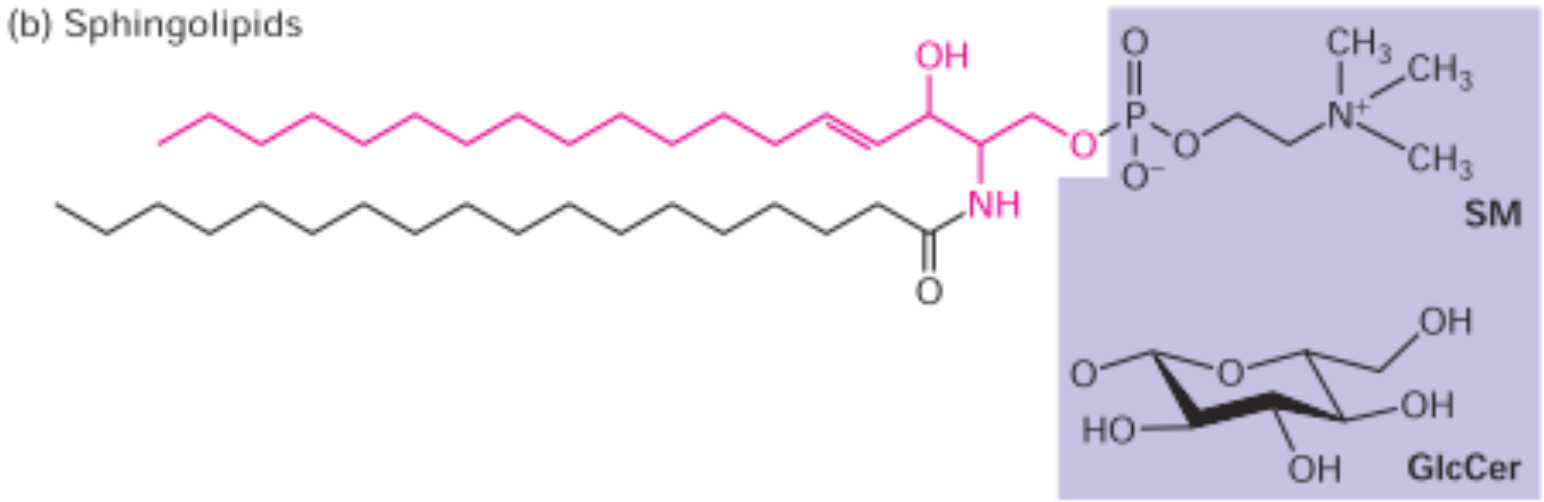
Struktur fosfolipid



3 kelas lipid membran

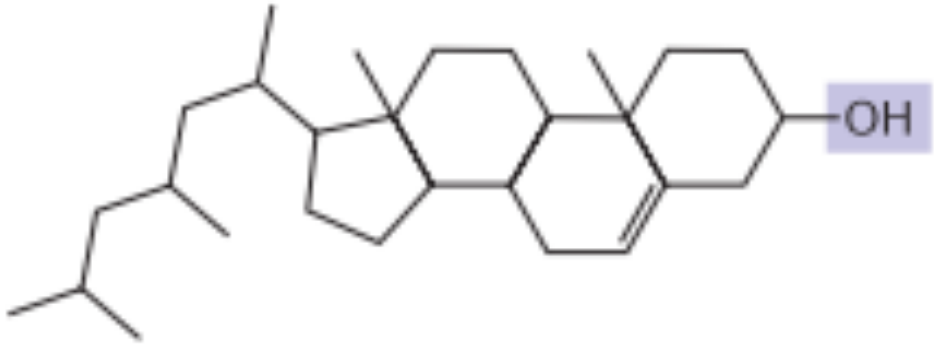


