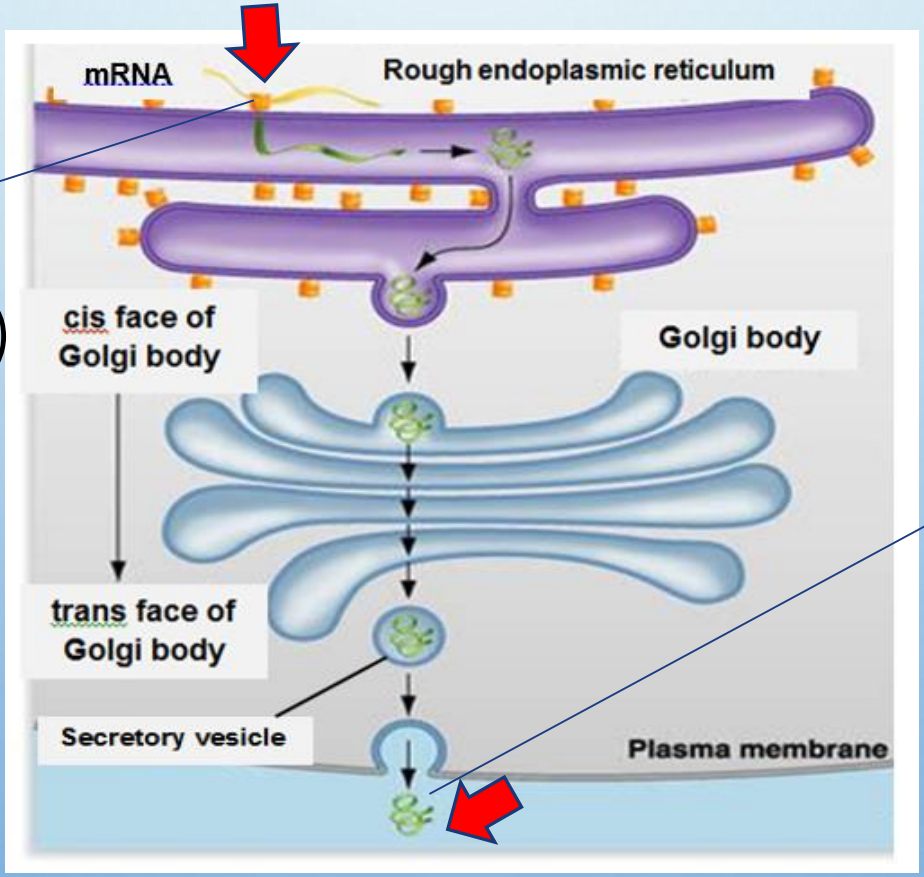
PROTEIN TRAFFICKING

JOURNEY OF A SECRETORY PROTEIN: "BIRTH" TO "DESTINY"

Trace the route taken by proteins from ribosome (on RER) to outside of cell

From "birth" (ribosome on RER)



to "destiny" (outside of cell)

LET'S START FROM THE VERY BEGINNING..

Recall from SDL..

- There are free ribosomes and bound ribosomes

➢ **In cytosol**

➢ Make proteins that function within cytosol

➢ **On RER**

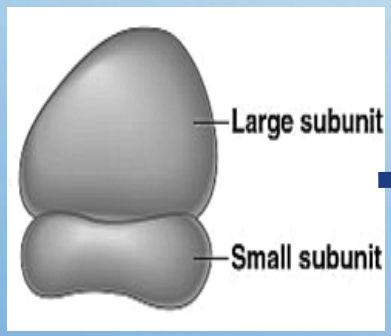
➢ Make proteins that are:

1. Inserted into membranes
2. Packaged within lysosomes
3. Secreted out of cell

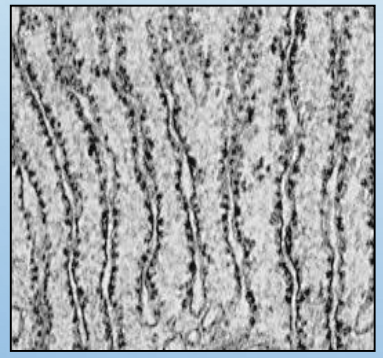
PROTEIN TRAFFICKING (WITH A FOCUS ON PROTEINS SECRETED OUT OF CELL)

- Example of a protein secreted out of cell – insulin

General route of a secretory protein:



