

3.3 MITOSIS

Learning Outcome

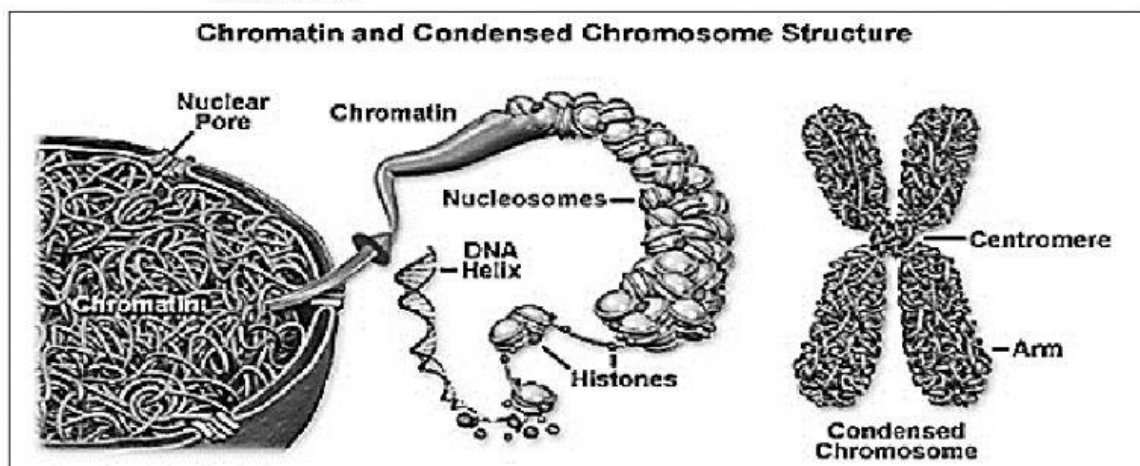
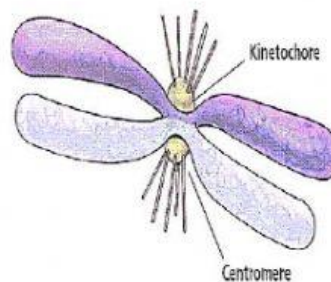
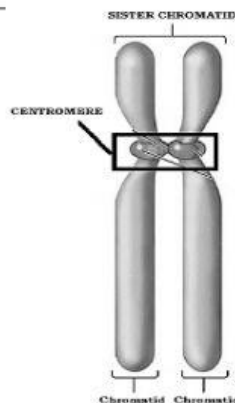
At the end of this topic, students should be able to :

- Describe the four stages of mitosis**
- Describe briefly the **cytokinesis** process in animal and plant cell

1. Terminologies in Mitosis

Exercise 3.3 (a): Fill in the blanks to explain the terminologies in mitosis.

No.	Term and Diagram	Explanation
1.	DNA and Chromosome	❖ Chromosomes of eukaryotic cells are composed of _____ and histone proteins. ❖ The function of histone proteins is to maintain the structure of chromosome and help control the activities of the genes.
2.	Chromatin	❖ Refer to the chromosomes in the form of 'threads'. ❖ Very _____ and _____; can't be seen under light microscope.
3.	Sister chromatids	❖ Each _____ chromosome has two sister chromatids , which separate during cell division (both have identical copies of DNA).
4.	Centromere	❖ The _____ region in which two sister chromatids attached to each other.



2. The Four Stages of Mitotic Cell Division & The Chromosomal Behaviour

Definition of Mitosis:

A cell's nucleus divides (karyokinesis) and followed by cytokinesis to produce _____ **daughter cells**. Each daughter cell contains the _____ number of chromosomes as their parent cell which is diploid ($2n$).

Exercise 3.3 (b): Draw and label the diagram for each stage of mitosis. Fill in the blanks to complete the statements for each stage.

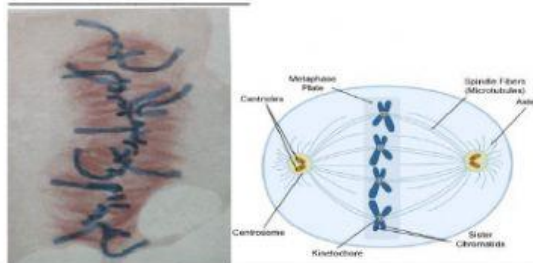
STAGES OF MITOSIS & CHROMOSOMAL BEHAVIOUR AT EACH STAGES

1. PROPHASE

- Chromatin _____ and thicken (condense)
- Chromosome become visible
- Each chromosome exists as a pair of sister chromatids attached together at _____
- The centrosome migrate to opposite poles of the cell.
- _____ fibers form.

