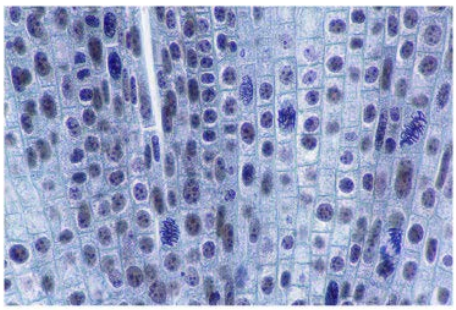
Abstract:

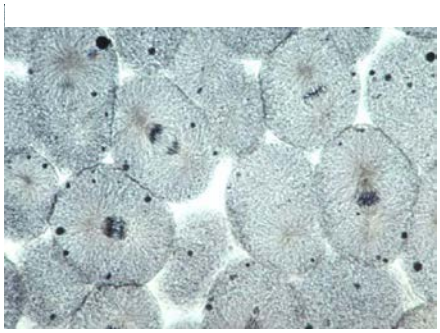
The purpose of this laboratory experiment was to identify in what stage of mitosis viewed cells were in. The stages of mitosis include prophase, metaphase, anaphase and telophase. Although the stage interphase occurs prior to mitosis, it is not ordinarily considered a phase of mitosis. Once a stage was identified, we sketched the stage onto a piece of paper noting and counting how many cells were in each stage, and count, at minimum, 200 cells in each stage identification and count. After a brief background about mitosis and the different stages and what occurs during each stage was reviewed from the instructor's notes, materials such as the prepared slides (the whitefish blastula-animal cell and onion root tip-plant cell) and certain methods were followed to obtain data about how many of the cells in the whitefish blastula and the onion root tip were going through each stage of mitosis. After viewing, identifying and counting stages on the given slides, we concluded that the cells reflected primarily interphase or prophase stages of mitosis. Given that interphase is not ordinarily considered a stage of mitosis, we concluded as well that the primary stage viewed in our experiments was comprised of the prophase stage. The prophase stage comprised the greatest number identified and counted of all phases.

The illustrations below reflect other scientists' results in identifying and counting the stages of the onion root tip and the whitefish blastula.

ONION ROOT TIP:



THE WHTEFISH BLASTULA:



Introduction:

The purpose of this laboratory experiment was to identify in what stage of mitosis viewed cells were in. The stages of mitosis include prophase, metaphase, anaphase and telophase. Although the stage interphase occurs prior to mitosis, it is not ordinarily considered a phase of mitosis. Using the microscope, materials and methods and application of these tools, materials and methods, experimental results were obtained.

By way of background, all cells come from other cells. New cells are formed during cell division, which involves both the replication of the cell's nucleus and division of the cytoplasm. The two kinds of cellular division are mitosis and meiosis. Mitosis usually

makes body cells, somatic cells. Mitosis is used in adult cells for asexual reproduction, regeneration, and the maintenance and repair of body parts. The process called meiosis makes gametes, sperm and eggs, and spores in plants. Gamete or spore cells have half the chromosomes that the parent cell has.

Mitosis is the first of the cell divisions studied in this lab. It is easily observed in cells that are growing at a fast pace such as found in whitefish blastula or onion root tips, which are used in this lab. The whitefish blastula is formed directly after the egg is fertilized. This is a period of a fast-paced growth and numerous cellular divisions for which mitosis can be observed. The whitefish blastula is an animal cell Because the root is presumably one of the most fertile places and origin for cell growth, the onion root tips have a high percentage of cells going through mitosis. The onion root tip is a plant cell.

Before mitosis, the cell enters a interphase, a part of the cell cycle in which the cell has a distinct nucleus and nucleoli. The next stage is prophase, in which the chromatin thickens into distinct chromosomes and the nuclear envelope breaks open releasing the chromosomes into the cytoplasm. It is during this stage that the first signs of the spindle apparatus begin to appear.

After the prophase stage, the cell begins metaphase, in which the spindle attaches to the centromere of each chromosome pair and moves chromosome pair to the middle of the cell. This level position is called the metaphase plate. After the metaphase stage, the anaphase begins when the chromatids are separated and pulled to the opposite poles. The final stage of mitosis occurs in the telophase stage, in which the nuclear envelope is reformed and the chromosome gradually uncoil. Cytokinesis then may occur, forming a cleavage furrow, allowing the two daughter cells to separate.

Materials:

1. Light microscope
2. Prepared slides: whitefish blastula and onion root tips
3. Pencil
4. Paper
5. Page 246-247 of the text book

Methods:

1. Draw two circles onto the plain paper (these will represent what you see in your *field* of vision through the microscope).

