

CONCEPT: ENDOMEMBRANE SYSTEM: PROTEIN SECRETION

- **Endomembrane System:** a group of _____-bound *organelles* _____ a *eukaryotic cell*.
 - Includes many organelles that are interconnected by _____ (little membrane bubbles).
 - Has *multiple* functions including *protein* _____ & *cellular* _____.

EXAMPLE: Organelles of the Endomembrane System.

① Nuclear Envelope (Nucleus)	⑤ Lysosomes & Peroxisomes
② Endoplasmic Reticulum	⑥ Vacuoles
③ Golgi Apparatus	⑦ Cell Membrane (see <i>Cell Membranes</i> lesson)
④ Transport Vesicles	

Protein Secretion

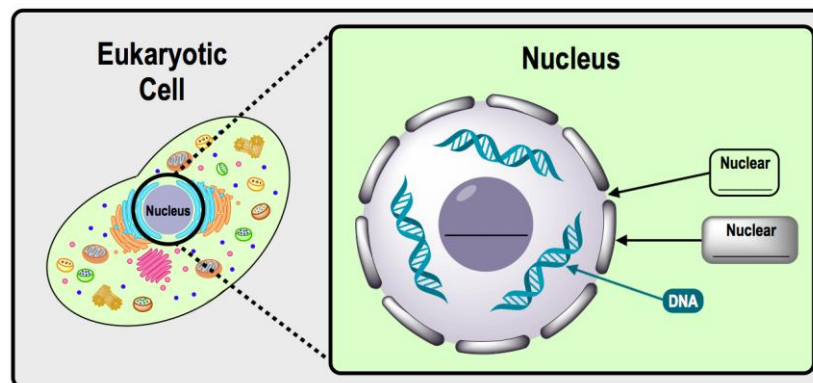
- **Secretion:** a process by which a substance is _____ into the environment.
 - Protein secretion involves *several* organelles that interact in a specific _____.



1) Nucleus

- Protein secretion starts in the _____, which stores DNA, the “recipe/code” for making the protein.
- **Nucleus:** a rounded structure that contains & protects *most* of a eukaryotic cell’s _____.
 - **Nuclear** _____: the *double-membrane* that surrounds the nucleus & acts as its barrier.
 - **Nuclear Pores:** tiny “_____” in the *nuclear envelope* that allow entry/exit into & out of the nucleus.
 - **Nucleolus:** a small dense structure inside the nucleus where _____ are assembled.

EXAMPLE: Eukaryotic Nucleus.



- DNA in the nucleus is *transcribed* into RNA, which is then *translated* into a _____ (more details on this later).

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PRACTICE: Which part of the nucleus is responsible for assembling ribosomes and ribosomal RNA?

- a) The mitochondria.
- b) Nuclear Envelope.
- c) Nuclear pores.
- d) Nucleolus.

2) Endoplasmic Reticulum

● **Endoplasmic Reticulum** (____): membranous structures continuous with the nuclear envelope with multiple functions.

□ **ER** ____: the *internal* space/compartiment of the ER.

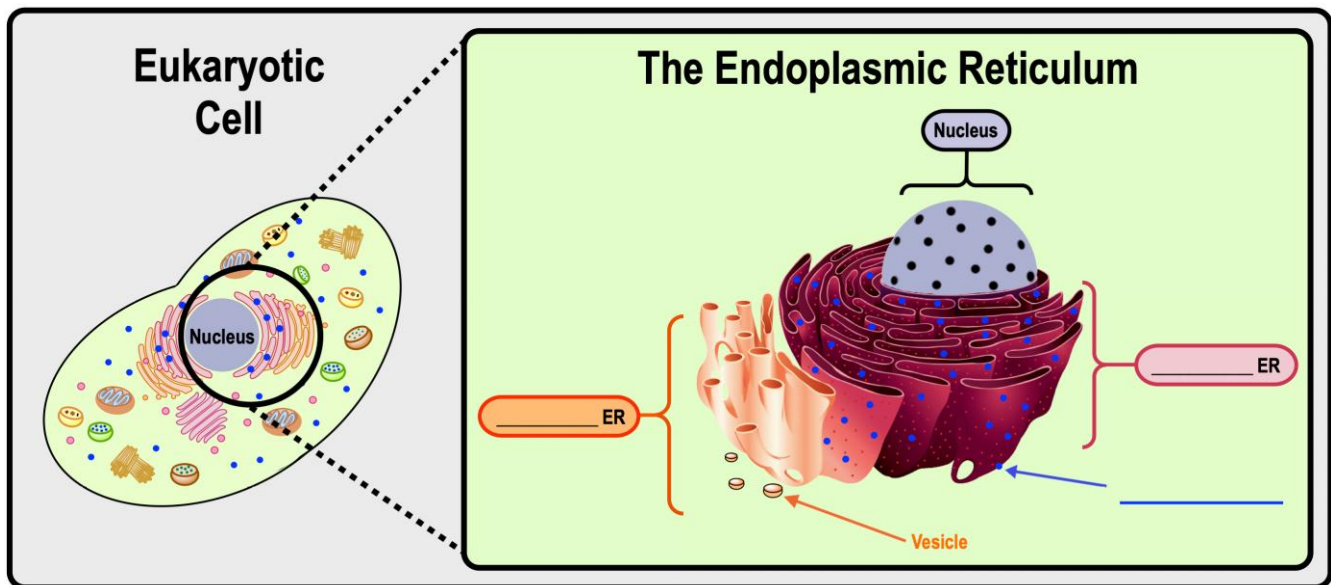
1) **Rough ER** (____): closer to nucleus with a _____, _____-coated surface.

