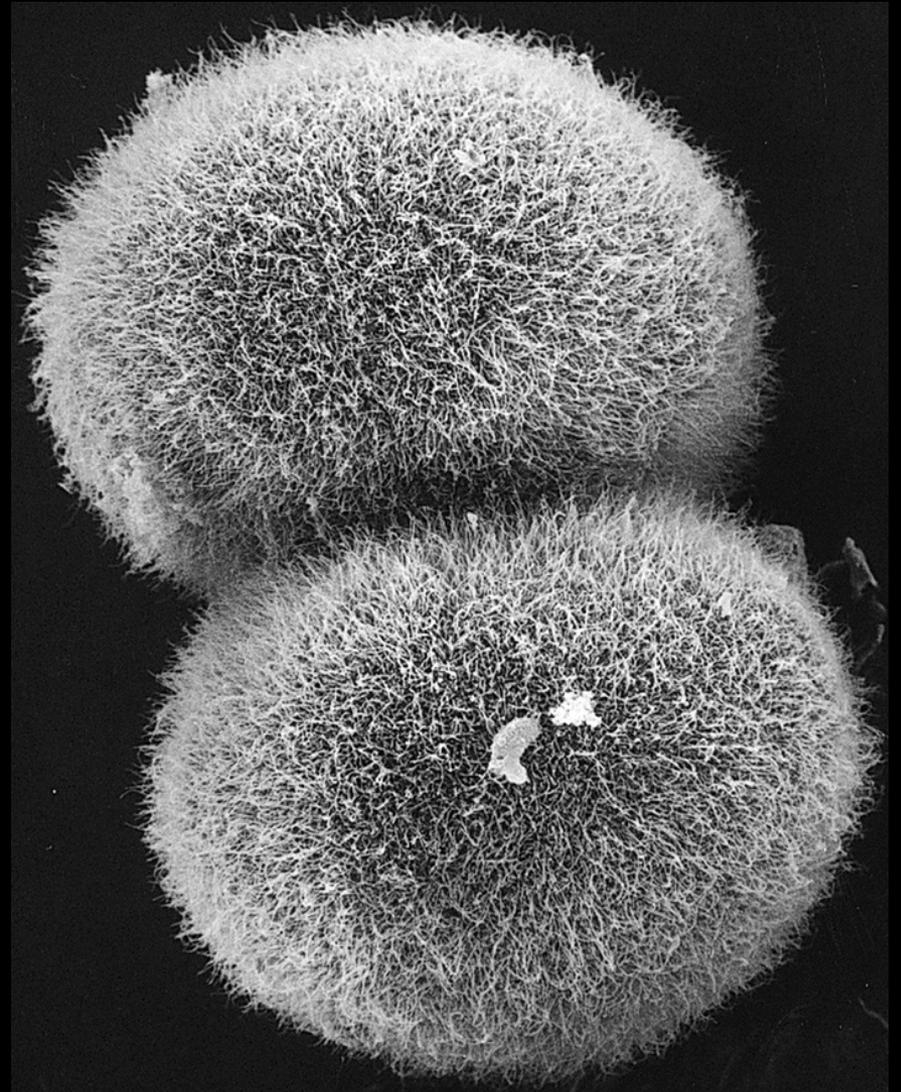
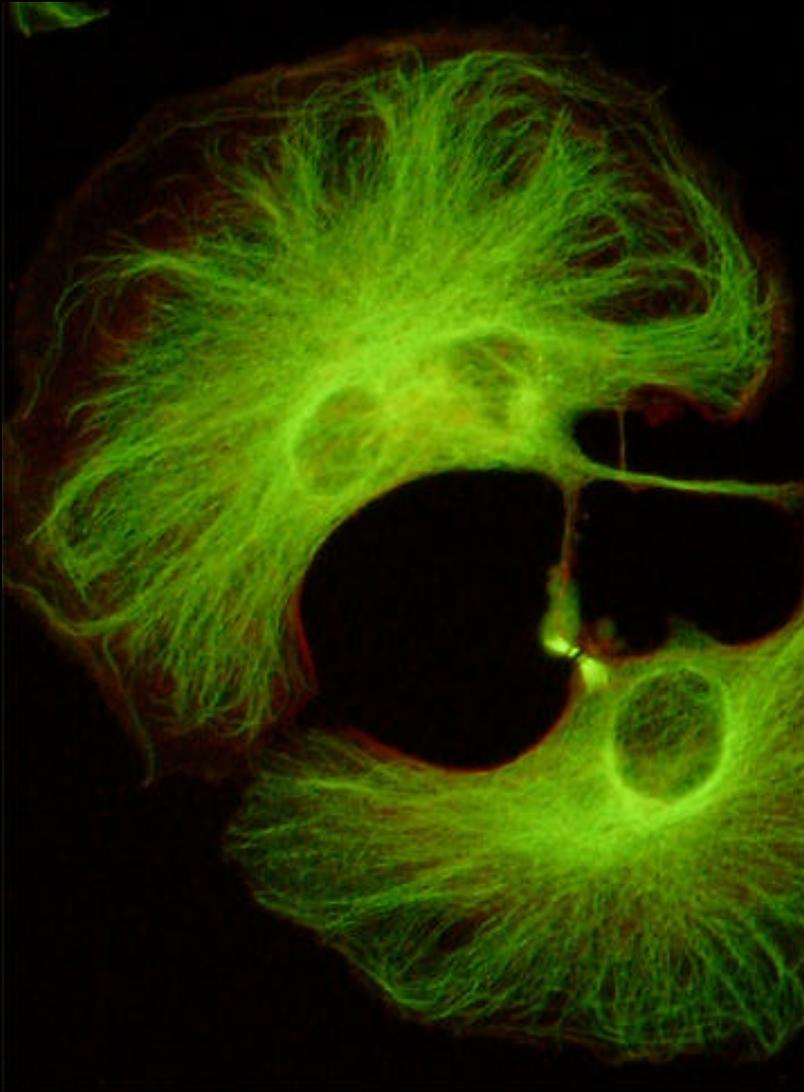
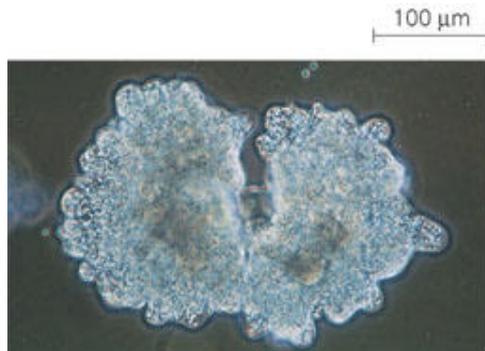


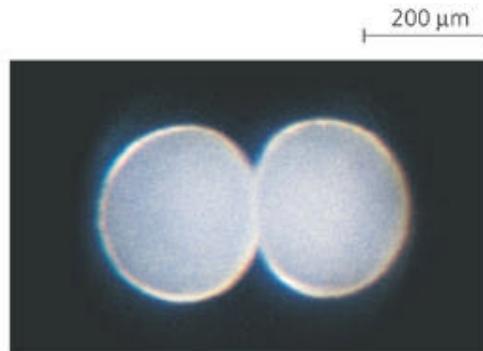
Cell Cycle and Cell Division



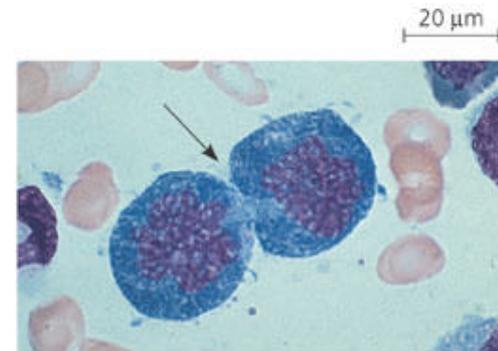
Why Do Cells Divide?



(a) Reproduction. An amoeba, a single-celled eukaryote, is dividing into two cells. Each new cell will be an individual organism (LM).



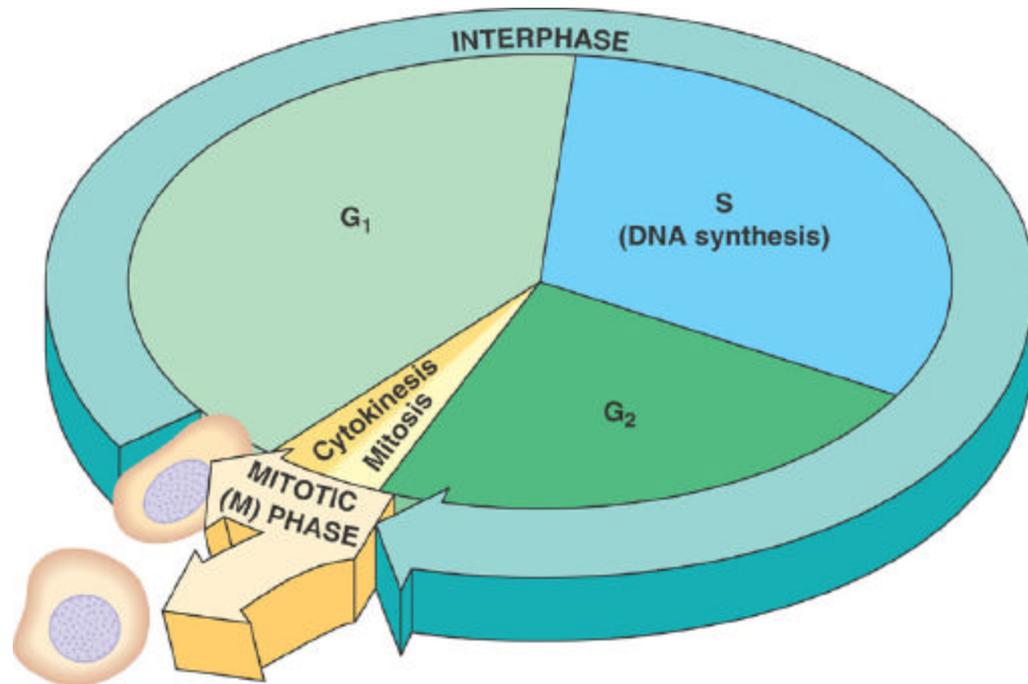
(b) Growth and development. This micrograph shows a sand dollar embryo shortly after the fertilized egg divided, forming two cells (LM).