2. Label one circle “10X” for low power.

3. Label the other circle “40X” for high power.

4. Observe each of the prepared slides of whitefish blastula and onion root tip under the 10X and 40X objectives.

5. Observe every cell and determine what stage the cell is in.

6. Count at least 200 cells total, separating them into groups of the same phase.

7. Consider it takes 24 hours for the onion root-tip cells to complete the cell cycle.

8. Then set your microscope to 4X for your initial setting.

9. To find a specimen under low power, start with a clean slide and clean lens.

10. Make sure adjustments are centered.

11. Raise the body tube.

12. Place slide on stage **under the stage clips**.

13. Rotate the nosepiece so that the 10X objective faces down.

14. Then, **while looking from the side,** lower the body tube all the way down.

15. Now look through the eyepiece.

16. Very slowly raise the objective by turning the coarse adjustment knob toward you until the specimen comes into view.

17. Adjust focus using the coarse adjustment knob.

18. Center the specimen in your field of view.

19. Draw what you see on the circle labeled “10X” that you made.

20. To find a specimen under high power, start with clean slide and clean lens.

21. Make sure adjustments are centered.

22. Raise the body tube.

23. Place slide on stage **under the stage clips**.

24. Rotate the nosepiece so that the 40X objective faces down.

25. Then, **while looking from the side,** lower the body tube all the way down.

26. Now look through the eyepiece.

27. Very slowly raise the objective by turning the coarse adjustment knob toward you until the specimen comes into view.

28. Adjust focus using the coarse adjustment knob.

29. Center the specimen in your field of view.

30. Draw what you see on the circle labeled "40X" that you made.

31. Then, place the part of the specimen you want to observe in the exact center of your low power field of view.

32. **Without raising the body tube,** rotate the high objective power objective (40X) into place.

33. Focus more clearly using the **fine adjustment knob only.**

34. If visual field is too bright, darken the field by turning the diaphragm.

35. Fill in the chart you have with all the information that you gathered from observing each specimen (the whitefish blastula and the onion root tip), under the 10X and 40X view.

Results:

Table 1 below provides viewing results from the laboratory experiment. Table 1 summarizes the number of cells seen in a certain phase of mitosis under the 10X view (field 1) and 40X view (field 2). An extra field was added (Field 3), as our cell counts did not total the minimum of at least 200 cells. Figure 1 represents our interpretation of what we saw through the microscope of the whitefish blastula in 10X and 40X view and also the onion root tip in 10X and 40X view. In both of these views and settings, we labeled where we saw the different stages of mitosis and recorded how many cells were counted from both the whitefish blastula and the onion root tip samples. Table I reflects our labeling and recording of these cells. The whitefish blastula reflected a pinkish/purplish color. All of the stages were seen within the whitefish blastula, including interphase, which occurs prior to mitosis. The stages interphase and prophase dominated our views and counts, only one or two of other stages of mitosis were observed. All observed stages within the whitefish blastula appeared scattered about and not in a set pattern. The onion root tip had a pattern of white and yellow and then white and yellow again as a color. The onion root tip, in contrast to the whitefish blastula, was observed to reflect all of the

stages, again with prophase and interphase stages dominating, and observed in a "layered" pattern, not found scattered, as with the whitefish blastula samples.

Last, our results are presented in Table I, Figure I, and analysis questions and answers. We concluded from our experiment and its results that the cells on a whole were mostly in the stages of interphase or prophase, as these stages had the highest observed, identified and counted incidence.

Table 1:

Number of Cells

Stage/Phase the cells are in:	*Field 1 (10X):*	*Field 2 (40X):*	*Field 3: (didn't count 200 cells- added another view)*	*Total:*
Interphase	86	38	53	177
Prophase	9	5	7	21
Metaphase	6	2	5	13
Anaphase	3	1	2	6
Telophase	3	1	3	7
				Total number of cells counted-- 224

1.) Why is it more accurate to call mitosis “ nuclear replication” rather than “cellular division”?

It is more accurate to say "nuclear replication" to describe mitosis because the actual cell splitting occurs in cytokinesis. The whole process of mitosis is a series of steps that split the nucleus into two separate nuclei at opposite poles. The cell does not divide in any of the mitotic steps. The entire process of mitosis is a series of steps that divides the nucleus into two separate nuclei at opposite poles. When a cell is truly split, the process is known as cytokinesis.

2.) Explain why the whitefish blastula and onion root tip are selected for a study of mitosis.

The whitefish blastula is a hollow ball of cells that forms from the fertilization of an egg. Rapid growth occurs and numerous cellular divisions take place making mitosis in various stages easy to observe. Onion root tips are also a region of high percentage of cells going through mitosis because this is where most of the root growth takes place. The whitefish blastula is an animal cell while the onion root tip is a plant cell.

3.) If your observations had not been restricted to the area of the root tip that is actively dividing, how would your results have been different?

There would have been virtually no cells undergoing division, so many more of the cells observed would have been in the interphase stage in which cells elongate and differentiate. Most of the growth take place here, in the root tip.

4.)Based your data in the table, what can you infer about the relative length of time an onion root-tip cell spends in each stage of cell division.

Prophase is the longest stage of mitosis (though interphase, which occurs prior mitosis, takes up the most time of the cell’s life). Then, based on the data gained, the time spent in each stage decreases as you go further along.