

Cell Division

B.1

There is a constant need for new cells in the body, to replace worn or damaged tissues and to provide for growth. Most cells in the body are capable of dividing to form two new smaller cells where previously there was only one. This process of cell division is known as mitosis. When a cell divides, the genetic plans of the body, contained in the chromosomes, are duplicated and transferred to the new daughter cells. The cytoplasm and organelles are also divided relatively equally between the two new cells. At the completion of mitosis, the two daughter cells are identical to the single parent cell from which they originated.

Cell
theory

- reproduce
- growth
- repair

Mitosis

Mitosis may be conveniently divided into 5 phases: (See Figures 1.15 and 1.16.)

1. Interphase. This is sometimes inappropriately referred to as the "resting phase". It is the period of time during which the cell is not actively dividing, but is carrying out the specific function for which it is adapted. All the normal processes and activities are taking place in the cell; it is not, therefore, really at rest. One special activity that takes place toward the end of this phase is the duplication of chromosomes. This chemical process cannot be seen by using a microscope.

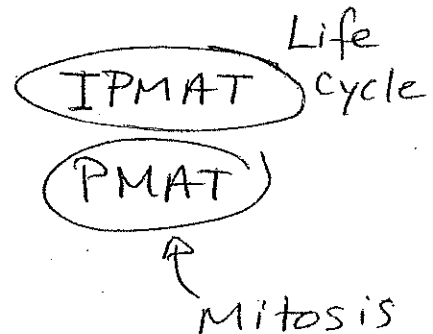
2. Prophase. The centrioles move to opposite poles in the cell. Thin spindles develop between the centrioles. The nuclear membrane breaks down and the chromatin net condenses into visible chromosomes. The chromosomes have duplicated and they can be seen side by side as two thin chromatids.

3. Metaphase. The chromosomes move to the centre of the cell and align themselves across the equatorial plane. They are attached by spindles to the asters formed from the centrioles at either end of the cell.

4. Anaphase. The two chromatids in each chromated pair are pulled apart as the spindles contract. One copy of each pair is drawn to each pole of the cell.

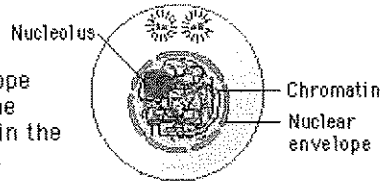
5. Telophase. The chromosomes become less distinct, returning to the dispersed chromatin net form. New nuclear membranes form around the chromosomes and the centrioles divide. The cell separates into approximately equal halves as the cell membrane pinches in to form the two new cells. The two cells then re-enter interphase and mature in size before further division takes place.

MITOSIS



Interphase

The nucleolus and the nuclear envelope are distinct and the chromosomes are in the form of threadlike chromatin.



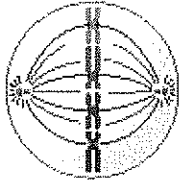
Prophase

The chromosomes appear condensed, and the nuclear envelope is not apparent.



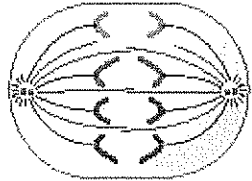
Metaphase

Thick, coiled chromosomes, each with two chromatids, are lined up on the metaphase plate.



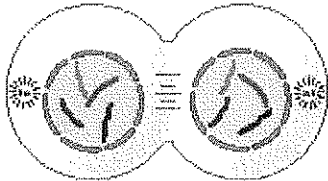
Anaphase

The chromatids of each chromosome have separated and are moving toward the poles.



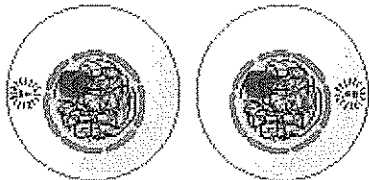
Telophase

The chromosomes are at the poles, and are becoming more diffuse. The nuclear envelope is reforming. The cytoplasm may be dividing.



Cytokinesis

Division into two daughter cells is completed.