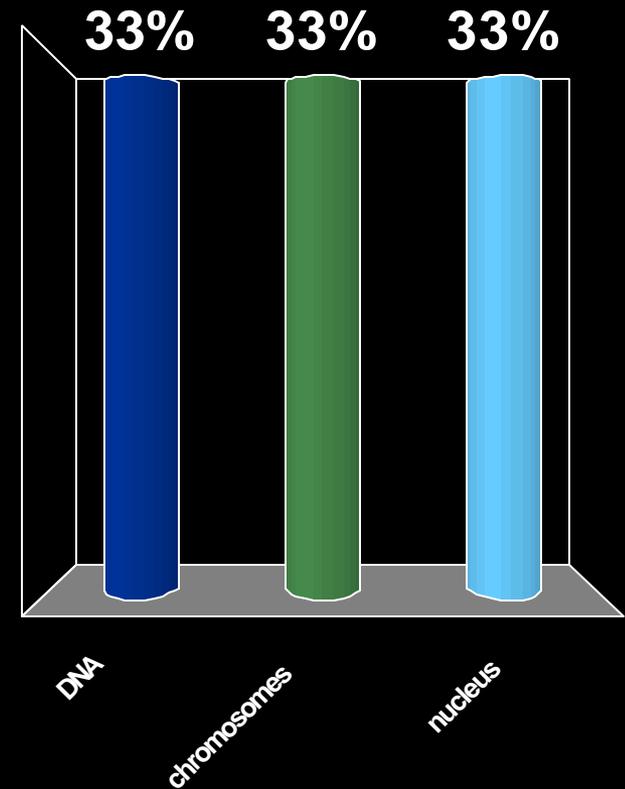
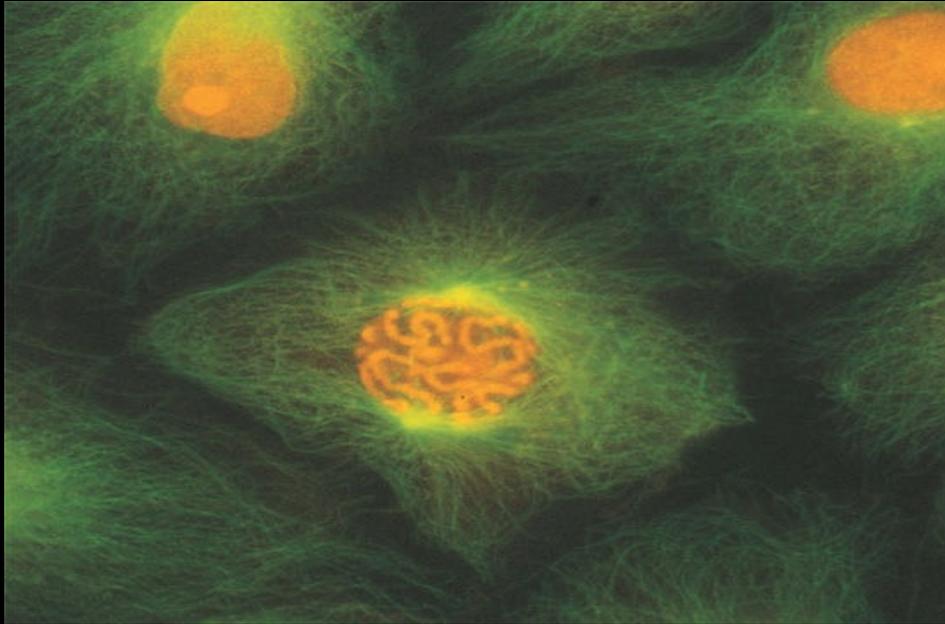
(c) Tissue renewal. These dividing bone marrow cells (arrow) will give rise to new blood cells (LM).

- Reproduction
- Growth and Development
- Tissue Renewal

The Cell Cycle

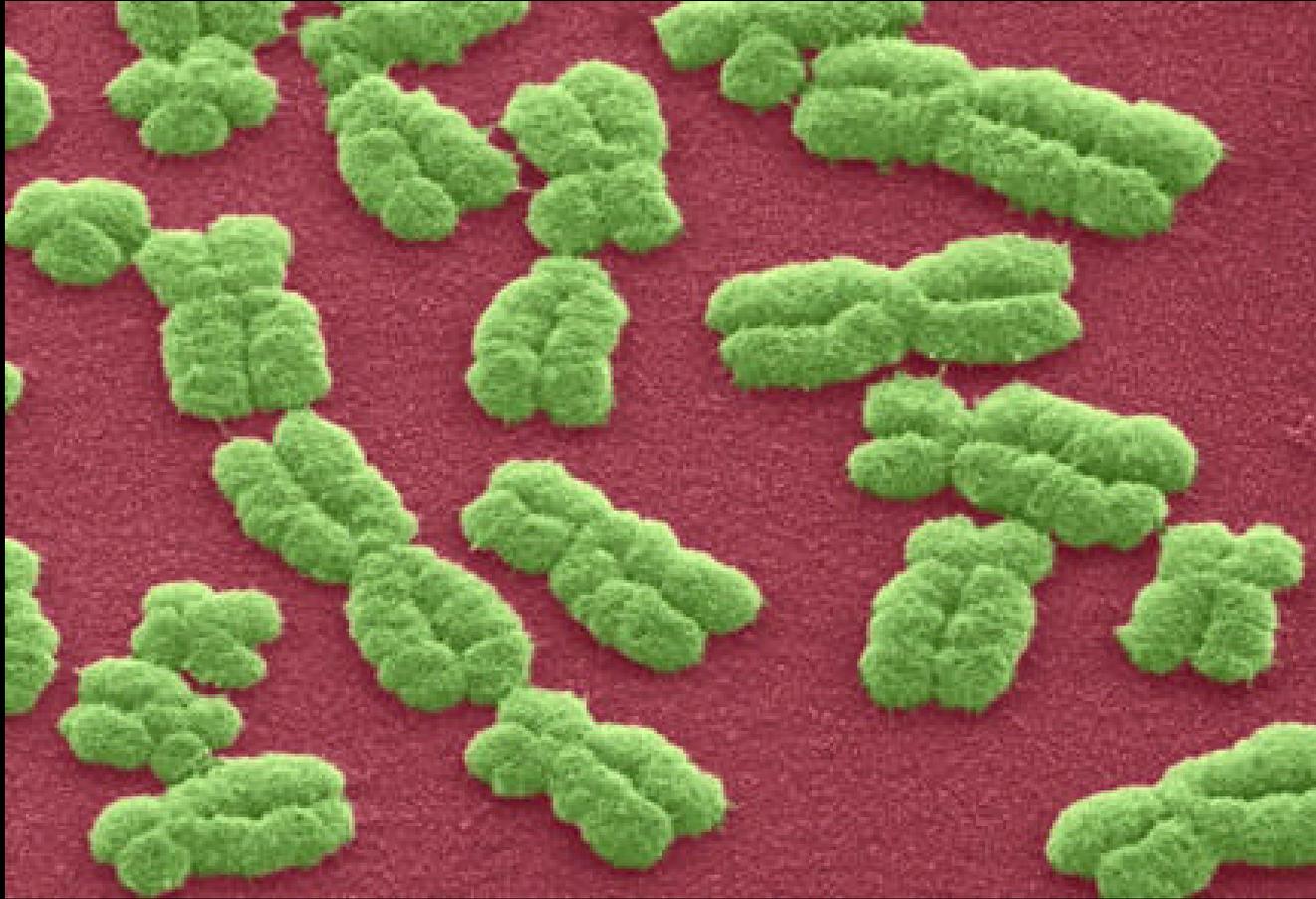


What Structures Do Divide When The Cell Divides?

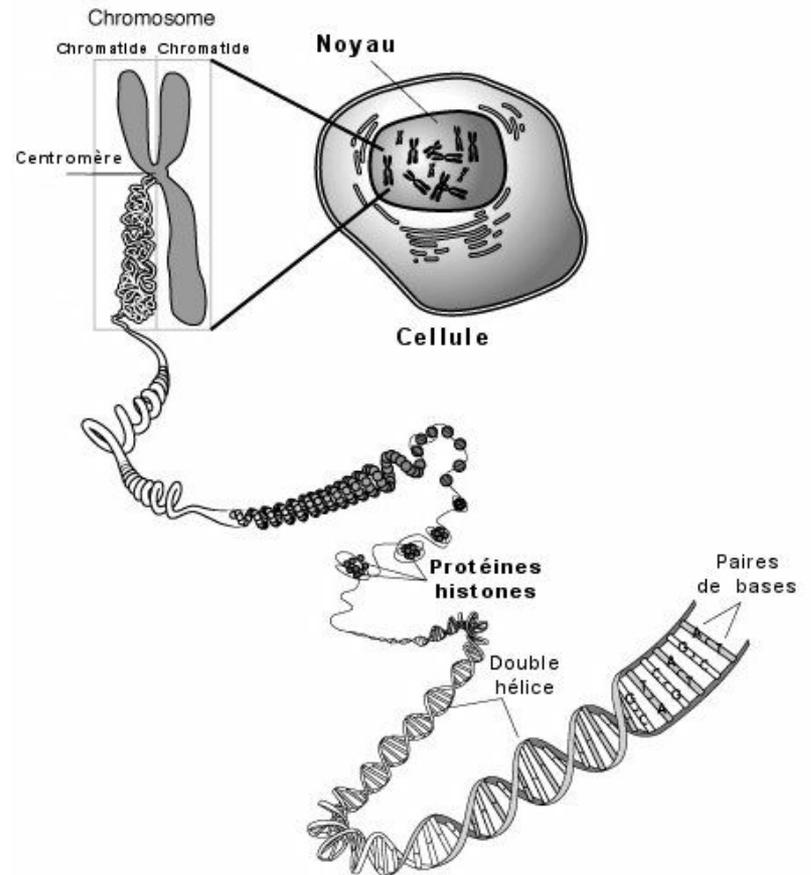
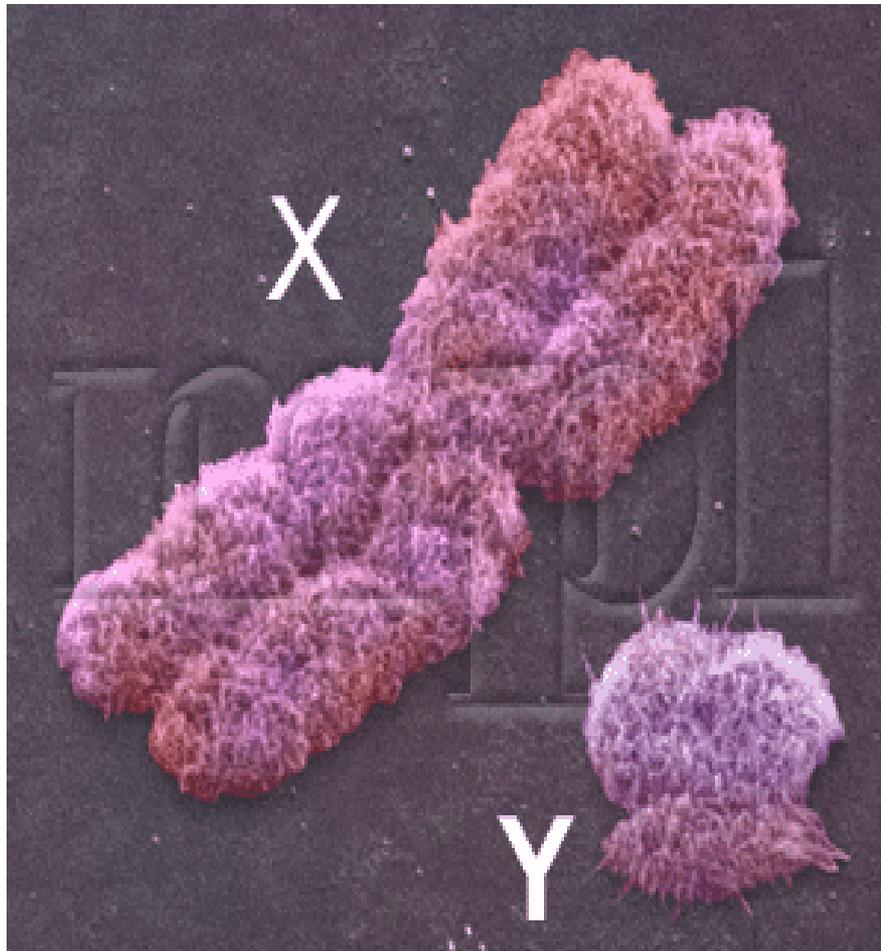


1. DNA
2. chromosomes
3. nucleus

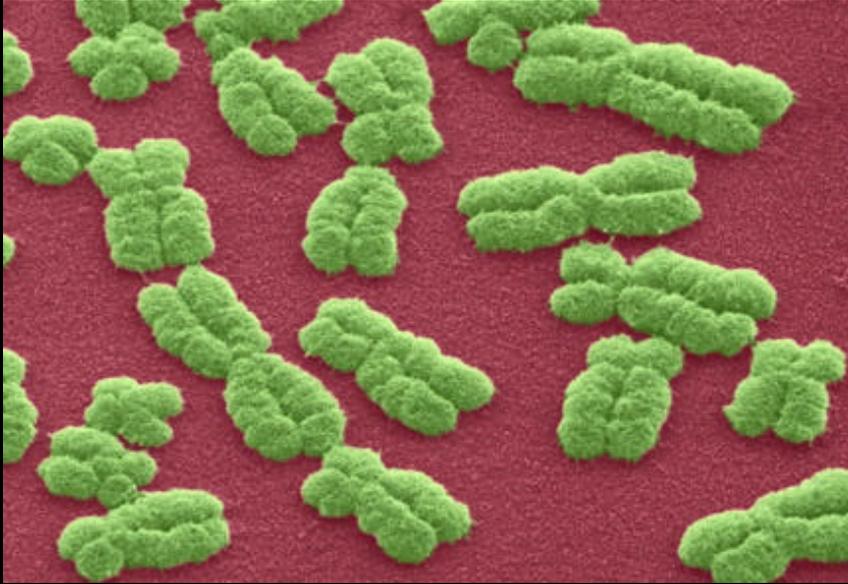
What is a Chromosome?