Ribosome



RER

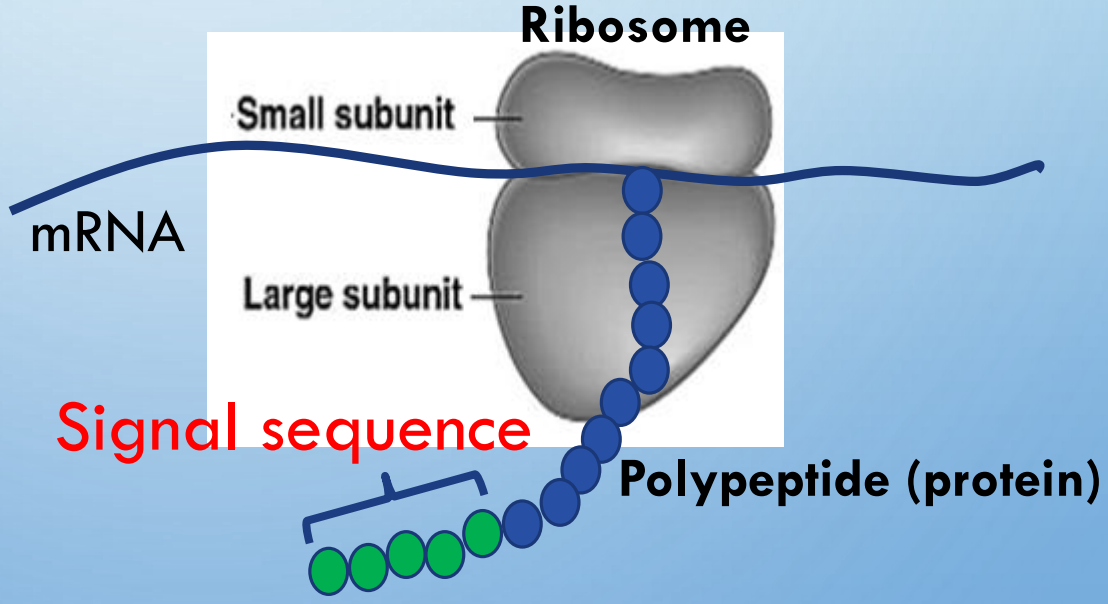
Golgi body

Cell surface membrane

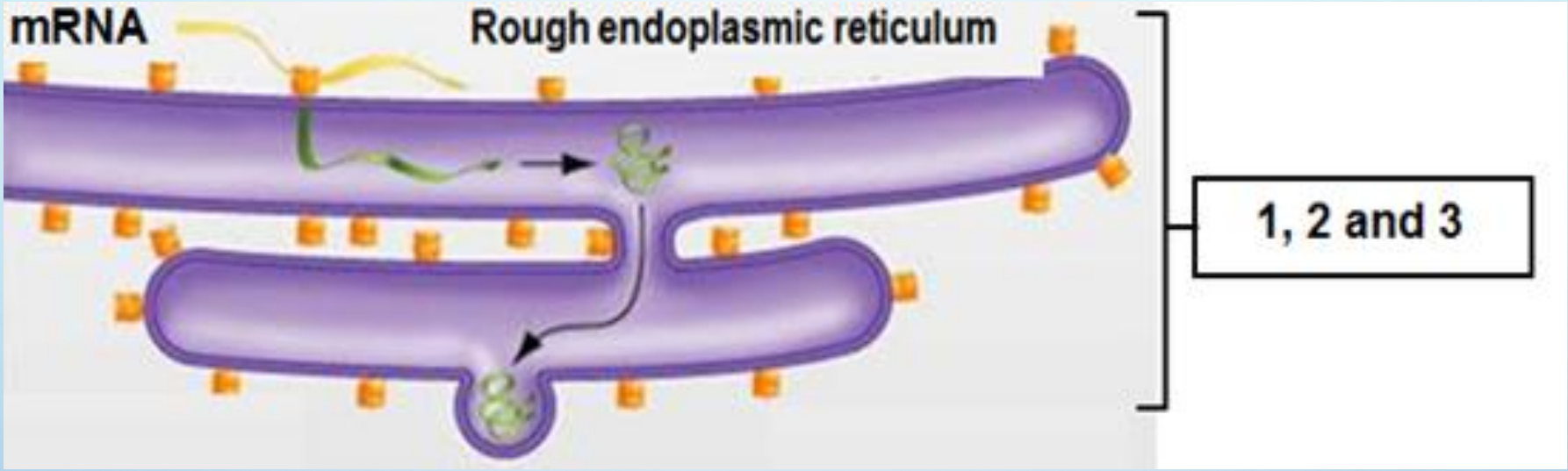
TRANSCRIPTION & TRANSLATION

- HOW IS PROTEIN SYNTHESIZED IN THE CELL?