MITOSIS

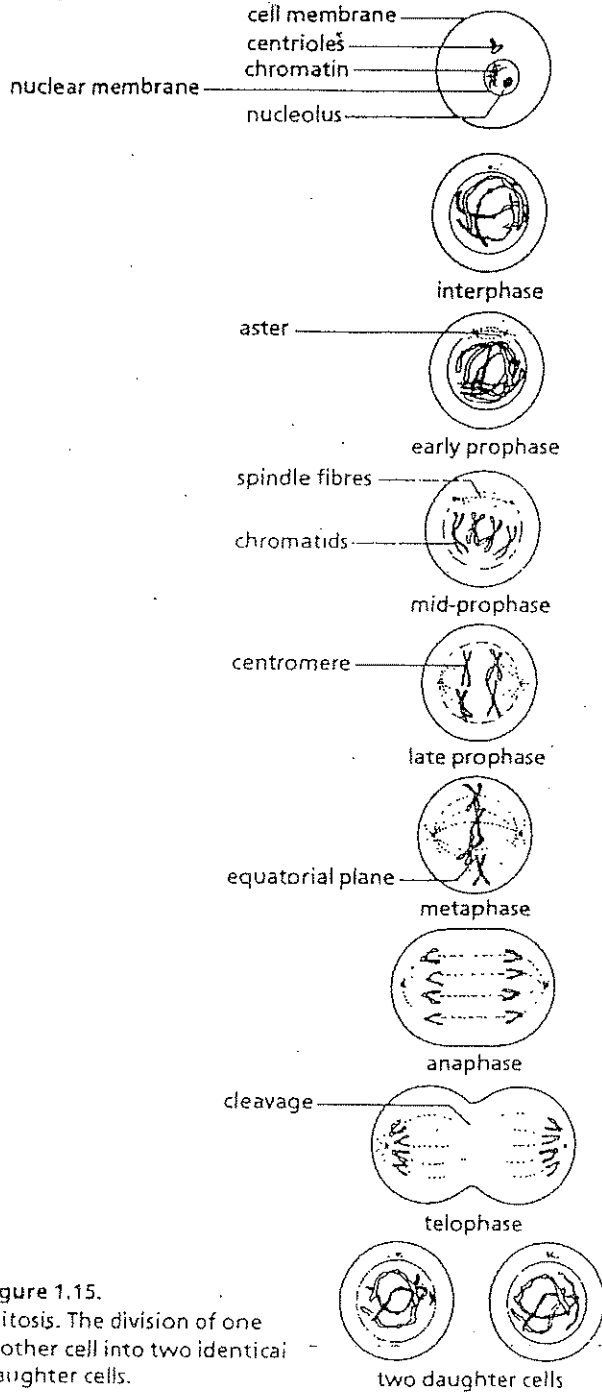


Figure 1.15. Mitosis. The division of one mother cell into two identical daughter cells.

B.L.

INTERPHASE

Nuclear membrane and nucleolus visible. Chromatin present as granular mass. The cell is active, involved in its normal functional activities. Just prior to entering prophase the chromosomes duplicate.

PROPHASE

Aster rays appear. Centrioles move towards opposite poles of cell. Chromosomes appear as thin threads. Nucleolus no longer visible.

Centrioles form spindle fibres attached to chromosomes now seen as two chromatids.

Centrioles reach the poles of the cell. Nuclear membrane no longer visible.

Chromatid pairs start to migrate towards the equator of the cell.

METAPHASE

Chromatid pairs line up across the middle of the cell. Separation of chromatid pairs occurs as the centromere splits. Each chromatid is joined by a spindle fibre from the centromere to the aster.

ANAPHASE

Two complete sets of chromosomes now are drawn towards the opposite poles of the cell. The contraction of the spindle fibres causes this movement.

TELOPHASE

Nuclear membrane reappears and surrounds chromosomes. Nucleoli reappear. Chromosomes become less distinct. Division of the cytoplasm occurs. Cell membrane starts to indent.

