Names: _____
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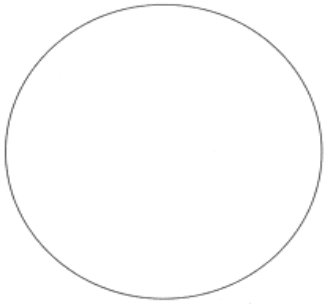
Datum Sheet for Laboratory 2
Introduction to Microscopy

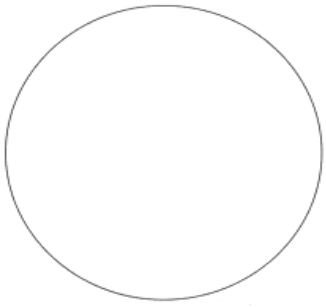
A. Basic Light Microscopic Techniques

Using the following circles to represent the microscopic fields, draw the cells on the prepared slide of the stained animal tissue as seen with the **20X or 40X and 100X** objectives with bright field illumination. **Indicate the total magnification in each case. Record your observations next to the circles** (0.5 point each, 1 point total).

type of tissue _____



_____X



_____X

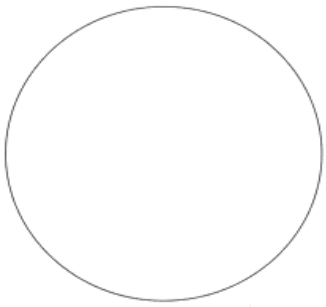
B. Calibration of the Ocular Micrometer

Fill in the following table to indicate your calibration factors for the ocular micrometer with different objectives in μm/unit (1 point each, 4 points total).

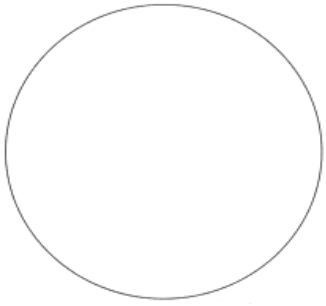
Objective Lens	Calibration Factor (μm/unit)
10X	
20X	
40X	
100X	

C. Microscopic Observation of Human Cheek Cells

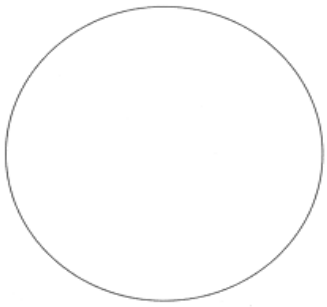
1. Using the following circles to represent the microscopic fields, draw the human cheek cells in the wet mount as seen with the **40X objective** with different optical systems. **Indicate the total magnification in each case. Record your observations next to the circles** (0.5 point each, 1.5 points total).



bright field _____X

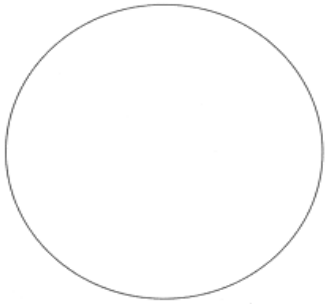


dark field _____X

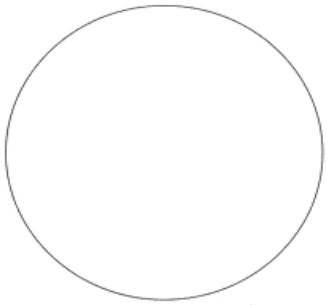


phase contrast _____X

2. Using the following circles to represent the microscopic fields, draw the human cheek cells in the wet mount as seen with the 20X or 40X and 100X objective lenses after staining with methylene blue. Indicate the total magnification in each case. Record your observations next to the circles (0.5 point each, 1 point total).



_____X



_____X

3. Give the individual values and the means for the diameters of 10 human cheek cells and 10 cheek cell nuclei **in ocular micrometer units** as seen with the 20X or 40X, and 100X objective, respectively (2 points each, 4 points total).

