

Student Laboratory Packet

Mitosis

A Laboratory Activity for the Living Environment

All new cells come from previously existing cells. New cells are formed by the process of cell division which involves both replication of the cell's nucleus (**karyokinesis**) and division of the cytoplasm(**cytokinesis**).

There are two types of cell division: mitosis and meiosis. **Mitosis** typically results in new somatic (body) cells. Formation of an adult organism from a fertilized egg, asexual reproduction, regeneration, and maintenance or repair of body parts are accomplished through mitotic cell division. **Meiosis** results in the formation of either gametes (in animals) or spores (in plants). These cells have half the chromosome number of the parent cell. Where does one find cells undergoing mitosis? Plants and animals differ in this respect. In higher plants the process of forming new cells is restricted to special growing regions called **meristems**. These regions usually occur at the tips of stems or roots. In animals, cell division occurs anywhere new cells are formed or as new cells replace old ones. However, some tissues in both plant and animals rarely divide once the organism is mature.

Exercise 1: Observing Mitosis in Plant and Animal Cells Using Photographs of Prepared Slides of the Onion Root Tip and Whitefish Blastula

Figure 1 Close up view of different stages of mitosis in an onion root tip:

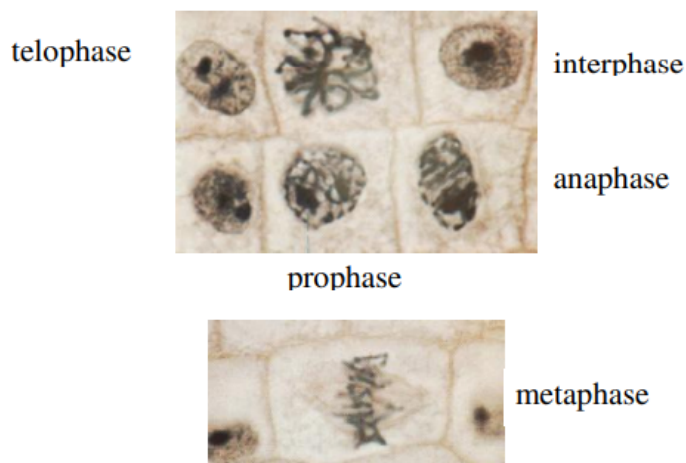
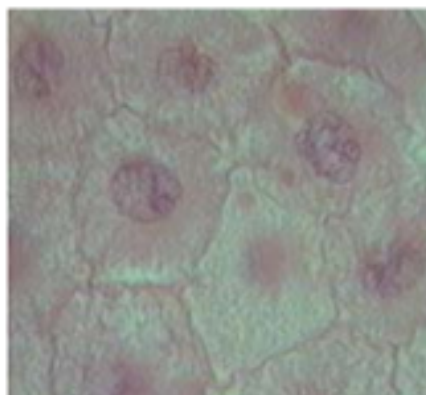


Figure 2 Whitefish Blastula



Procedure

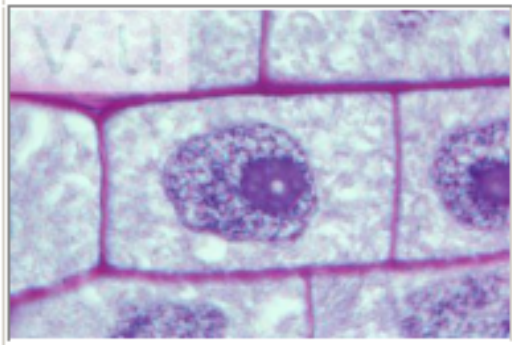
Examine the photographs of prepared slides of either onion root tips or whitefish blastula. Identify one cell which clearly represents each phase of mitosis. These cells are located in the meristematic (growing) region. **Sketch and label the cell in the boxes provided.**

1. The non dividing cell is in a stage called **interphase**. The **nucleus** may have one or more dark-stained **nucleoli** and is filled with a fine network of threads, the **chromatin**. During **interphase**, DNA replication occurs.
2. The first signs of cell division occurs in **prophase**. There is a thickening of the chromatin threads, which will continue until it is evident that the chromatin has condensed into **chromosomes**. With somewhat higher magnification you may be able to see the two **chromatids** held together by the **centromere**. As prophase continues the chromatids continue to thicken and shorten. The nuclear envelope disappears and the beginnings of the spindle apparatus begin to appear.

