CONCEPT: TARGETING PROTEINS TO THE MITOCHONDRIA AND CHLOROPLASTS

● Proteins entering into the mitochondria and chloroplast have _____ sequences that direct them to the organelle

□ A chaperone protein (Hsc/Hsp70) carries the protein to the organelle

- ATP hydrolysis removes the protein so it can pass through the TOM protein

□ The **TOM (TOC**- for chloroplast) protein complex on the outer membrane recognizes a signal sequence

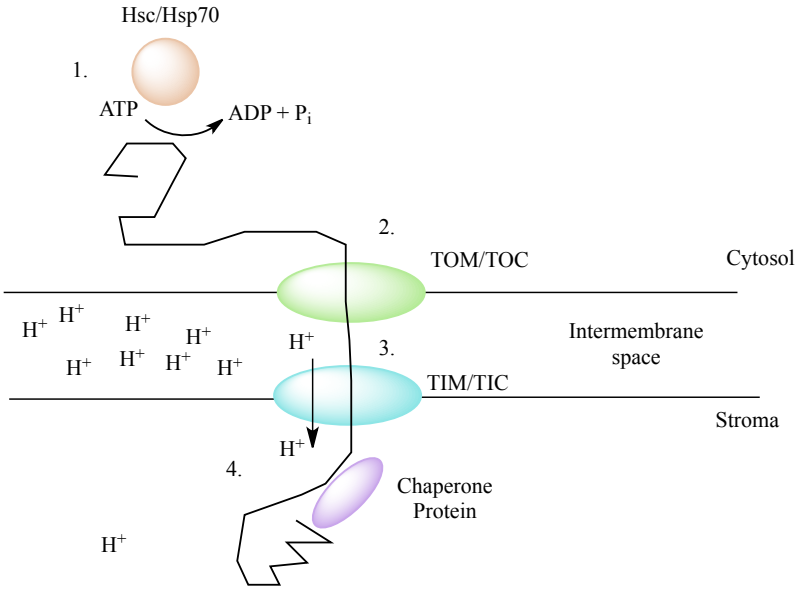
- The protein is unfolded and led into the intermembrane space

□ The **TIM (TIC** – for chloroplast) protein complex on the inner membrane recognizes a second signal sequence

- A H^+ gradient drives the passage of the protein through the TIM complex

□ _____ proteins within the organelle bind and help it refold

EXAMPLE: Protein feeding through the TOM/TIM complexes to enter the mitochondria



● Proteins are directed to many _____ within the organelles

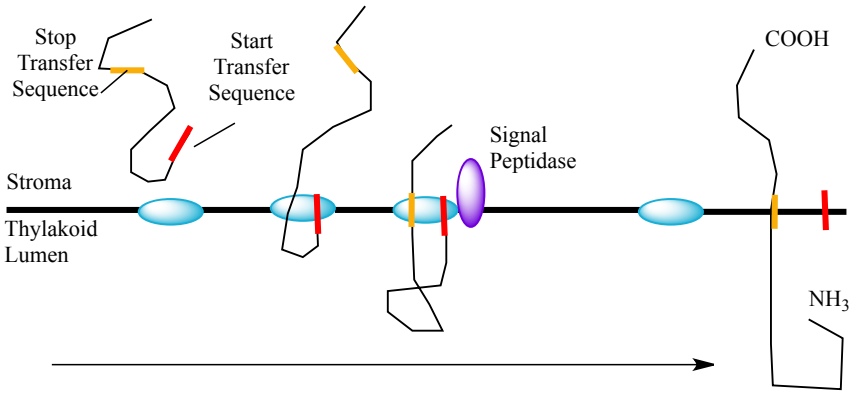
□ There are many sub compartments within the mitochondria and chloroplasts

- Signal sequences direct the protein to each compartments

□ Some proteins need to insert into various organelle membranes

- Inserts the same way as other transmembrane proteins

EXAMPLE: Insertion into a thylakoid membrane



PRACTICE:

1. True or False: Proteins must remain intact in order to cross the membrane and enter the mitochondria or chloroplast?
    a. True
    b. False

2. The energy to insert proteins through the TIM/TIC complex comes from what reaction?
    a. ATP hydrolysis
    b. H^+ gradient
    c. GTP hydrolysis
    d. Ca^{2+} influx into the mitochondria or chloroplast