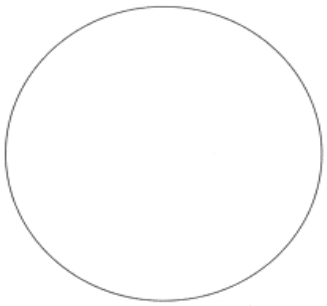
Cell/ Nucleus	Human Cheek Cell Diameter (ocular micrometer units @____X)	Human Cheek Cell Nuclear Diameter (ocular micrometer units @____X)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean		

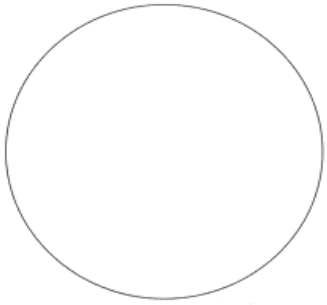
4. Calculate the actual means, variances, and standard deviations for the cell and nuclear diameters in **µm** using the appropriate calibration or conversion factors (0.5 point each, 3 points total).

parameter	mean	variance	standard deviation
cell diameter			
nuclear diameter			

D. Light Microscopic Observations of *Elodea* Cells

1. Using the following circles to represent the microscopic fields, draw examples of the *Elodea* cells in the wet mount as seen with the 20X or 40X and the 100X objective with the bright field optical system. Indicate the total magnification in each case (0.5 point each, 1 point total).





bright field _____X

bright field _____X

2. Describe your observations of cyclosis in *Elodea* (0.5 point).

3. Give the individual and mean values for the length and width of 10 *Elodea* cells in **ocular micrometer units** as seen with the 20X or 40X objective (2 points each, 4 points total).

ElodeaCell	Length (ocular micrometer units @ ____X)	Width (ocular micrometer units @ ____ X)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Mean		

4. Calculate the mean length and width of the *Elodea* cells in **µm** using your calibration or conversion factors. Also calculate the variance and standard deviation (0.5 point each, 3 points total).

parameter	mean	variance	standard deviation
cell length			
cell width			

5. Give the individual and mean values for the diameters of 10 *Elodea* chloroplasts in **ocular micrometer units** as seen with the 100X objective (1 point).

Chloroplast	Diameter (ocular micrometer units @ 100X)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Mean	

6. Calculate the mean diameter of the chloroplasts in **µm** using your calibration or conversion factor. Also calculate the standard deviation (0.5 point each, 1 point total).

	Ocular Units	µm
Mean		
Standard Deviation		

E. Calculation of Cell Volumes. **Show all calculations in detail and include the correct conversion factors and units** (0.5 point each, 5 points total).

1. Based on these examples and your previous calculation of the mean diameter of 10 human cheek cells, determine the volume of an average human cheek cell in μm^3 assuming that it is a sphere.

2. Human cheek cells are actually flattened and stacked on top of one another in what is called simple squamous epithelium. Assuming that the thickness of an average human cheek cell is 5 μm, what is the mean volume of an average human cheek cell in μm^3? Use the formula for a cylinder.

3. Based on your previous calculation of the mean diameter of 10 human cheek cell nuclei, calculate the average volume of a human cheek cell nucleus in μm^3. Assume it is a sphere.

4. If a flattened human cheek cell (#2) were filled only with nuclei, how many could it hold?

5. Based on your previous measurements of the mean length and width of 10 *Elodea* cells, determine the average volume of these cells in μm^3 assuming they are rectangular solids. Assume that the thickness of the cell is the same as its width.

6. How does the volume of an *Elodea* cell compare to the volume of a human cheek cell? What is their ratio?

7. Based on your previous calculation of the mean diameter of 10 *Elodea* chloroplasts, calculate the average volume of a chloroplast in μm^3 assuming it is a sphere.

8. How does the size of an *Elodea* chloroplast compare to the size of a cheek cell nucleus? What is the ratio of the two volumes?

9. If an *Elodea* cell were filled only with chloroplasts, how many could it hold?

10. If an *Elodea* cell were filled only with nuclei the same size as a cheek cell nucleus, how many could it hold?