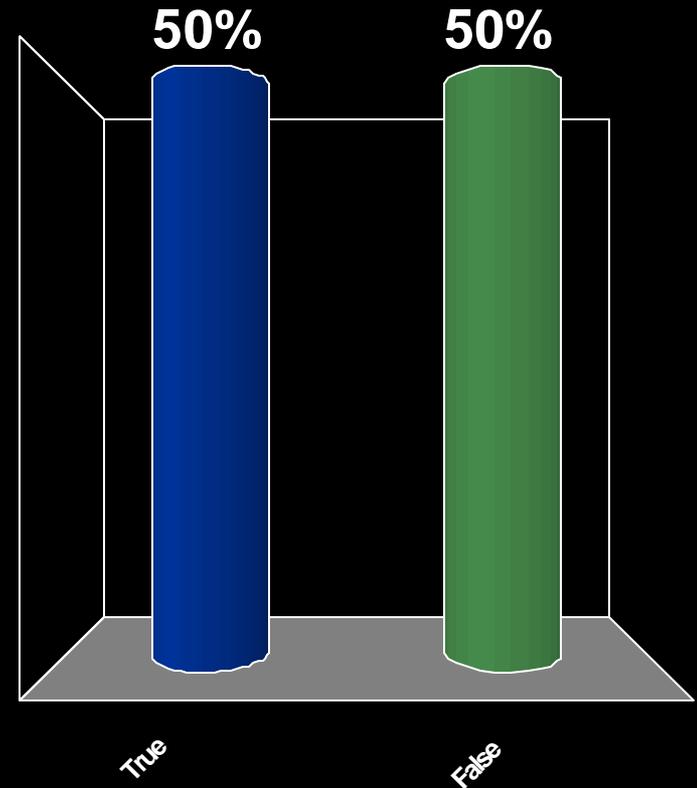
What is a Chromosome?



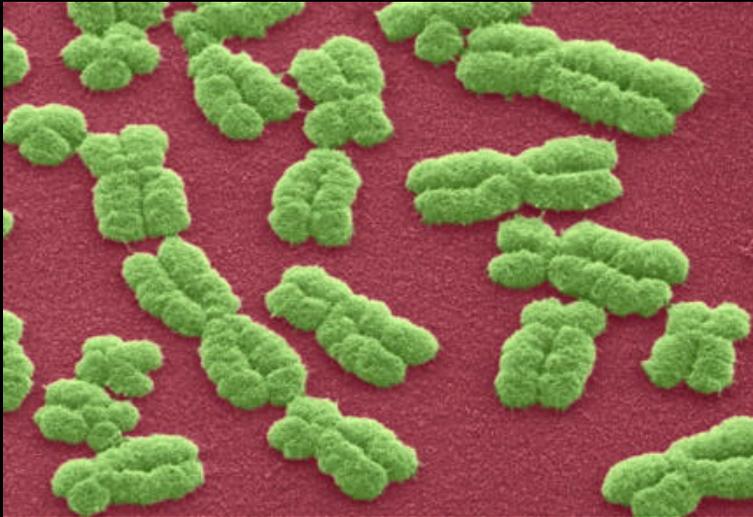
A chromosome is a molecule of DNA



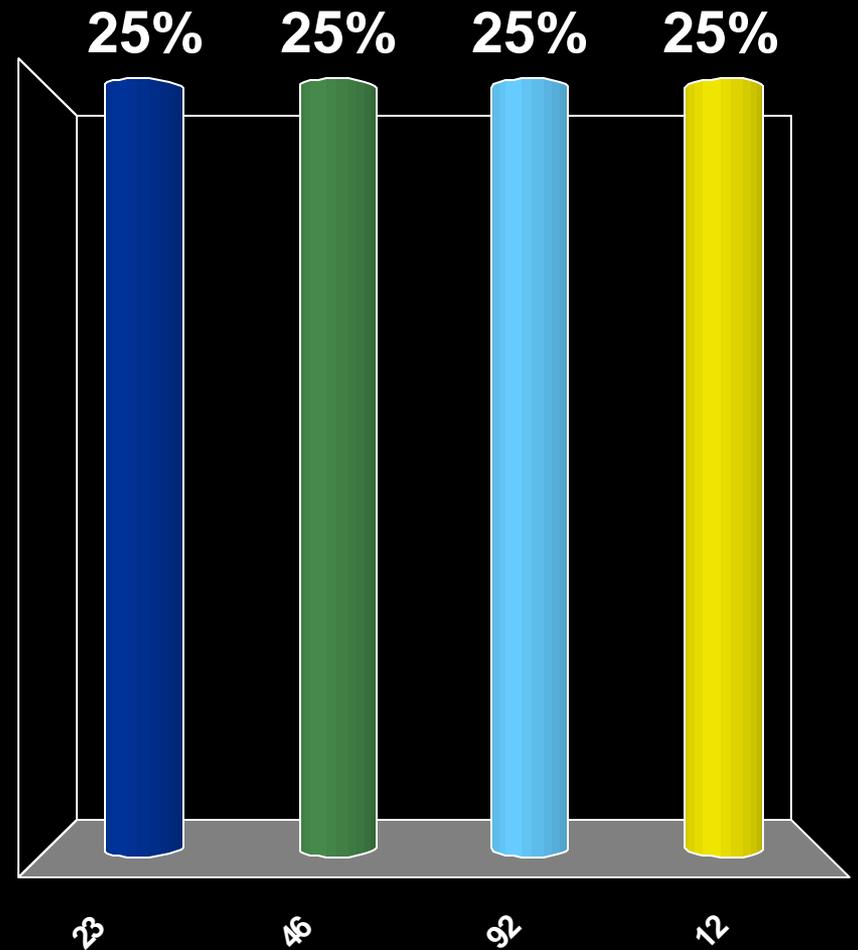
1. True
2. False



How many molecules of DNA are there in one of your skin cells?

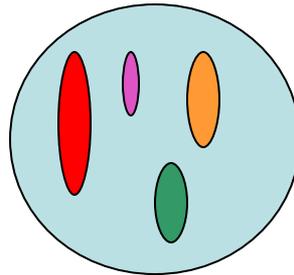


1. 23
2. 46
3. 92
4. 12



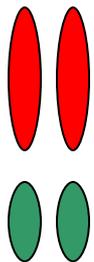
Depending on the Arrangement of Chromosomes Organisms are:

- Haploid (n)

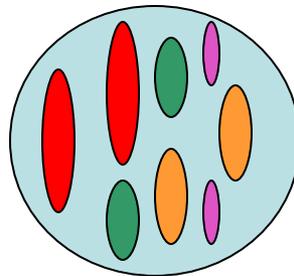


Only one chromosome of each type
Number of chromosomes= n=

- Diploid (2n)



Homologous
Chromosomes

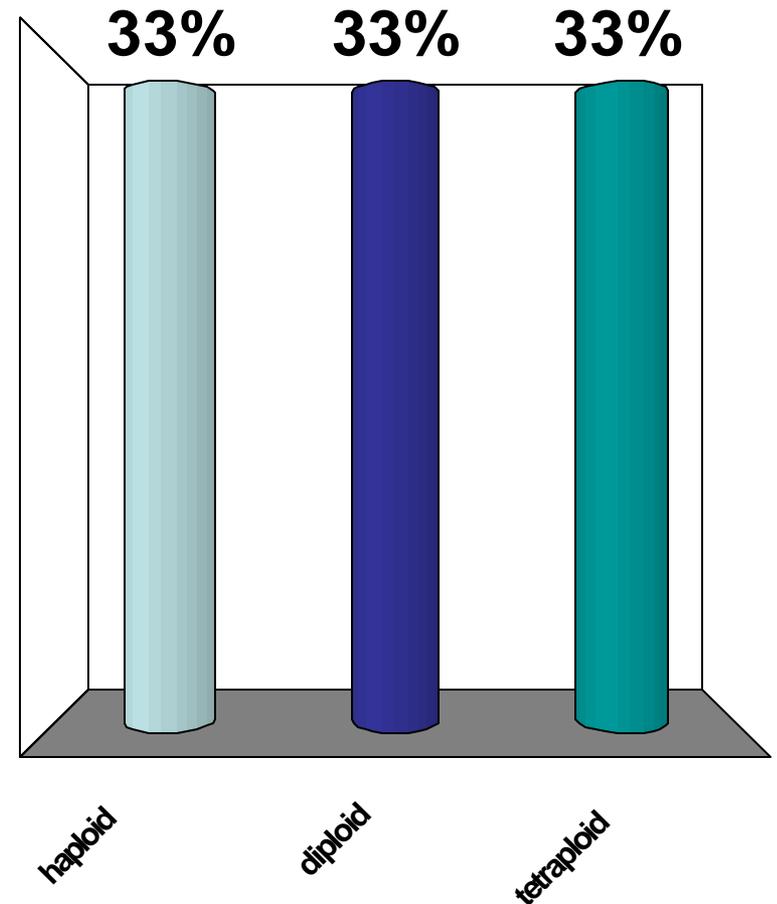


Two chromosomes of each type,
one from each parent

Number of chromosomes= 2n=

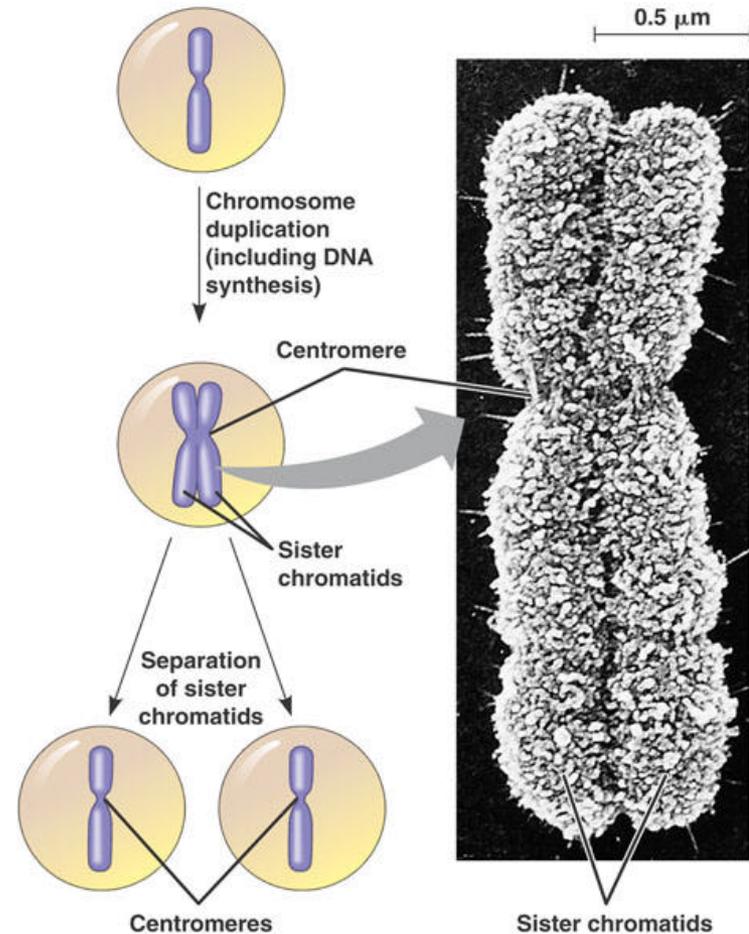
Humans are _____ organisms.

