**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 *Cell Membranes* 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.

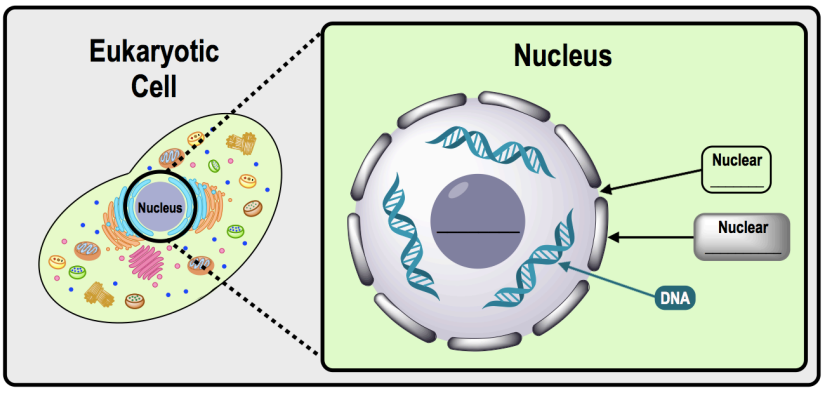
●**Nucleus**: a rounded structure that contains & protects *most* of a eukaryotic cell's _____.

□ **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).

**CONCEPT:** ENDOMEMBRANE SYSTEM: PROTEIN SECRETION

**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/compartment of the ER.

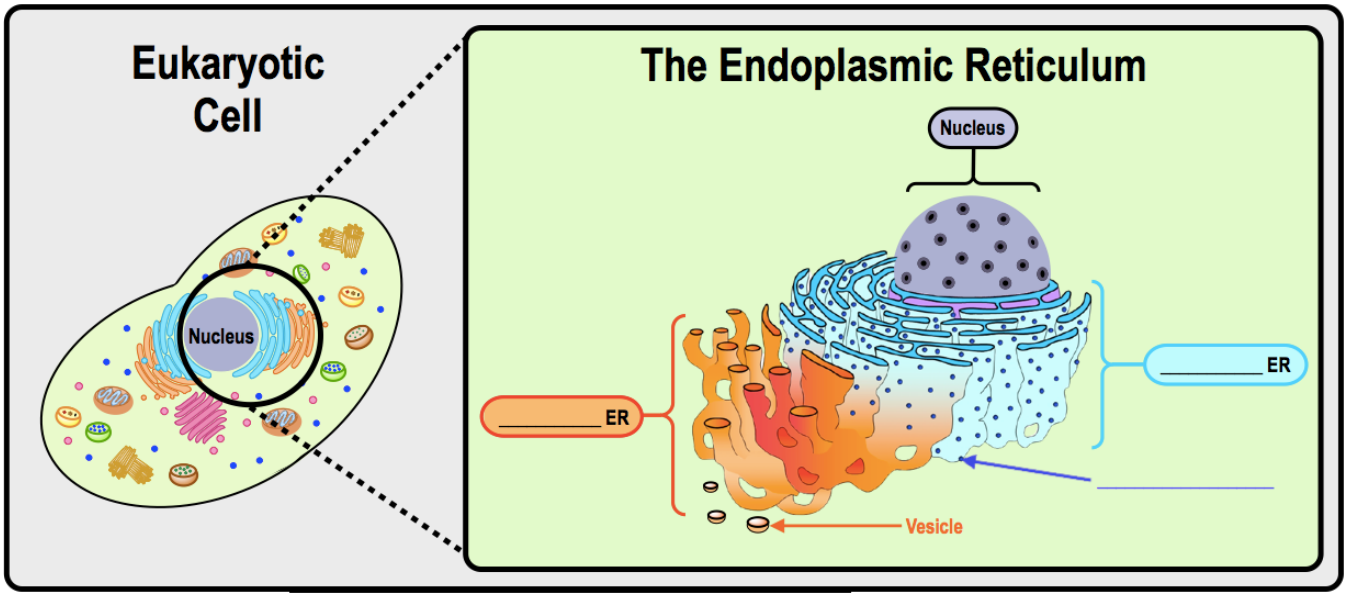
1) **Rough ER** (_____): closer to nucleus with a _____, _____-*coated* surface.

□ 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.

**CONCEPT:** ENDOMEMBRANE SYSTEM: PROTEIN SECRETION

**3) Golgi Apparatus**

●Molecules synthesized in the ER (ex. proteins & lipids) are transported by *vesicles* to the _____ *apparatus*.

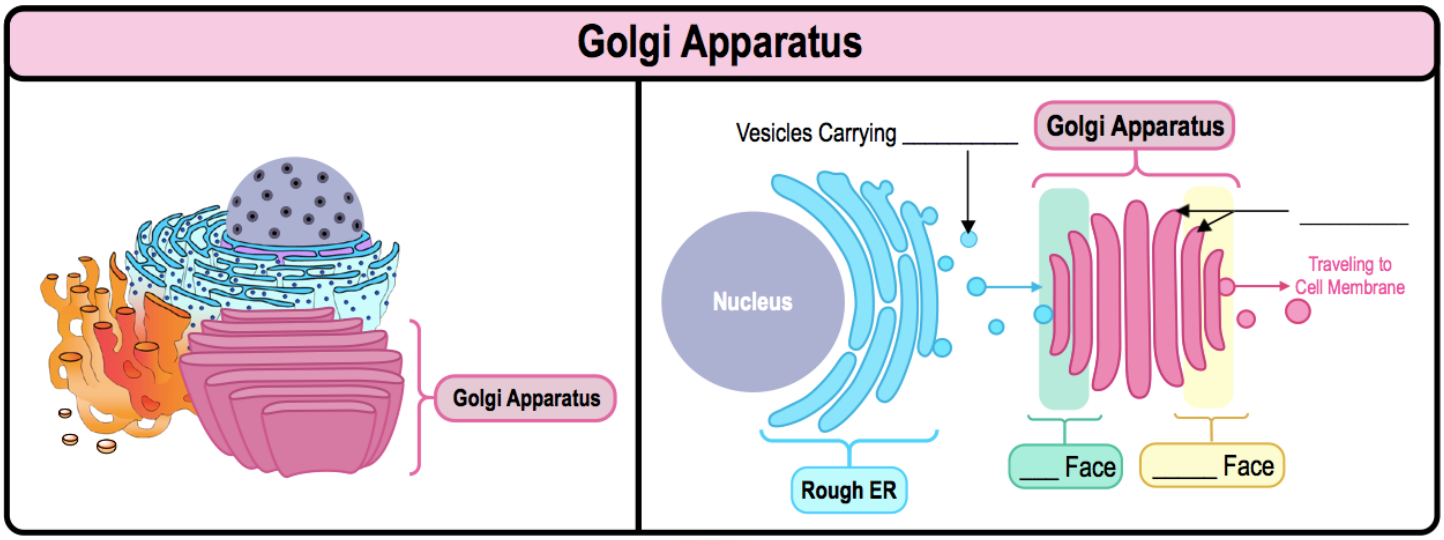
●**Golgi Apparatus**: stack of flat, membranous sacs (_____) that function as a "*processing center*."

□ _____ 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.