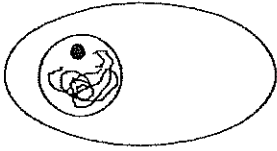
DAUGHTER CELLS ENTER INTERPHASE

Cells now resemble original mother cell, containing an identical set of genetic material. Cleavage and division of the cytoplasm is complete.

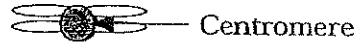
Mitosis Notes

Cell division occurs in a series of stages, or phases.

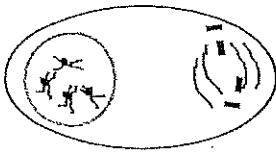
1st: INTERPHASE



- Chromosomes are copied (# doubles)
- Chromosomes appear as threadlike coils (chromatin) at the start, but each chromosome and its copy (sister chromosome) change to sister chromatids at end of this phase

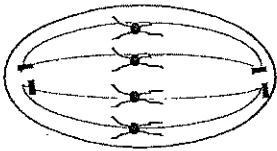


2nd: PROPHASE

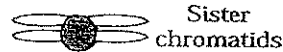


- Mitosis begins (cell begins to divide)
- Centrioles (or poles) appear and begin to move to opposite ends of cell
- Spindle fibers form between the poles

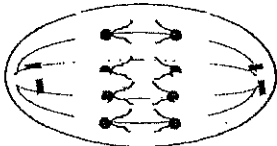
3rd: METAPHASE



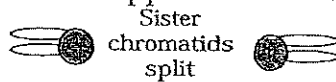
- Chromatids (or pairs of chromosomes) attach to the spindle fibers



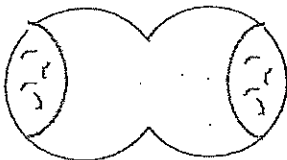
4th: ANAPHASE



- Chromatids (or pairs of chromosomes) separate and begin to move to opposite ends of the cell

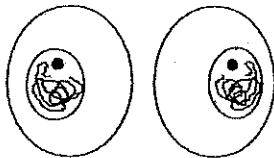


5th: TELOPHASE



- Two new nuclei form
- Chromosomes appear as chromatin (threads rather than rods)
- Mitosis ends

6th: CYTOKINESIS



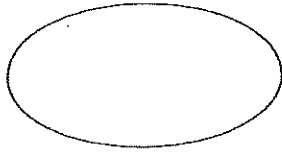
- Cell membrane moves inward to create two daughter cells - each with its own nucleus with identical chromosomes

Mitosis Notes

Name _____

_____ occurs in a series of stages, or _____.

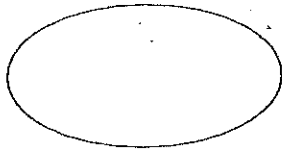
1st: _____



- Chromosomes are _____ (# doubles)
- Chromosomes appear as threadlike coils (_____) at the start, but each chromosome and its copy (_____ chromosome) change to sister chromatids at end of this phase

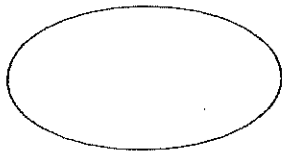


2nd: _____

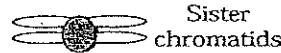


- _____ begins (cell begins to divide)
- _____ (or poles) appear and begin to move to opposite ends of cell
- _____ form between the poles

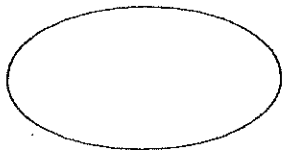
3rd: _____



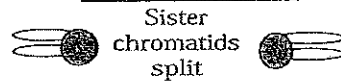
- _____ (or pairs of chromosomes) attach to the spindle fibers



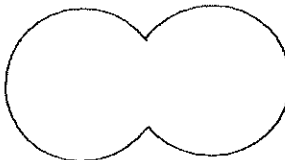
4th: _____



- Chromatids (or pairs of chromosomes) _____ and begin to move to _____ ends of the cell