1. haploid
2. diploid
3. tetraploid



Chromosomes Duplicate During the S Phase

- During the S phase all the chromosomes duplicate
- When a chromosome duplicates, it produces a replica chromosome referred to as *chromatid* or *sister chromatid*
- Sister chromatids are joint at the *centromere*

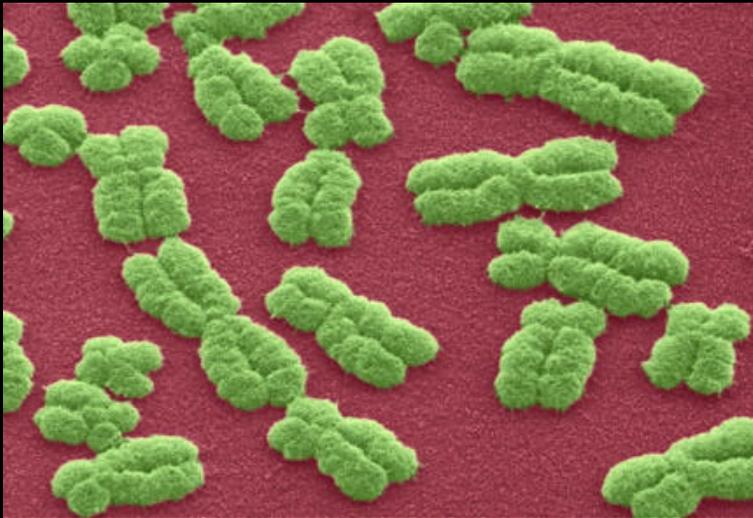


How Human Chromosomes Look After Chromosome Duplication

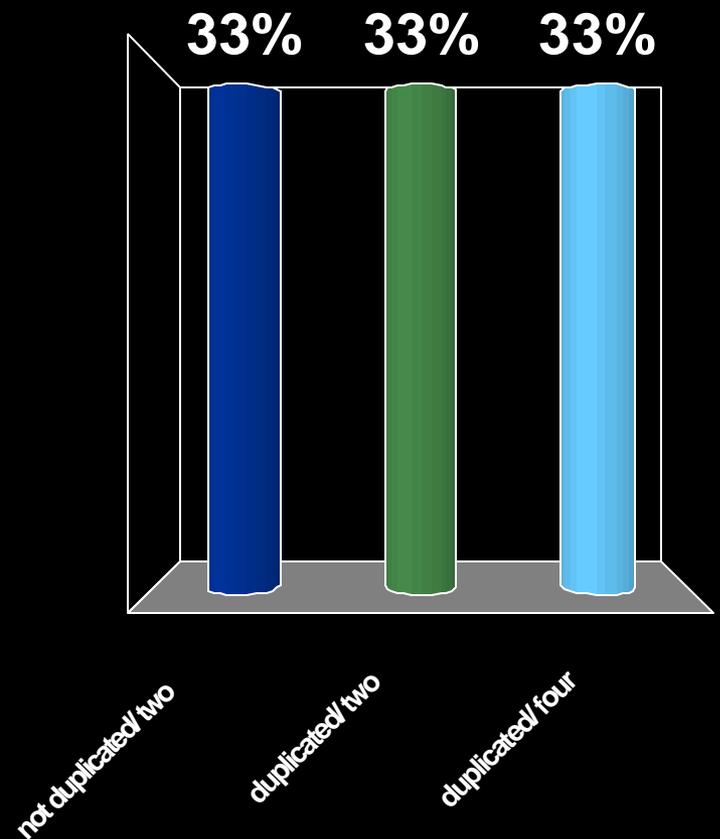


Human Karyotype

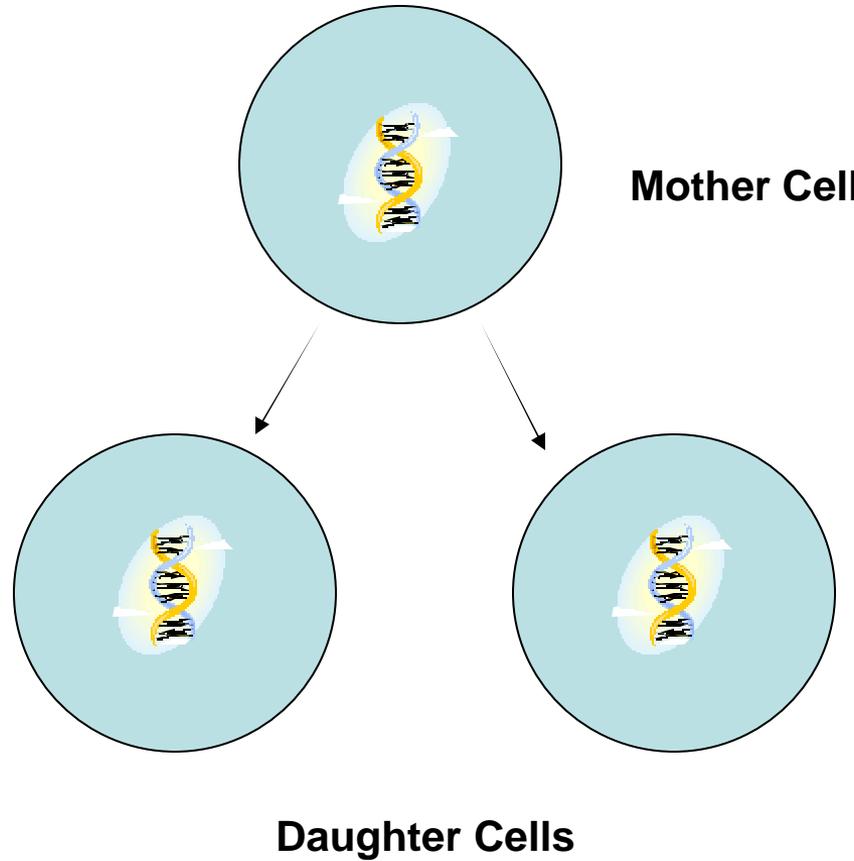
These chromosomes are ___ and made of ___ sister chromatids.



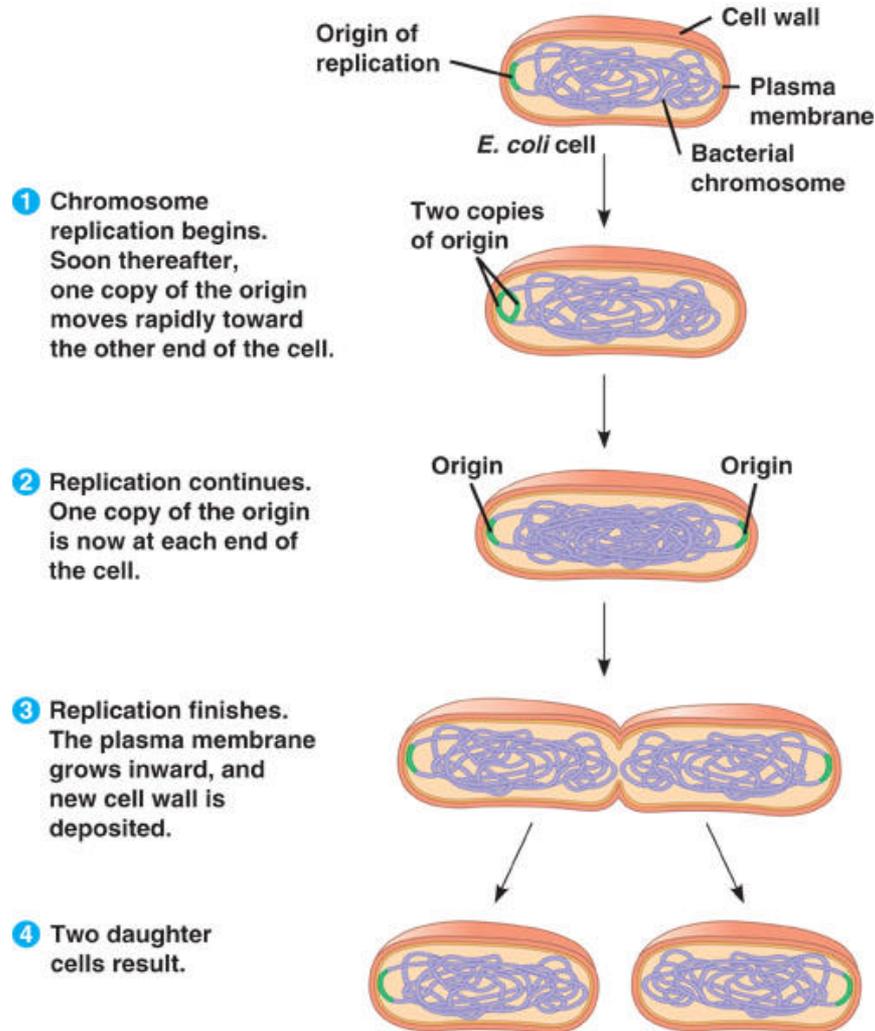
1. not duplicated/ two
2. duplicated/ two
3. duplicated/ four



Cell Division: What is it?



