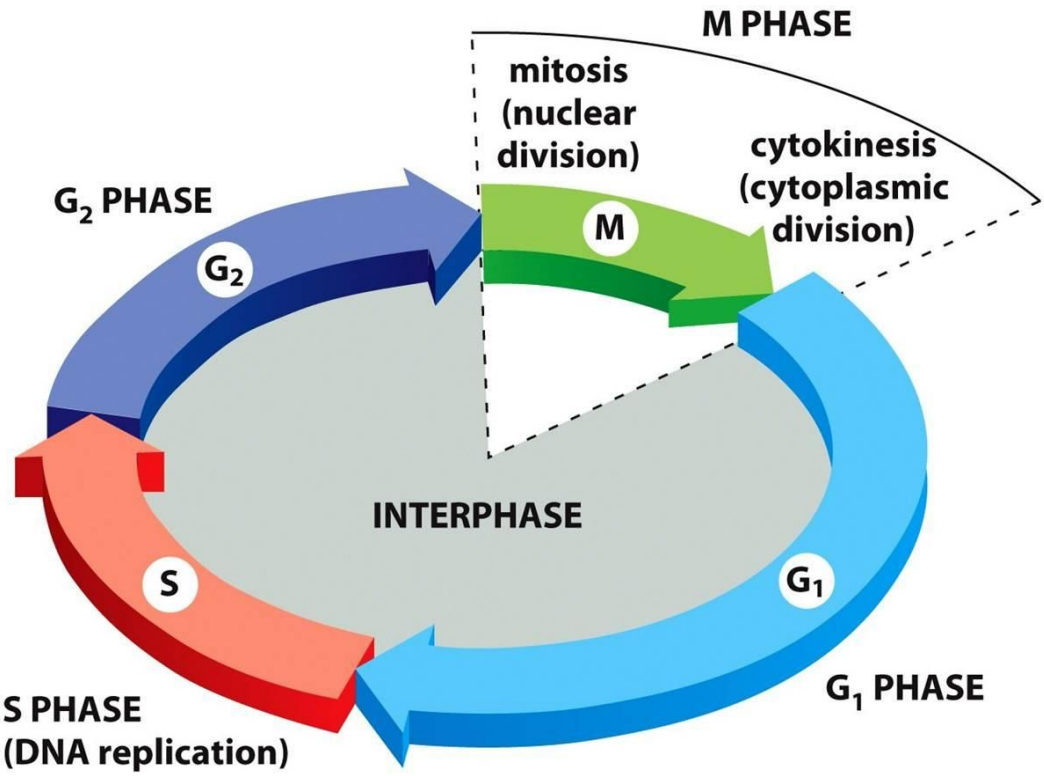
Cell Cycle

Eukaryotic cells undergo a regular cycle of division, followed by a period of growth (pg 80) = cell cycle



Phases:

