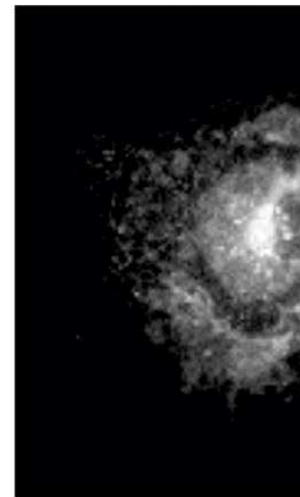
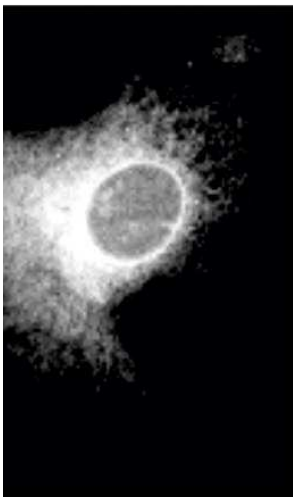


min

40 min

180 min



ER

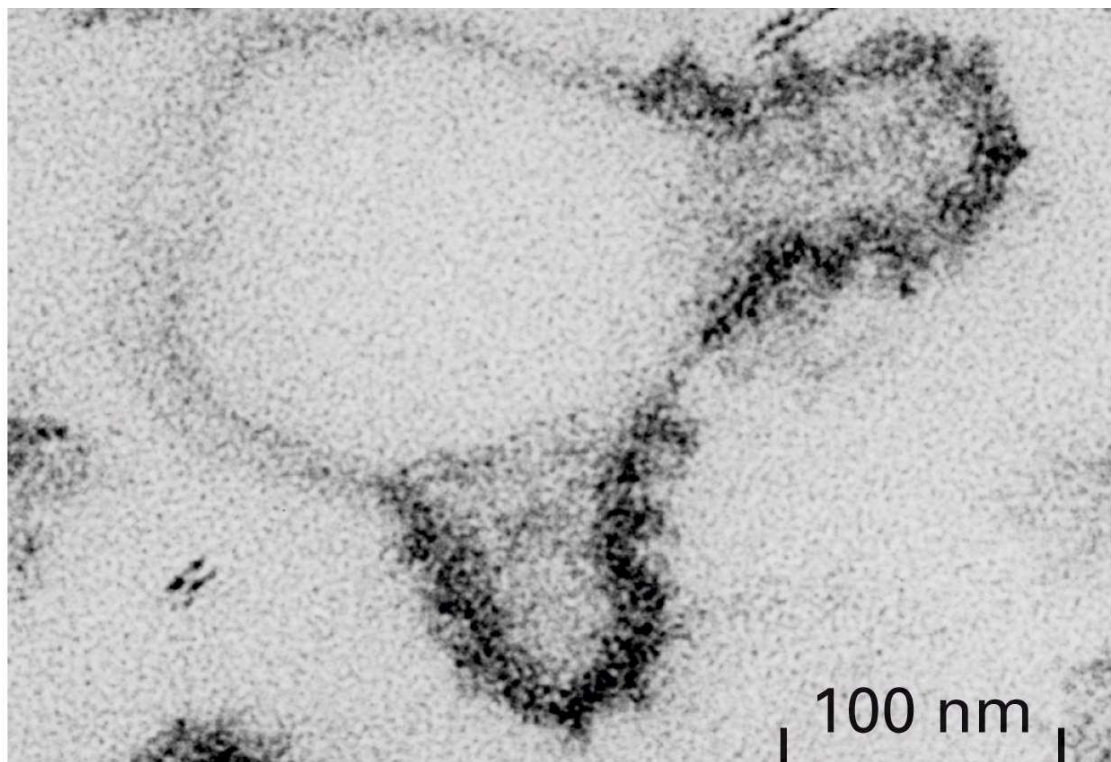
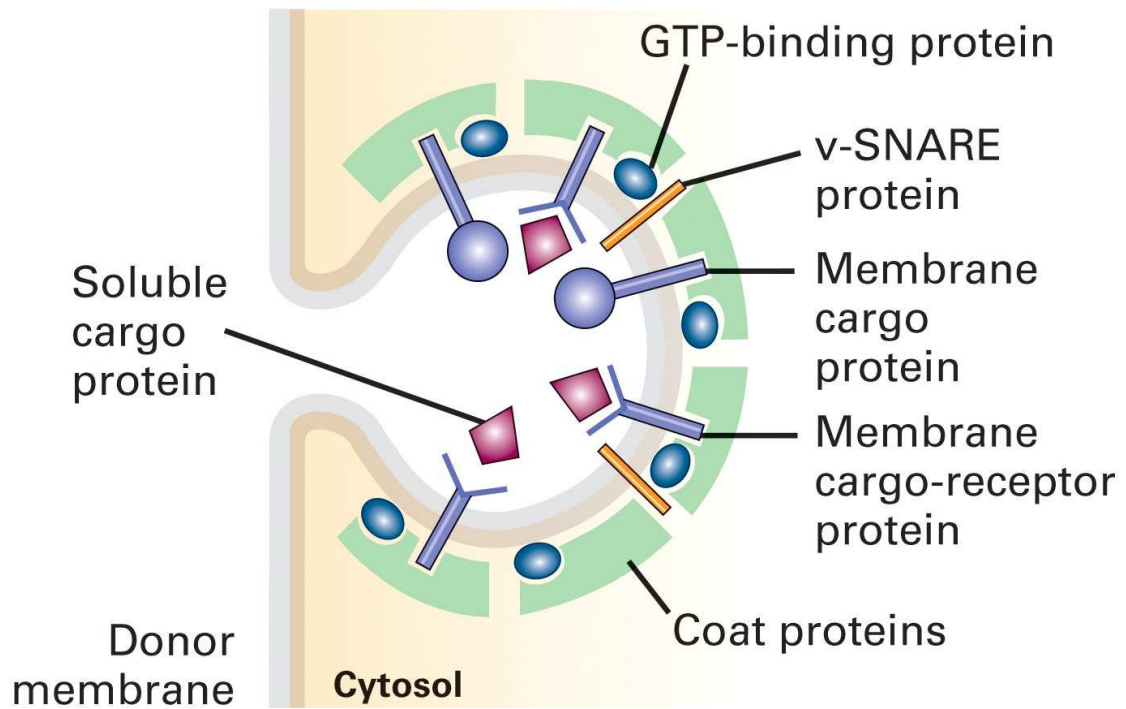