DNA —transcription→ RNA —translation→ protein

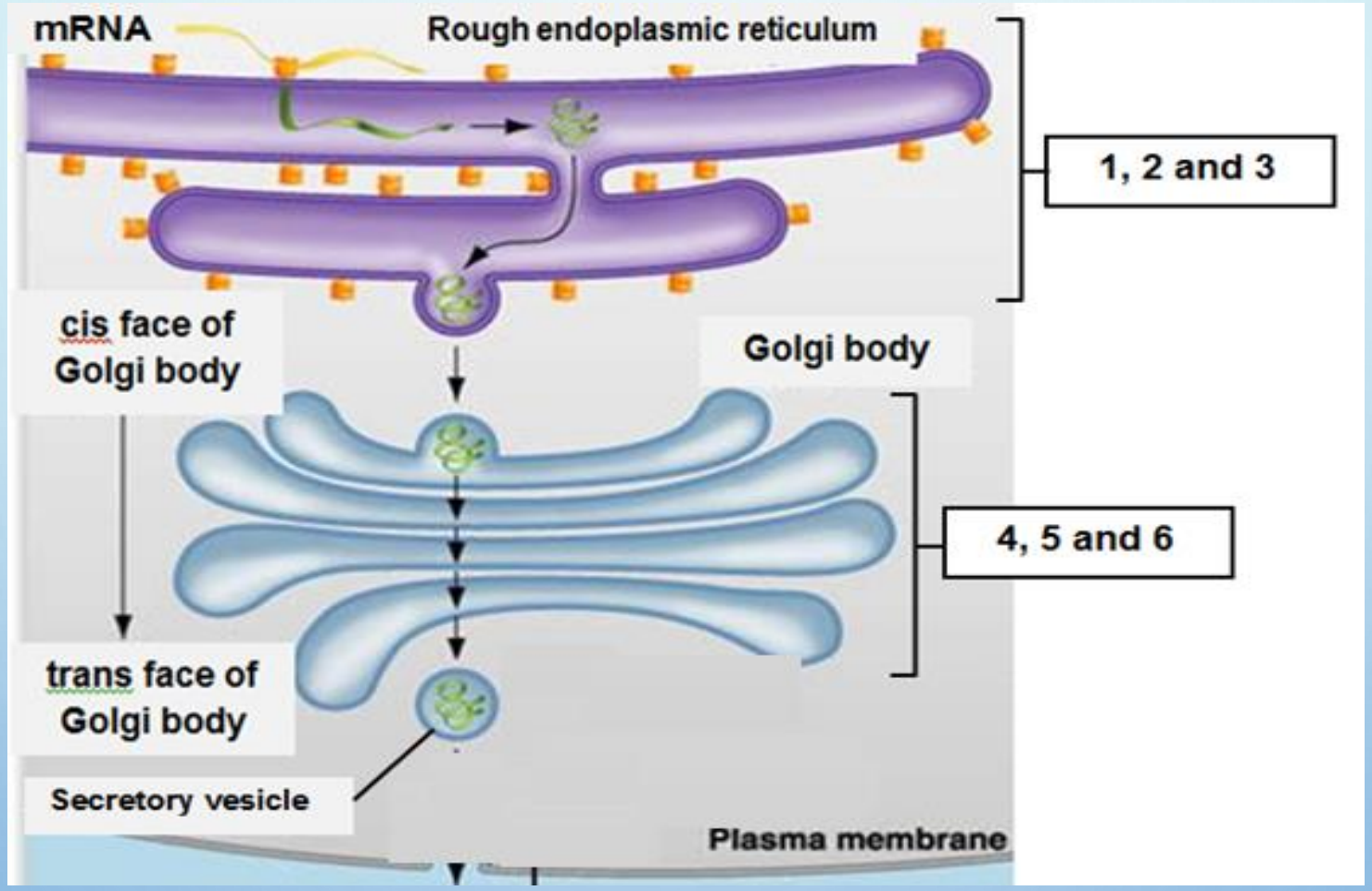


b) Protein trafficking



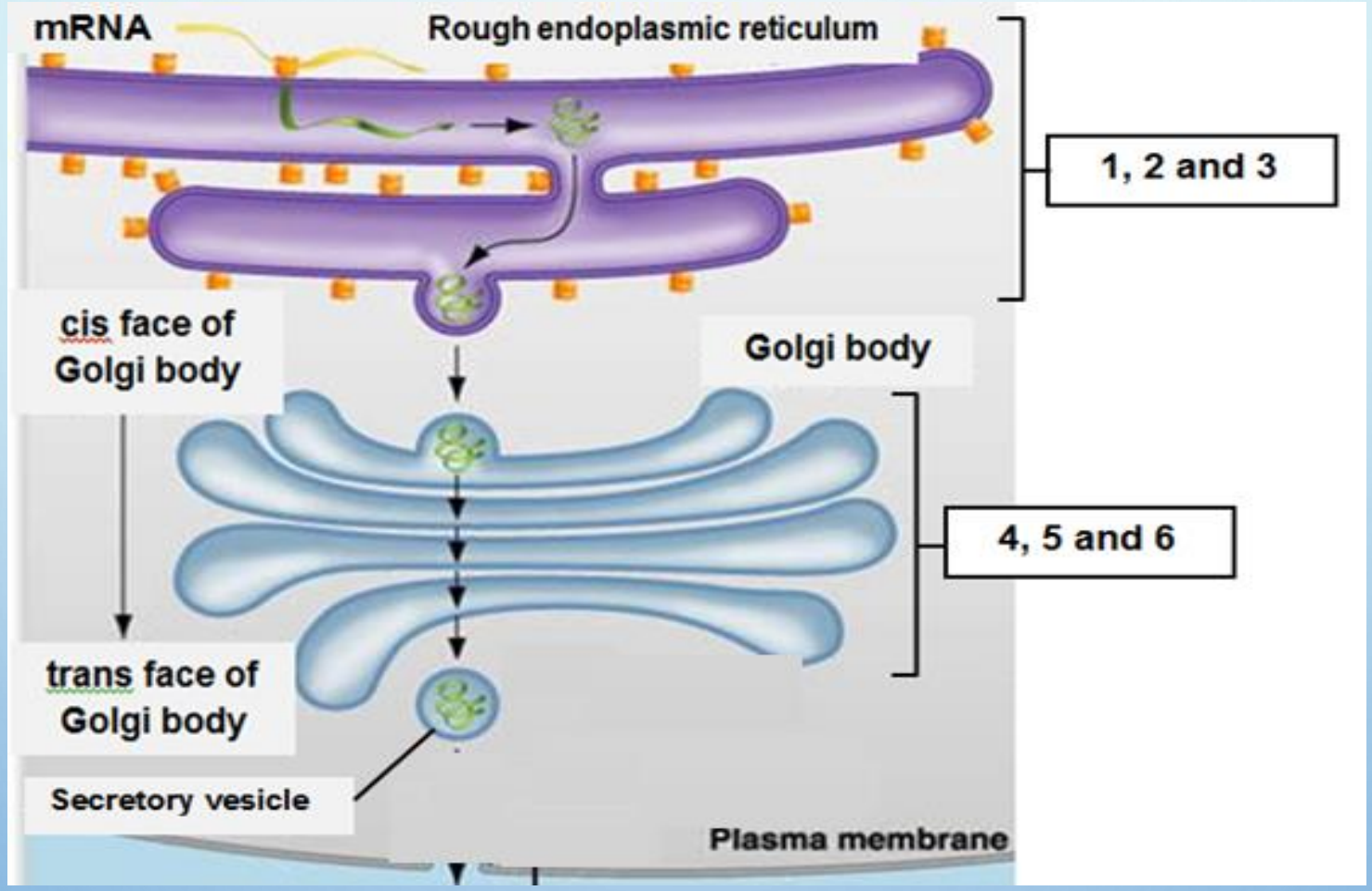
1. Newly synthesised polypeptide **enters RER lumen** & **folds into its native / 3D conformation** (only applies to globular proteins)
2. In RER lumen, **proteins undergo chemical modification** where short carbohydrate chains added to proteins (glycosylation)
3. Modified proteins packaged into **transport vesicles** which **buds off** the RER