G1 (growth) - protein synthesis

G2 (growth) - organelles duplicated

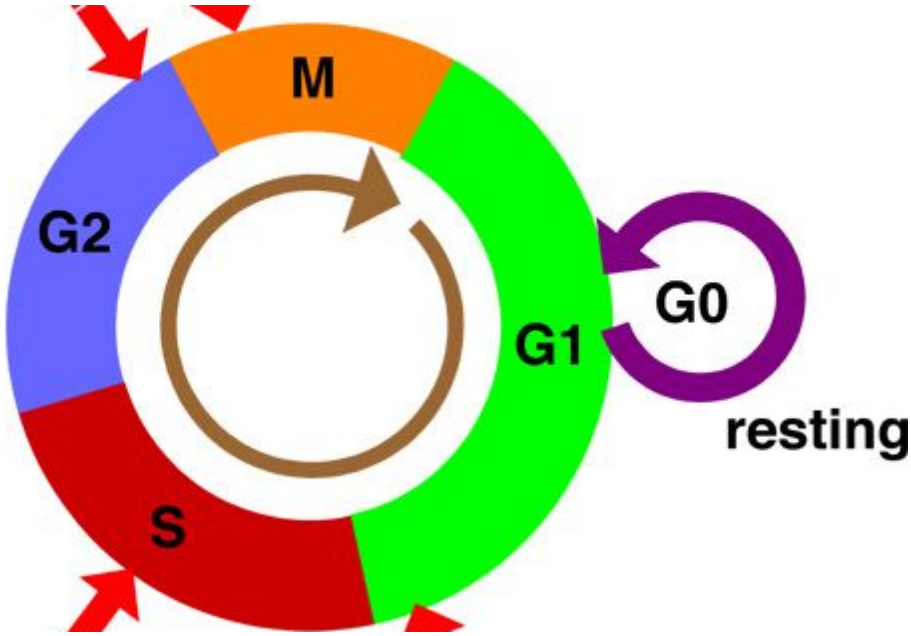
S - DNA replication

M - Mitosis (or meiosis)

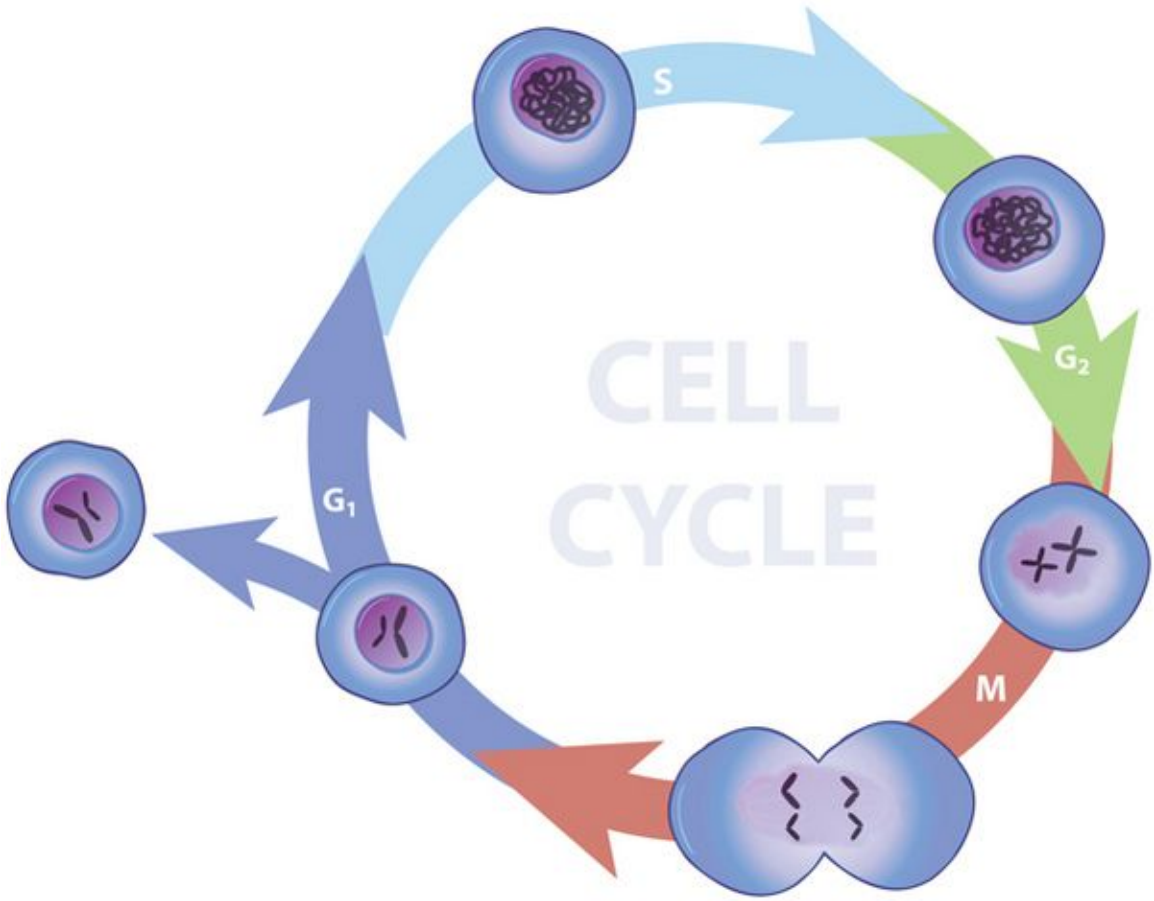
G1, G2 and S phase make up Interphase, the growth phase. The last step of M phase is Cytokinesis - cell division.