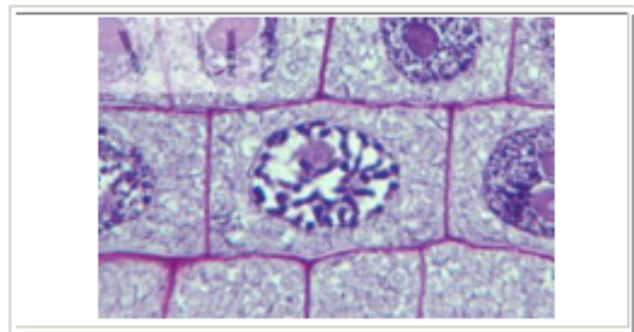
3. At **metaphase**, the chromosome pairs have moved to the center of the spindle. One particular part of each chromosome, the centromere, attaches to the spindle. The centromeres of all the chromosomes lie about the same level of the spindle called the **metaphase plate**.

4. At the beginning of **anaphase**, the centromere regions of each pair of chromatids separate and are moved by the spindle fibers toward opposite poles of the spindle, dragging the rest of the chromatid behind them. Once each chromatid is separate it is called a chromosome.

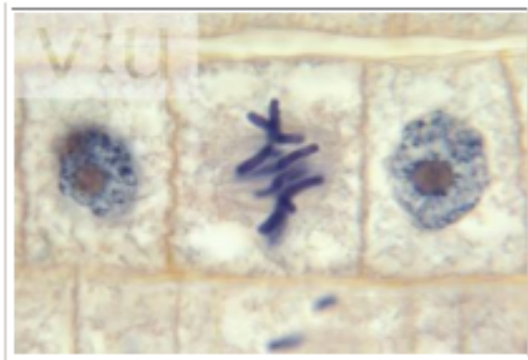
5. **Telophase**, the last stage of division, is marked by a pronounced condensation of the chromosomes, followed by the formation of a new nuclear envelope around each group of chromosomes. The chromosomes gradually uncoil into the fine threads of chromatin, and the nucleoli reappears. **Cytokinesis** may occur. This is the division of the cytoplasm into two new cells. In plants, a new cell wall is laid down between the daughter cells. In animal cells, the old cells will pinch off in the middle along a **cleavage furrow** to form two new daughter cells.