3 kelas lipid membran



3 kelas lipid membran

(c) Cholesterol



Macam-macam lipid membran

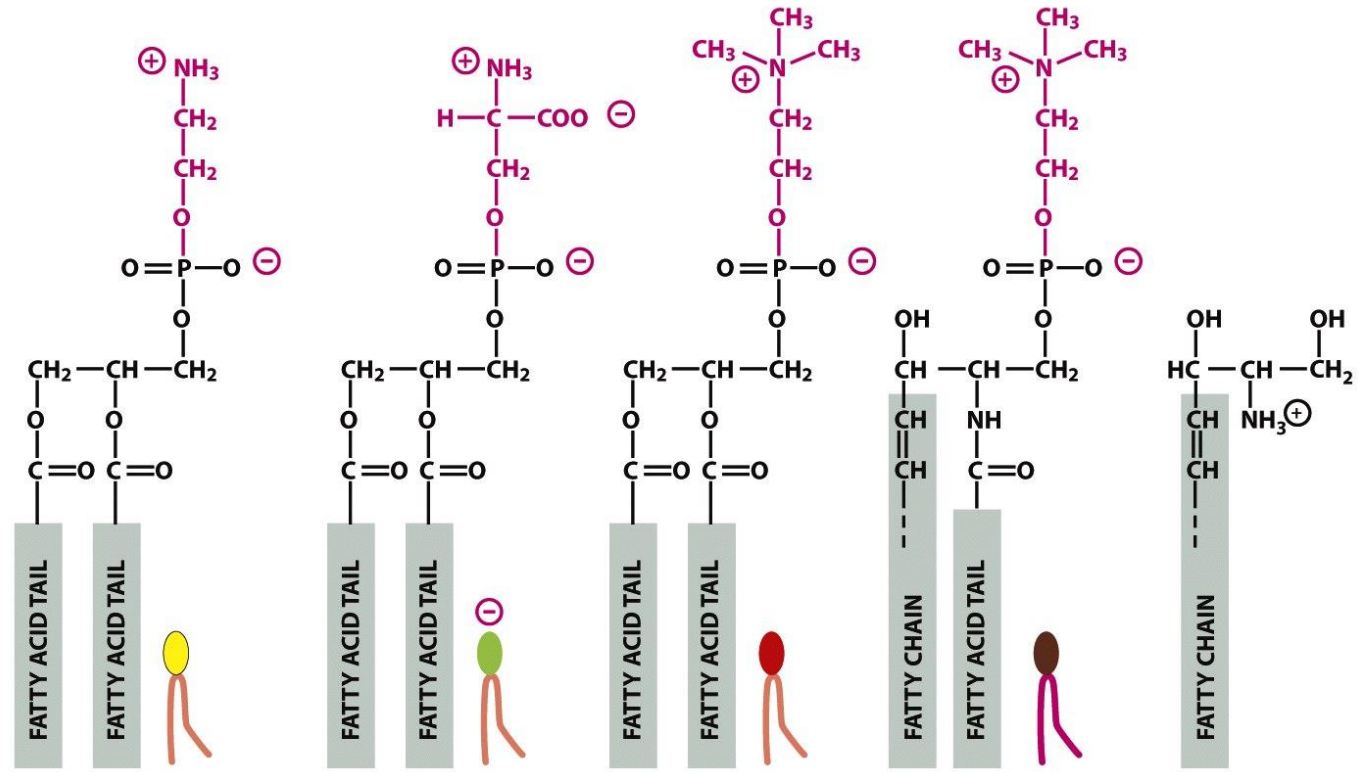
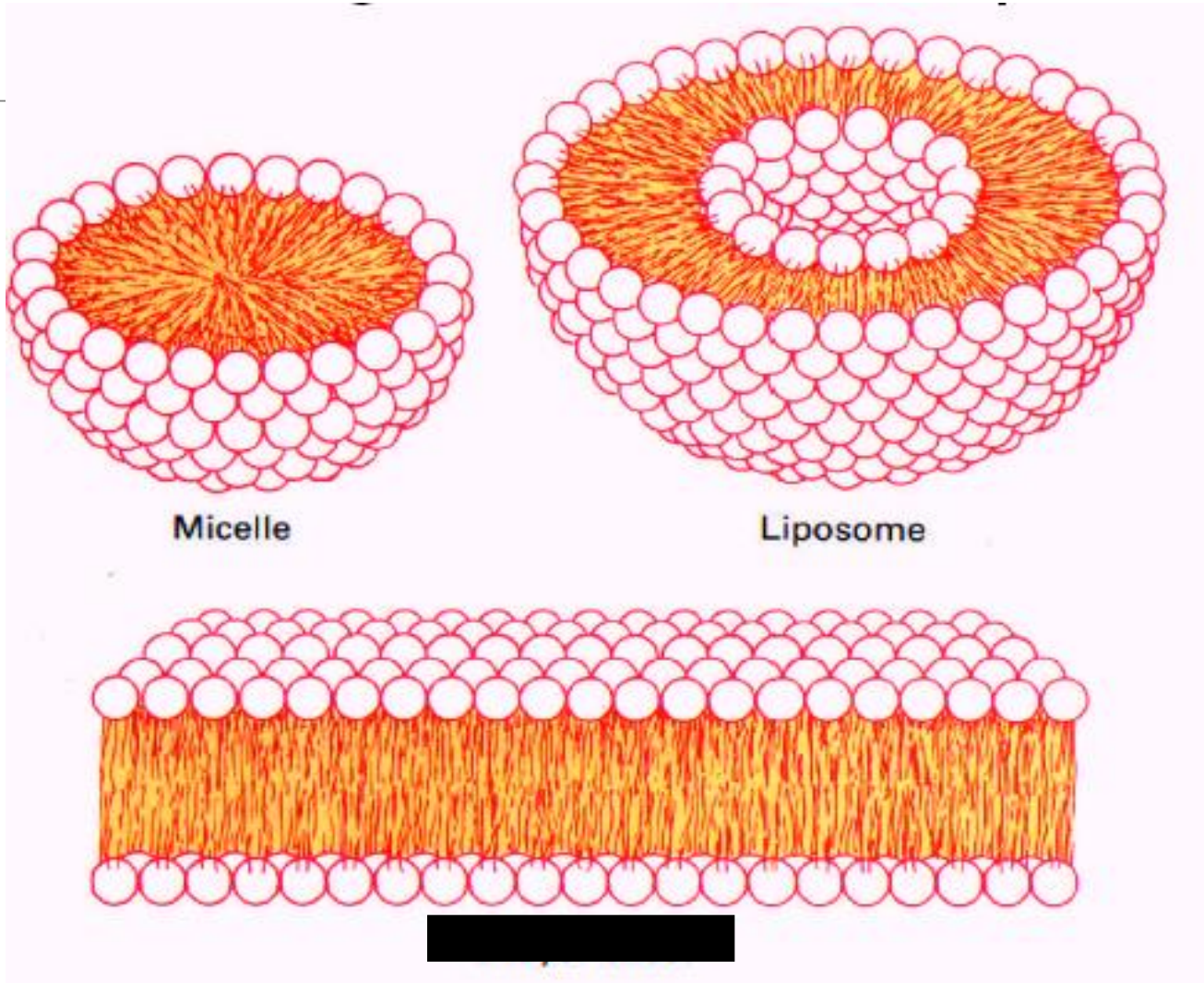
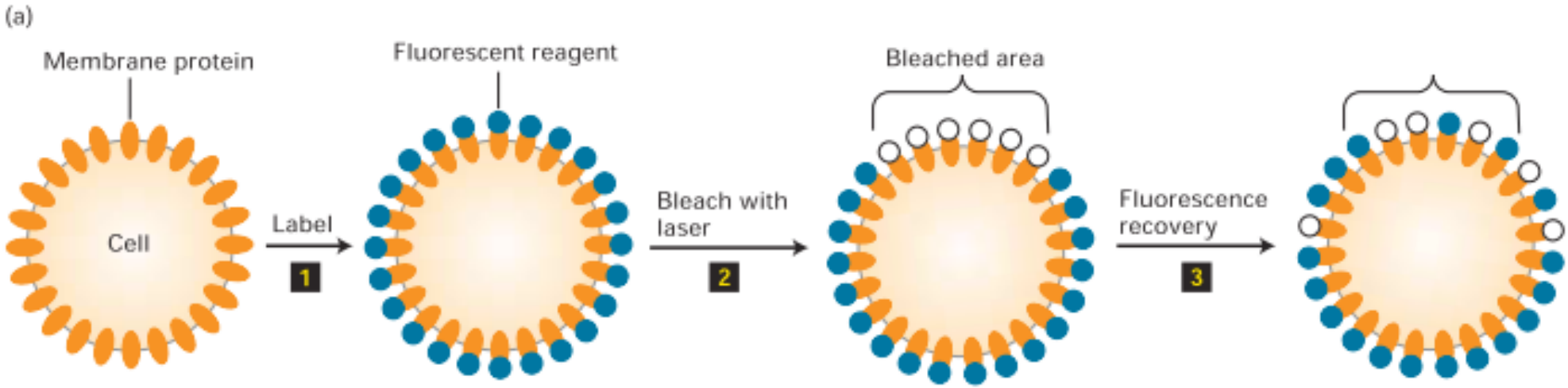


