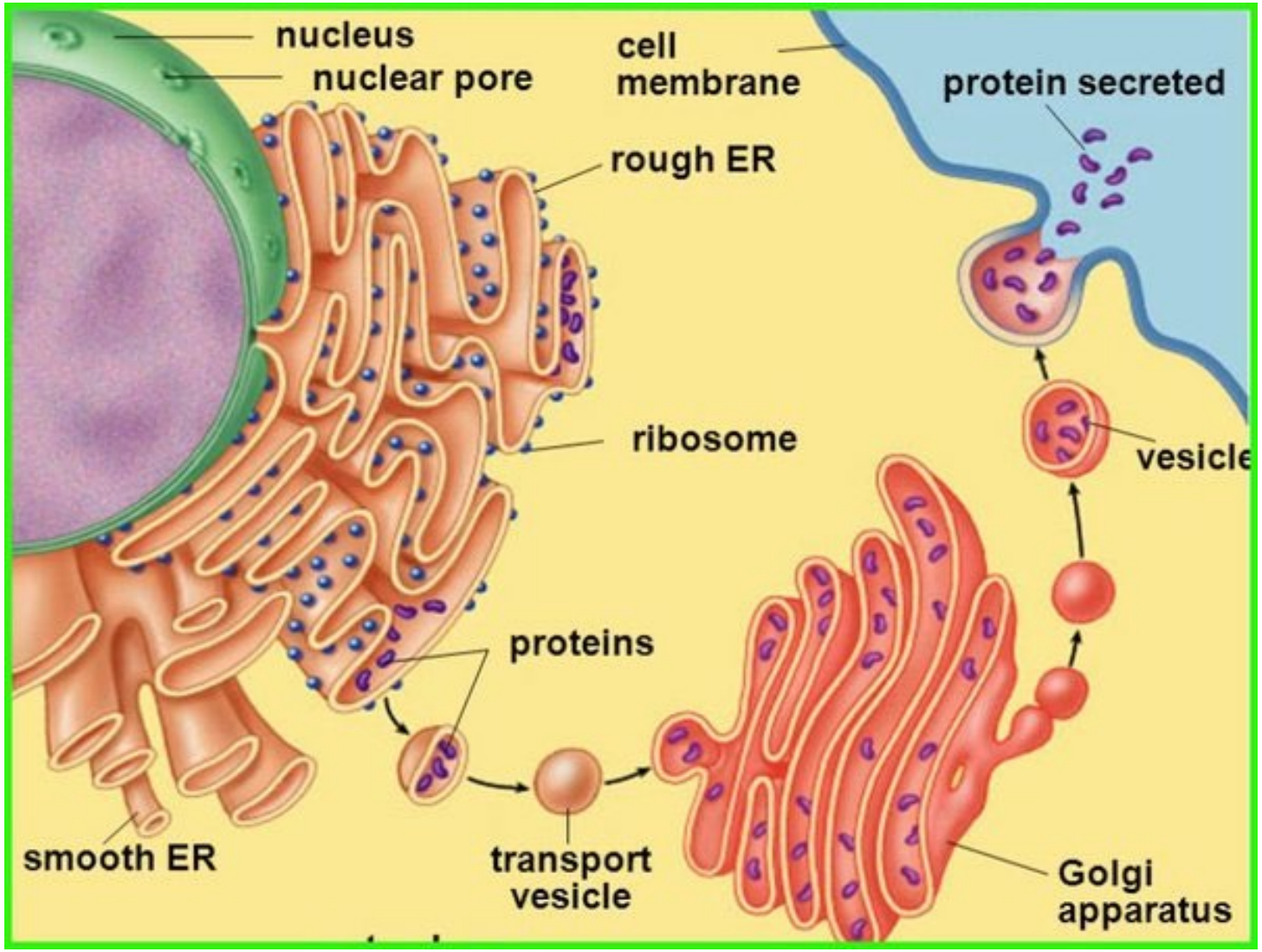
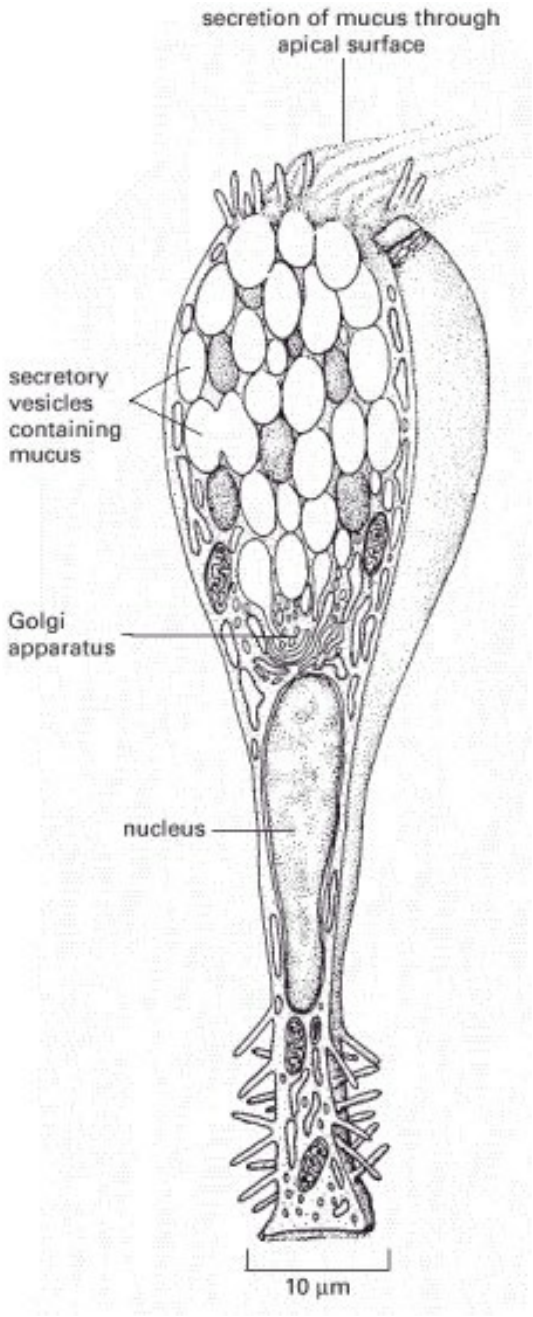
Endoplasmic reticulum and Golgi complex



