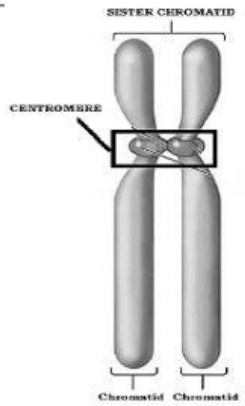
3.3 MITOSIS

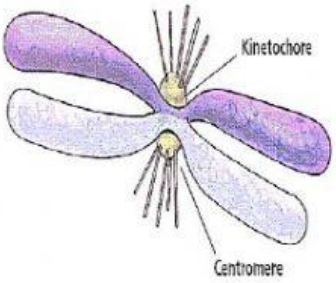
Learning Outcome
At the end of this topic, students should be able to :
a) **Describe** the **four stages** of **mitosis**
b) Describe briefly the **cytokinesis** process in animal and plant cell

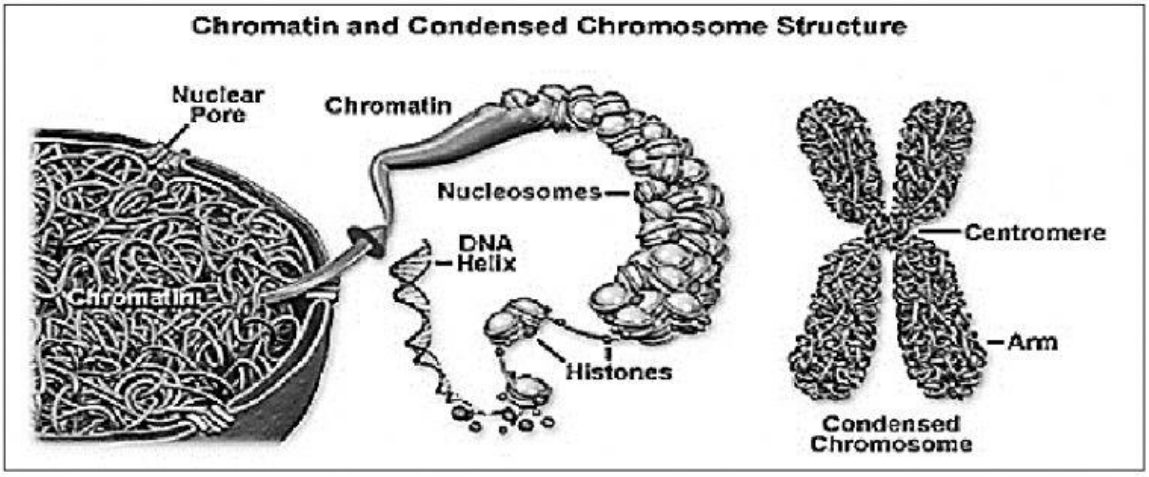
1. Terminologies in Mitosis

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.







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

Definition of Mitosis:

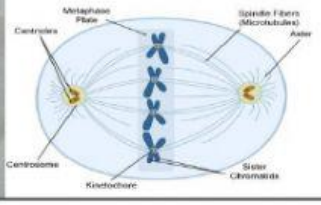
A cell's nucleus divides (karyokinesis) and followed by cytokinesis to produce _____ **daughter cells**. Each daughter cell contains the _____ number of chromosomes as their parent cell which is diploid (2n).

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.

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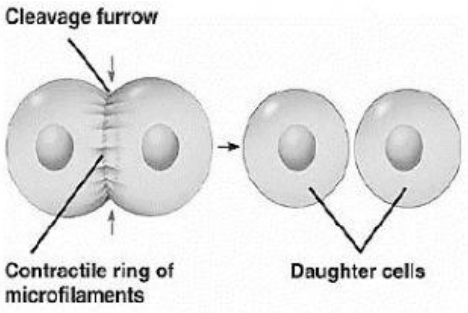
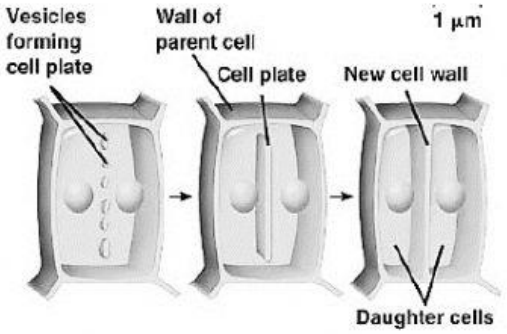
3. Cytokinesis

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

CYTOKINESIS

ANIMAL CELL **Formation of** _____	**PLANT CELL** **Formation of** _____
	
• 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.

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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.

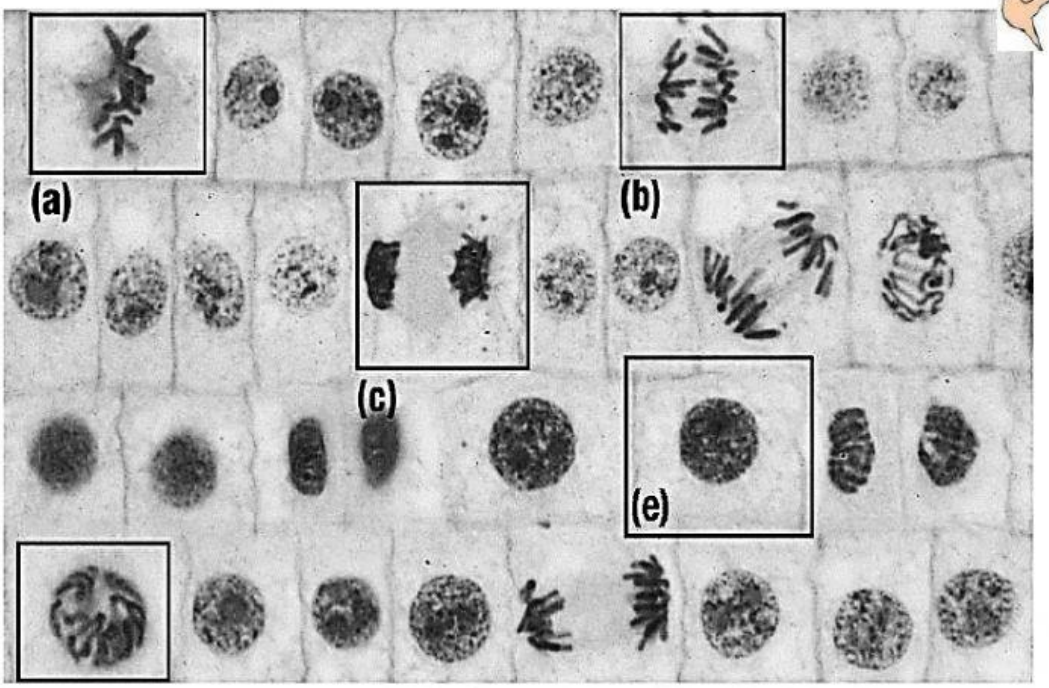
PLANT CELL

- 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**:_____



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