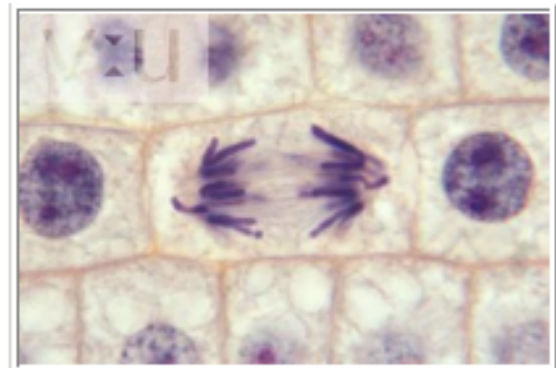
Interphase



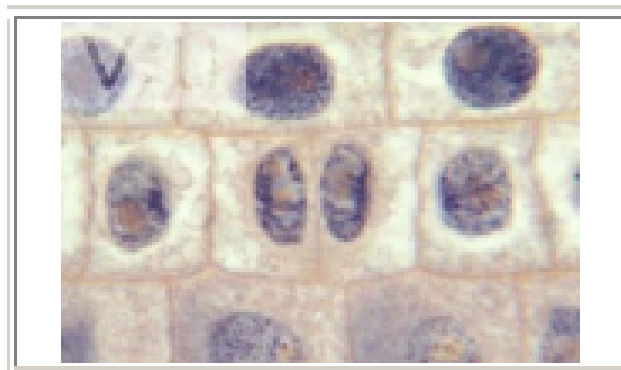
Prophase



Metaphase

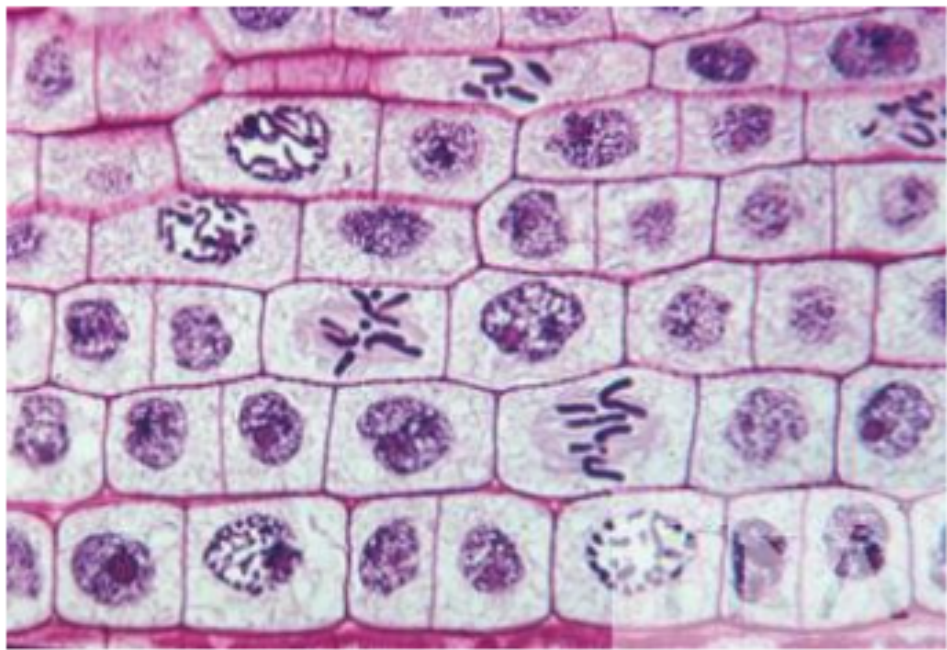


Anaphase

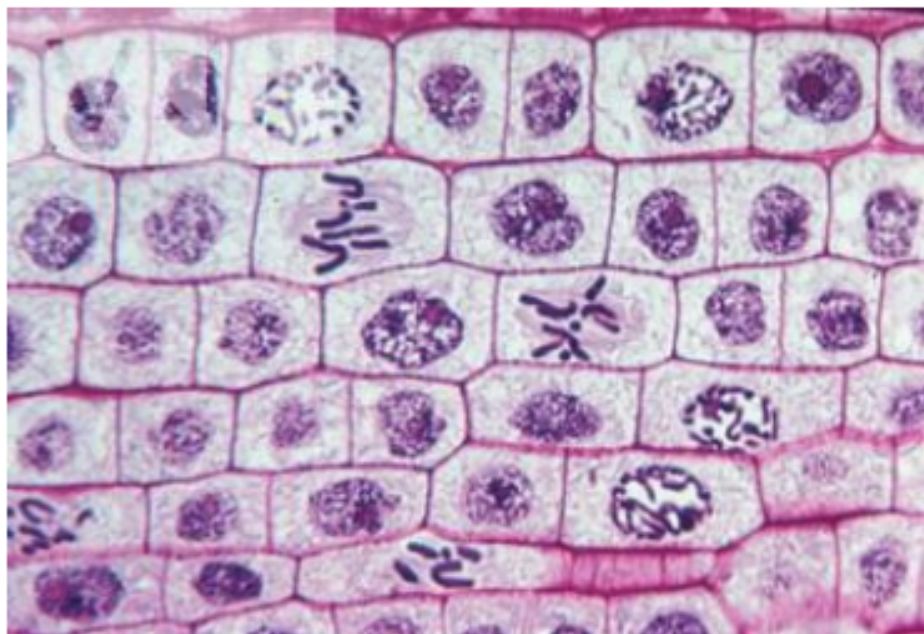


Telophase

Field One



Field Two



Field Three