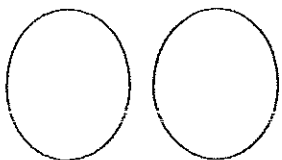


5th: _____



- Two new _____ form
- Chromosomes appear as chromatin (_____ rather than _____)
- _____ ends

6th: _____



- Cell membrane moves inward to create two _____ cells - each with its own _____ with identical _____

Mitosis - Cell Division

Date _____

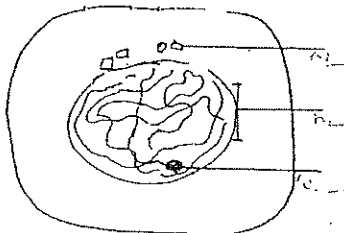
Name _____

Mitosis is the division of any cell for growth and repair. Generally, the cell grows until the cytoplasm increases in size. At this point the cell can no longer get oxygen or needed materials in adequate portions. When a cell divides by mitosis, cells are produced which are identical to the original cell or parent cell. All body cells under go cell division (called mitosis) except egg and sperm cells.

Label the colored parts of each mitosis

The following are the events in order for mitosis.

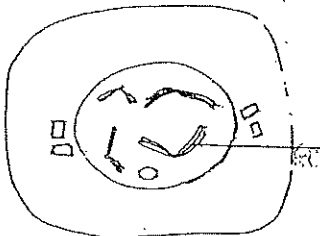
INTERPHASE



Characteristics

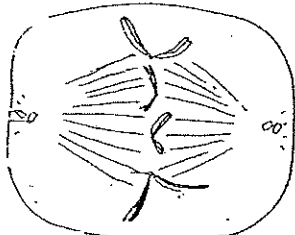
1. _____
2. _____
3. _____

PROPHASE



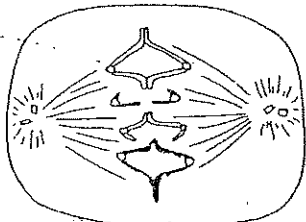
1. _____
2. _____
3. _____
4. _____

METAPHASE



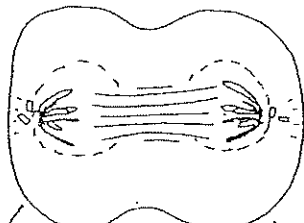
1. _____
2. _____

ANAPHASE

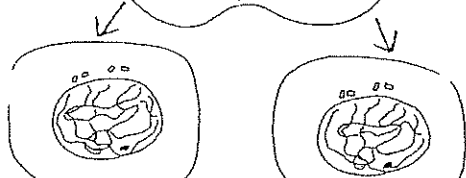


1. _____

TELOPHASE



1. _____
2. _____
3. _____



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NAME _____

2.4 For 49 → 52

1. What are the main stages of cell division?

1.

2.

3.

4.

5.

6.

7.

