BIOLOGY I

NAME:

THE PHASES OF MITOSIS

MATERIALS

Microscope Prepared slide of onion root tip Prepared slide of whitefish blastula

OBJECTIVES:

- To recognize the different stages of mitosis.
- To compare the mitotic phases in plant & animal cells.

DIRECTIONS: You have been provided with two slides, one slide of an **onion root tip** and another of a **whitefish blastula**. Part 1 of the lab is concerned with plant cell mitosis, and Part 2 with animal cell mitosis. **There are two observational requirements for this lab:**

- 1. You must observe both slides to complete the lab questions.
- You are required to find all four phases of mitosis PROPHASE, METAPHASE, ANAPHASE, and TELOPHASE – either on the onion root tip or on the whitefish mitosis slides. In addition, you are to find a cell in INTERPHASE and a cell undergoing CYTOKINESIS. These observations must be confirmed with the teacher initials on page 4 of this lab paper.
- 3. There are extra credit bonus opportunities with confirmation of additional observations described on page 4.



In this part, you will observe the phases of cell division known as mitosis. The genetic materials are replicated during the S_1 phase of Interphase and distributed through the process of mitosis. Mitosis, the second stage of the cell cycle, only refers to the separation of the chromosomes and, therefore, the DNA.

STEP 1: Observe the stages of mitosis by examining the cell of an onion root tip with the microscope.

- The phases of mitosis are: **prophase**, **metaphase**, **anaphase**, **and telophase**.
- Interphase is <u>not</u> part of Mitosis; it is the portion of the cell cycle when the cell is preparing for division.



Start your observations of the onion root tip with the 4X objective (40X magnification). You will notice that there are two sections of root tip on your slide. Locate an area on one of the root tips where mitotic changes can be observed. These changes are best observed in the region just <u>above the tip</u> of the root and <u>below the elongated cells</u> toward the top of the root.

STEP 2: Turn your microscope to 100X and focus. After it is completely in focus, switch to 400X magnification to begin your observations. As you locate a required phase, call me to verify your identification and to initial your verification sheet.

Be sure to observe the poles of an onion cell in metaphase.



<u>**Cytokinesis**</u> begins as telophase is drawing to a close. Two daughter cells are formed as the cell membrane closes off the two halves of the parent cell to separate its cytoplasm into two parts with a new nucleus in each part.

RECOMMENDATION: See your notes for better examples of the appearance of each of the phases. The above drawings depict the activity of each phase of cellular division, but are highly diagrammatic. They do NOT look like any actual cells.

QUESTIONS:

1. How can you differentiate prophase from interphase?

2. How can you differentiate metaphase from prophase?

3.	How can you differentiate anaphase from metaphase?
4.	How can you differentiate telophase from anaphase?
5.	What role does the spindle play in the dividing cell?
6.	How can you determine that the cell has entered cytokinesis?
7.	Where does the cell plate form in the mother cell?
8.	What is the function of the cell plate?
9.	What is the relationship between plant cells and asters?



In this Part, you will observe the mitotic phases in animal cells. You will observe certain structures that are not present during mitosis in plant cells.

- STEP 3: Observe the stages of mitosis of the whitefish under 40X. You will notice that there are a number of round circles on the slide. Each circle is a collection of whitefish cells. Turn your objective to 100X magnification, focus, and then observe your slide under 400X.
- **STEP 4:** Look for a cell in which the chromatids are visible. Study the poles of a whitefish cell in metaphase.

QUESTIONS:

10. How do the poles of the spindle of an animal cell differ from the poles of a plant cell?

11. How does the appearance of the chromosomes in animal cells differ from those in plant cells?_____

12. Describe the appearance of an animal cell in the process of cytokinesis.

OBSERVATIONS:

As each of the phases listed below on TABLE 1 is located, set slide so that the pointer is touching the edge of the cell and pointed at the cell in that stage. To receive credit each must be confirmed and initialed by the teacher. State which phase you are looking at as the teacher arrives (before she looks into your microscope). To receive full credit, each student must identify **interphase, cytokinesis,** and the four stages of **mitosis** in **either** the plant **or** the animal cells.

After you have identified all of phases in one organism, you may receive an additional 2 points for each of the required stages identified in the other organism. For each mitotic structure listed in TABLE 2 at the right, you may receive an additional 3 points when it is correctly identified. If you make all possible observations, you may receive 10 more extra credit points.

NOTE #1: Not all of these structures will be found in both plant and animal cells.

NOTE #2: No extra credit points are available unless all phases of one organism have been identified.

 TABLE 2. – Extra Credit

OTHER STRUC	CTURE	ES
	Plant	Animal
ASTER		
SPINDLE FIBERS		
CHROMOSOME		
CHROMATIDS		
CELL PLATE		
ANIMAL FURROW		
NUCLEUS		
NUCLEOLUS		

TABLE 1.

	INTERPHASE	PHASES OF MITOSIS				
		PROPHASE	METAPHASE	ANAPHASE	TELOPHASE	CYTOKINESIS
PLANT CELL						
ANIMAL CELL						

You must have <u>all examples of the plant cells</u> <u>OR</u> <u>all examples of the animal cells</u> signed. Signed examples of alternate cell are extra credit.

SUMMARY QUESTIONS:

13.	What is the significance of the mitotic process?			
14.	How does cytokinesis in plant cells differ from cytokinesis in animal cells?			
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15	Distinguish between MITOSIS and CYTOKINESIS?			
16.	Using <u>3 words or less</u> to describe each, distinguish between the 3 stages of the cell cycle.			
	INTERPHASE:			
	MITOSIS:			