- The Golgi apparatus is prominent in cells that are specialized for secretion, such as the goblet cells of the intestinal epithelium, which secrete large amounts of **polysaccharide-rich mucus** into the gut. In such cells, unusually large vesicles are found on the *trans* side of the Golgi apparatus, which faces the plasma membrane domain where secretion occurs.



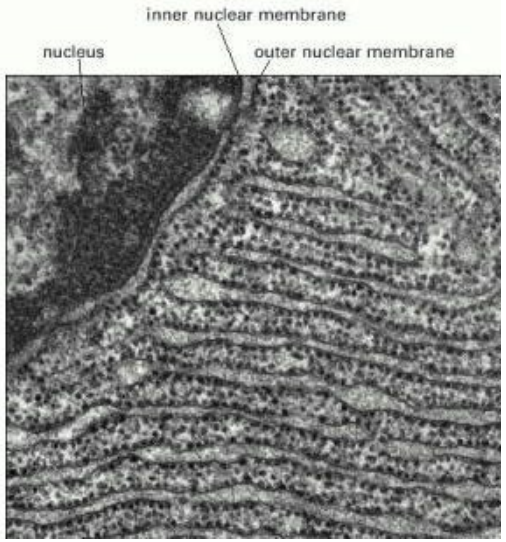
A goblet cell of the small intestine

This cell is specialized for secreting mucus, a mixture of glycoproteins synthesized in the ER and Golgi apparatus. Like all epithelial cells, goblet cells are highly polarized, with the apical domain of their plasma membrane facing the lumen of the gut and the basolateral domain facing the basal lamina. The Golgi apparatus is also highly polarized, which facilitates the discharge of mucus by exocytosis at the apical domain of the plasma membrane