2. METAPHASE

- Centrosome _____ at opposite poles.
- Chromosome _____ at metaphase plate
- Chromosomes attached to spindle fiber at _____



3. ANAPHASE

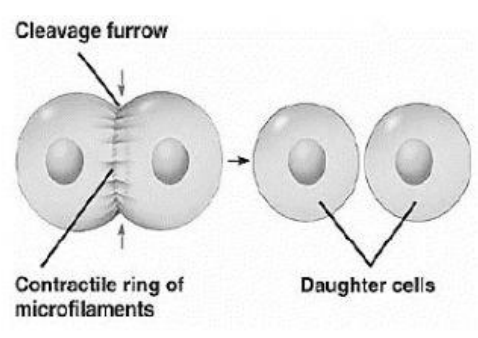
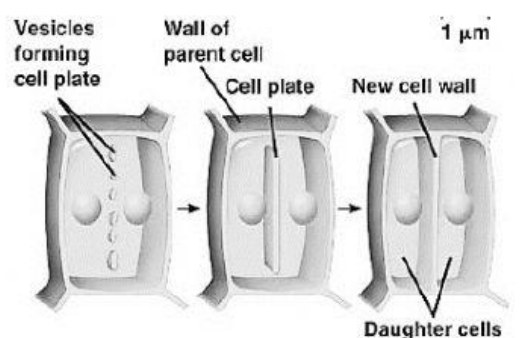
- Spindle fiber _____ and pull the sister chromatids.
- _____ split.
- Sister chromatids _____ and _____ towards opposite poles.
- At the end of this phase, each pole contains a complete set of chromosome.

4. TELOPHASE

- The chromosome _____ to the opposite poles.
- The chromosome _____ and lengthen, thus becoming invisible again
- A new _____ envelope forms around each group.
- The spindle fibers _____ and _____ reforms in each new nucleus.

3. Cytokinesis

Exercise 3.3 (c): Fill in the blanks to complete the statements.

CYTOKINESIS	
ANIMAL CELL Formation of _____	PLANT CELL Formation of _____
 Cleavage furrow Contractile ring of microfilaments Daughter cells	 Vesicles forming cell plate Wall of parent cell Cell plate New cell wall Daughter cells 1 µm
- Involve the formation of cleavage furrow. - The cleavage furrow is a contractile ring of microfilament. - Plasma membrane _____ forming cleavage furrow that will deepens until the parent cell pinched into two separate cells.	- During telophase, _____ derived from Golgi apparatus move along microtubule to the middle of the cell. - Vesicles fused to produce a _____. - The cell plate enlarges until its surrounding membrane _____ with the plasma membrane.

4. Cell Division in Animal and Plant Cell

COMPARISON OF CELL DIVISION IN ANIMAL AND PLANT CELL

ANIMAL CELL

- Formation of spindle fibers by centrosome with _____.
- Aster formation is _____.
- Cleavage furrow is formed during cytokinesis.
- Occur in cells or tissues throughout the body.

SIMILARITIES

1. Both cells undergo _____ stages of mitosis and followed by cytokinesis.
2. Produce _____ daughter cells that possess _____ number of chromosomes to each other & to parental cell.

PLANT CELL

- Formation of spindle fibers by centrosome without _____.
- Aster formation is _____.
- Cell plate is formed during cytokinesis.
- Occur mainly in _____ cell or tissues.

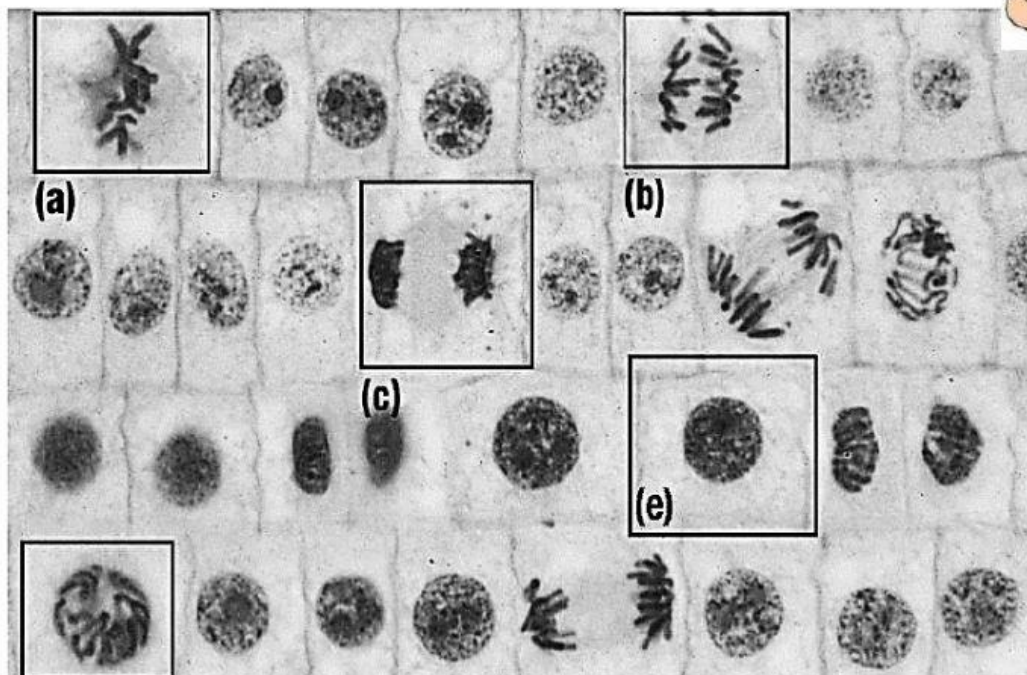
Exercise 3.3 (d): The diagram below shows stages of mitosis on onion root tip. Label **a**, **b**, **c** and **d**.

a: _____

b: _____

c: _____

d: _____



(d)