TABLE 10–1 Approximate Lipid Compositions of Different Cell Membranes

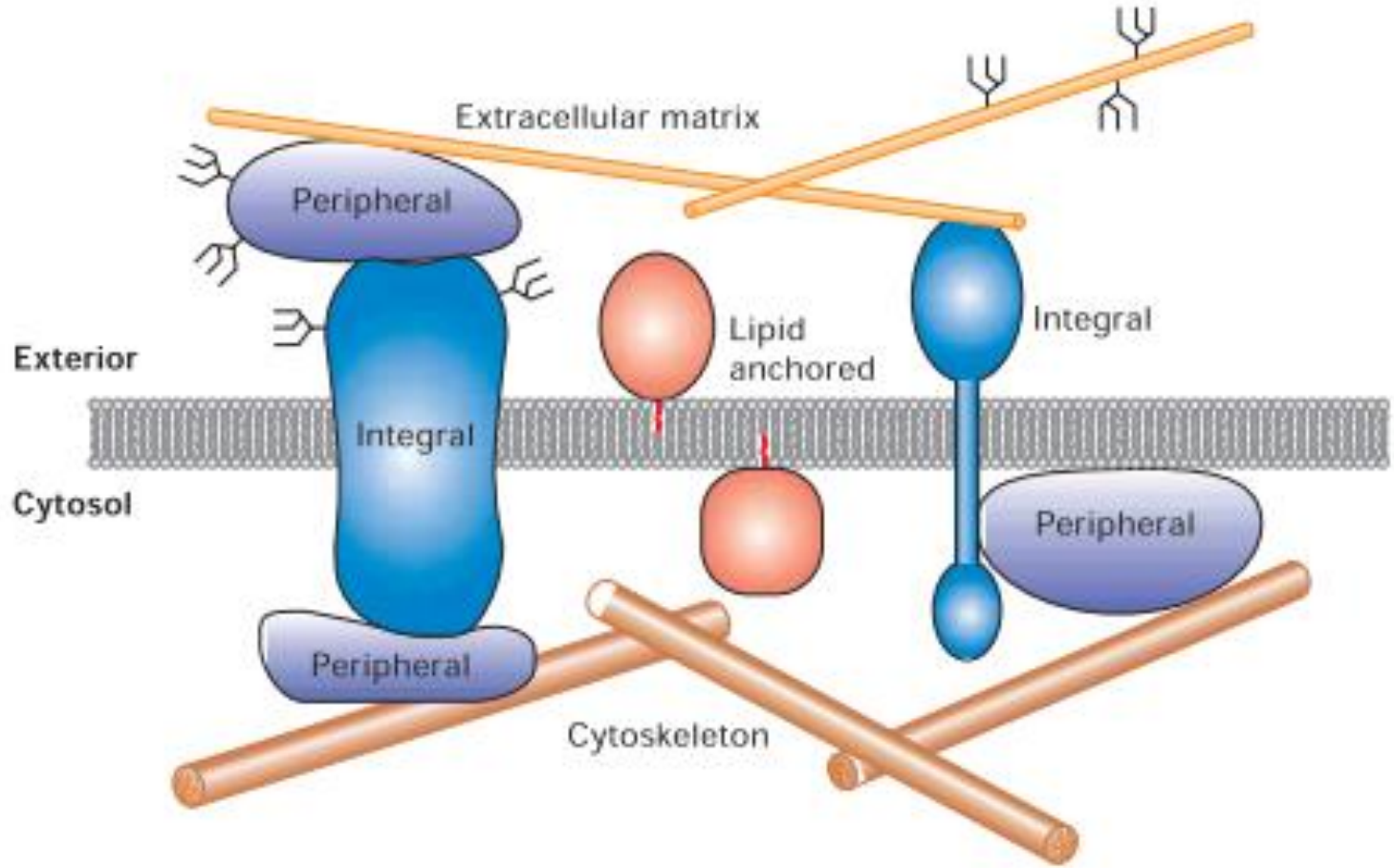
LIPID	PERCENTAGE OF TOTAL LIPID BY WEIGHT					
	LIVER CELL PLASMA MEMBRANE	RED BLOOD CELL PLASMA MEMBRANE	MYELIN	MITOCHONDRION (INNER AND OUTER MEMBRANES)	ENDOPLASMIC RETICULUM	*E. COLI* BACTERIUM
Cholesterol	17	23	22	3	6	0
Phosphatidylethanolamine	7	18	15	25	17	70
Phosphatidylserine	4	7	9	2	5	trace
Phosphatidylcholine	24	17	10	39	40	0
Sphingomyelin	19	18	8	0	5	0
Glycolipids	7	3	28	trace	trace	0
Others	22	13	8	21	27	30

Three structure types:

