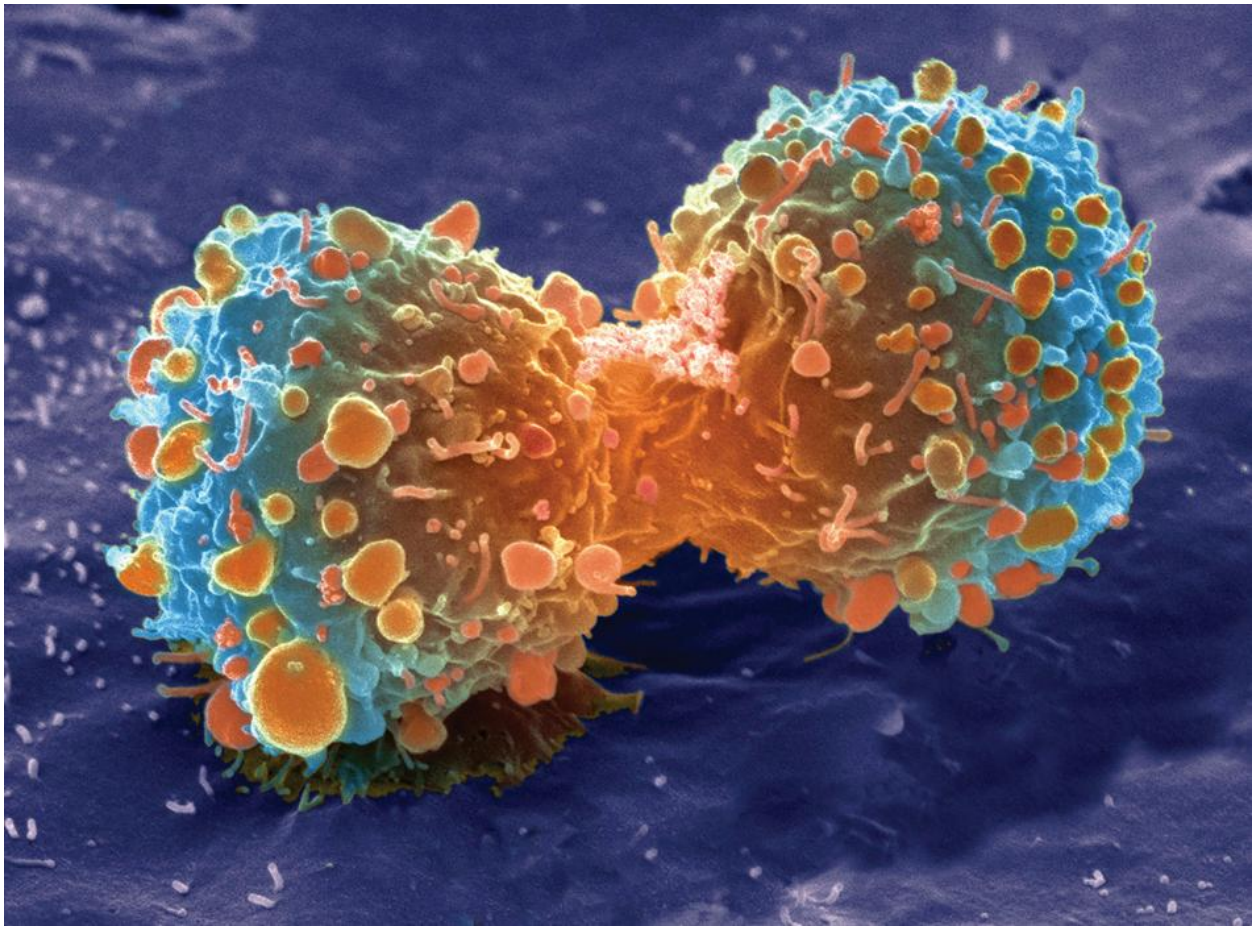
5.1 The Cell Cycle

KEY CONCEPT

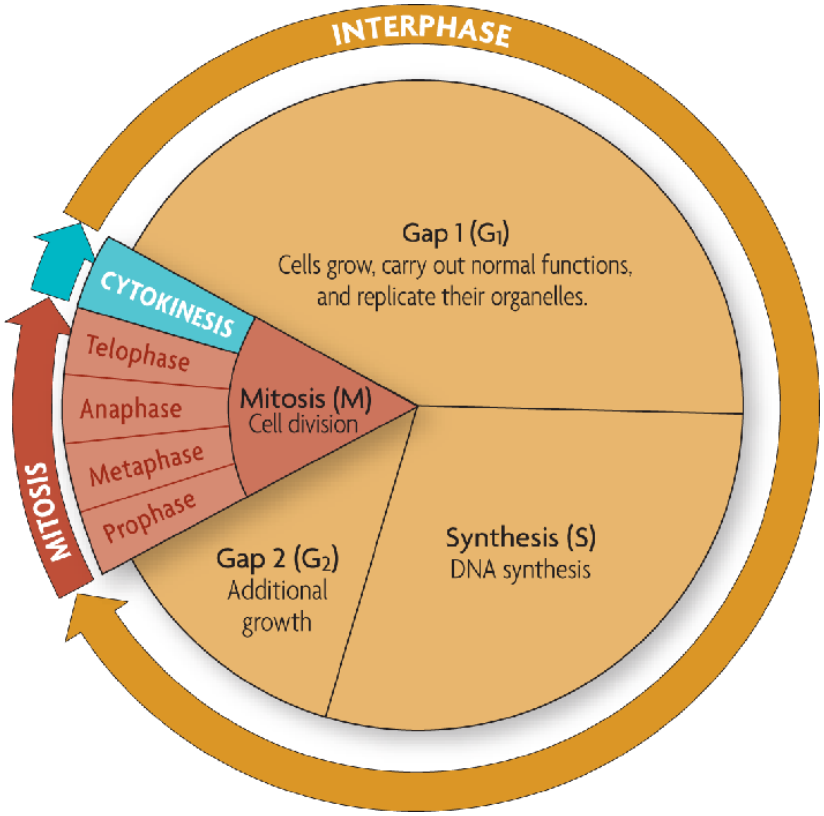
Cells have distinct phases of growth, reproduction, and normal functions.