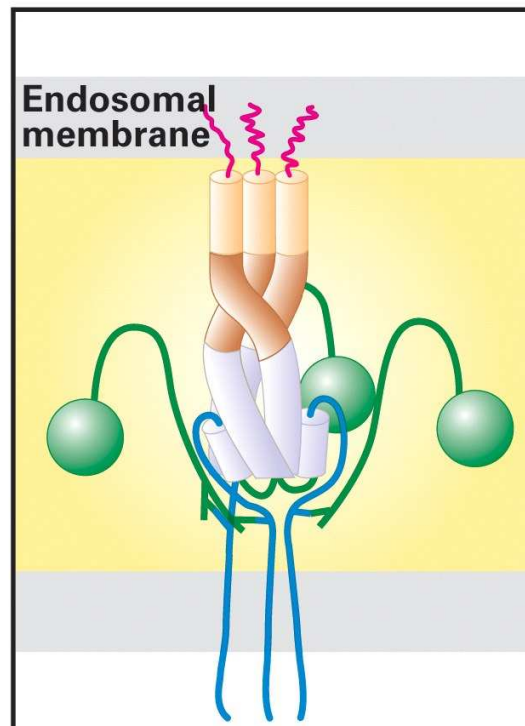
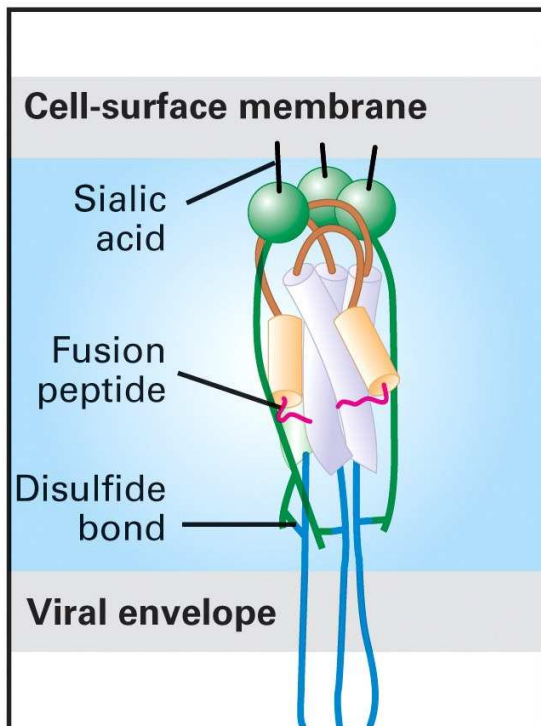
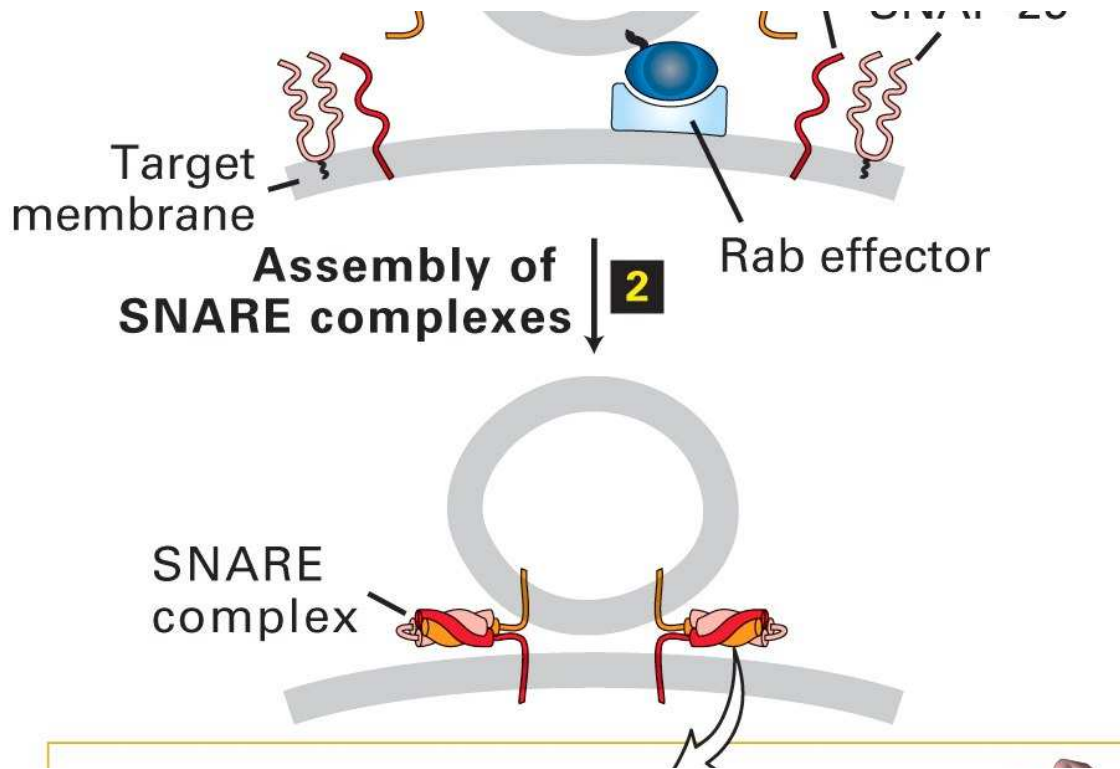
Golgi