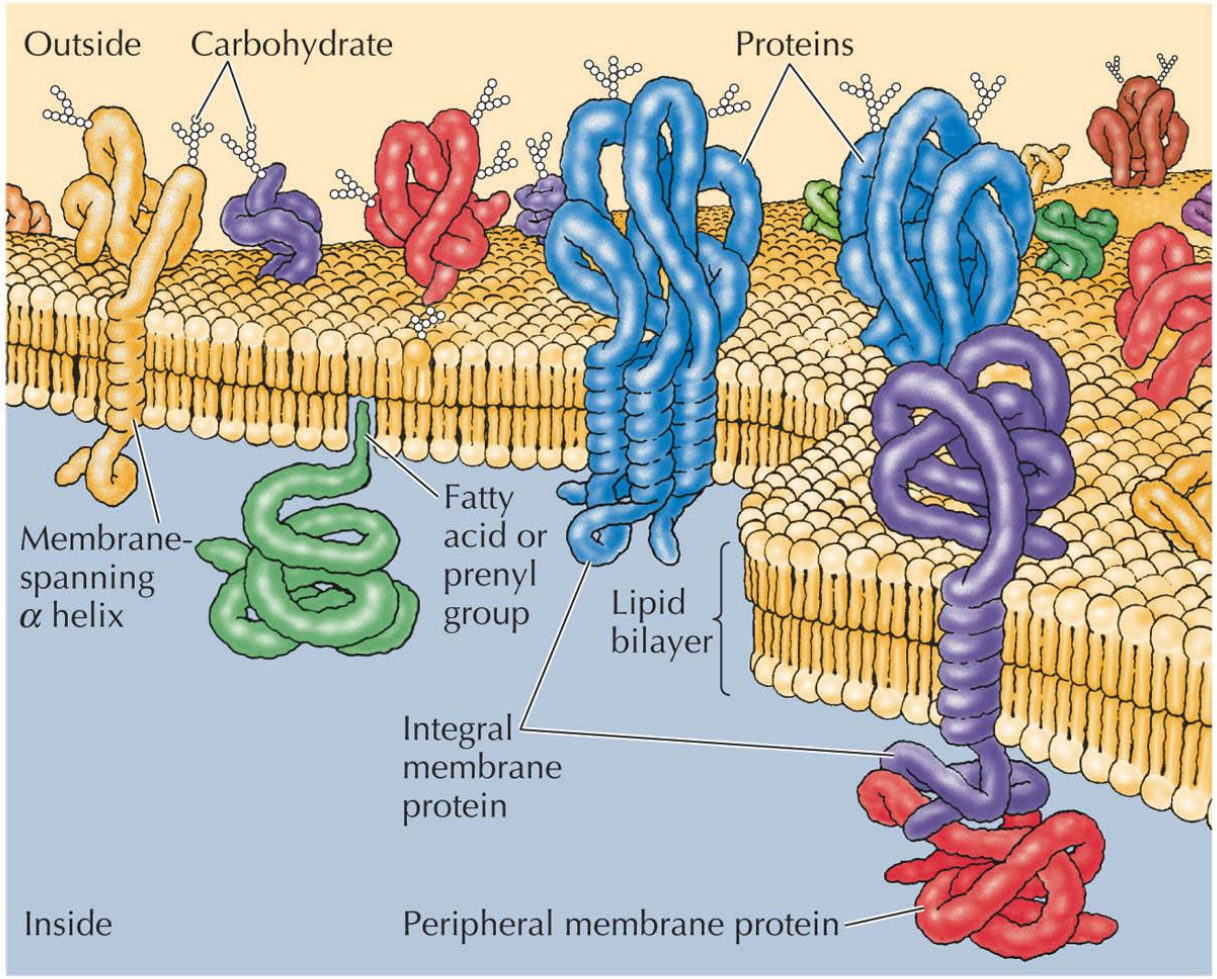



(a)
Membrane protein
Cell
Label
1
Fluorescent reagent
Bleach with laser
2
Bleached area
Fluorescence recovery
3

