

BCH2MBC 2018
END-OF-SEMESTER EXAM QUESTIONS

Gunter Blobel was awarded his Nobel Prize for medicine by showing that proteins contain signal sequences that direct them to specific organelles. Outline the general features of such signal sequences for proteins directed from the:

- (i) cytosol to the nucleus;
- (ii) cytosol to the mitochondria;
- (iii) cytosol to the endoplasmic reticulum;
- (iv) Golgi to lysosomes.

Gunter Blobel was awarded his Nobel Prize for medicine by showing that proteins contain signals within their sequences that target them to specific organelles. Outline the basic features of a signal found in a protein that is:

- (i) directed from the cytosol to the endoplasmic reticulum
- (ii) directed from the cytosol to the mitochondrion
- (iii) retained within the endoplasmic reticulum

Describe two techniques that utilize antibodies to determine the subcellular location of a specific protein.

The use of Green Fluorescent Protein (GFP)-reporter fusions to proteins has revolutionized the field of cell biology. Describe the features that make this protein so useful.

The use of Green Fluorescent Protein (GFP)-reporter fusions to proteins has revolutionized the field of cell biology. Describe FIVE features that make GFP so useful.

What is the general composition of the nuclear localization sequence (NLS)? Outline how the NLS was first discovered and experimentally verified.

What is the general composition of the nuclear localization sequence (NLS)? Describe the experiment that led to the discovery of the NLS within the SV40 large T antigen.

Describe the process by which importins direct proteins to the nucleus.

Describe how importins are involved in the import of proteins into the nucleus and how Ran regulates this process.

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Proteins that are imported into the endoplasmic reticulum (ER) may be retained within that organelle or transported to other locations along the secretory pathway.

- (i) Briefly outline how the signal recognition particle (SRP) functions in the process of protein import into the ER.
- (ii) Describe how proteins of the ER lumen are retained within this compartment.

With the aid of diagrams, describe the process of protein import into the endoplasmic reticulum.

With the aid of diagrams, outline the function of the Signal Recognition Particle (SRP).

With the aid of diagrams, outline how the Signal Recognition Particle (SRP) functions in the recognition and delivery of proteins to the endoplasmic reticulum.

Describe the functions of the endoplasmic reticulum and Golgi apparatus in the protein secretory pathway.

Before proteins leave the ER and follow along the secretory pathway, various post-translational modifications and quality control steps are performed.

- (i) Describe the sequence of events and possible post-translational modifications that may occur to a protein before it leaves the ER.
- (ii) Why do such quality control mechanisms exist in the ER?

Describe FOUR post-translational modifications that a protein can undergo following its import into the endoplasmic reticulum and its movement along the secretory pathway.

Outline FOUR (4) post-translational modifications that a protein can undergo following its import into the endoplasmic reticulum.

Describe the function of clathrin and dynamin in endocytosis.

Describe how clathrin and dynamin function in the budding of membranes to form vesicles.

Describe how clathrin and dynamin function in vesicle formation.

Outline the mechanism that enables the correct sorting of proteins from the Golgi apparatus to the lysosome.