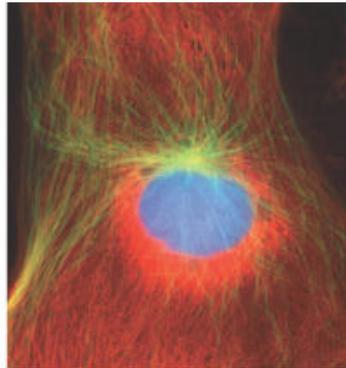
Cell Division in Asexual Reproduction: Binary Fission



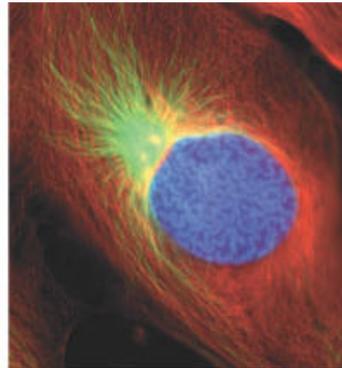
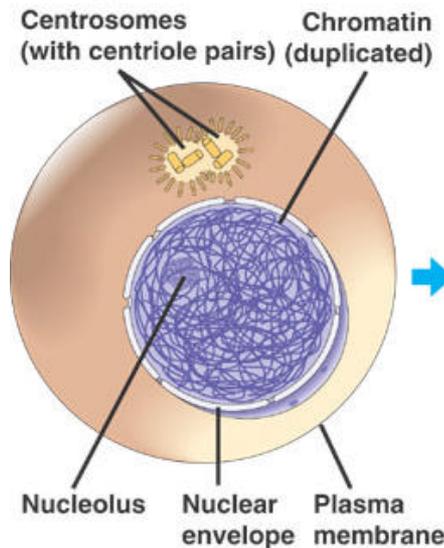
Cell Division in Eukaryotes: Mitosis

- Mitosis is the mechanism by which *somatic* eukaryotic cells produce identical daughter cells
- Mitosis produces two identical, diploid daughter cells
- Mitosis involves partition of both cytoplasmic and nuclear structures
- Mitosis consist of five phases: prophase, prometaphase, metaphase, anaphase, and telophase
- After telophase, the mother cell splits into two and produces two daughter cells by undergoing a process referred to as *cytokinesis*

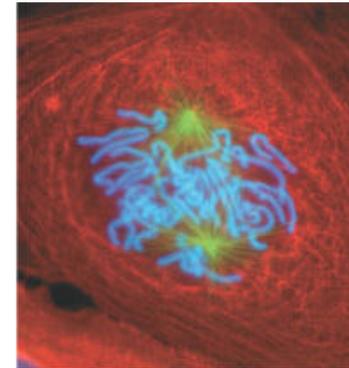
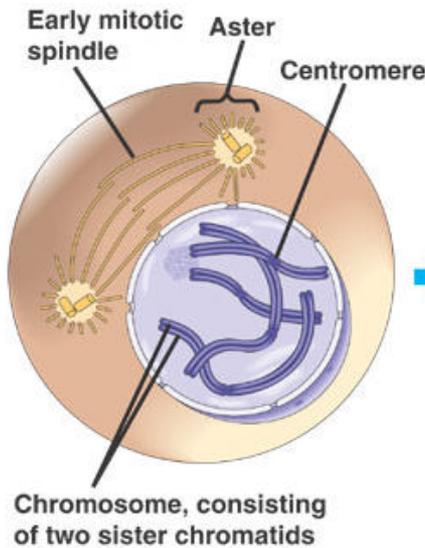
Cell Division in Eukaryotes: Mitosis



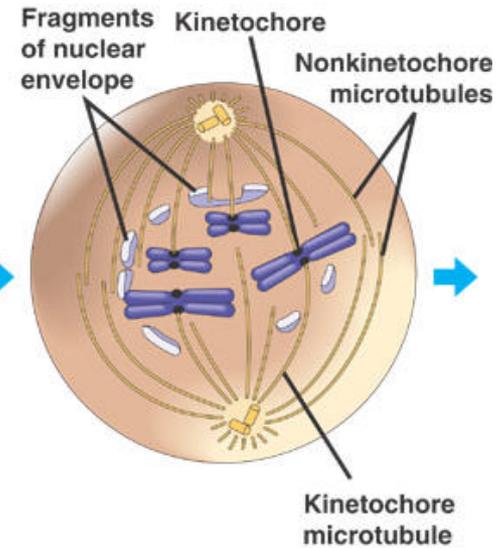
G₂ OF INTERPHASE



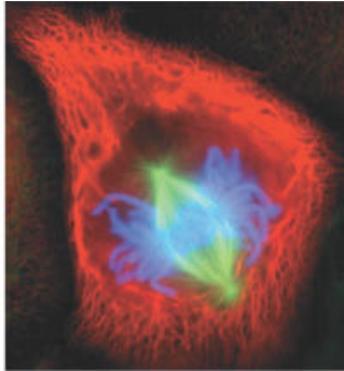
PROPHASE



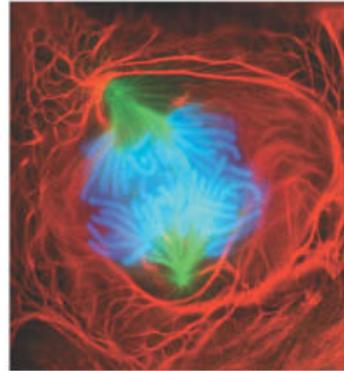
PROMETAPHASE



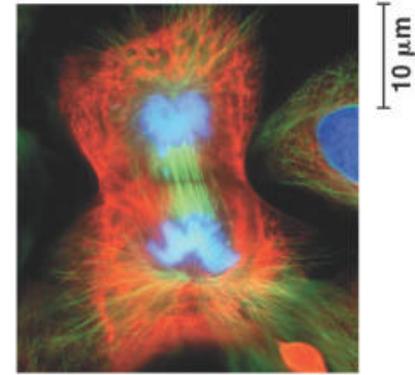
Cell Division in Eukaryotes: Mitosis



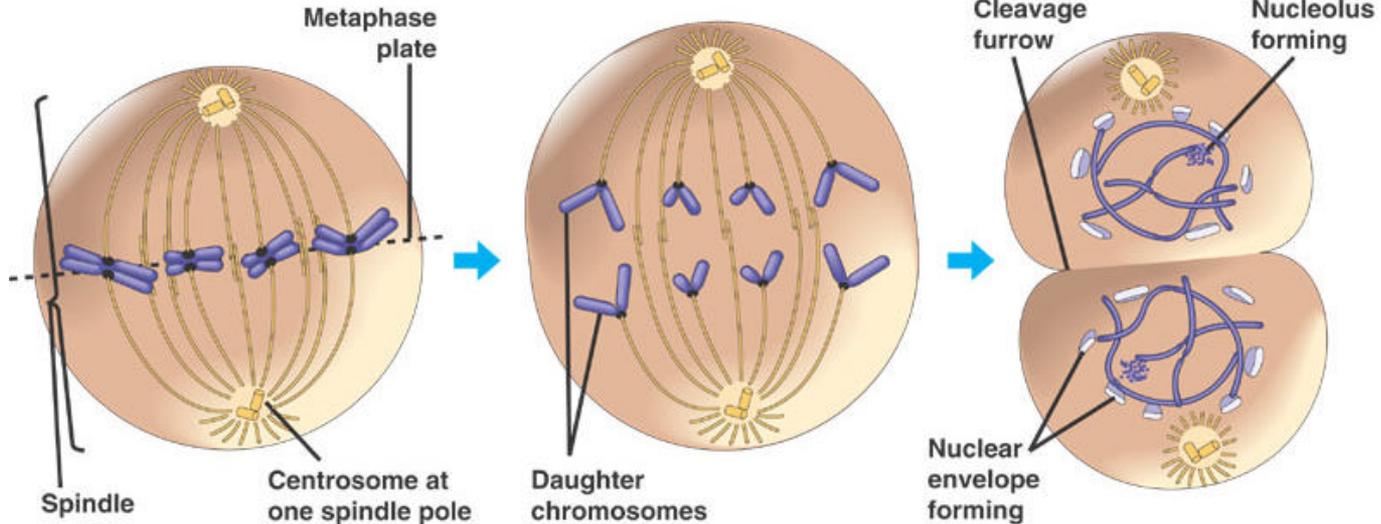
METAPHASE



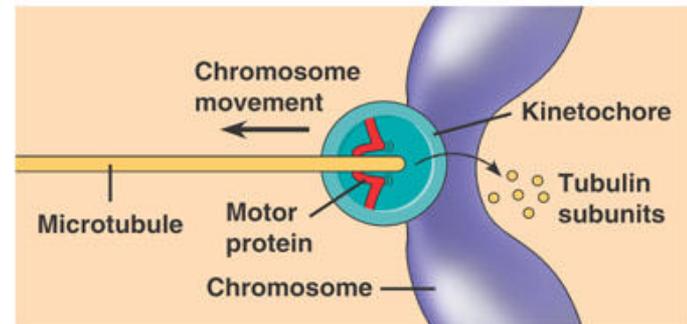
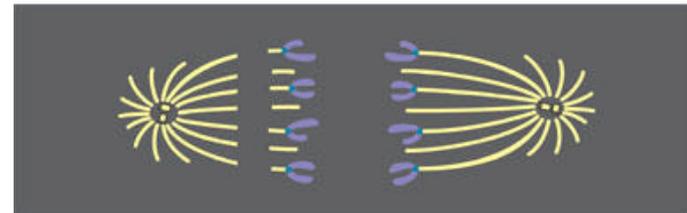
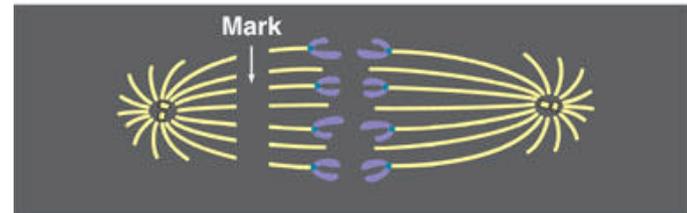
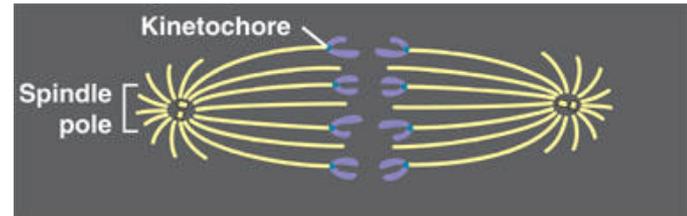
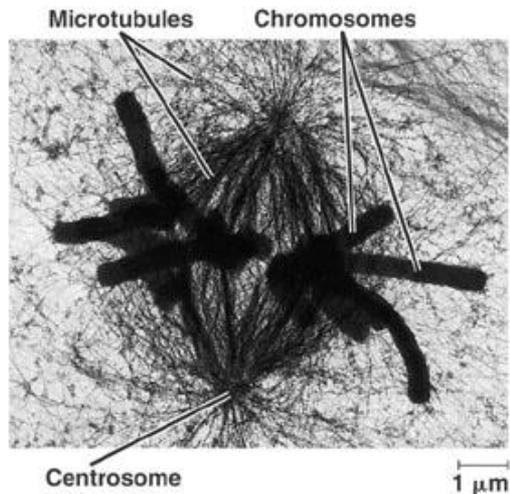
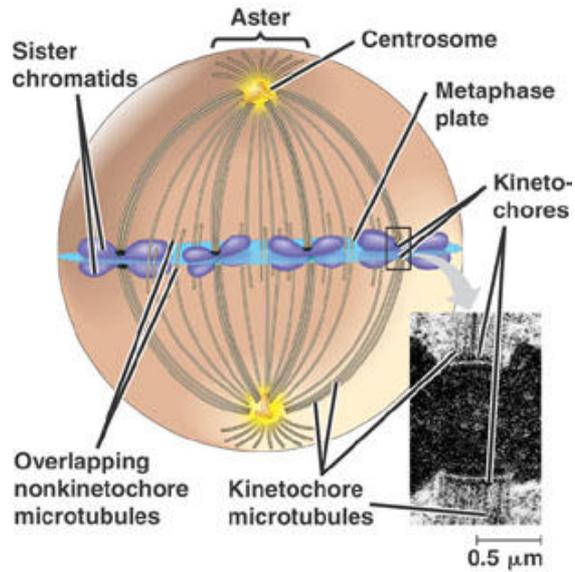
ANAPHASE