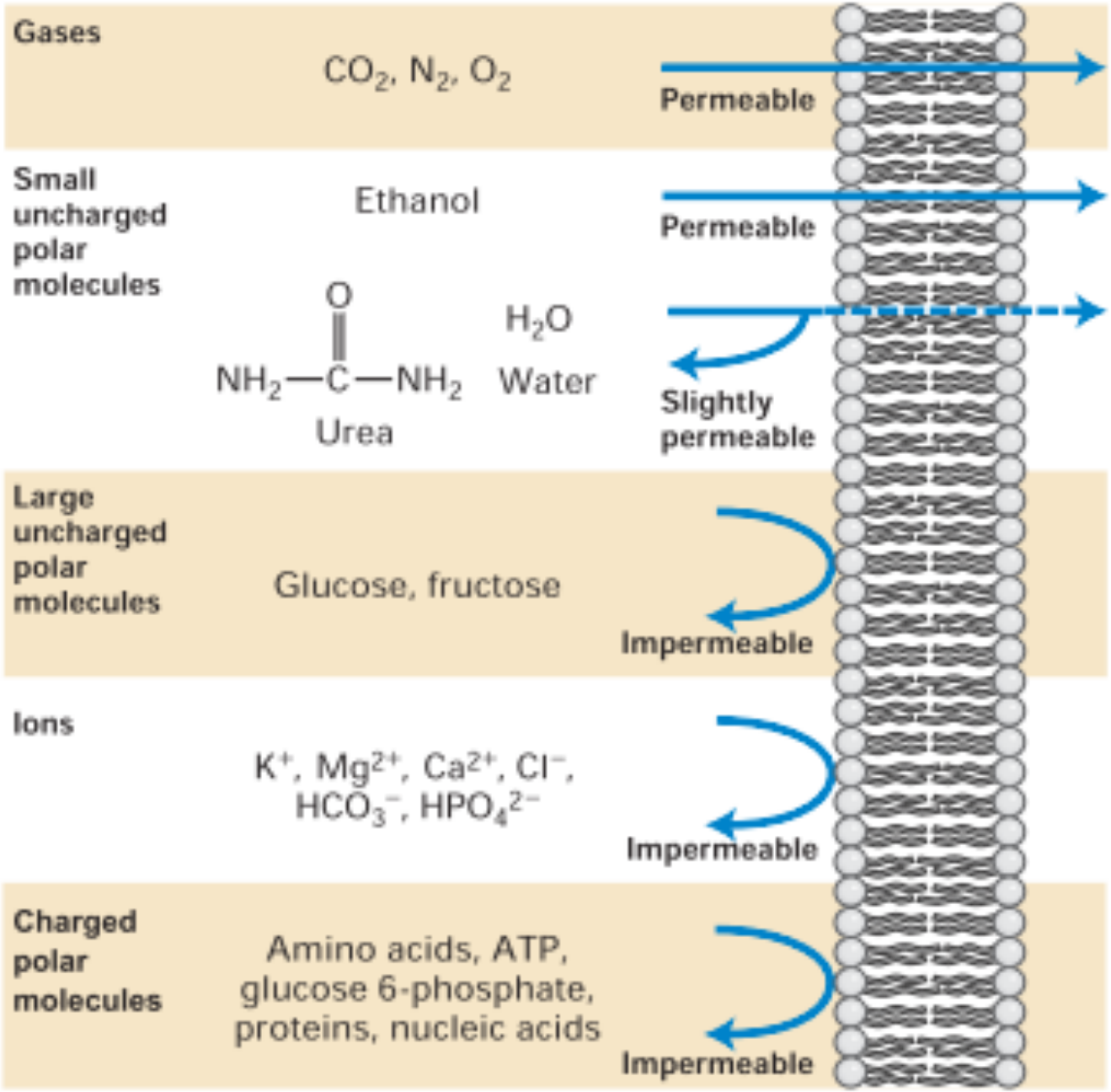
3 Macam Protein Membran



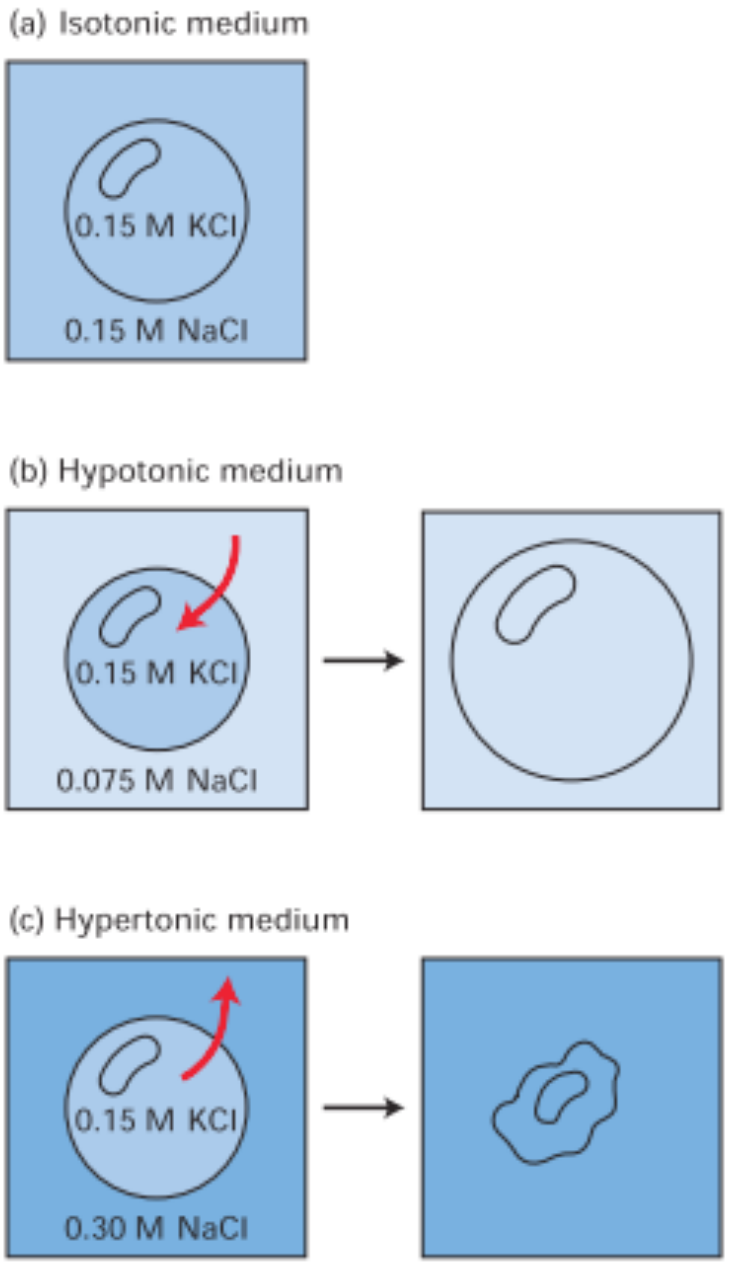
3 Macam Protein Membran



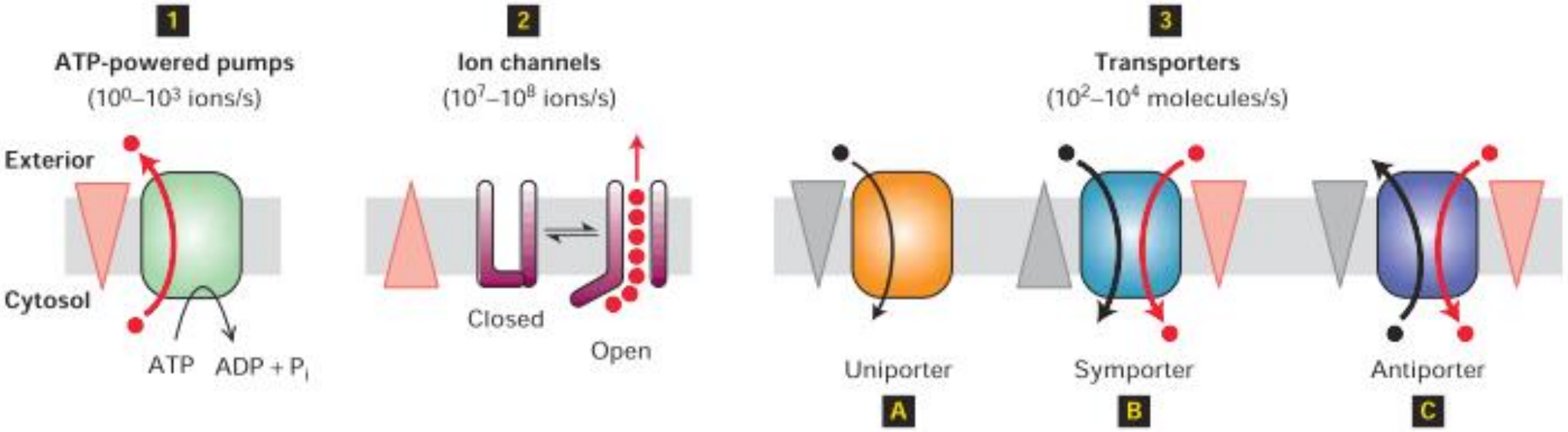
THE CELL, Third Edition, **Figure 2.48** ASM Press and Sinauer Associates, Inc.


Gases
CO_2, N_2, O_2
Permeable
Small uncharged polar molecules
Ethanol
Permeable
H_2O
Water
Urea
Slightly permeable
Large uncharged polar molecules
Glucose, fructose
Impermeable
Ions
K^+, Mg^{2+}, Ca^{2+}, Cl^-, HCO_3^-, HPO_4^{2-}
Impermeable
Charged polar molecules
Amino acids, ATP, glucose 6-phosphate, proteins, nucleic acids
