

The Key Roles of Cell Division

- (p.215) 1. What are the key roles of *cell division*? State each role and give an example.
- (a) **Cell division allows for the asexual reproduction in unicellular organisms.**
Ex: Amoeba
 - (b) **Cell division enables sexually reproducing organisms to develop from a single cell - the fertilized egg, or zygote.** Ex: Humans
 - (c) **Cell division allows for the renewal, repair and replacing of cells that die from normal wear and tear or accidents.** Ex: Fall down and skin your knee.
- (p.215) 2. What is meant by the *cell cycle*?
- The cell cycle is the life of a cell from its origin in the division of a parent cell until its own division into two genetically identical cells.**
- (p.216) 3. Define each of the following terms:
- (a) **genome - A cell's endowment of DNA (genetic material)**
 - (b) **chromosomes - packages of DNA and protein (histones)**
 - (c) **somatic cells - all diploid body cell except haploid reproductive cells**
 - (d) **gametes - haploid reproductive cells - sperm and egg**
 - (e) **chromatin - DNA-protein complex organized into a long, thin fiber**
- the condition of the genetic material in nondividing cells
 - (f) **mitosis - the division of the nucleus**
 - (g) **cytokinesis - the division of the cytoplasm**

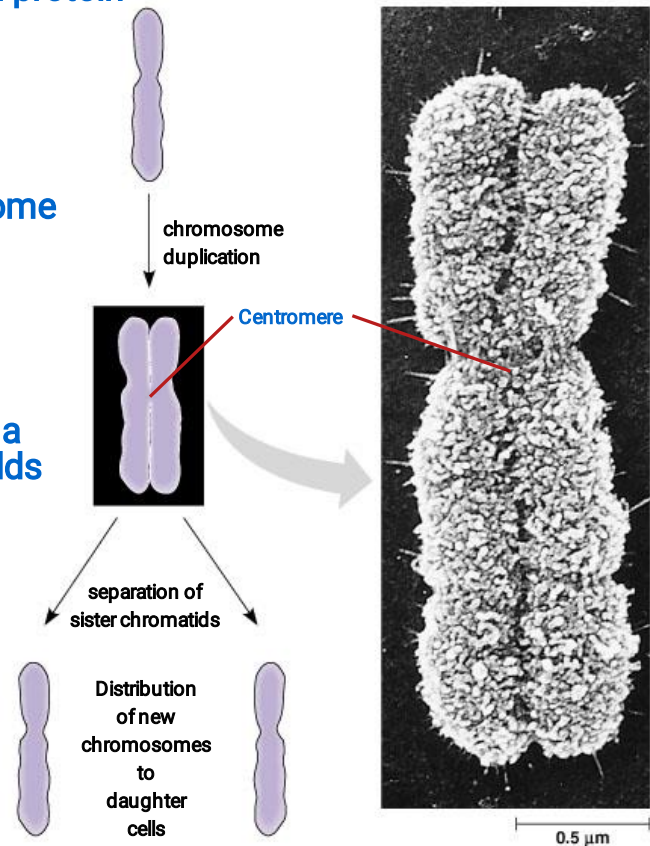
(p.216-17)4. You are going to have to learn the difference between a number of similar-sounding terms. The diagram looks like an X represents a *replicated chromosome* that has two *sister chromatids*. The narrow “waist” represents the location of the *centromere*. Students often get all these terms confused, so take time now to label the indicated areas in the diagram and then define each of the terms below.

(a) **chromosome** - **package of DNA and protein**

(b) **chromatid** - **a duplicated chromosome**

(c) **centromere** - **the narrow "waist" of a chromosome that holds sister chromatids together**

(d) **chromatin** -
 - **DNA-protein complex organized into a long, thin fiber**
 - **the condition of the genetic material in nondividing cells**



(p.217)5. Describe what happens to the chromosome number as we follow the human life cycle through the generations.

In each generation of humans, meiosis reduces the chromosome number from 46 to 23. Fertilization fuses two gametes (sex cells) together and doubles the chromosome number to 46 again, and mitosis conserves that number in every somatic cell nucleus of the new individual.