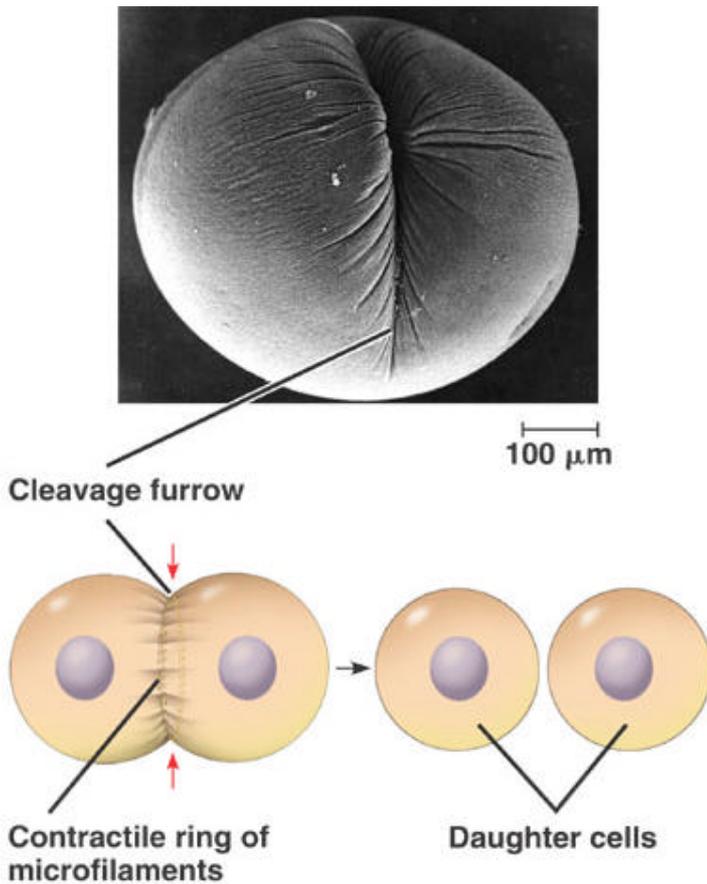
TELOPHASE AND CYTOKINESIS



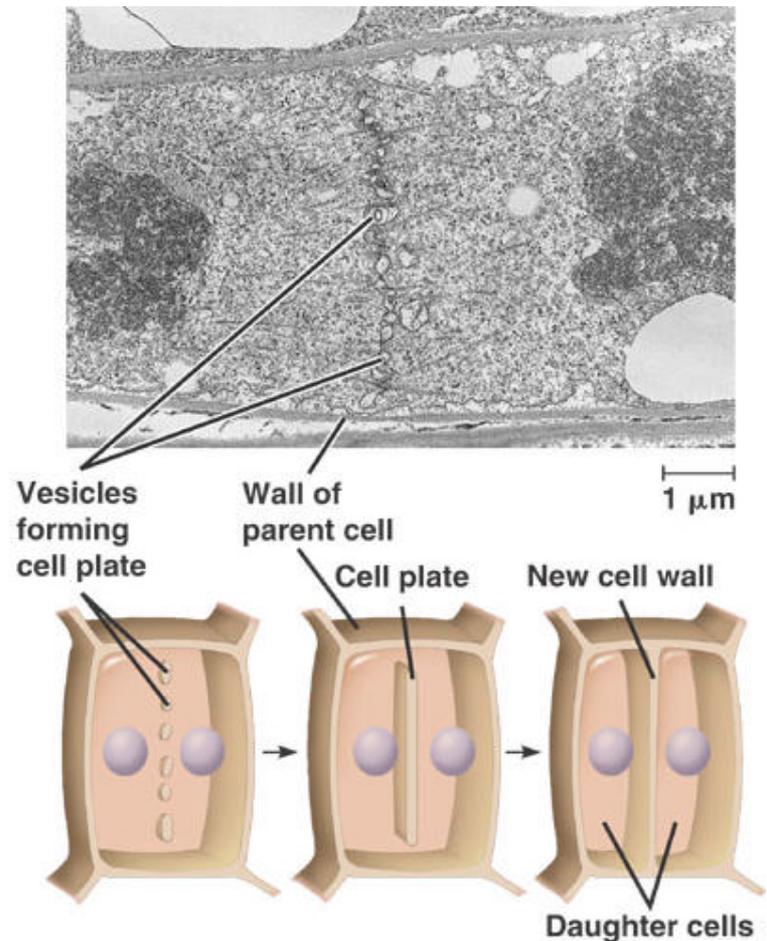
Spindle Apparatus



Division of Nuclear and Cytoplasmic Structures: Cytokinesis

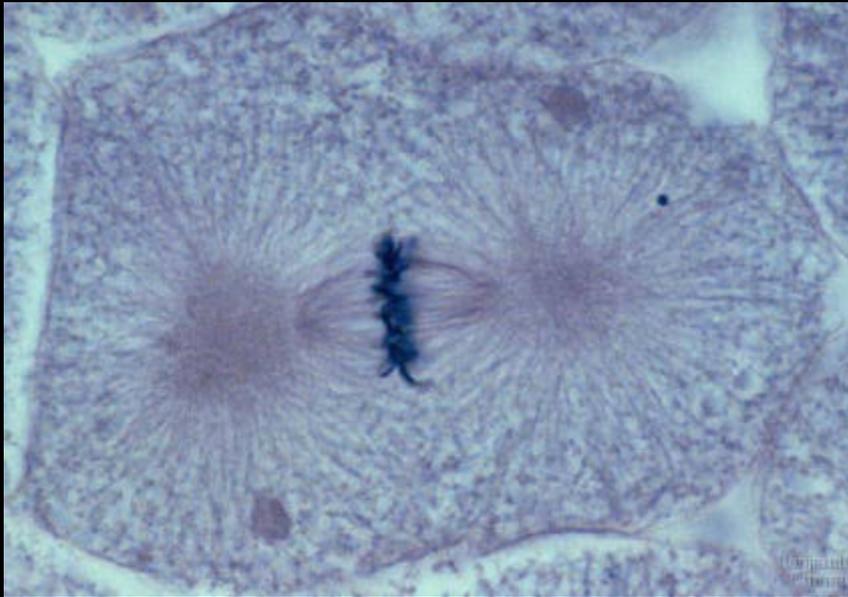


(a) Cleavage of an animal cell (SEM)

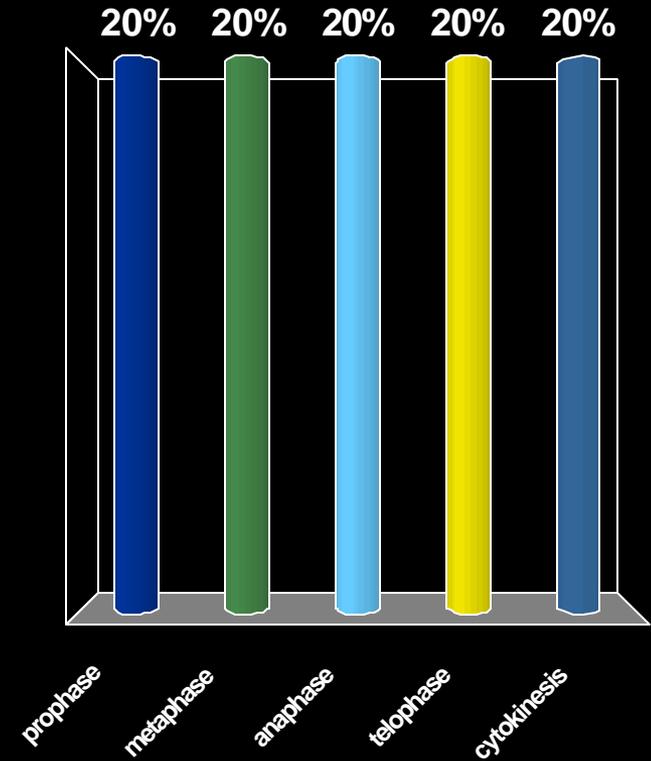


(b) Cell plate formation in a plant cell (TEM)

This mitotic cell is in _____



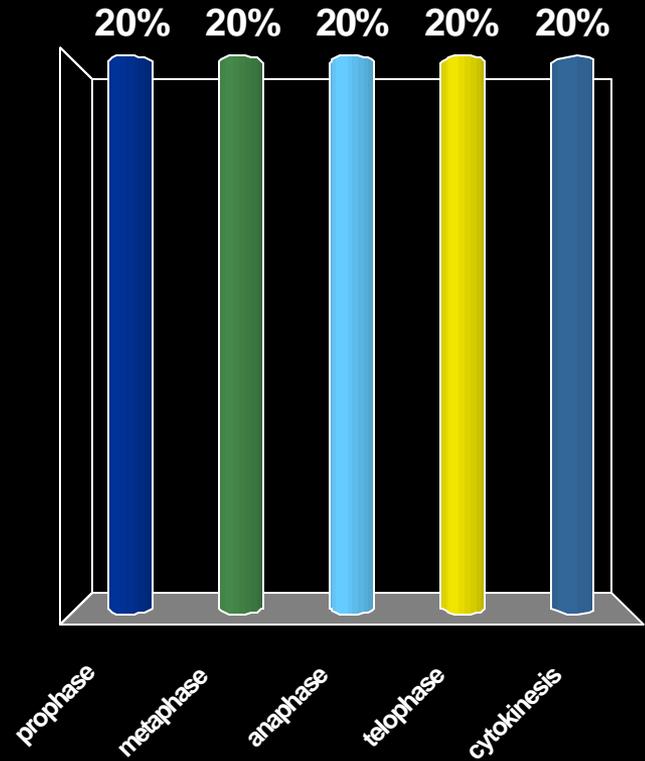
1. prophase
2. metaphase
3. anaphase
4. telophase
5. cytokinesis



This mitotic cell is in _____



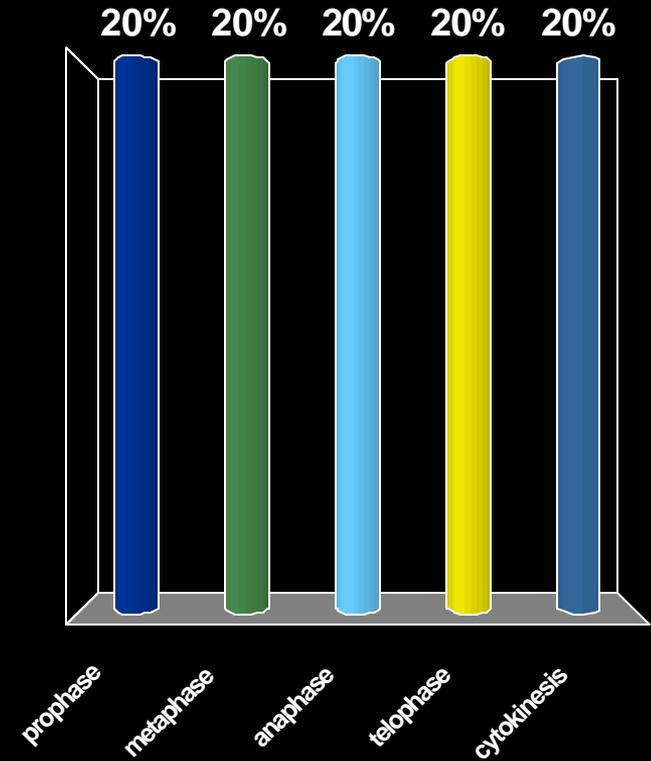
1. prophase
2. metaphase
3. anaphase
4. telophase
5. cytokinesis