b) Protein trafficking



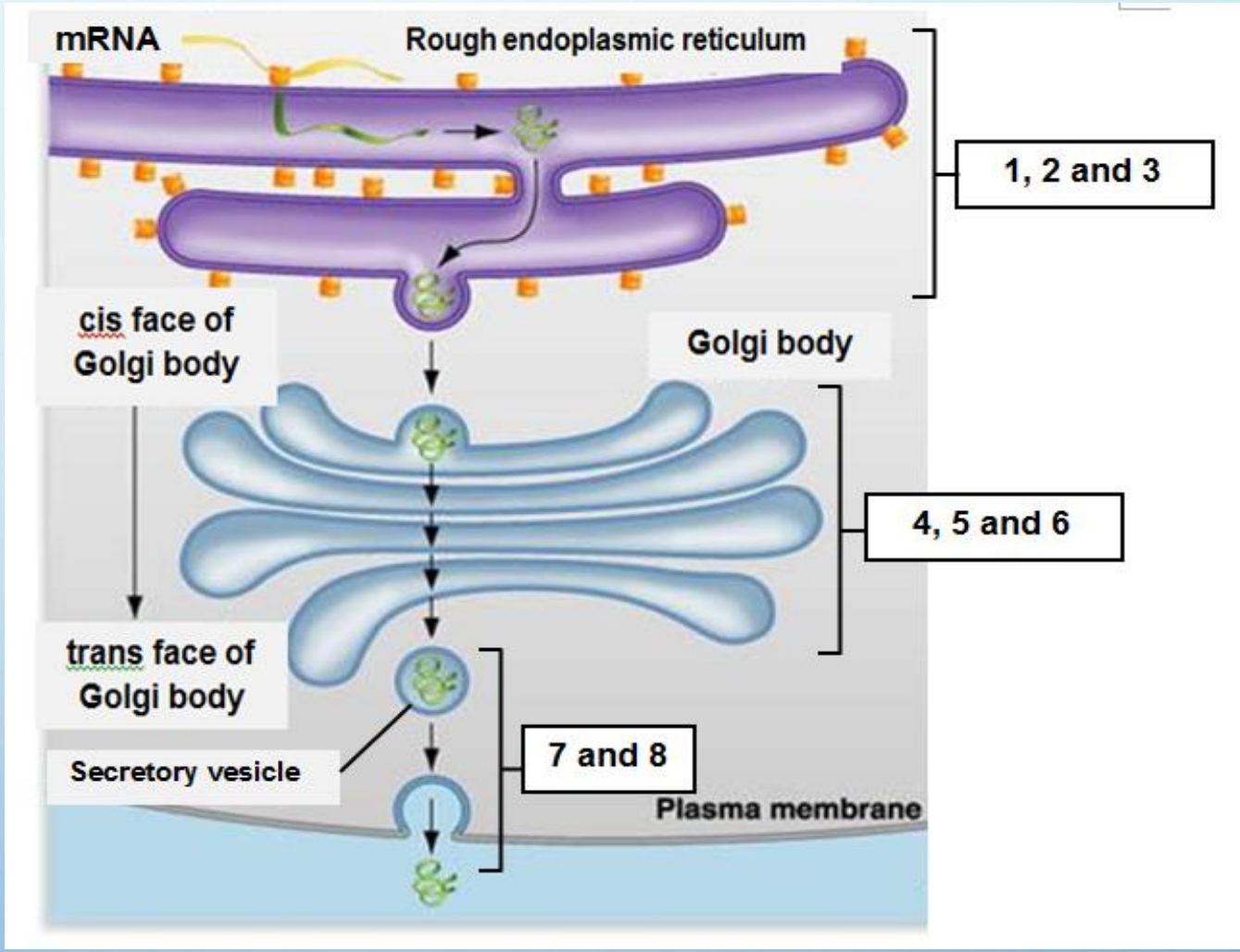
4. Transport vesicles move and **fuse** with **cis face** of Golgi body
5. **Further** chemical modification of protein occurs