5.1 The Cell Cycle

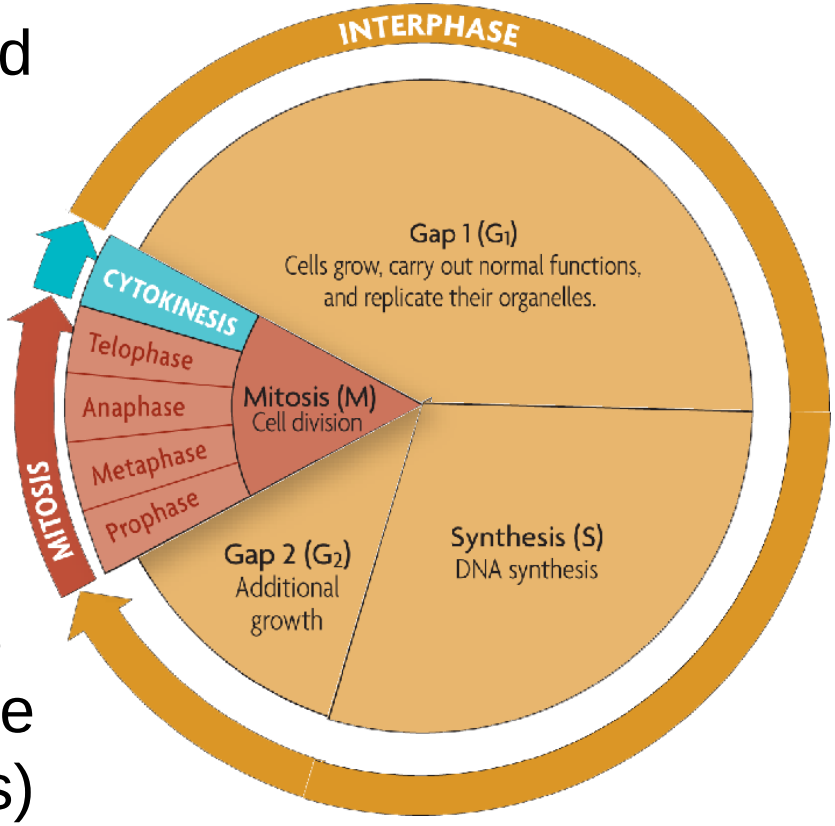
The cell cycle has four main stages.

- The cell cycle is a regular pattern of growth, DNA replication, and cell division.



5.1 The Cell Cycle

- The main stages of the cell cycle are gap 1, synthesis, gap 2, and mitosis.
  - Gap 1 (G_1): cell growth and normal functions
  - DNA synthesis (S): copies DNA
  - Gap 2 (G_2): additional growth
  - Mitosis (M): includes division of the cell nucleus (mitosis) and division of the cell cytoplasm (cytokinesis)



- Mitosis occurs only if the cell is large enough and the DNA undamaged.

5.1 The Cell Cycle

Cells divide at different rates.

- The rate of cell division varies with the need for those types of cells.

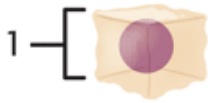
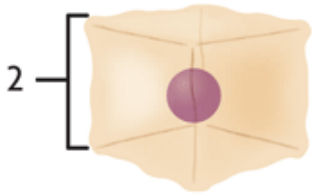
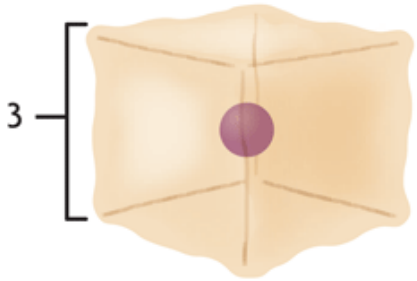
FIGURE 5.2 CELL DIVISION	
CELL TYPE	APPROXIMATE LIFE SPAN
Skin cell	2 weeks
Red blood cell	4 months
Liver cell	300–500 days
Intestine—internal lining	4–5 days
Intestine—muscle and other tissues	16 years

- Some cells are unlikely to divide (G_0).

5.1 The Cell Cycle

Cell size is limited.

- Volume increases faster than surface area.

Relative size			
Surface area (length × width × number of sides)	6	24	54
Volume (length × width × height)	1	8	27
Ratio of surface area to volume	$\frac{6}{1}$ = 6:1	$\frac{24}{8}$ = 3:1	$\frac{54}{27}$ = 2:1

5.1 The Cell Cycle

- Surface area must allow for adequate exchange of materials.
  - Cell growth is coordinated with division.
  - Cells that must be large have unique shapes.