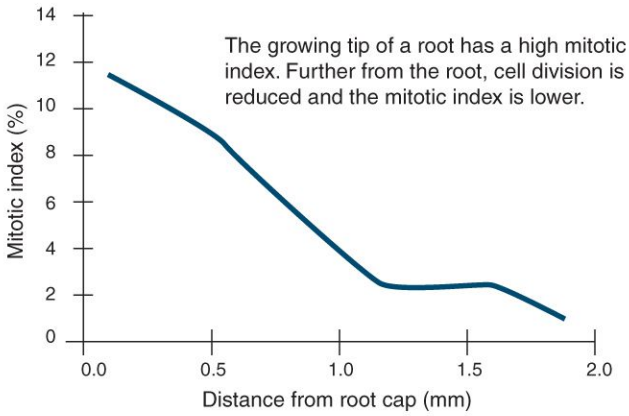
39 Recognising Stages in Mitosis

Key Idea: The stages of mitosis can be recognised by the organisation of the cell and chromosomes.
Although mitosis is a continuous process it is divided into four stages (prophase, metaphase, anaphase, and telophase) to more easily describe the processes occurring during its progression.

The mitotic index

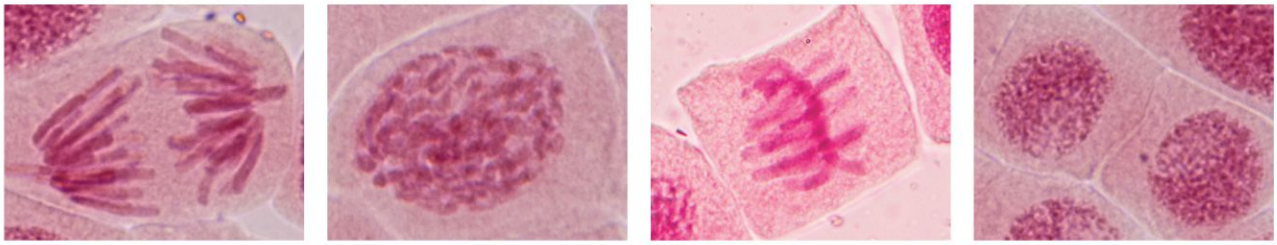
The mitotic index measures the ratio of cells in mitosis to the number of cells counted. It is a measure of cell proliferation and can be used to diagnose cancer (because cancerous cells divide very quickly). In areas of high cell growth the mitotic index is high such as in plant apical meristems or the growing tips of plant roots. The mitotic index can be calculated using the formula below:

$$\text{Mitotic index} = \frac{\text{Number of cells in mitosis}}{\text{Total number of cells}}$$



The growing tip of a root has a high mitotic index. Further from the root, cell division is reduced and the mitotic index is lower.

1. Use the information in the previous activity to identify which stage of mitosis is shown in each of the photographs below:



(a) _____ (b) _____ (c) _____ (d) _____

2. (a) The light micrograph (right) shows a section of cells in an onion root tip. These cells have a cell cycle of approximately 24 hours. The cells can be seen to be in various stages of the cell cycle. By counting the number of cells in the various stages it is possible to calculate how long the cell spends in each stage of the cycle. Count and record the number of cells in the image that are in mitosis and those that are in interphase. Cells in cytokinesis can be recorded as in interphase. Estimate the amount of time a cell spends in each phase.

Stage	No. of cells	% of total cells	Estimated time in stage
Interphase			
Mitosis			
Total		100	

(b) Use your counts from 2(a) to calculate the mitotic index for this section of cells.

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_____

Onion root tip cells

3. What would you expect to happen to the mitotic index of a population of cells that loses the ability to divide as they mature?

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