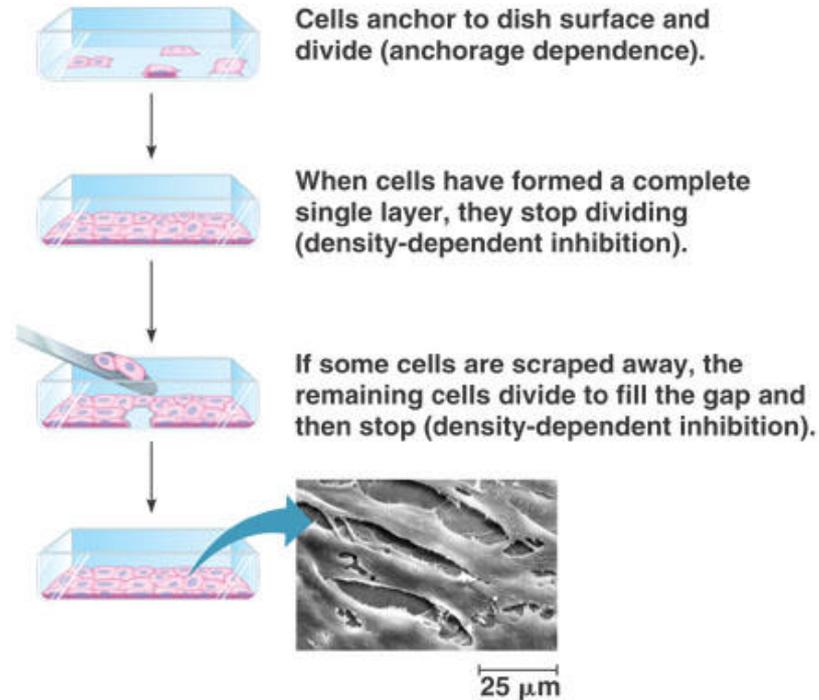
This mitotic cell is in _____



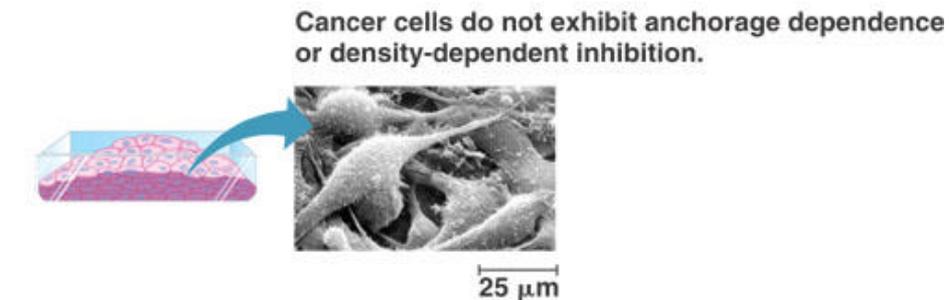
1. prophase
2. metaphase
3. anaphase
4. telophase
5. cytokinesis



Control of Cell Division. Uncontrolled Cell Division

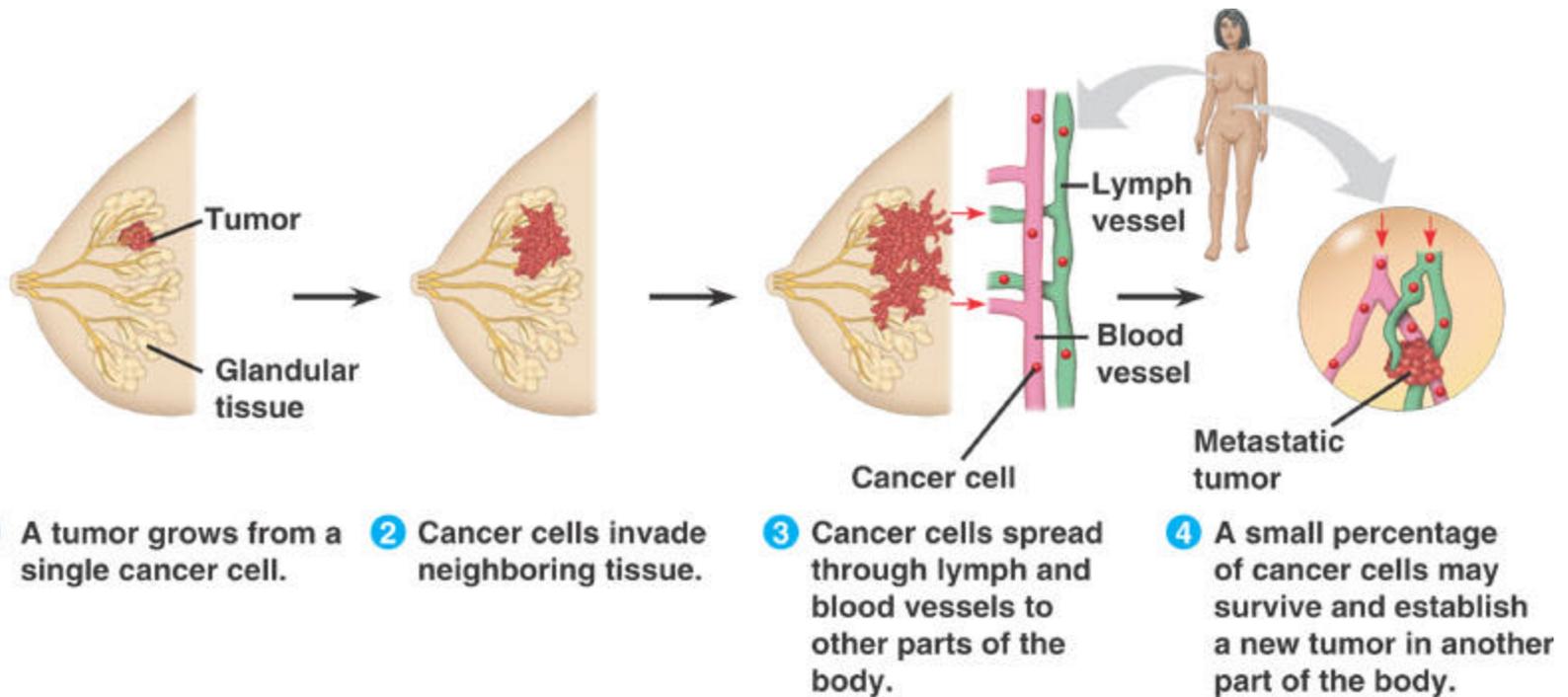


(a) Normal mammalian cells

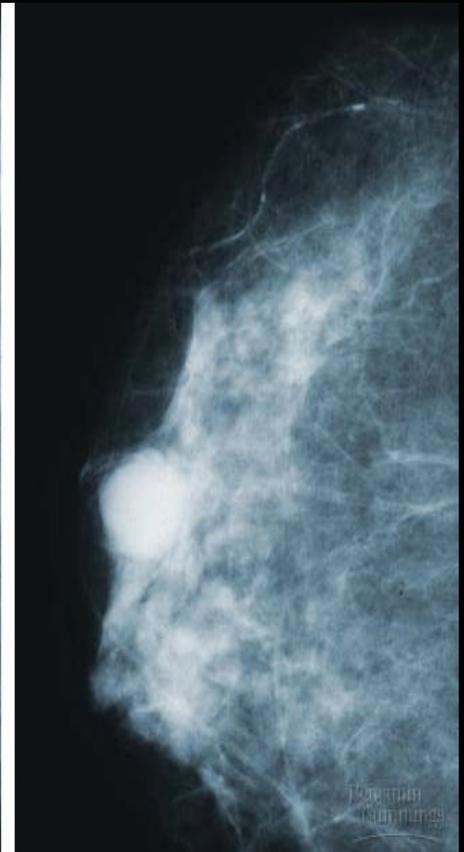
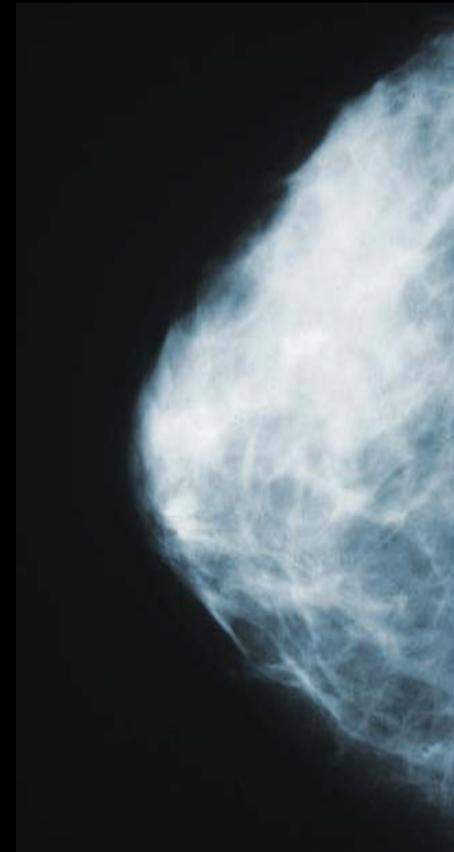


(b) Cancer cells

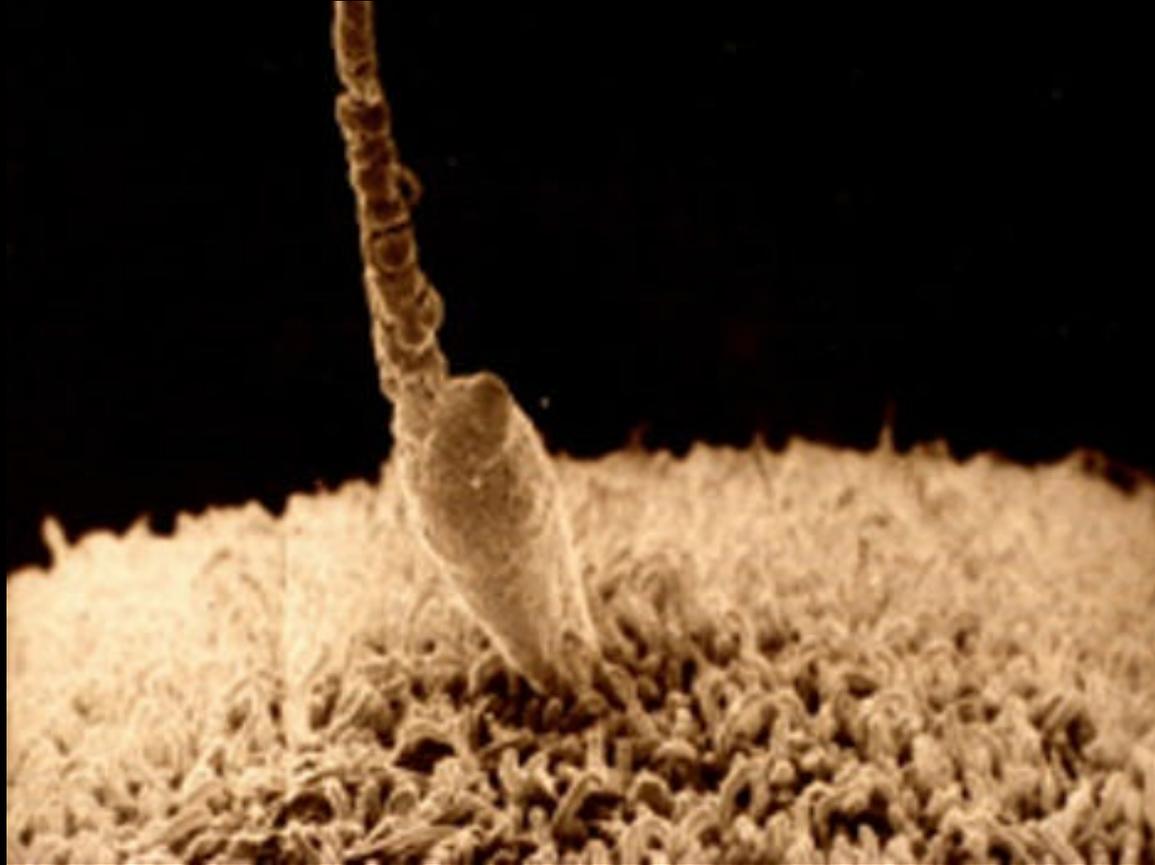
Uncontrolled Cell Division: Cancerous Cells