Impermeable

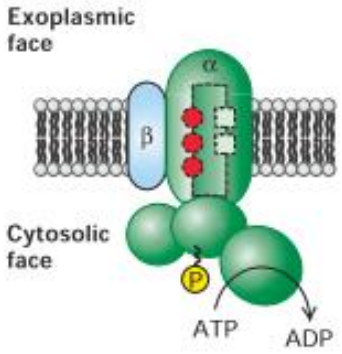
Osmosis


(a) Isotonic medium
0.15 M KCl
0.15 M NaCl
(b) Hypotonic medium
0.15 M KCl
0.075 M NaCl
(c) Hypertonic medium
0.15 M KCl
0.30 M NaCl

Fungsi protein integral



Macam protein yang kerjanya memerlukan energy dari ATP



P-class pumps

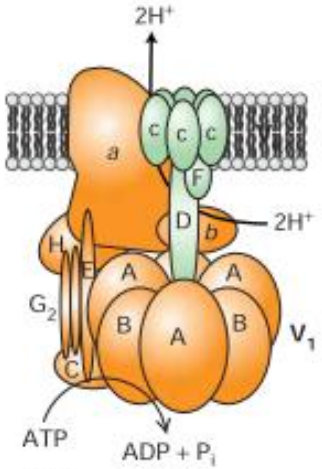
Plasma membrane of plants, fungi, bacteria (H^+ pump)

Plasma membrane of higher eukaryotes (Na^+/K^+ pump)

Apical plasma membrane of mammalian stomach (H^+/K^+ pump)

Plasma membrane of all eukaryotic cells (Ca^{2+} pump)

