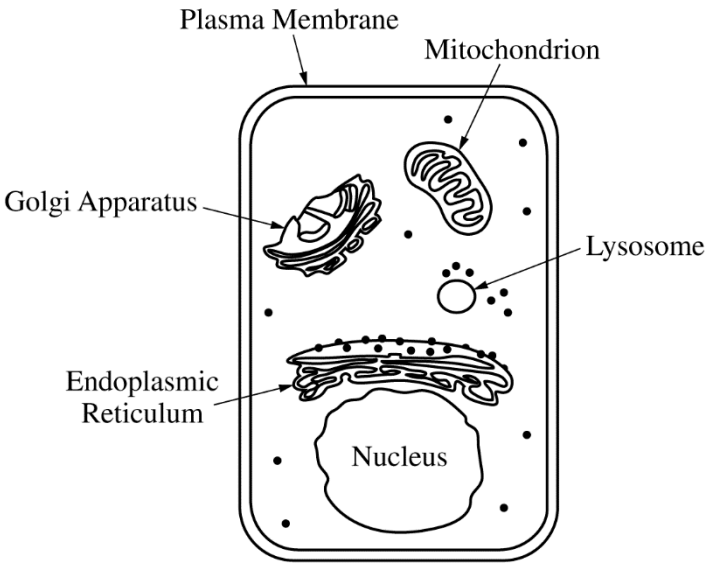
6. Cystic fibrosis is a genetic condition that is associated with defects in the CFTR protein. The CFTR protein is a gated ion channel that requires ATP binding in order to allow chloride ions (Cl^-) to diffuse across the membrane.

   (a) In the provided model of a cell, **draw** arrows to describe the pathway for production of a normal CFTR protein from gene expression to final cellular location.

   (b) **Identify** the most likely cellular location of the ribosomes that synthesize CFTR protein.

   (c) **Identify** the most likely cellular location of a mutant CFTR protein that has an amino acid substitution in the ATP-binding site.



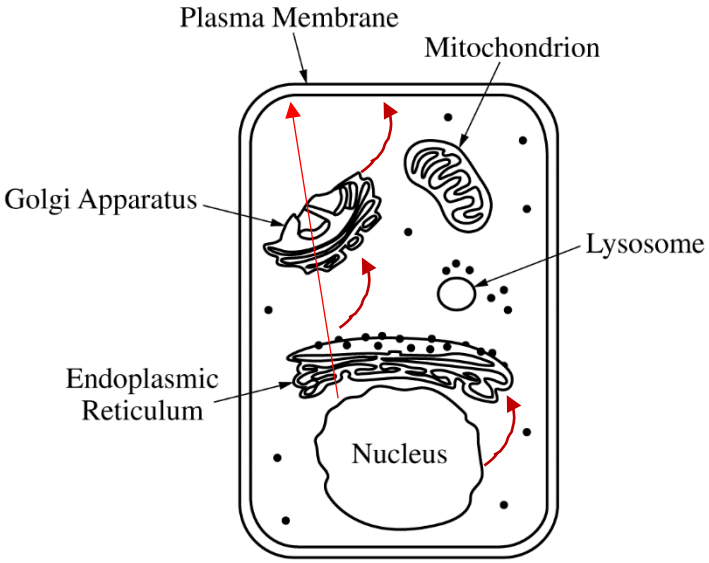
AP® BIOLOGY
2018 SCORING GUIDELINES

Question 6

Cystic fibrosis is a genetic condition that is associated with defects in the CFTR protein. The CFTR protein is a gated ion channel that requires ATP binding in order to allow chloride ions (Cl^-) to diffuse across the membrane.

(a) In the provided model of a cell, **draw** arrows to describe the pathway for production of a normal CFTR protein from gene expression to final cellular location.

Drawing (1 point)



The response must follow this pathway: nucleus/nuclear envelope → endoplasmic reticulum → Golgi apparatus → plasma membrane.

The response may be in the form of a continuous arrow or multiple discontinuous arrows.

(b) **Identify** the most likely cellular location of the ribosomes that synthesize CFTR protein.

Identification (1 point)

- (Rough) Endoplasmic Reticulum/ER

(c) **Identify** the most likely cellular location of a mutant CFTR protein that has an amino acid substitution in the ATP-binding site.

Identification (1 point)

- In the (cellular/plasma) membrane