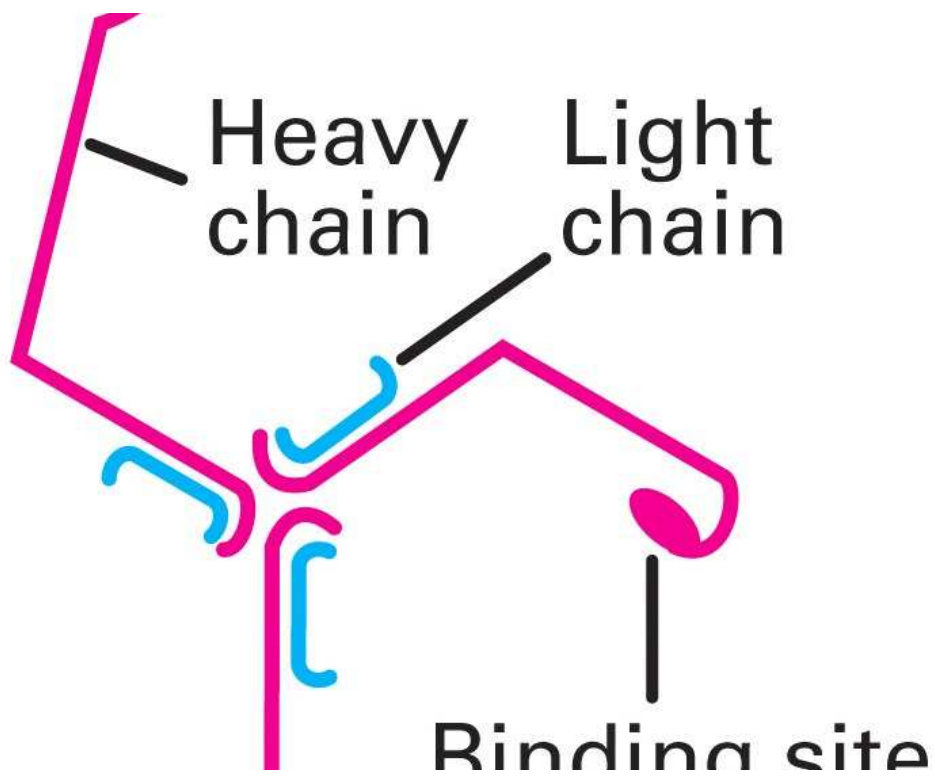
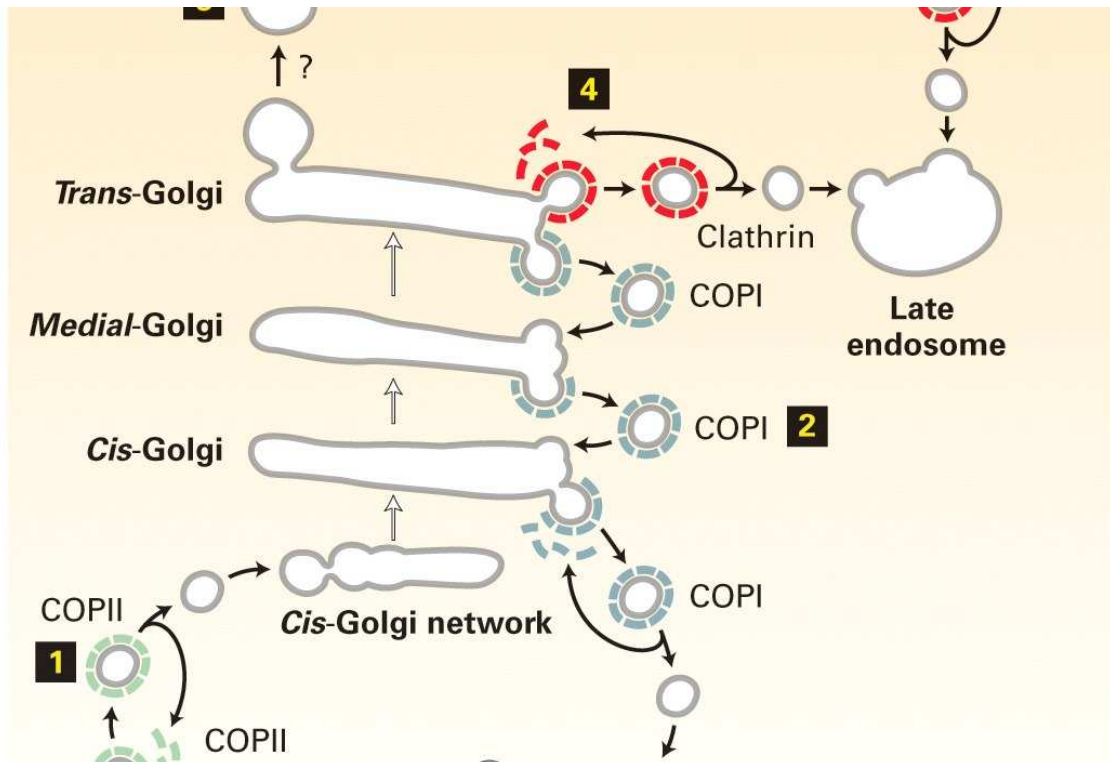


