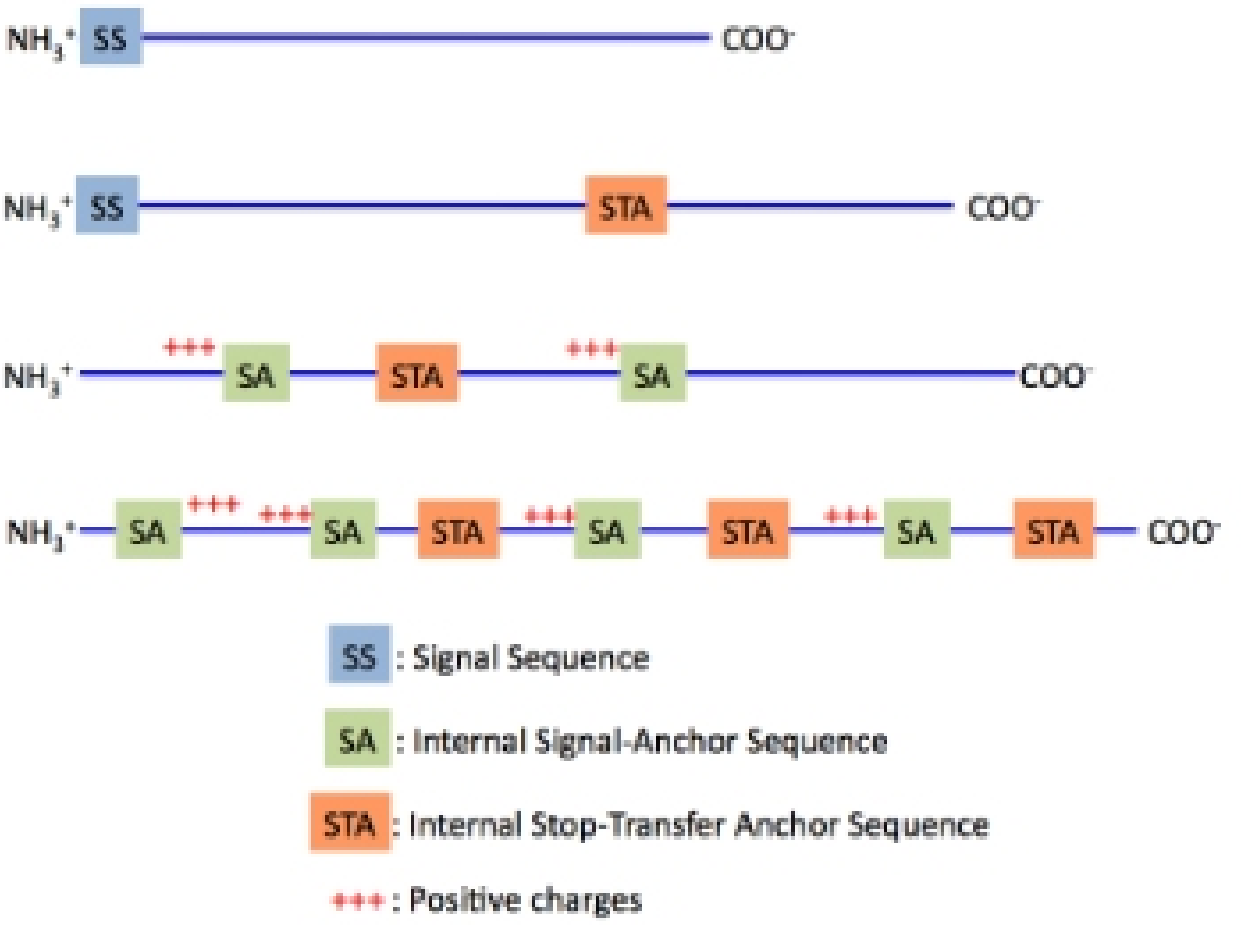
CBIO 3400 – Week 5 Study Questions

1. What are SRP and SR? Describe their structures and functions regarding protein transportation.
   SRP is a signal recognition particle made up of RNA (300 bp) and 6 proteins; it is a ribonucleoprotein particle. SRP binds the signal sequence, pausing translation.
   SR is the SRP receptor. It is a heterodimer made up of SRβ (a transmembrane protein, 300 AAs) and SRα (a peripheral membrane protein, 640 AAs); both of these proteins are GTPases. The cytoplasmic domain of SRβ binds SRP (OR ribosome) and relieves the block in chain elongation (i.e., the paused translation caused by SRP binding the "block" signal sequence). Basically, once SRβ binds SRP, translation can start up again.

2. There are four different peptide sequences as shown below. Describe their sub-cellular localization shortly after being synthesized.



(1) ER lumen b/c of [SS]

(2) NH_3^+ in ER lumen b/c of [SS] and COO^- in cytoplasm b/c of [STA] → this is a type 1 localization

(3) NH_3^+ in cytoplasm b/c [+++] comes before the [SA] and COO^- in ER lumen b/c [+++] comes before the [SA] (+ charges always face side that's in cytosol)

(4) NH_3^+ in ER lumen and COO^- also in ER lumen b/c there's an even # of topogenic sequences (meaning NH_3^+ and COO^- are in same compartment instead of distinct compartments, as is the case when there's an odd # of topogenic sequences)

3. Proteins are glycosylated in the ER lumen. Describe the complete mechanism regarding sugar chain synthesis, transfer, and trimming in the ER.