Cells that no longer need to actively divide can enter the G_0 phase - rest phase.

When needed, they can be re-activated to enter G1 phase.

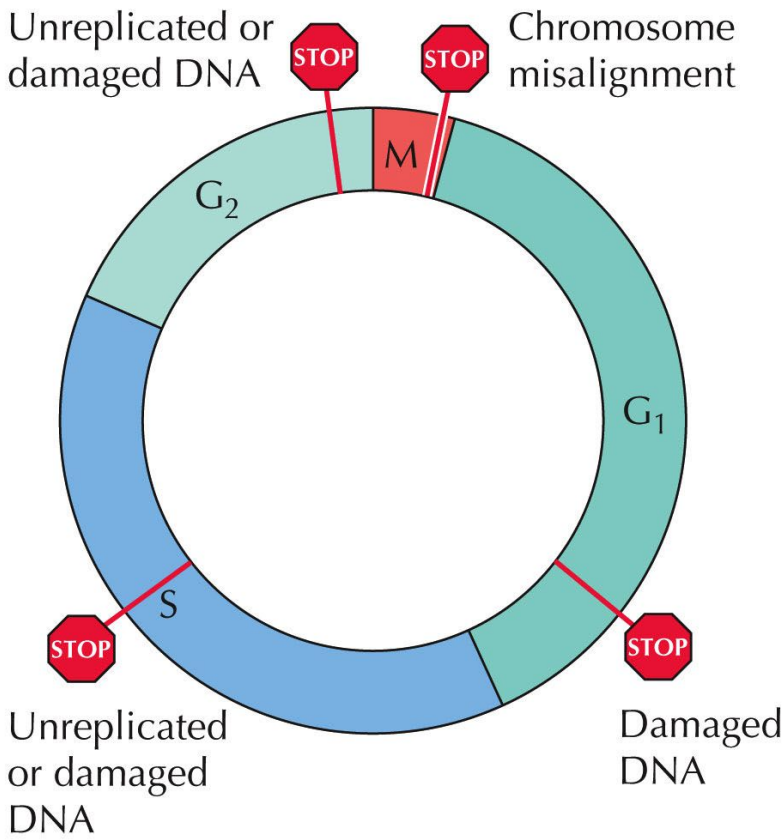


DNA switches between the chromosome and chromatin form in the cell cycle



It remains in the chromatin form in interphase
In condenses into the chromosome form at the start of the M phase