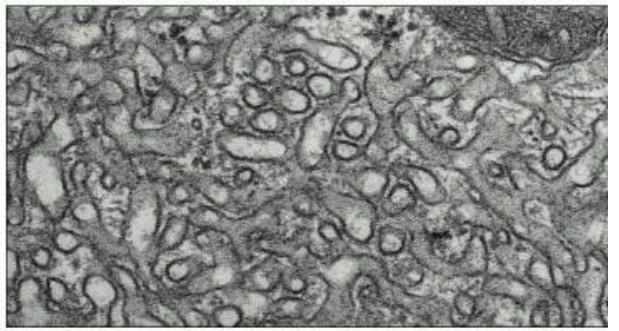
The Endoplasmic Reticulum

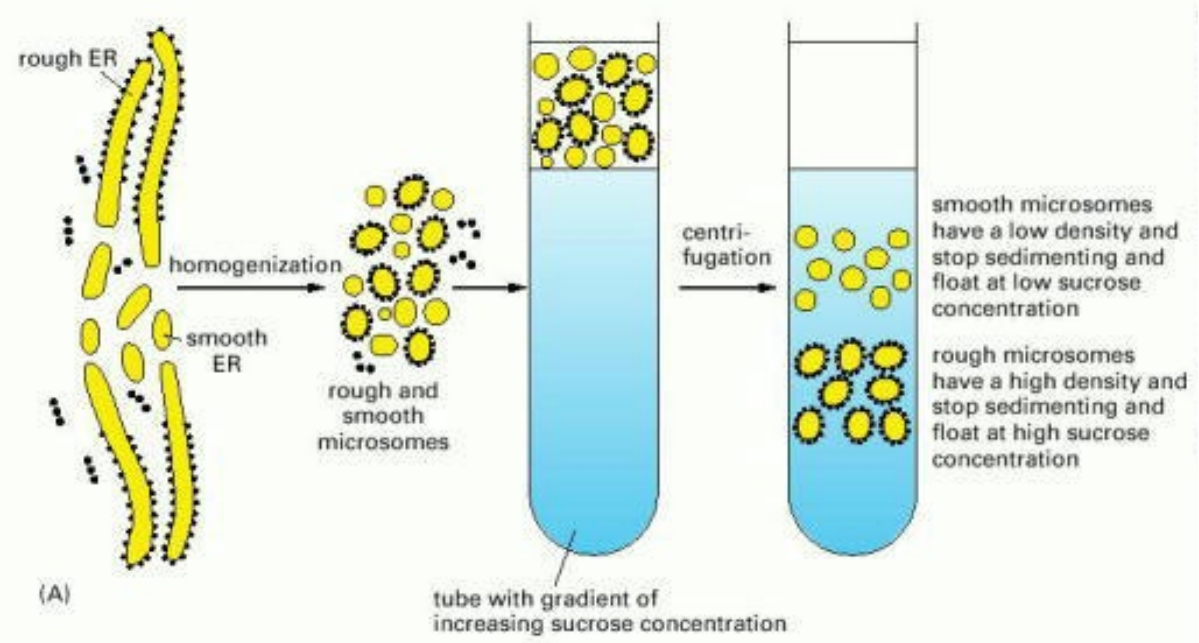
- All eucaryotic cells have an endoplasmic reticulum (ER).
- The ER is organized into a netlike branching tubules extending throughout the cytosol
- The ER membrane separates the ER lumen from the cytosol.
- **The ER has a central role in lipid and protein biosynthesis for most of the cell's organelles, including the ER itself, the Golgi apparatus, lysosomes, endosomes, secretory vesicles, and the plasma membrane.**

