Name _____Block:____

# Observing Mitosis Lab

**Background:**
In a growing plant root, the cells at the tip of the root are constantly dividing to allow the root to grow. Because each cell divides independently of the others, a root tip contains cells at different stages of the cell cycle. This makes a root tip an excellent tissue to study the stages of cell division.

**Materials:**
microscope prepared slides of onion root tips

**Procedure:**
1. Get one microscope for your lab group and carry it to your lab desk with two hands. Make sure that the low power objective is in position and that the diaphragm is open to the widest setting. **With your partner you will take turns being the observer and the recorder.**

2. Obtain a prepared slide of an onion root tip. Hold the slide up to the light to see the pointed ends of the root sections. This is the root tip where the cells were actively dividing. (The root tips were freshly sliced into thin sections, then preserved when the slide was prepared.)

3. Place the slide on the microscope stage with the root tips pointing away from you. Using the low-power objective to find a root tip, and focus it with the coarse adjust until it is clearly visible. Just above the root "cap" is a region that contains many new small cells. The larger cells of this region were in the process of dividing when the slide was made. These are the cells that you will be observing. Center the image, then switch to high power.

4. Observe the box-like cells that are arranged in rows. The chromosomes of the cells have been stained to make them easily visible. Select one cell whose chromosomes are clearly visible. (If you need to change the focus when using high power, remember to only use the fine adjust!)

5. Sketch the cell that you selected in the box on the right. Use the **Biological Drawing Checklist** to help you make sure that you are sketching correctly.

6. Look around at the cells again. Select four other cells whose internal appearances are **different** from each other and the first one that you sketched. Sketch them in the boxes below.

**Rules for Scientific Drawing**
Purpose: To serve as a record of your laboratory work. In other words, these are your observations. They must be completed while viewing your specimen. They cannot be done "in rough" at school, and then redone at home "in good". A scientific drawing is a precise record of specific details.

**BIOLOGICAL DRAWING CHECKLIST**
**Check that you have the following items:**
____ Blank paper
____ Sharp pencil
____ Good Eraser
**TITLE:**
____ Underlined
____ Centered at top of page
____ Indicates cell/tissue/organ type
____ Type of section being viewed (i.e. cross section)

**DRAWING:**
____ Draw what you actually see
____ Space used well (i.e. as large as possible)
____ Drawn just left of center on the page
____ Proportional (to scale)
____ Stippled to show contrast and detail (NO SHADING)
____ Drawn with sharp pencil (no open circles, all lines have a distinct beginning and end)

**LABELS:**
____ Lined up and placed on the right side of the drawing
____ Printed; first letter NOT capitalized
____ Labels are pluralized where necessary
____ Label lines point precisely to the structure being labeled
____ Label lines are drawn with a ruler, do not cross and do not end in an arrow
____ Labels are at end of label line, not on top of it

**Cell sketches in each phase of mitosis:**

| Interphase | Prophase | Metaphase |
|---|---|---|
| Anaphase | Telophase | |

7. As you look at the cells of the root tip, you may notice that some cells seem to be empty inside (there is no dark nucleus or visible chromosomes). This is because these cells are three dimensional, but we are looking at just thin slices of them. (If you slice a hard boiled egg at random, would you definitely see the yolk in your slice? No) We want to continue to look at the cells, but we will ignore any where we cannot see the genetic material (dark areas).

8. Looking along the rows of cells, identify what stage each cell is in. Use the photos that are spread around the room as a guide.

9. Use the data table to record the number of cells that you see in each of the stages. The easiest way to do this is for one person to look through the microscope, going along each row of cells. For each cell, say out loud what stage the cell appears to be in. Another student can make tally marks for each stage.

| Stage of Cell Cycle | Number of cells in the Stage: | Percentage of Cells |
|---|---|---|
| **Anaphase** | | |
| **Metaphase** | | |
| **Prophase** | | |
| **Interphase** | | |
| **Telophase** | | |

**Analysis & Conclusions:**

1. What stage were the majority of the cells in?

2. What evidence shows that mitosis is a continuous process, not a series of separate events?

3. What is a distinguishing **visible** feature of each stage of mitosis?

Prophase:

Metaphase:

Anaphase:

Telophase:

4. Based upon your percentage results, order the stages of mitosis from shortest (1) to longest (4). After the longest and shortest stage, give a brief explanation of why that stage may have that time period.

Prophase ___

Metaphase ___

Anaphase ___

Telophase ___

**Criterion C: Processing and evaluating** **Level:____**

| Achievement level | Level descriptor |
|---|---|
| 0 | The student does not reach a standard described by any of the descriptors below. |
| 1-2 | The student is able to:<br>• **collect and present** data in numerical and/or visual forms<br>• **accurately interpret** data<br>• **state** the validity of a hypothesis **with limited reference** to a scientific investigation<br>• **state** the validity of the method **with limited reference** to a scientific investigation<br>• **state limited** improvements or extensions to the method |
| 3-4 | The student is able to:<br>• **correctly collect and present** data in numerical and/or visual forms<br>• **accurately interpret** data and **describe** results<br>• **state** the validity of a hypothesis based on the outcome of a scientific investigation<br>• **state** the validity of the method based on the outcome of a scientific investigation<br>• **state** improvements or extensions to the method that would benefit the scientific investigation |
| 5-6 | The student is able to:<br>• **correctly collect, organize and present** data in numerical and/or visual forms<br>• **accurately interpret** data and **describe** results **using scientific reasoning**<br>• **outline** the validity of a hypothesis based on the outcome of a scientific investigation<br>• **outline** the validity of the method based on the outcome of a scientific investigation<br>• **outline** improvements or extensions to the method that would benefit the scientific investigation |
| 7-8 | The student is able to:<br>• **correctly collect, organize, transform and present** data in numerical and/or visual forms<br>• **accurately interpret data** and **describe** results **using correct scientific reasoning**<br>• **discuss** the validity of a hypothesis based on the outcome of a scientific investigation<br>• **discuss** the validity of the method based on the outcome of a scientific investigation<br>• **describe** improvements or extensions to the method that would benefit the scientific investigation |