□ Newly built _____ *fold* & are *modified* in the rER lumen.

2) **Smooth ER** (____): further from nucleus with a _____, ribosome-_____ surface.

□ Synthesizes _____ & *detoxifies* drugs/poisons.

EXAMPLE: Rough ER vs. Smooth ER.



PRACTICE: Which of the following is most likely to have the greatest concentration of smooth endoplasmic reticulum?

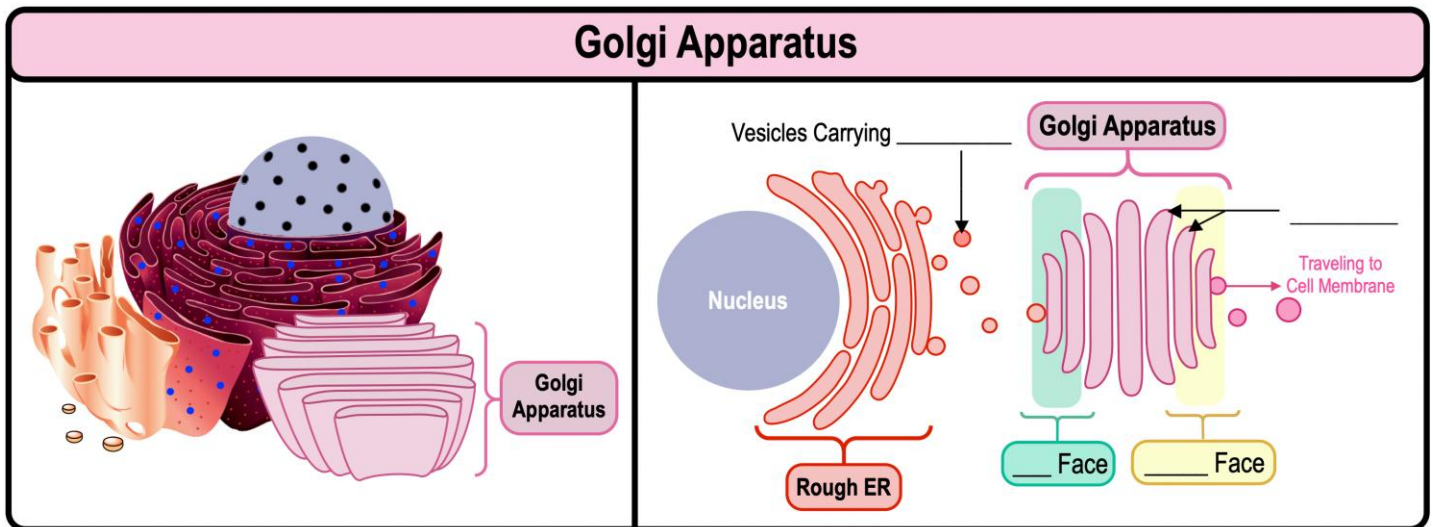
- a) A cell that secretes enzymes.
- b) A cell that destroys pathogens.
- c) A cell that makes steroid hormones.
- d) A cell that engages in photosynthesis.
- e) A cell that manufactures proteins.

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3) Golgi Apparatus

- Molecules synthesized in the ER (ex. proteins & lipids) are transported by *vesicles* to the _____ apparatus.
- **Golgi Apparatus:** stack of flat, membranous sacs (_____) that function as a “*processing center*.”
 - _____ vesicles, _____ vesicle contents, & *repackages* contents into *vesicles* for export.
 - *Receiving* end of the Golgi = “_____” end. □ *Shipping* end of the Golgi = “_____” end.
 - Some vesicles shipped from Golgi apparatus can fuse with the *cell membrane* for _____.

EXAMPLE: Golgi Apparatus.



PRACTICE: Which of the following is the most common pathway taken for a newly synthesized protein to be secreted?

- a) Rough ER → Golgi → Transport vesicle → Nucleus.
- b) Golgi → Rough ER → Lysosome → Transport vesicle → Cell membrane.
- c) Rough ER → Golgi → Transport vesicle → Cell membrane.
- d) Rough ER → Lysosome → Transport vesicle → Cell membrane.