Electron micrograph of the rough ER



Electron micrograph of the smooth ER

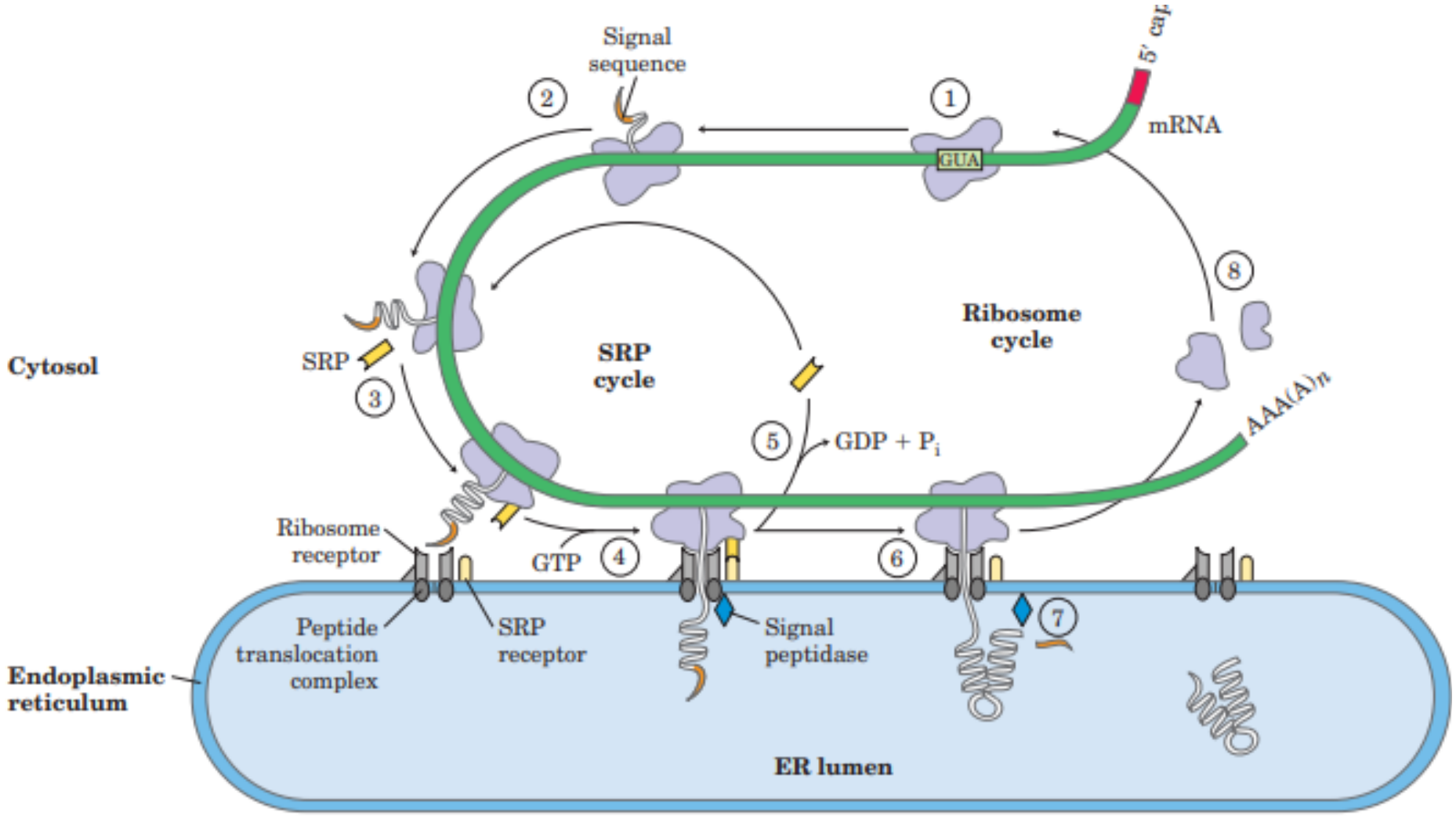




Rough and Smooth Regions of ER Can Be Separated by Centrifugation

How are proteins directed to their final cellular destinations?