The glycosylation of a protein is the covalent addition of carbohydrates to the protein. If this is done onto serine or threonine, it is called O-linked; if it is done onto asparagine, it is called N-linked. The steps of N-linked glycosylation in the ER are: (1) synthesis of carbohydrate chain using dolichol-P and activated sugars, (2) transfer of carbohydrate chain to asparagine of protein in the ER, and (3) processing of sugar chain (ER and Golgi).

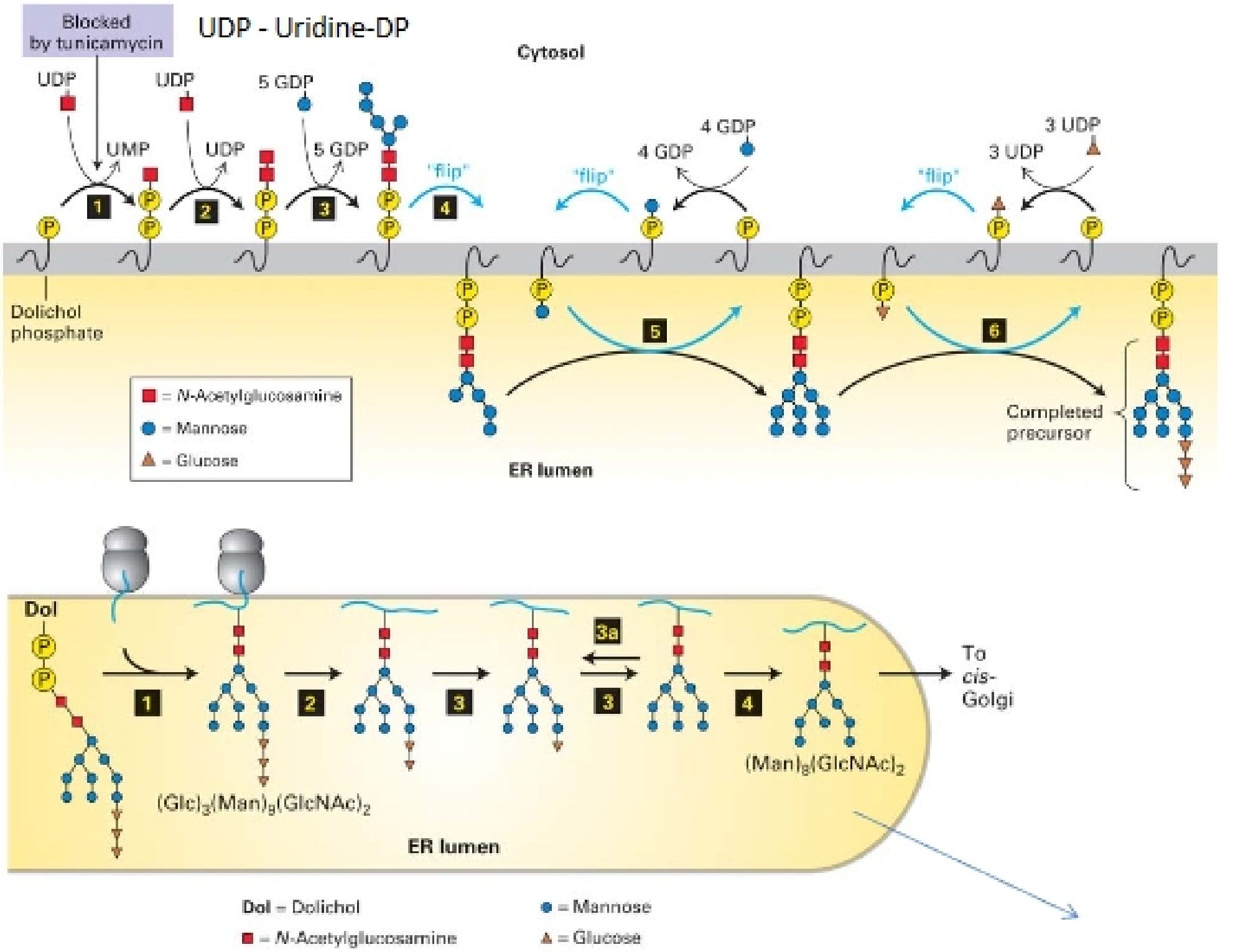


Figure 13.18

At specialized ER exit sites

4. What mechanism does the ER utilize to tell whether or not a protein is ready to be delivered to the Golgi?

5. ARF1 plays an important role in intracellular vesicle transport. Describe the structure, function, and regulation of ARF1.
   ARF1 indirectly changes membrane lipid composition via effectors. It activates PC-specific phospholipase D and also increases phosphatidic acid in the microenvironment. ARF1 is regulated by GEF and GAP. ARF-GDP is present in the cytoplasm and is turned into ARF-GTP by GEF. ARF-GTP is membrane-bound and is turned off by GAP.