Sarcoplasmic reticulum membrane in muscle cells (Ca^{2+} pump)

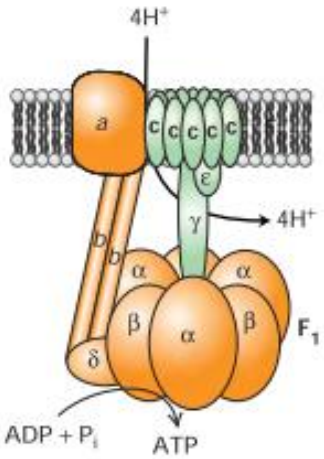


V-class proton pumps

Vacuolar membranes in plants, yeast, other fungi

Endosomal and lysosmal membranes in animal cells

Plasma membrane of osteoclasts and some kidney tubule cells

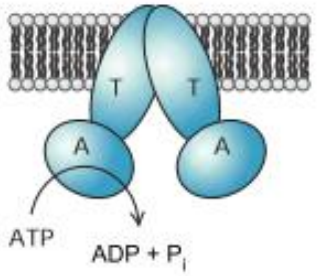


F-class proton pumps

Bacterial plasma membrane

Inner mitochondrial membrane

Thylakoid membrane of chloroplast



ABC superfamily

Bacterial plasma membranes (amino acid, sugar, and peptide transporters)

Mammalian plasma membranes (transporters of phospholipids, small lipophilic drugs, cholesterol, other small molecules)

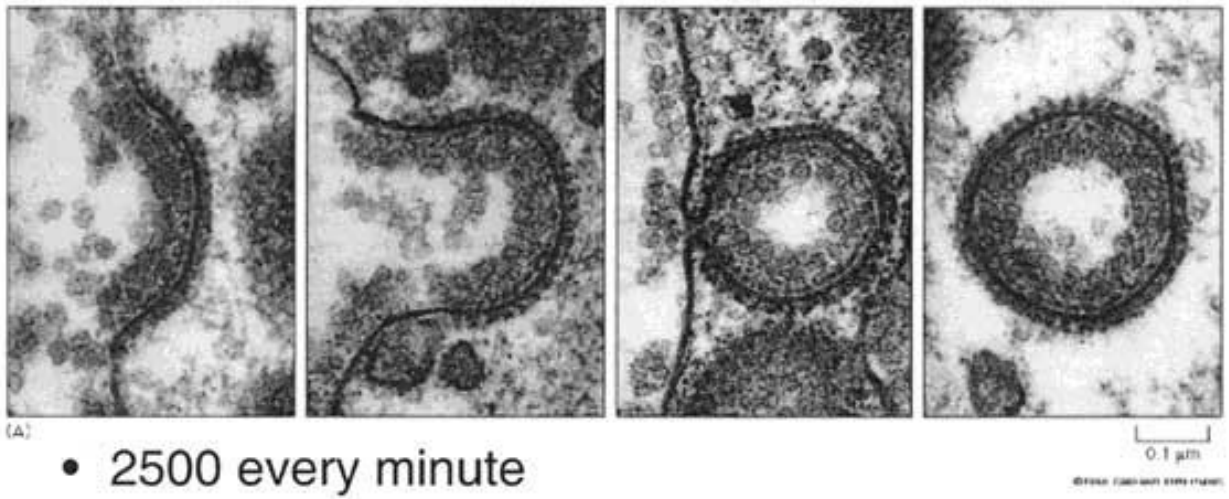
TABLE 11-1 A Comparison of Ion Concentrations Inside and Outside a Typical Mammalian Cell

COMPONENT	INTRACELLULAR CONCENTRATION (mM)	EXTRACELLULAR CONCENTRATION (mM)
Cations		
Na^+	5–15	145
K^+	140	5
Mg^{2+}	0.5	1–2
Ca^{2+}	10^{-4}	1–2
H^+	7×10^{-5} ($10^{-7.2}$ M or pH 7.2)	4×10^{-5} ($10^{-7.4}$ M or pH 7.4)
Anions*		
Cl^-	5–15	110

*The cell must contain equal quantities of positive and negative charges (that is, be electrically neutral). Thus, in addition to Cl^-, the cell contains many other anions not listed in this table; in fact, most cellular constituents are negatively charged (HCO_3^-, PO_4^{3-}, proteins, nucleic acids, metabolites carrying phosphate and carboxyl groups, etc.). The concentrations of Ca^{2+} and Mg^{2+} given are for the free ions. There is a total of about 20 mM Mg^{2+} and 1–2 mM Ca^{2+} in cells, but this is mostly bound to proteins and other substances and, for Ca^{2+}, stored within various organelles.

Endositosis

Formation of Clathrin-Coated Vesicles



- 2500 every minute
- CCV uncoat within seconds