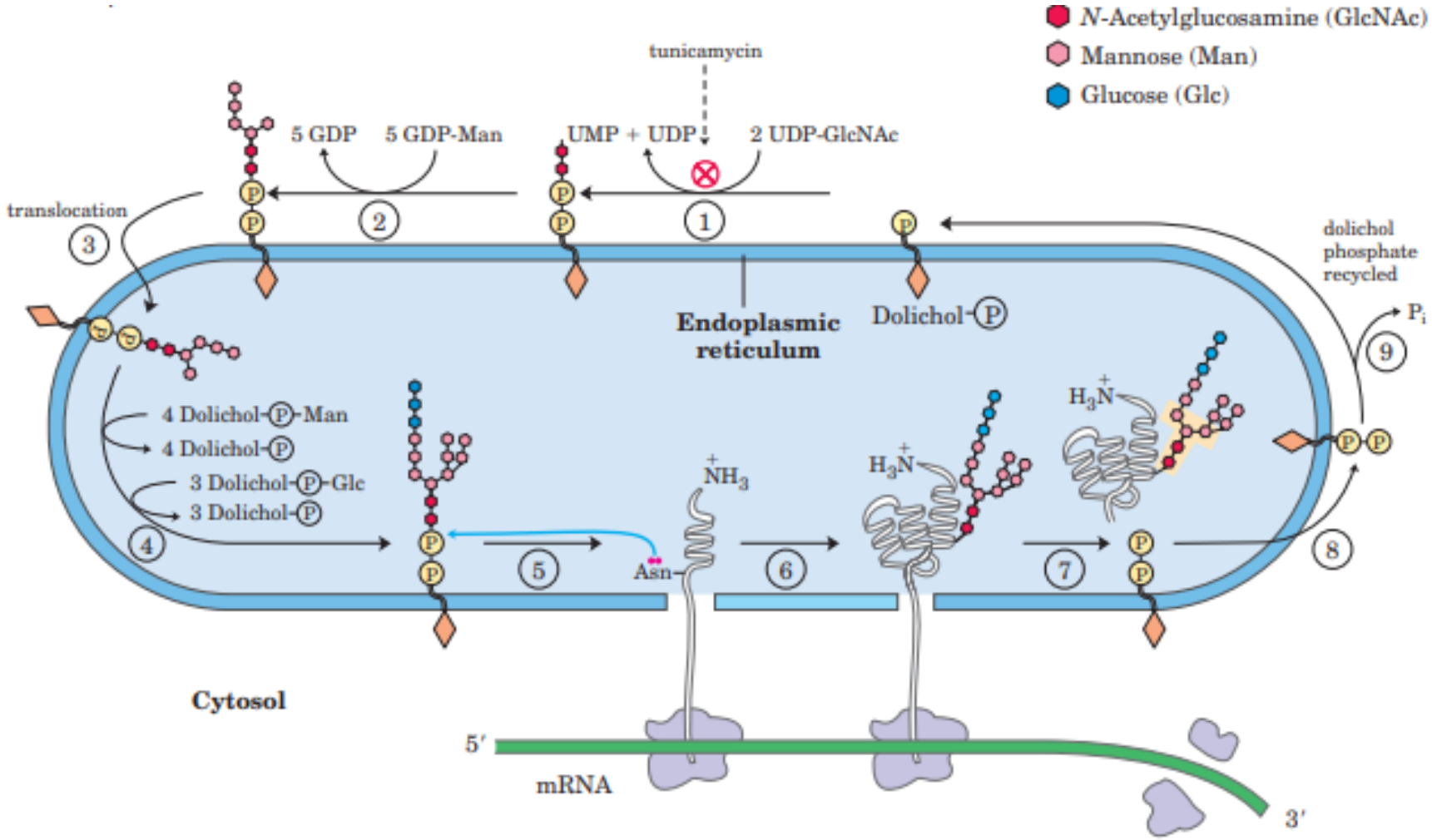
A short sequence of amino acids called a signal sequence (13-36 aa) recognized by SRP, directs a protein to its appropriate location in the cell and, for many proteins, is removed during transport or after the protein has reached its final destination marks them for translocation into the lumen of the ER



Glycosylation takes place in the lumen of the endoplasmic reticulum and in the Golgi complex, plays a key role in protein targeting