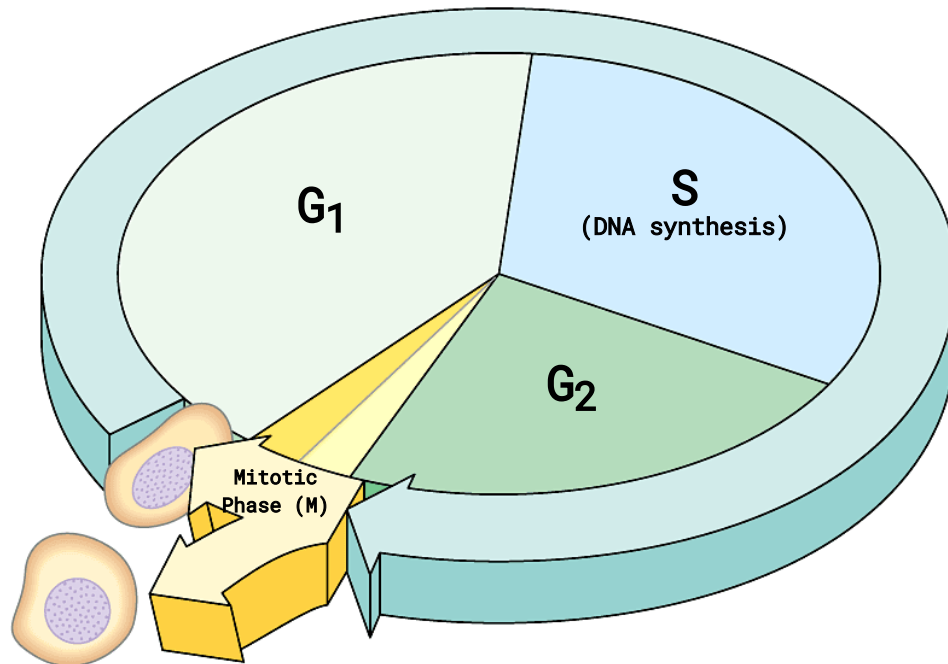
(p.216) 6. What is the difference between *mitosis* and *cytokinesis*?

Mitosis is the division of the nucleus and cytokinesis is the division of the cytoplasm.

The Mitotic Cell Cycle

(Introduction to the Cell Cycle)

(p.217) 7. Label the parts of the cell cycle listed below and give a brief explanation of what happens in each phase.



(Lab p.8) G₁ - The cell increases in size.
- Cell structures are duplicated - mitochondria and chloroplast divide by binary fission.

(Lab p.8) S - DNA replication occurs duplicating the chromosomes.

(Lab p.8) G₂ - The cell continues to grow.
- DNA replication is checked for integrity.
- Errors are corrected and repairs are made.

(Lab p.8) Mitosis - duplicated chromosomes are separated into 2 nuclei

(Lab p.8) Cytokinesis - the division of the cytoplasm and separation of organelles into daughter cells.

8. How does interphase fit onto the cell cycle diagram on the previous page?

Interphase is the time between mitosis and cytokinesis.

(p.221-22)9. How does *cytokinesis* differ in animal cells and plant cells?

Cytokinesis in animal cells occurs by a process known as cleavage which begins with the appearance of a cleavage furrow or shallow groove in the cell membrane which deepens until the parent cell is pinched in two. Cytokinesis in plant cells is different because plants cells have cell walls and occurs through the formation of cell plate which grows and divide the plant cell into 2 daughter cells.

(p.223-24)10. Prokaryote (*bacteria*) reproduction does not involve mitosis, but instead occurs by binary fission. This process involves an *origin of replication*. Describe *binary fission*.

Binary fission is the splitting of the parent cell into two, genetically identical daughter cells. The single, circular bacteria chromosome replicates, and the two copies move apart by an unknown mechanism. Meanwhile, the cell grows in size (SA:V ratio). The plasma membrane grow inward to divide the cell in two as a new cell wall is deposited between the genetically, identical daughter cells.

(p.224) 11. Notice that now you are learning a number of differences between prokaryotic and eukaryotic cells. Besides the fact that prokaryotes lack a membrane-bounded nucleus, do not undergo mRNA processing during transcription, describe each of the following differences:

(a) Mode of reproduction? **Prokaryotic: Binary Fission**
Eukaryotic: Mitosis

(b) Number of chromosomes? **Prokaryotes: A single chromosome**
Eukaryotes: Gametes - haploid chromosome number (n)
Somatic Cells - diploid chromosome number ($2n$)

(c) Shape of chromosome? **Prokaryotes: circular (plasmid)**
Eukaryotes: double-stranded during mitosis
single-stranded (chromatin) in nondividing cells