**Cell-to-Scale Project**

STEM II

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**GOAL**: To enhance your understanding of organelles and cell structure and function by creating a scale model of a eukaryotic plant cell.

**YOUR TASK**: As a STEM II class you will be responsible for 3d printing part or parts of a eukaryotic plant cell. There are 13 total cell parts to print.

Group cell structures: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Project Description:**

* Your task is to create a quality 3d representation of your cell structure(s).
* Consider how many of the cell structures you are required to create.
* Research the function of your cell structure and what it may look like.
* Calculate how large your cell structure should be if a cell were approximately 1 foot long (use the chart on the back of this page)
* Approximate Dimensions: Length\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Width \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Depth \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

An important aspect of our Cell-to-Scale Project is that our organelles match the scale of the size cell we are making. Fill in the following chart to figure out the dimensions for each organelle.

Plant Cell

|  |  |  |  |
| --- | --- | --- | --- |
| **Organelle** | **Average Size**  **(μm)** | **Scaling Factor for our Model**  **(1 μm = 1 cm)** | **Model Size (cm)** |
| **Average Plant Cell Diameter** | **30 μm diameter** | **30 μm × 1 cm/μm** | **30 cm** |
| **Cytosol (cytoplasm)** (must be clear and hold all organelles) | **n/a size of space between organelles** |  |  |
| **Rough Endoplasmic**  **Reticulum** (wrap at least partially around nucleus) | **2.5 x 2.5 μm and each layer 0.5 μm thick** w/**0.025 μm ribosomes** on outside |  |  |
| **Smooth Endoplasmic**  **Reticulum** (orient towards the outside of the rough ER) | **1.5 x 1.5 μm with each layer 0.1 μm thick** |  |  |
| **Cell Membrane** (must fit just inside cell wall) | **29 μm diameter** |  |  |
| **Cell Wall** (must fit just outside cell membrane) | **30 μm diameter** |  |  |
| **Chloroplast** (must be partially open showing internal structure) | **5 μm long x 2 μm wide** |  |  |
| **Mitochondria** (must be partially open showing internal structure) | **6 μm x 1 μm** |  |  |
| **Nucleus** (allow spot for nucleolus to sit) | **5 -10 μm** |  |  |
| **Nucleolus** (must fit inside nucleus) | **2.5 μm** |  |  |
| **Golgi Complex**  **See** [**http://3dprint.nih.gov/discover/3dpx-000003**](http://3dprint.nih.gov/discover/3dpx-000003) | **2.5 x 2.5 μm** (membranes have thickness of ER) |  |  |
| **Vacuole** (must be partially open and filled in) | **Varies:**  **15 x 20 μm** |  |  |
| **Free Ribosome x 3** | **0.025 μm** |  |  |
| **Vesicles** | **1 μm** |  |  |
| **Microtubules x 3** | **0.3 μm diameter x as long as needed** |  |  |