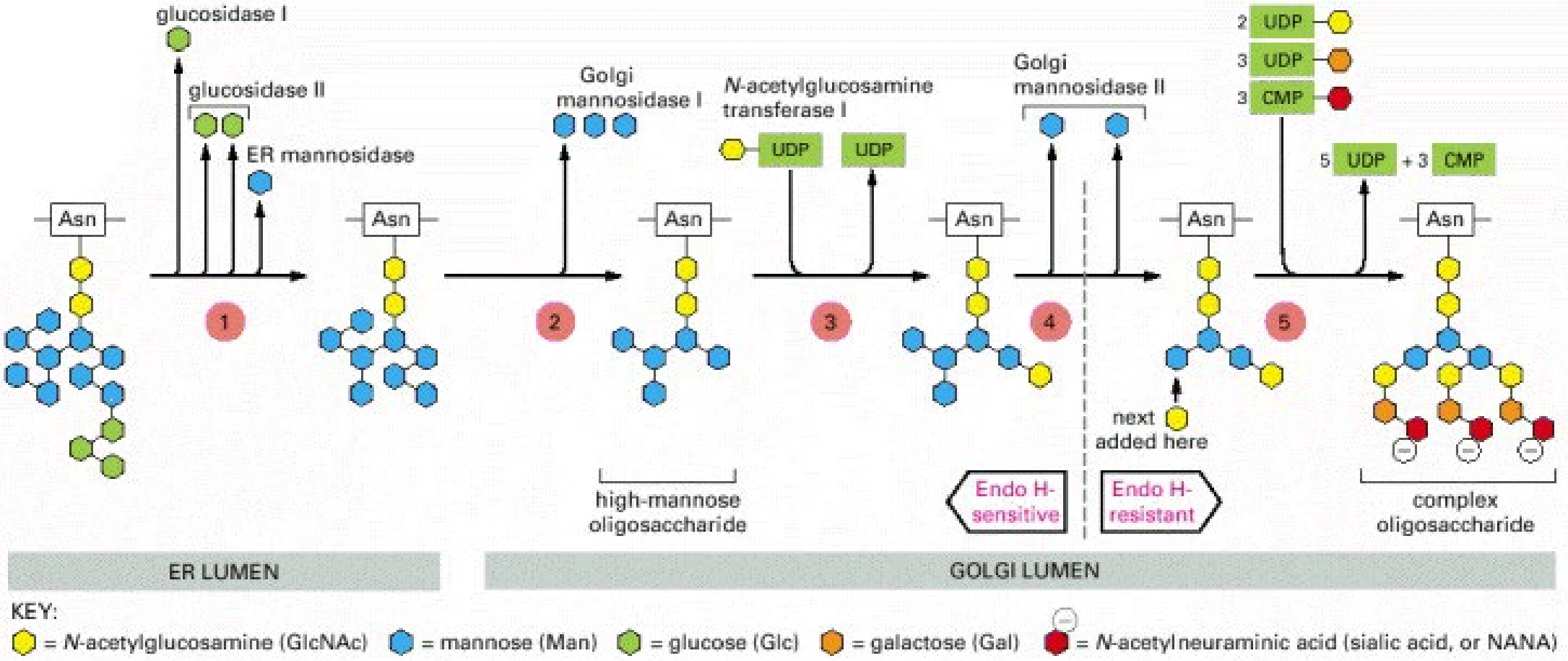
The *N*-linked glycosylation begins in the ER and continues in the Golgi complex, whereas the *O*-linked glycosylation takes place exclusively in the Golgi complex.

The 14-sugar-residue precursor attached to this dolichol phosphate intermediate is then transferred as a bloc to a specific **asparagine** residue of the growing polypeptide chain.