The cell cycle is controlled by checkpoints

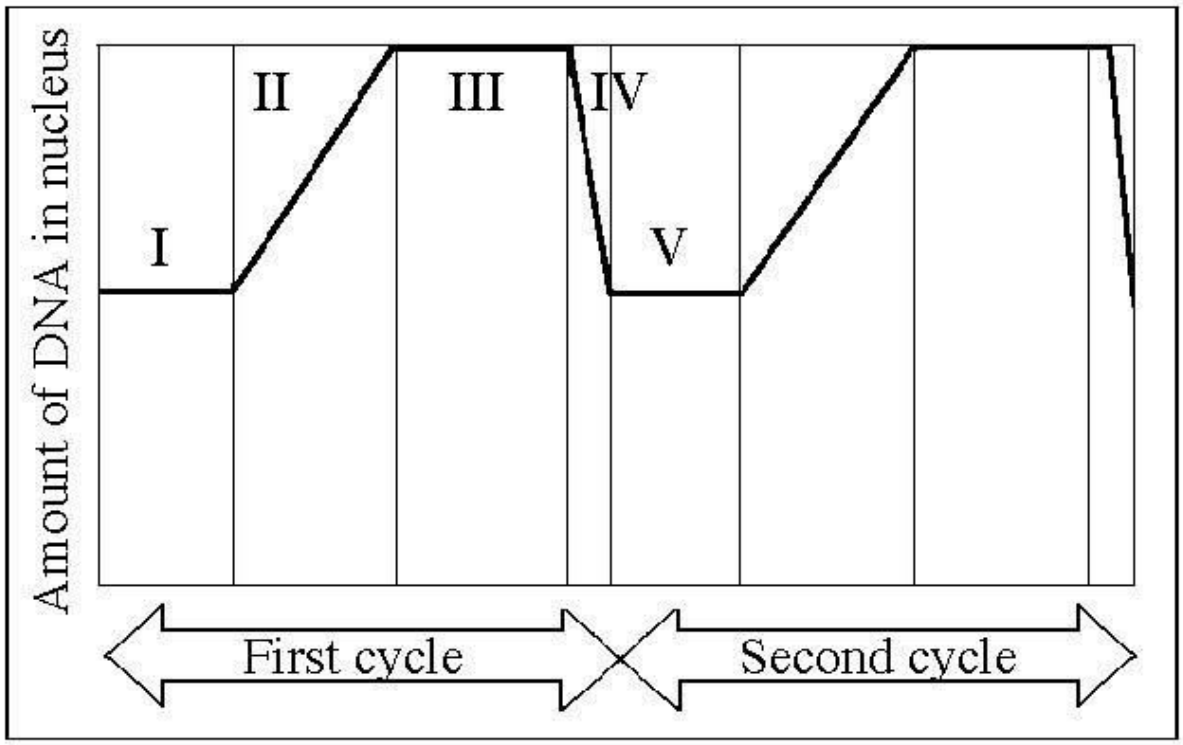


THE CELL, Fourth Edition, Figure 16.8 © 2006 ASM Press and Sinauer Associates, Inc.

Damage to proteins and enzymes that control the checkpoints can allow the cell to grow at an unregulated rate = cancer

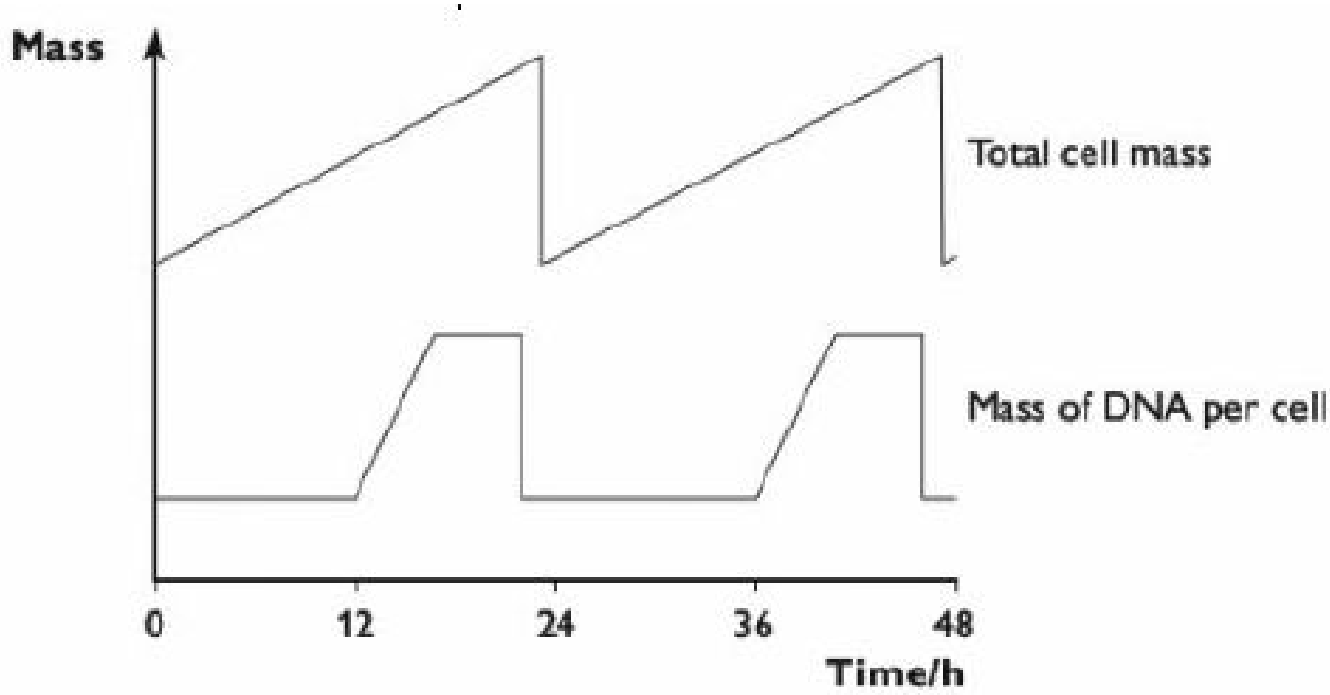
Malignant - grow and spread rapidly
Benign - slow growing, usually self-limiting