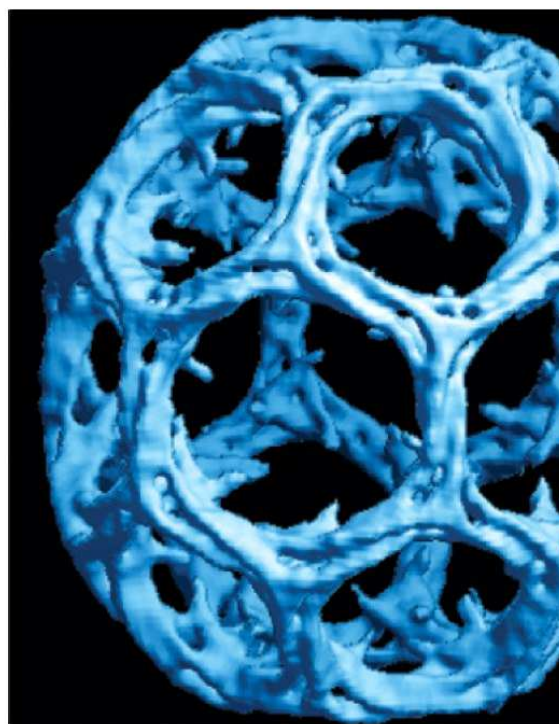
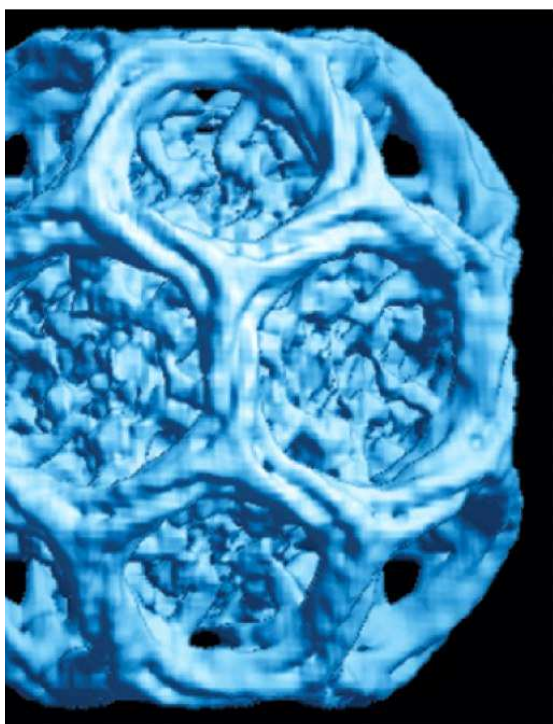
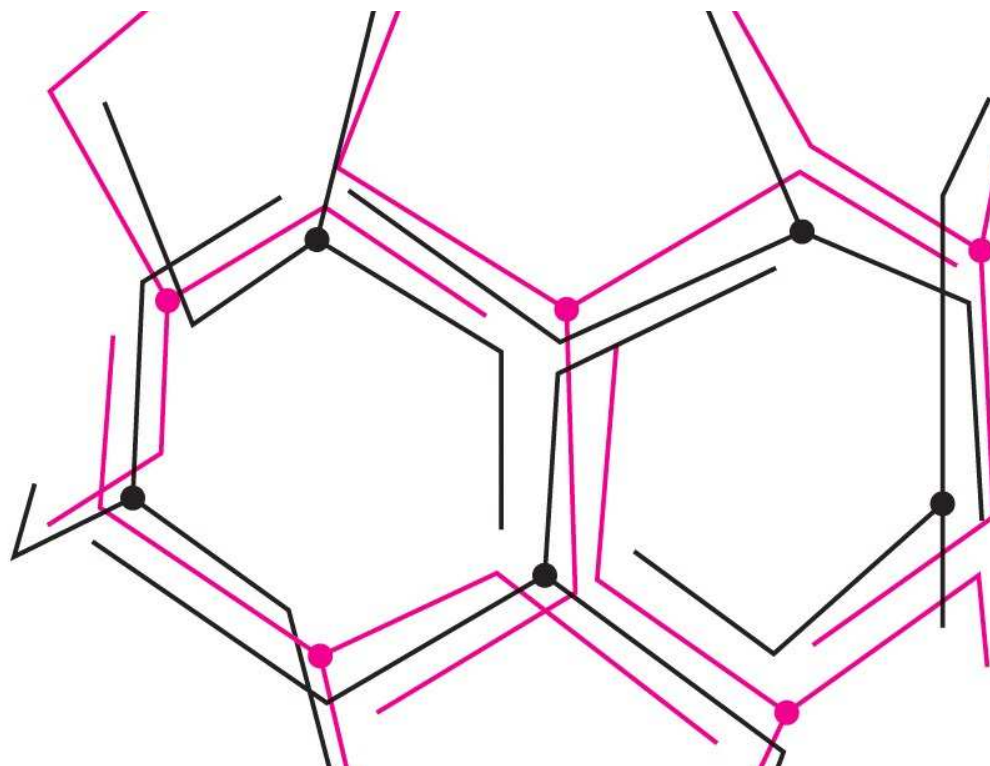
Plasma
membrane

