

## Cell Division

- Cell division allows multicellular organisms to grow, maintain and repair themselves, as well as reproduce
  - o You have gone from 1 cell (sperm + egg = zygote) to trillions of cells. How? Cell division!
- There are 2 main types of cell division:
  - o Mitosis is used to reproduce diploid cells (almost all of your body cells)
  - o Meiosis is used to reproduce haploid cells (your sex cells which are also known as gametes)

## The Cell Cycle

- The process by which the parent cell grows, duplicates its DNA and divides to produce 2 new identical daughter cells
- This process is continuous, meaning it is always going on, it never stops.
- The 3 major phases of the cell cycle are interphase, mitosis and cytokinesis

### Phase 1: Interphase

- The phase in which the cell spends most of its life
- Cell performs its normal functions, grows and prepares to divide
  - o Mitosis is not happening at this point
- In preparation for cell division, the chromatin is duplicated and then condensed to form double stranded chromosomes joined in the middle by a centromere
  - o The cell now has 92 chromatids arranged in 46 pairs

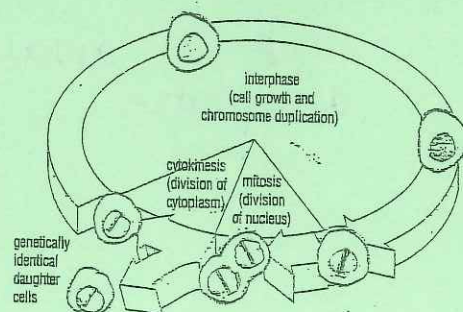


chromosome duplication



centromere

Figure 1.8 A diagram to show how, at the end of interphase, each duplicated chromosome is made up of two copies of the genetic information

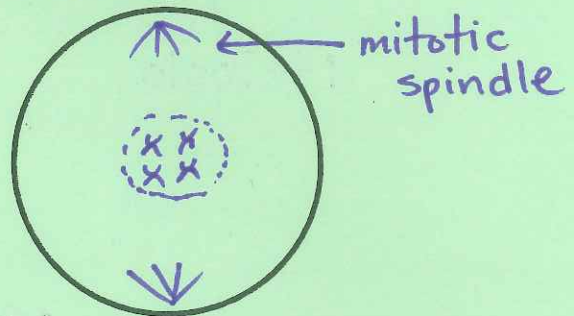


## Phase 2: Mitosis

- Mitosis consists of 4 stages
  - o Use the acronym PMAT to remember them

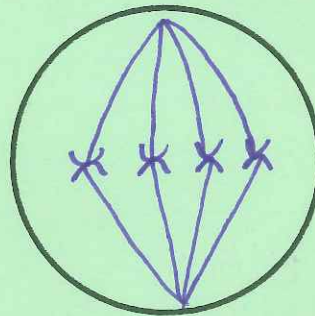
### 1. Prophase

- Duplicated chromosomes condense and shorten to the point they can be seen with a microscope
- The nuclear membrane and nucleolus begin to break down and disappear
- mitotic spindle forms



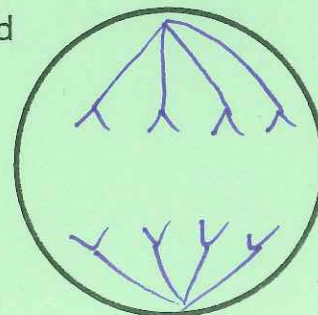
### 2. Metaphase

- Chromosomes line up along the middle of the cell on the mitotic spindle
- Nuclear membrane has completely disappeared
  - o Think M for middle and metaphase



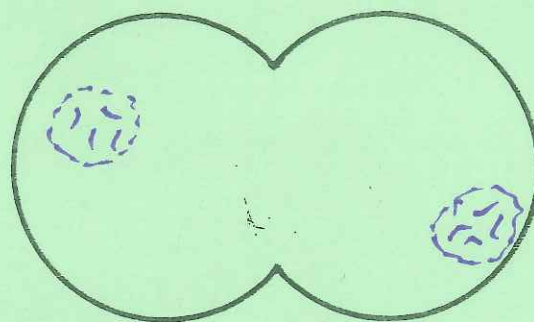
### 3. Anaphase

- Spindle fibres contract and shorten, pulling centromeres apart
- Chromosome strands separate and move to opposite ends along spindle fibres
  - o Think A for away and anaphase



#### 4. Telophase

- Chromosomes arrive at opposite ends of the cell (ie. 46 chromosomes at each end)
- Mitotic spindle disappears
- New nuclear membrane begins to form around each set of chromosomes to form 2 new nuclei
- Chromosomes begin to lengthen, become less condensed and are no longer visible under a microscope



#### Phase 3: Cytokinesis

- In animal cells, the cell membrane pinches in to divide the nuclei, cytoplasm and other organelles to form 2 new identical daughter cells
- In plant cells, a cell wall forms between the 2 nuclei, dividing the cytoplasm and other organelles to form 2 new identical daughter cells
- After cytokinesis is complete, the daughter cells are in interphase and the cell cycle begins again.
- Most of your body cells are produced through mitosis
- All daughter cells produced through mitosis have the same number of chromosomes as the parent cell



- Understanding cell division and reproduction is important because it allows us to:

- o Develop new medicines and cures
- o Help assist endangered species
- o Understand how our bodies work, grow and repair themselves so that we can make better informed decisions about our own health

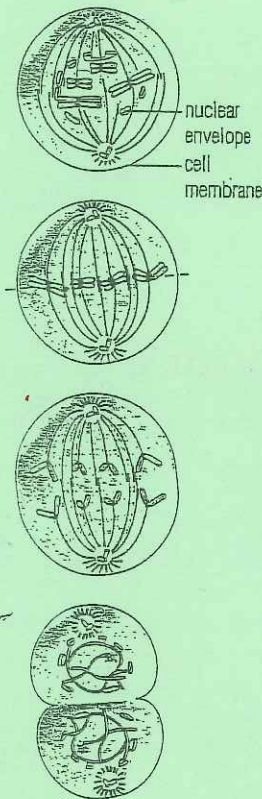


Figure 1.9 Mitosis happens in a series of four stages.

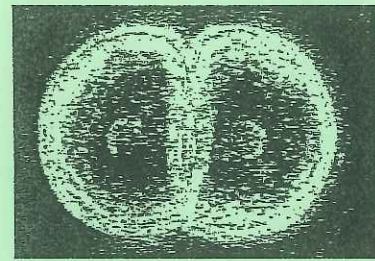


Figure 1.10 During cytokinesis in an animal cell, the cell membrane pinches in to form two daughter cells.

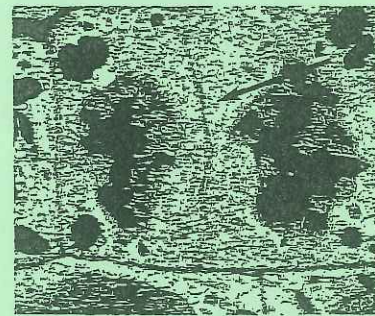


Figure 1.11 During cytokinesis in a plant cell, the cell wall divides the cell into two daughter cells.