

## Cell Cycle



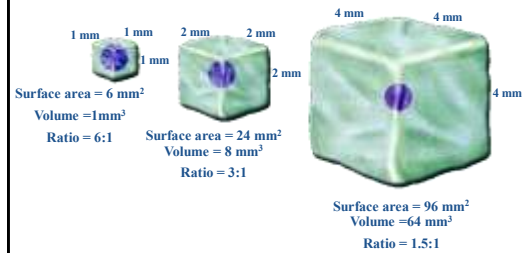
## Limits on Cell Size

- Diffusion
  - Fast over short distance
  - Organelles can't get what they need if large
- DNA
  - Can only copy directions for proteins so fast
  - Cell dies if directions can't get to ribosomes in time

## Limits on Cell Size

- Surface area – to – volume ratio
  - Nutrients pass through membrane (surface area)
  - Nutrients distributed to cell (volume)
  - If cell too big, not enough membrane for transport

## Surface Area – to – Volume

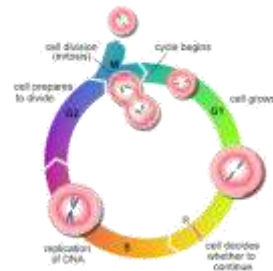


## Cell Division

- All cells come from pre-existing cells
- Why cell division?
  - Maintain small cells
  - Growth
  - Repair

## The Cell Cycle

- Sequence of growth and cell division



## Interphase

- Longest part of cell cycle
- Cell carries on normal cell activities
- Three parts
  - Growth (G1)
  - DNA replication (S)
  - Prepare to divide (G2)

The diagram illustrates the cell cycle as a circular process. It starts with 'Cells that cease division' at the bottom. The cycle proceeds through 'M - Mitosis (cell division)' at the bottom, then 'G2 - Gap 2 (cell prepares to divide)' on the right, 'S - Replication of DNA' at the top, and 'G1 - Gap 1 (cell grows)' on the left, returning to the start. The entire cycle is labeled 'Interphase'.

## Mitotic Phase

- Cell division
- Two parts
  - Mitosis – nuclear division
  - Cytokinesis – cytoplasm division
- Two daughter cells formed
  - Each identical to parent cell

## Chromosomes

- When cell not dividing, DNA exists as chromatin
  - Long, thin strands of DNA wrapped around proteins
  - Looks like spaghetti under electron microscope
  - Must be loose so that information can be “read”

## Chromosomes

- When cell is replicating, chromatin condenses into chromosomes
  - Tightly packed
  - Visible under light microscope
  - Easy to separate

The diagram shows the progression of DNA packaging. It starts with 'Nuclear Pore' and 'Chromatin' (loose strands). This leads to 'Solenoid Chromatin Fiber' (tightly packed strands), then 'Nucleosomes' (DNA wrapped around histones), and finally 'Condensed' chromosomes. Labels include 'Telomere', 'Centromere', and 'Arm'.

## Chromosome

- Centromere = center of chromosome
- Sister chromatid = EXACT COPY of a chromosome.
- Double-chromosome - two sister chromatids = copied chromosome

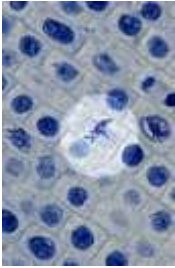
## Mitosis

- Set up (prophase)
  - Condense chromatin into chromosomes
  - Nuclear membrane disappears

The diagram shows a single chromosome undergoing 'Chromosome duplication' to form two 'Sister chromatids'. The final stage is 'Chromosome distribution to daughter cells'.

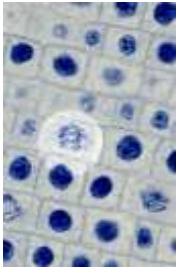
## Mitosis

- Preparing to separate (metaphase)
  - Chromosomes are lined up at the center for “roll call”
    - moved to center (metaphase plate) by spindle fibers



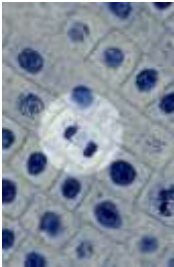
## Mitosis

- Separating sister chromatids (anaphase)
  - Each chromatid is pulled toward opposite end of cell



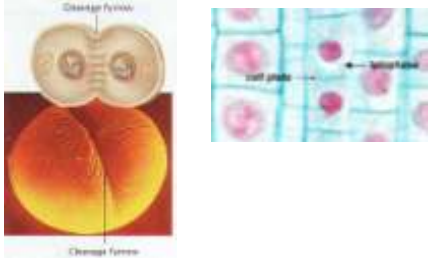
## Mitosis

- Forming new nuclei (telophase)
  - Nuclear membrane forms around each set of chromosomes

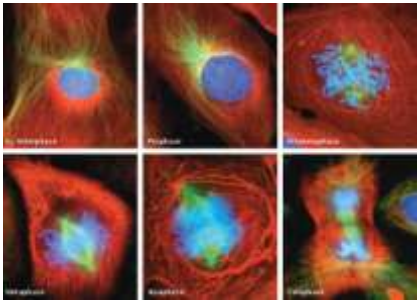


## Cytokinesis

- Division of cytoplasm




## Cell Division



## Control of Cell Cycle

- Enzymes control cell cycle
  - Multiple checkpoints
- When out of control = cancer
  - Genetics
  - Environmental factors
  - Viruses
  - UV radiation



## NOTE CARDS

- Card for the following:
  - Interphase
  - Prophase
  - Metaphase
  - Anaphase
  - Telophase
  - Cytokinesis
- **Front:** Picture of a cell in that phase showing the identifying characteristics.
- **Back:** Name of phase; list of events