b) Protein trafficking

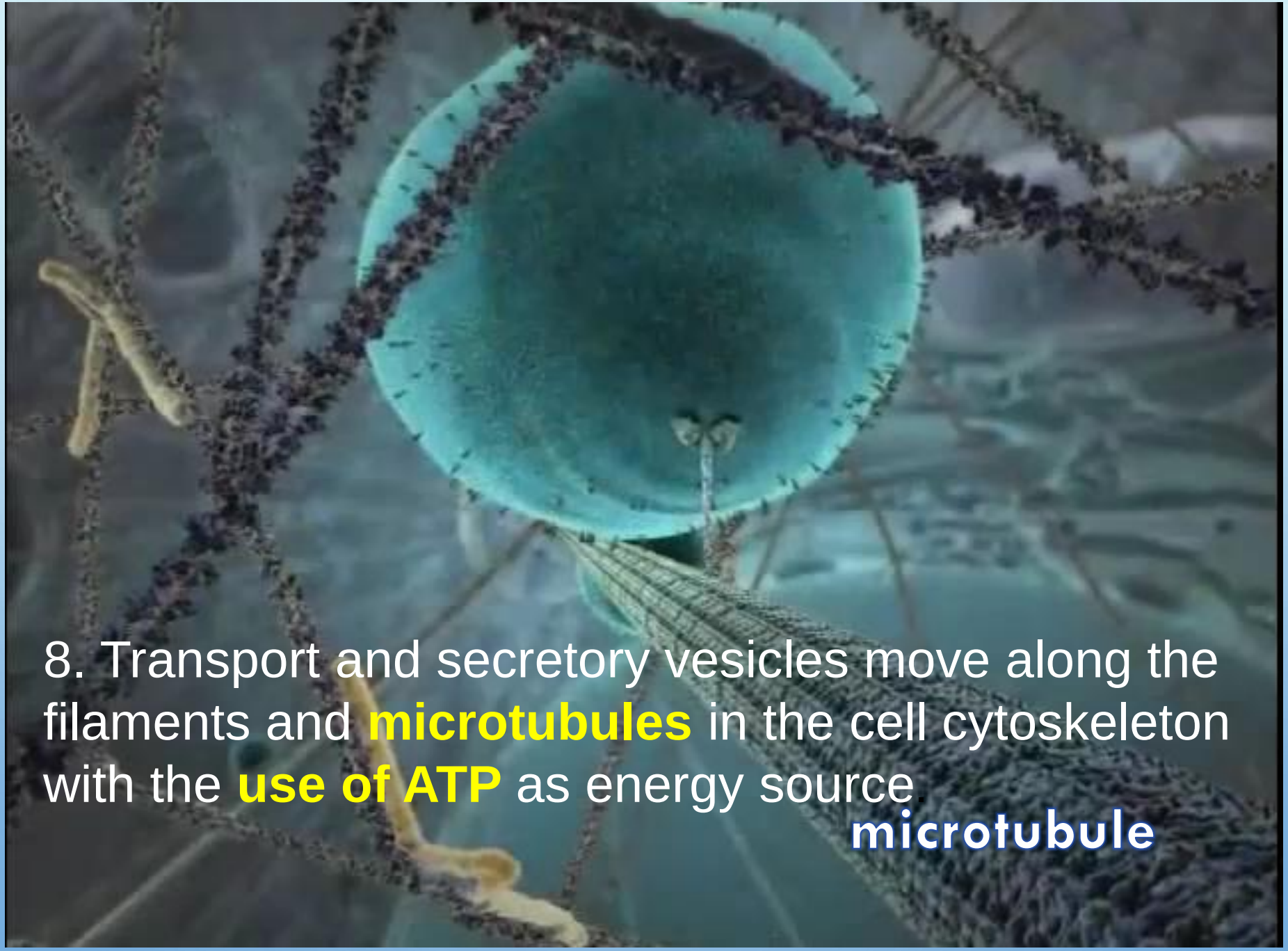


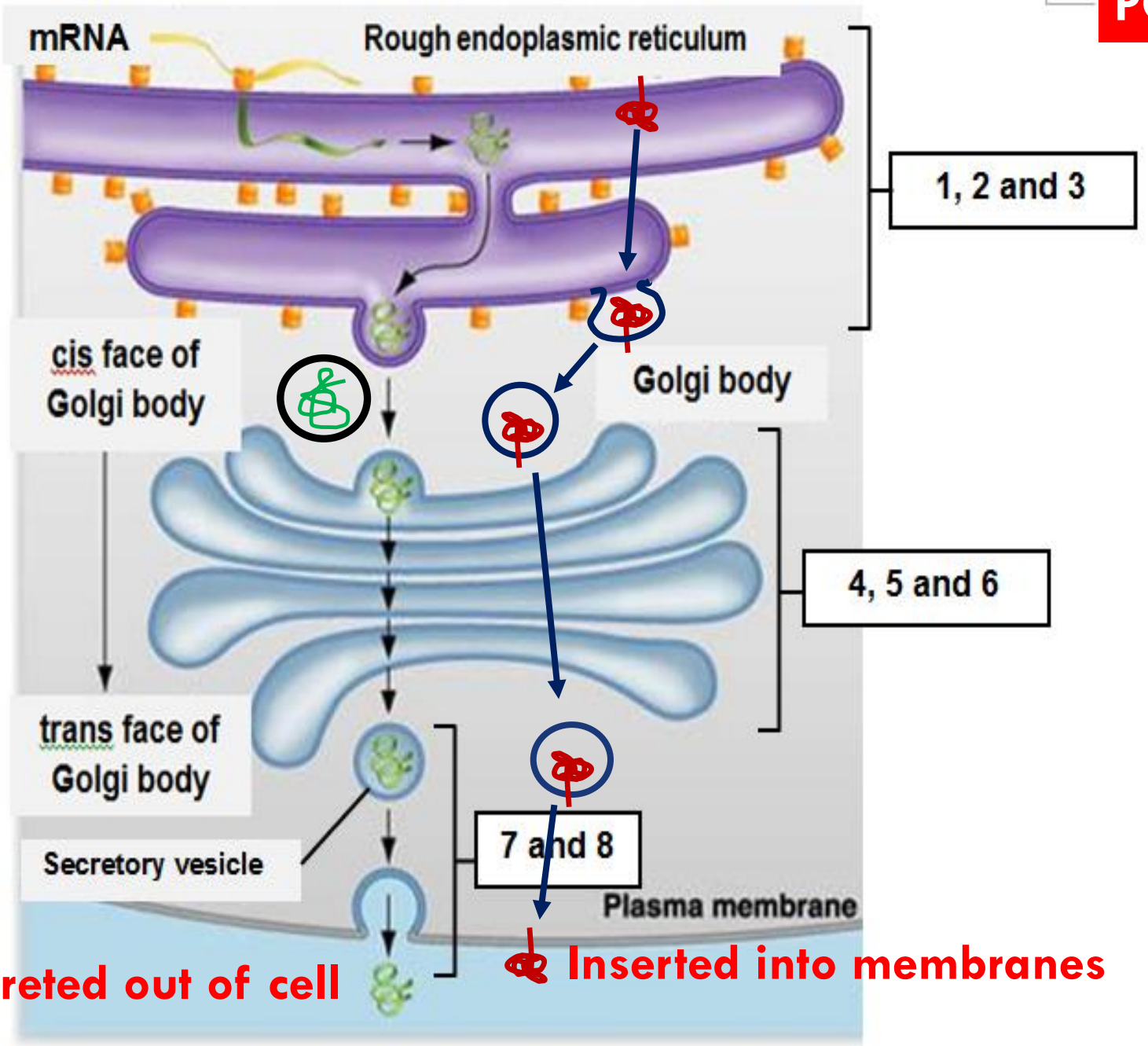
6. Modified proteins packaged into **secretory vesicles** which **bud off trans face** of Golgi body.