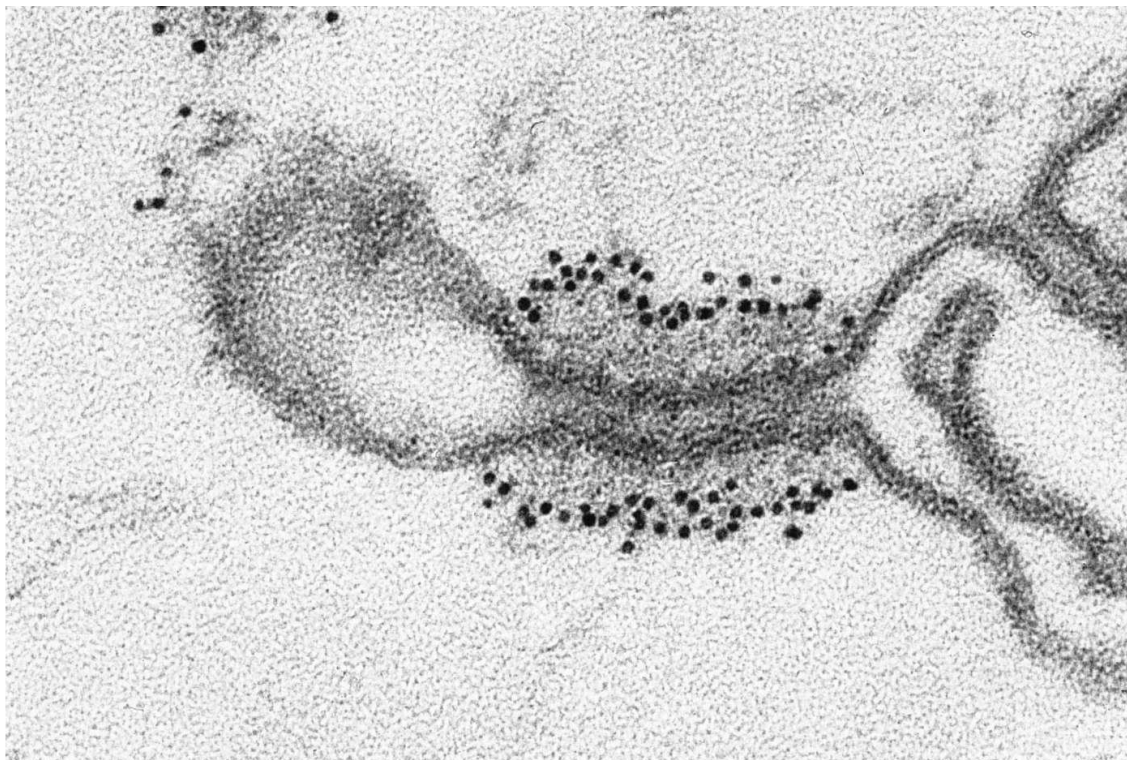
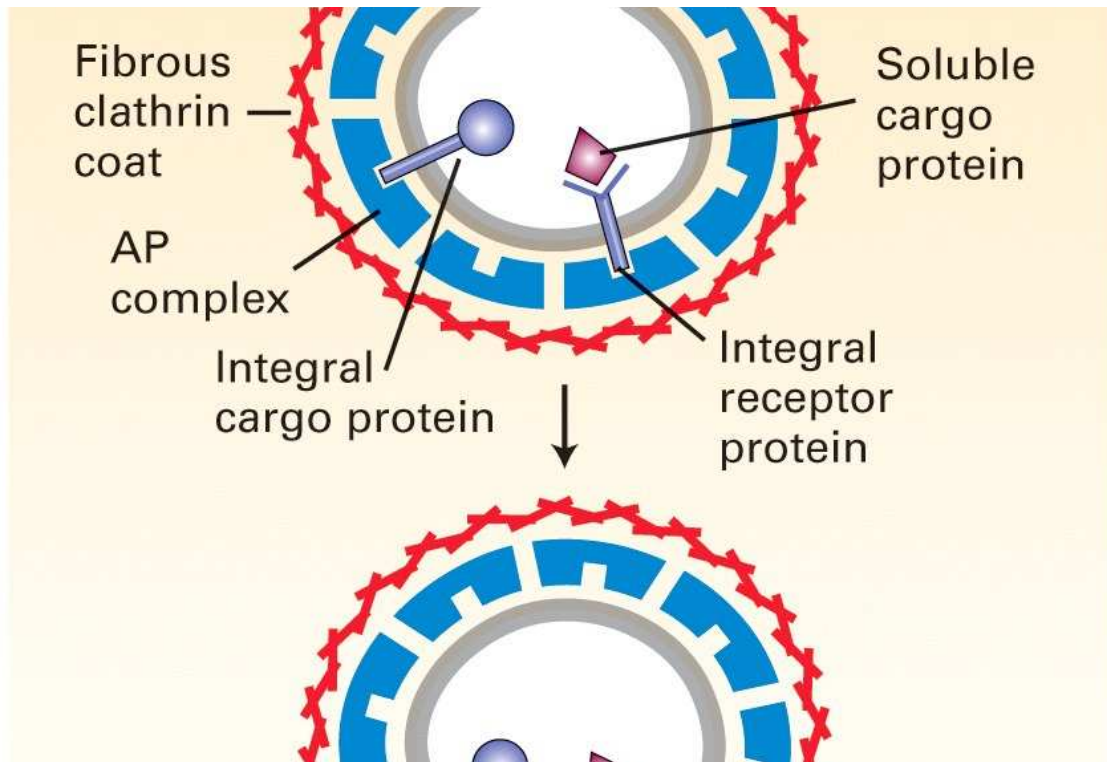
(a) Coated vesicle budding