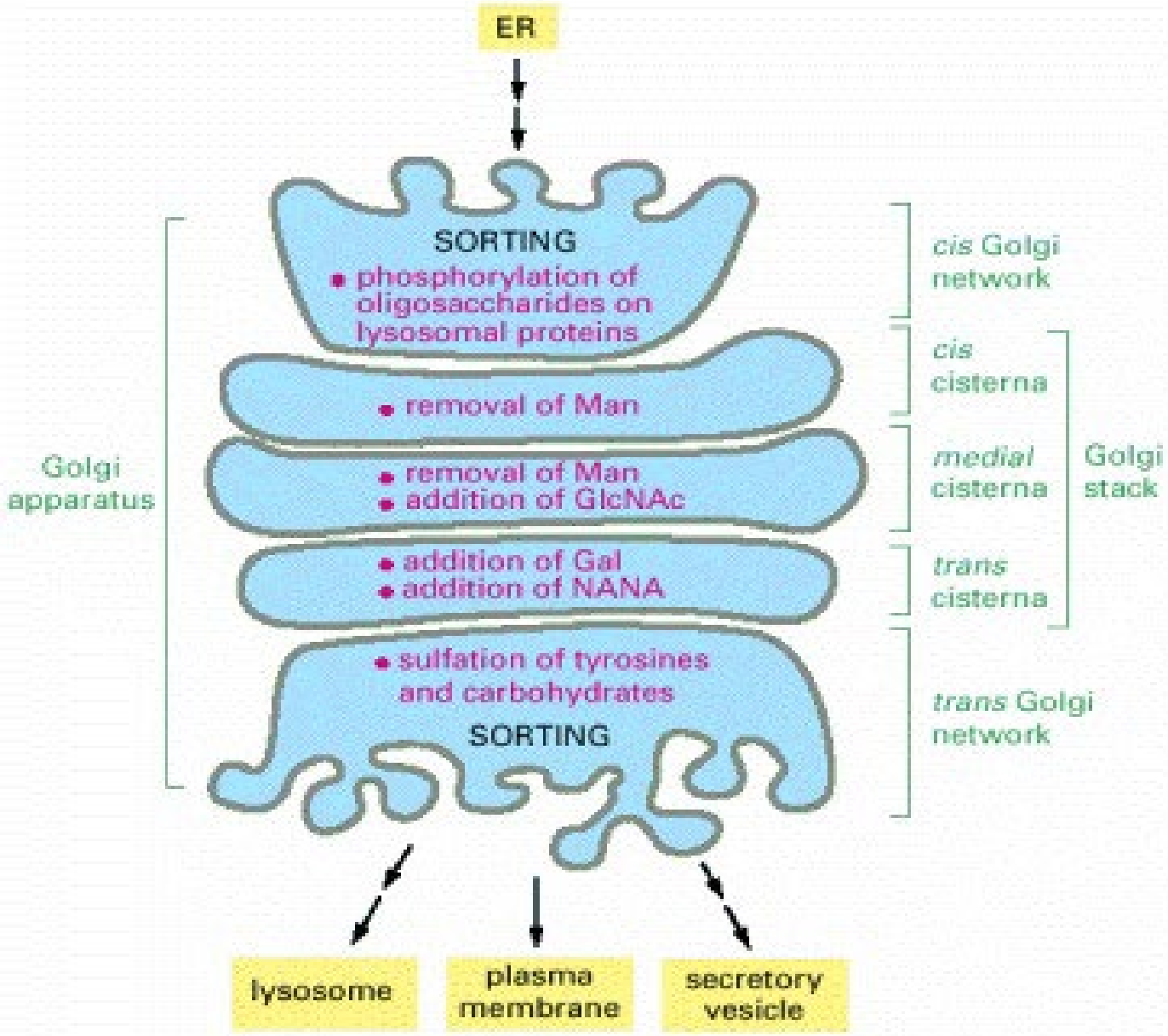


Most Proteins Synthesized in the Rough ER Are Glycosylated by the Addition of a Common N-linked Oligosaccharide

Oligosaccharide chains are processed or undergo posttranslational modifications in the ER and the Golgi apparatus



Endoglycosidase H (Endo H) is commonly used by cell biologists to monitor posttranslational modification in the Golgi apparatus.