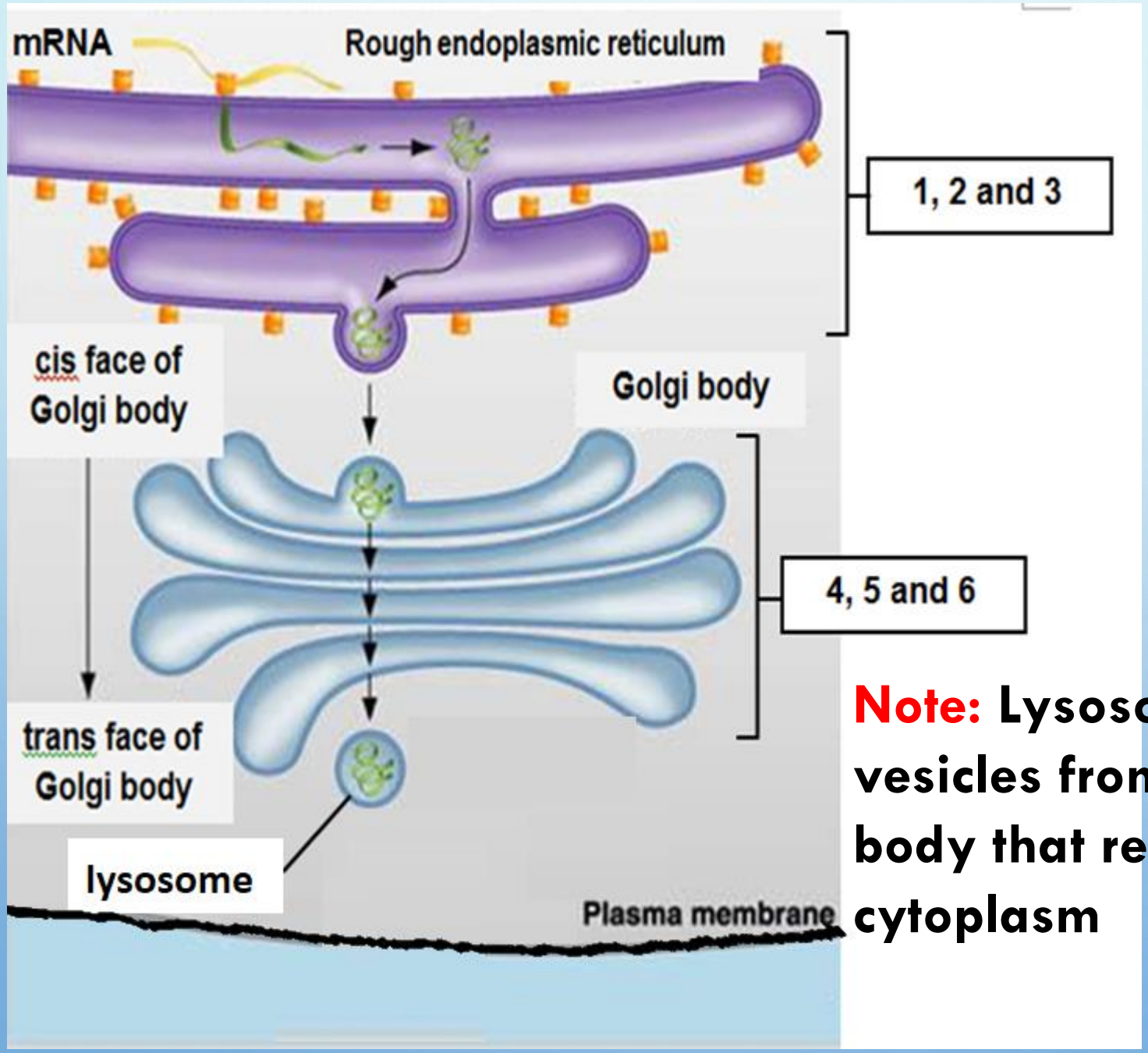
b) Protein trafficking



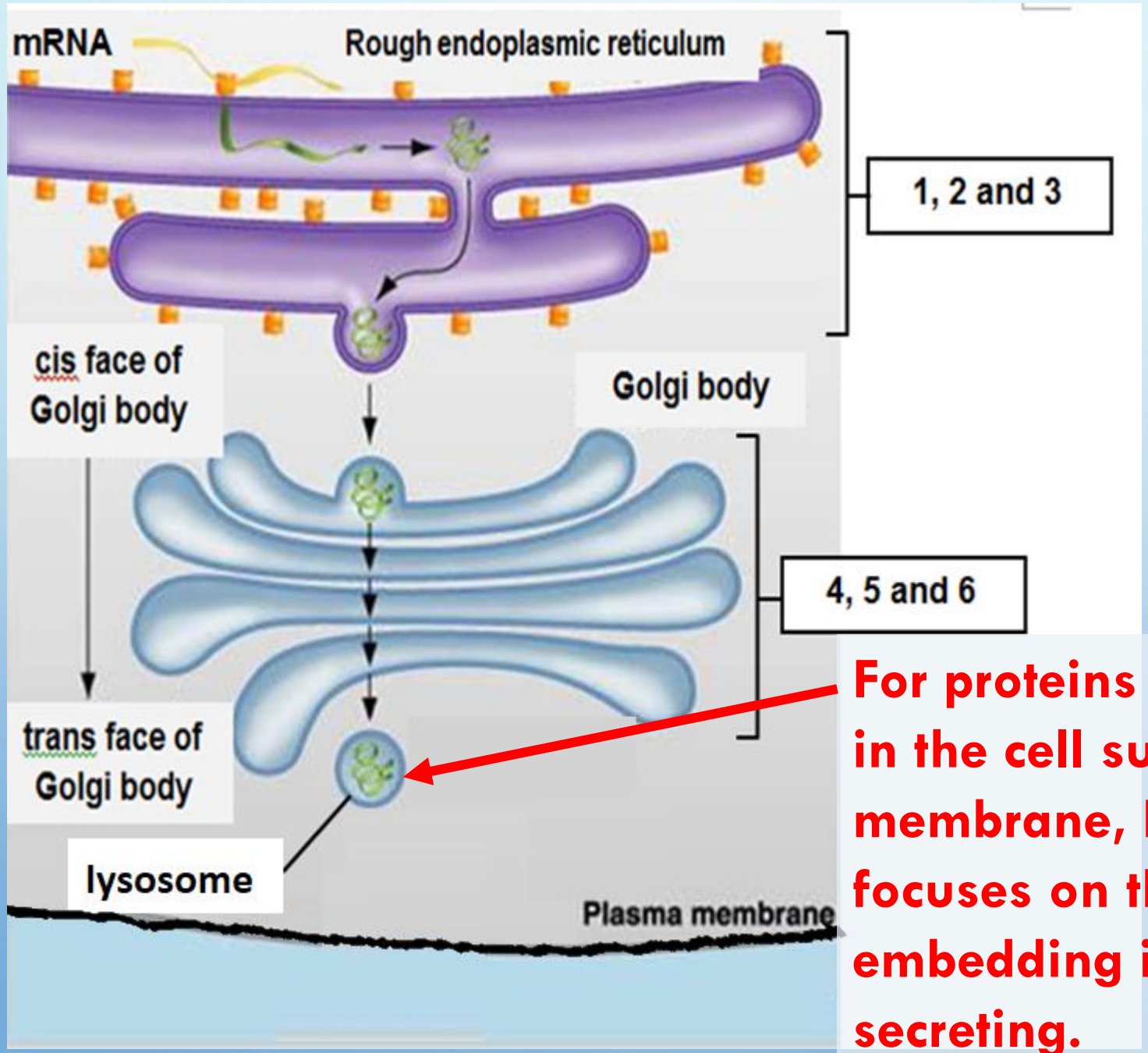
7. Secretory vesicles move **towards** and **fuse** with cell surface membrane, releasing modified protein via **exocytosis**


8. Transport and secretory vesicles move along the filaments and **microtubules** in the cell cytoskeleton with the **use of ATP** as energy source.
microtubule


mRNA
Rough endoplasmic reticulum
1, 2 and 3
cis face of Golgi body
Golgi body
4, 5 and 6
trans face of Golgi body
Secretory vesicle
7 and 8
Plasma membrane
secreted out of cell
Inserted into membranes



Note: Lysosomes are vesicles from the Golgi body that remain in the cytoplasm



For proteins embedded in the cell surface membrane, Point 7 focuses on the embedding instead of secreting.