Uptake-Targeting Sequences That Direct Proteins from the Cytosol to Organelles*

Organelle	Location of Sequence Within Protein	Removal of Sequence	Nature of Sequence
Cytosol (cytosol)	N-terminus	Yes	Core of 6–12 hydrophobic acids, often preceded by more basic amino acids
ER (ER)	N-terminus	Yes	Amphipathic helix, 20–30 residues in length, with Arg and Lys residues on one side and hydrophobic residues on the other
Mitochondria (matrix)	N-terminus	Yes	No common motifs; generally rich in Ser, Thr, and small hydrophobic residues and poor in Glu and Asp
Nucleus (matrix)	C-terminus (most proteins); N-terminus (few proteins)	No	PTS1 signal (Ser-Lys-Leu) at extreme C-terminus; PTS2 signal at N-terminus

*Additional sequences target proteins to organelle membranes and subcompartments. ¹ and ² for targeting sequences required for uptake of proteins into the nucleus.

TABLE 17-2 Known Sorting Signals That Direct Proteins to Specific Transport Vesicles

Signal Sequence*	Proteins with Signal	Signal Receptor	Vesicles That Incorporate Signal-bearing Protein
Lys-Asp-Glu-Leu (KDEL)	ER-resident luminal proteins	KDEL receptor in <i>cis</i> -Golgi membrane	COPI
Lys-Lys-X-X (KKXX)	ER-resident membrane proteins (cytosolic domain)	COPI α and β subunits	COPI
Di-acidic (e.g., Asp-X-Glu)	Cargo membrane proteins in ER (cytosolic domain)	COPII / subunit	COPII
Mannose 6-phosphate (M6P)	Soluble lysosomal enzymes after processing in <i>cis</i> -Golgi	M6P receptor in <i>trans</i> -Golgi membrane	Clathrin/AP1
	Secreted lysosomal enzymes	M6P receptor in plasma membrane	Clathrin/AP2
Asn-Pro-X-Tyr (NPXY)	LDL receptor in the plasma membrane (cytosolic domain)	AP2 complex	Clathrin/AP2
Tyr-X-X- Φ (YXX Φ)	Membrane proteins in <i>trans</i> -Golgi (cytosolic domain)	AP1 (μ 1 subunit)	Clathrin/AP1
	Plasma membrane proteins (cytosolic domain)	AP2 (μ 2 subunit)	Clathrin/AP2
Leu-Leu (LL)	Plasma membrane proteins (cytosolic domain)	AP2 complexes	Clathrin/AP2

*X = any amino acid; Φ = hydrophobic amino acid. Single-letter amino acid abbreviations are in parentheses.