2. What is the importance of mitosis?

3. What is a chromosome?

4. What are chromosomes important to organisms?

5. When cells are not undergoing cell division, what are they doing?

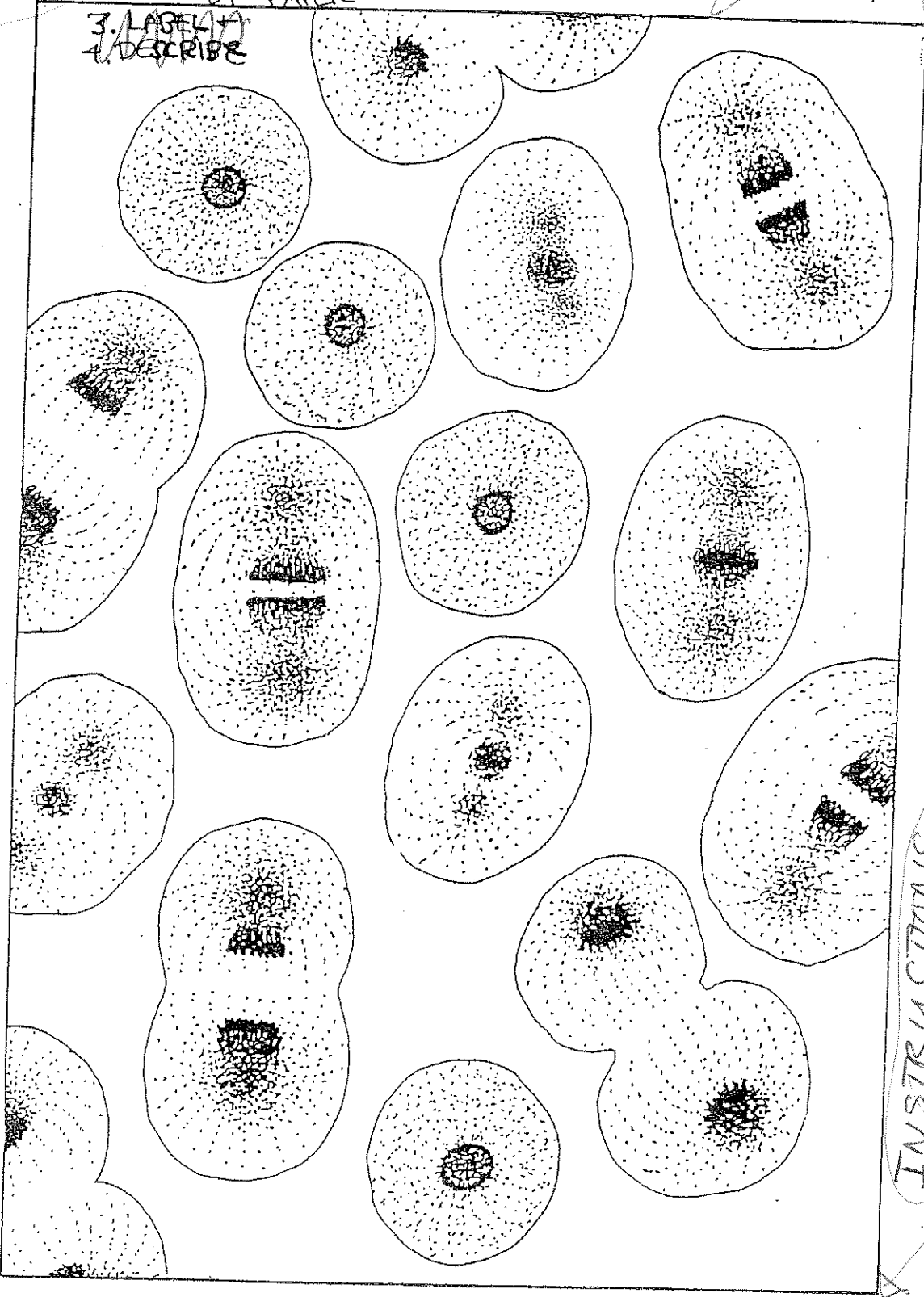
6. Which cells of your body do you think undergo mitosis often?

7. Which cells of your body probably do not need to be replaced frequently?

DIRECTIONS

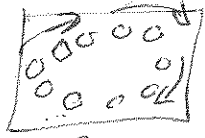
1. CUT OUT THE VARIOUS STAGES OF MITOSIS SHOWN HERE
2. PASTE OR TAPE IN CORRECT ORDER ONTO A 2ND piece OF PAPER

3. LABEL
4. DESCRIBE



MITOSIS

INSTRUCTIONS



- ① CUT OUT ALL THE CELLS AND PARTIAL CELLS AT VARIOUS STAGES OF MITOSIS (16 pieces)
- ② PLACE THEM IN ORDER, IN A CIRCLE AND TAPE OR GLUE THEM TO ANOTHER SHEET OF PAPER
- ③ LABEL EACH STAGE AND DESCRIBE WHAT HAPPENS IN THAT STAGE