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

**Scales, Sizes, and Specialization:**

**An activity highlighting the diversity in cell types**

## Part 1 and 2:

Remove the cards from **Bag A** and work to sort the cards on your desk or table based on which cell types you think are most prevalent to least prevalent in the human body. Put the cell type you think is MOST prevalent at the top and the LEAST prevalent at the bottom.

|  |  |
| --- | --- |
| **Bag A** Sorted by Prevalence | **Bag B** Sorted by Mass |
| Most Prevalent: | Most Mass: |
|  |  |
|  |  |
|  |  |
|  |  |
| Least Prevalent: | Least Mass: |

After completing the table above, answer the following questions:

1. Given a list of cellular measurements, what information would you need to use to determine a cell’s weight? Cellular measurements: length, width, height, density, surface area, volume, average circumference.
2. Using the cellular measurements you chose in question 1, how might these values be arranged mathematically to calculate weight?

## Part 3:

## What are the formulas for each of the calculations:

Average volume of one cell

Average density for one cell

Average mass of one cell

## Total weight from cell type in human body

Work to fill out the following table showing data about the size and prevalence of various cell types. Hint: Look at the formulas you just created

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cell type** | **Number of cells in the human body** | **Average volume of one cell (mL)** | **Average density for one cell (g/mL)** | **Average mass of one cell (g)** | **Total mass from cell type in human body (g)** |
| **Muscle fiber cells** | 2.50\*108 | 7.09\*10-5 | 1.10 | 7.80\*10-5 |  |
| **Adipocytes** | 5.00\*1010 | 2.93\*10-7 | 0.92 | 2.70\*10-7 |  |
| **Neurons** | 1.00\*1011 | 2.40\*10-9 | 1.10 |  | 2.64\*102 |
| **Epidermal cells** |  | 9.60\*10-9 | 0.9 | 8.6\*10-9 | 1.29\*103 |
| **Erythrocytes** | 2.5\*1013 | 9.70\*10-11 |  | 9.8\*10-11 | 2.46\*103 |
| **Endothelial cells** | 5.73\*1011 | 3.00\*10-10 |  | 3.30\*10-10 | 1.89\*102 |

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

## Part 4: Individual Practice

Now consider some additional cell types. How would these cell types fit into your earlier predictions about prevalence and mass?

Consider:

Glial cells

Hepatocytes

Leukocytes

Bacteria

Calculate the missing values for the table below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cell type** | **Number of cells in the human body** | **Average volume of one cell (mL)** | **Average density for one cell (g/mL)** | **Average mass of one cell (g)** | **Total mass from cell type in human body (g)** |
| **Bacteria** | 1.00\*1014 | 1\*10-12 | 1.00 | 1\*10-12 |  |
| **Glial cells** | 9.47\*1010 | 9.60\*10-9 | 1.10 |  | 1.0\*103 |
| **Leukocytes** | 4.71\*1011 |  | 1.02 | 2.15\*10-10 | 1.01\*102 |
| **Hepatocytes** | 2.70\*1011 | 4.90\*10-9 | 1.10 | 5.39\*10-9 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Bag A** Sorted by Prevalence | **Where do the new cells fit? (Re-rank the cell types with the new cards included)** | **Bag B** Sorted by total Mass | **Where do the new cells fit? (Re-rank the cell types with the new cards included)** |
| Erythrocytes |  | Muscle fibers |  |
| Endothelial cells | Adipocytes |
| Epidermal cells | Erythrocytes |
| Neurons | Epidermal cells |
| Adipocytes | Neurons |
| Muscle fibers | Endothelial cells |