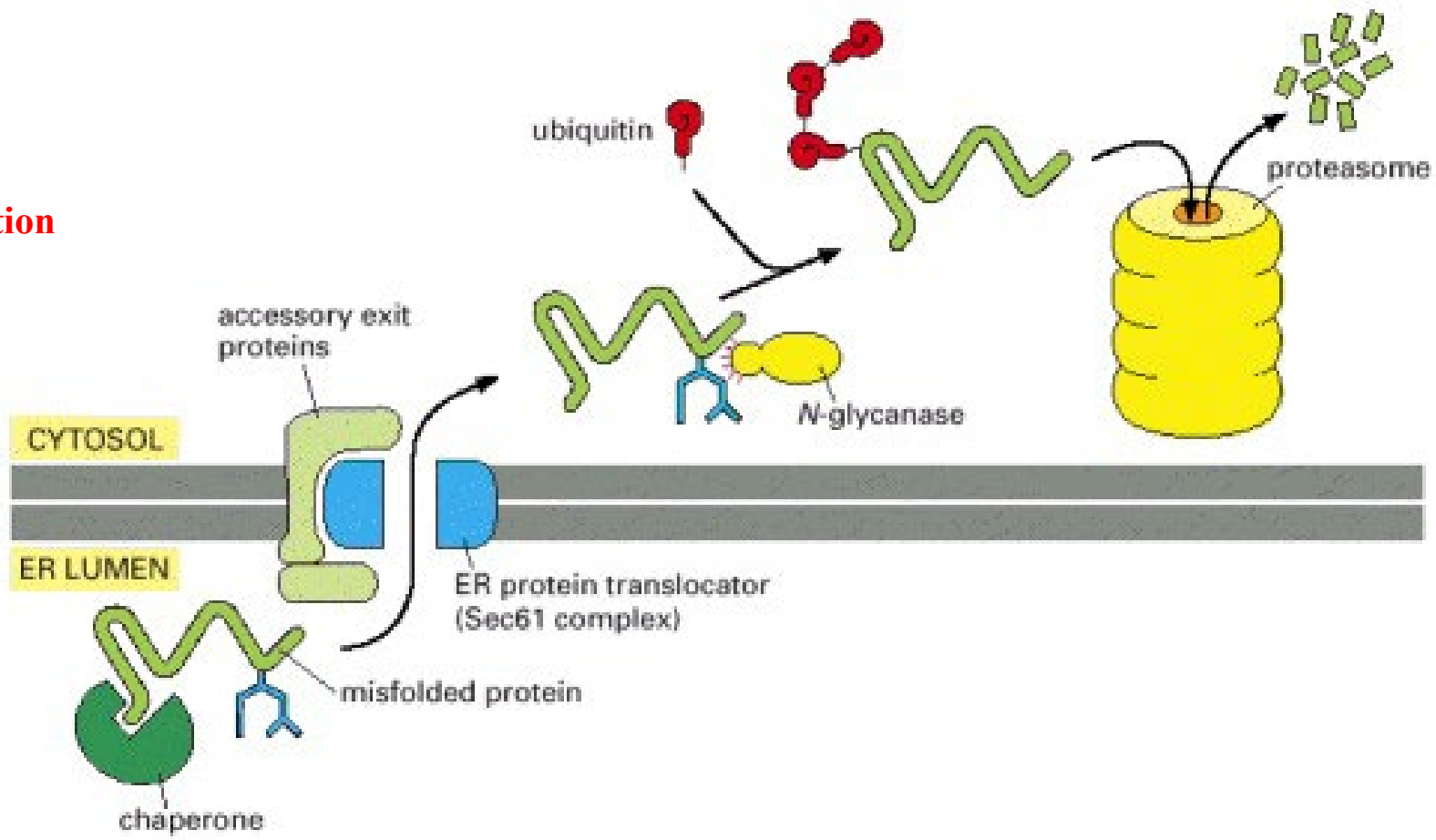


The functional compartmentalization of the Golgi apparatus, Consists of an Ordered Series of Compartments

The localization of each processing step shown was determined by a combination of techniques, including biochemical sub-fractionation of the Golgi apparatus membranes and electron microscopy after staining with antibodies specific for some of the processing enzymes.

The export and degradation of misfolded ER proteins

Dislocation or Retrotranslocation



Misfolded soluble proteins in the ER lumen are translocated back into the cytosol, where they are deglycosylated, ubiquitylated, and degraded in proteasomes. Misfolded membrane proteins follow a similar pathway as folded. Misfolded proteins are exported through the same type of translocator that mediated their import; accessory proteins that are associated with the translocator allow it to operate in the export direction.