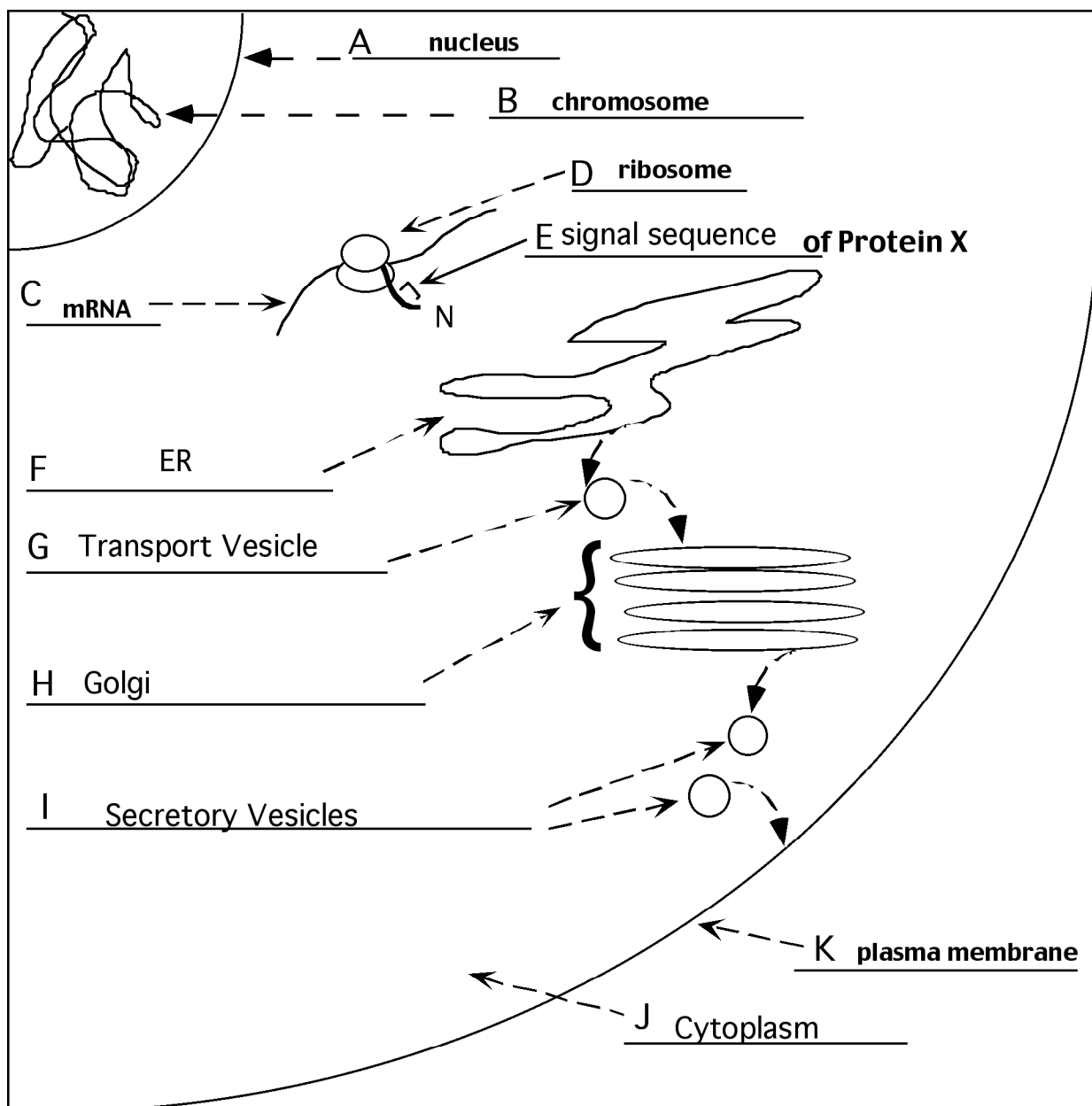


Solutions to 7.013 Protein Secretion Section Problem



a) Mutation A deletes the signal sequence in protein 2. Where in mutant A will you find

- | | |
|------------|---|
| Protein 1? | Cytoplasm. Protein 1 is not affected by the mutation in Protein 2 |
| Protein 2? | Cytoplasm. Protein 2 will not be directed for export without a signal sequence. |
| Protein 3? | Outside the cell. Protein 3 is not affected by Protein 2's missing signal sequence. |
| Protein 4? | Plasma Membrane. Protein 4 is not affected by Protein 2's missing signal sequence. |

b) Mutation B inactivates the SRP. Where in mutant B would you find

- | | |
|------------|--|
| Protein 1? | Cytoplasm. Protein 1 is not affected by the mutation. |
| Protein 2? | Cytoplasm. Without the SRP the protein won't be transported to the ER. |
| Protein 3? | Cytoplasm. Without the SRP the protein won't be transported to the ER. |
| Protein 4? | Cytoplasm. Without the SRP the protein won't be transported to the ER. |

c) Mutation C deletes the transmembrane sequence in protein 4. Where in mutant C would you find

- Protein 1? Cytoplasm. Protein 1 is not affected by the mutation in Protein 4
- Protein 2? Outside the cell. Protein 2 is not affected by Protein 4's missing Transmembrane sequence.
- Protein 3? Outside the cell. Protein 3 is not affected by Protein 4's missing signal sequence.
- Protein 4? Outside the cell. Protein 4 will not be tethered in the membrane without a transmembrane domain.

d) Mutation D prevents the fusion of transport vesicles with the golgi membrane. Where would you find

- Protein 1? Cytoplasm. Protein 1 is not affected by the mutation
- Protein 2? In transport vesicles. If the secretion pathway is blocked at this fusion stage, all secreted and membrane proteins will be trapped in the transport vesicles.
- Protein 3? In transport vesicles. If the secretion pathway is blocked at this fusion stage, all secreted and membrane proteins will be trapped in the transport vesicles.
- Protein 4? In transport vesicles. If the secretion pathway is blocked at this fusion stage, all secreted and membrane proteins will be trapped in the transport vesicles.

e) Mutation E disrupts the SRP docking protein on the ER membrane. Where would you find.

- Protein 1? Cytoplasm. Protein 1 is not affected by the mutation.
- Protein 2? Cytoplasm. Without the docking protein SRP can't "dock" on the ER and any protein would remain in the cytoplasm. (Translation would actually cease.)
- Protein 3? Cytoplasm. Without the docking protein SRP can't "dock" on the ER and any protein would remain in the cytoplasm. (Translation would actually cease.)
- Protein 4? Cytoplasm. Without the docking protein SRP can't "dock" on the ER and any protein would remain in the cytoplasm. (Translation would actually cease.)

f) Mutation F results in a fusion of a signal sequence in frame before protein 1. Where would you find.

- Protein 1? Outside the cell. With a signal sequence, Protein 1 will be directed for export.
- Protein 2? Outside the cell. Protein 2 is not affected by Protein 1's signal sequence.
- Protein 3? Outside the cell. Protein 3 is not affected by Protein 1's signal sequence.
- Protein 4? Plasma Membrane. Protein 4 is not affected by Protein 1's signal sequence.