Mass of DNA during cell division (pg 80, Fig 2)



Identify phases I, II, III and IV

Mass (or volume) of cells during cell cycle



Mass of cell is maximum just before the cell enters Mitosis

Mass of cell halves after cytokinesis

Cancer and the cell cycle

- Uncontrolled cell division
- Cancer cells grow faster than healthy cells
- Starve healthy cells of glucose and oxygen
- Organ failure and death

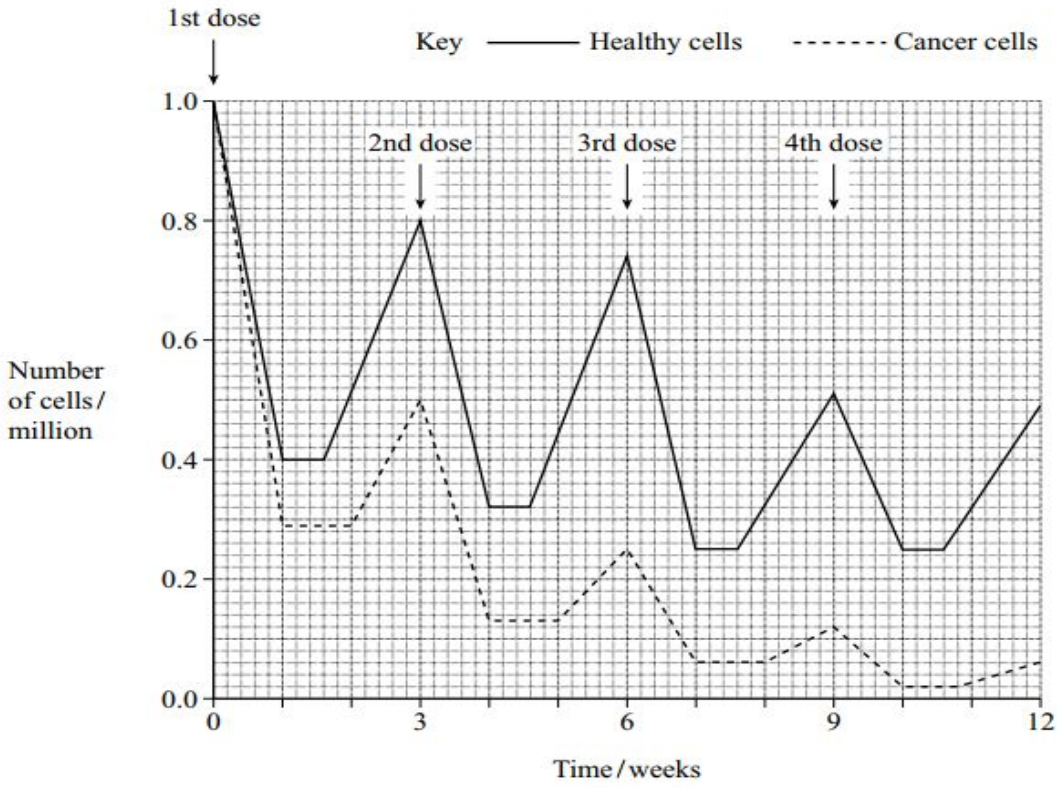
Treatment of cancer

- Preventing DNA from replicating in the S-phase
- Preventing cytokinesis in the M-phase

Drawbacks

- Any treatment for cancer cells also affects healthy cells
- Healthy cells that grow rapidly are most affected by treatment - ie. hair follicles

Graph showing changes in number of healthy cells and cancer cells in a tissue during chemotherapy - pg 81, fig3



The drug reduces number of both cancer and healthy cells

Both cells start to recover and re-grow

Repeated doses slows down the growth of cells, and results in a large % decrease in number of cancer cells