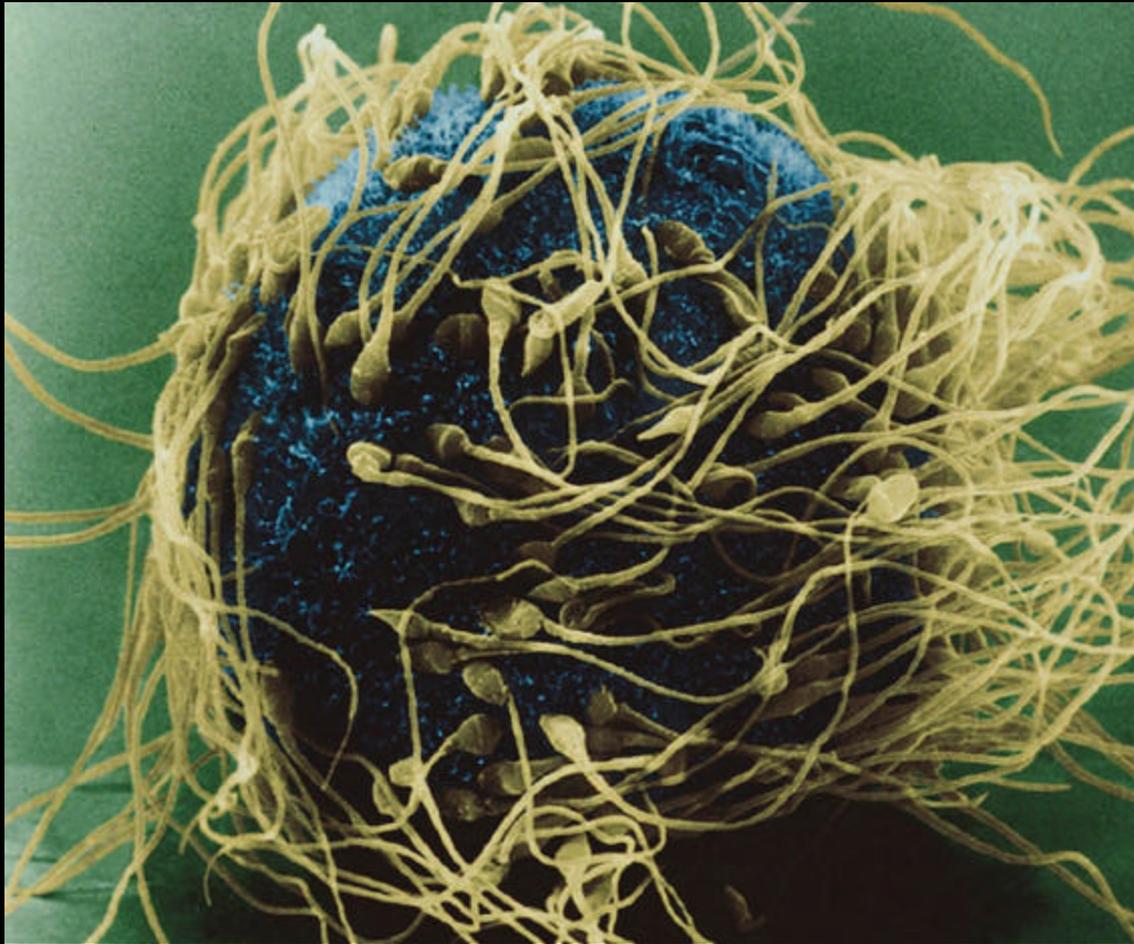
Uncontrolled Cell Division: Cancerous Cells



Cell Division in Sexual Reproduction: Meiosis



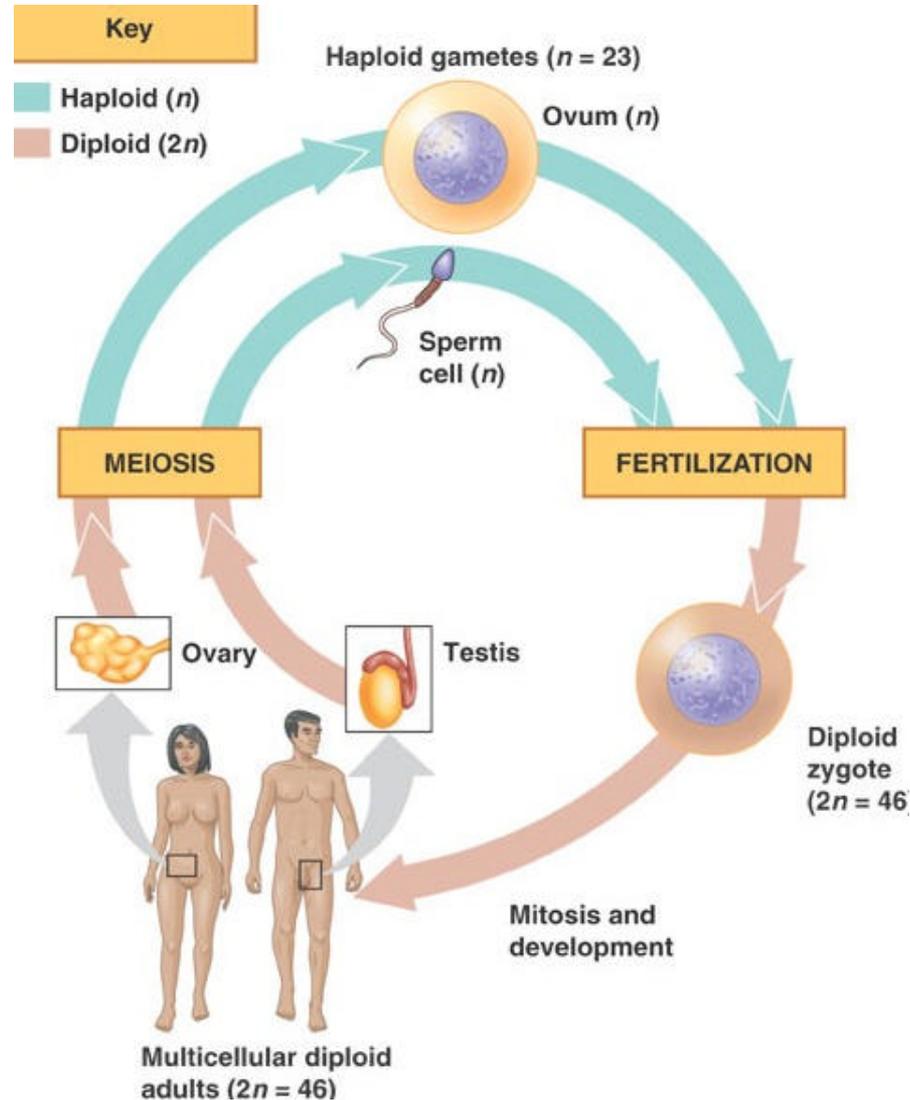
Meiosis: Oogenesis and Spermogenesis



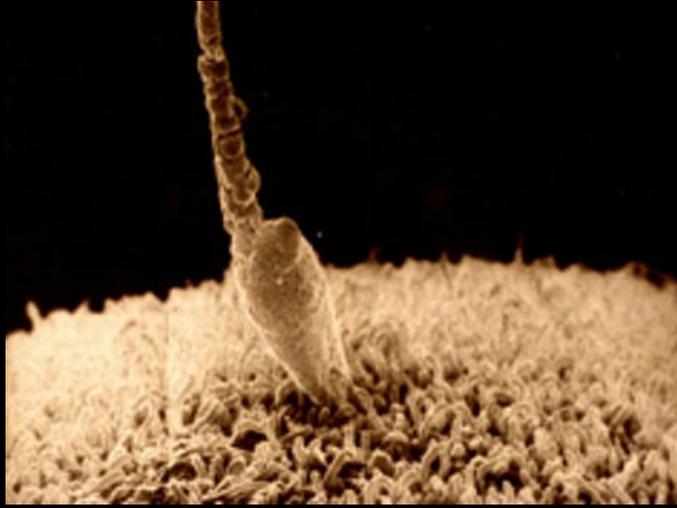
Cell Division in Sexual Reproduction: Meiosis

- Meiosis is the mechanism by which eukaryotic cells produce mature *sex cells or gametes*
- Meiosis produces four haploid cells (gametes)
- Meiosis involves partition of both cytoplasmic and nuclear structures
- Meiosis consists of Meiosis I and Meiosis II. Both phases are followed by cytokinesis.
- Meiosis I consists of four phases: prophase I, metaphase I, anaphase I, and telophase I.
- Meiosis II consists of four phases: prophase II, metaphase II, anaphase II, and telophase II.
- *Oogenesis* is the production of mature eggs; *spermiogenesis* is the production of mature sperm cells

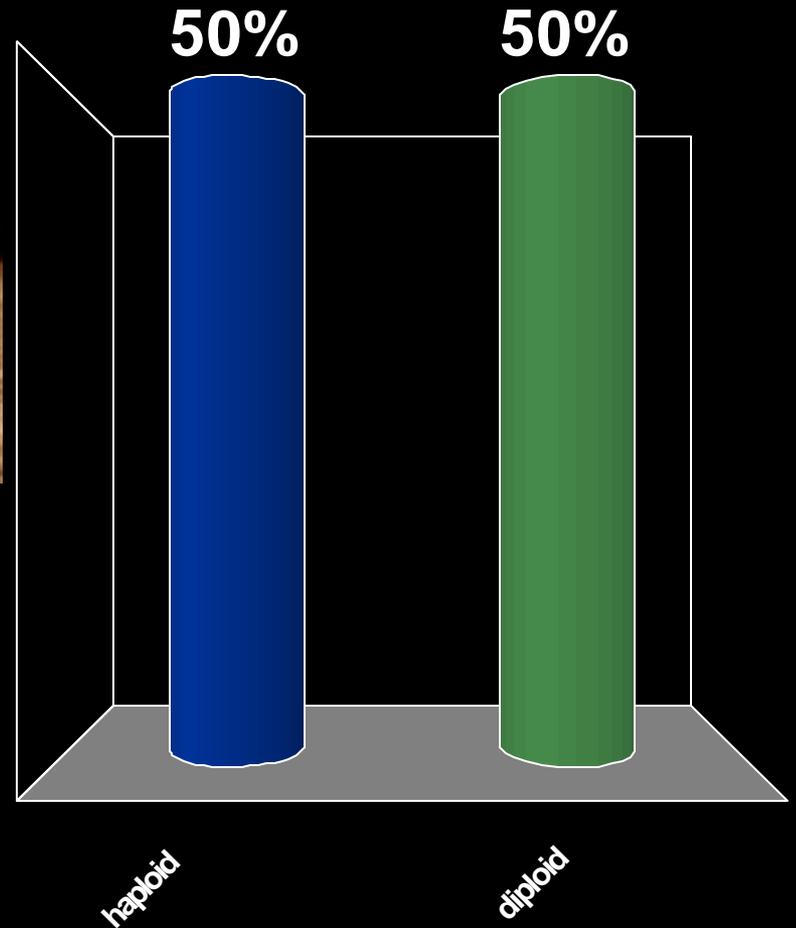
Meiosis and Sexual Reproduction



Mature gametes are:

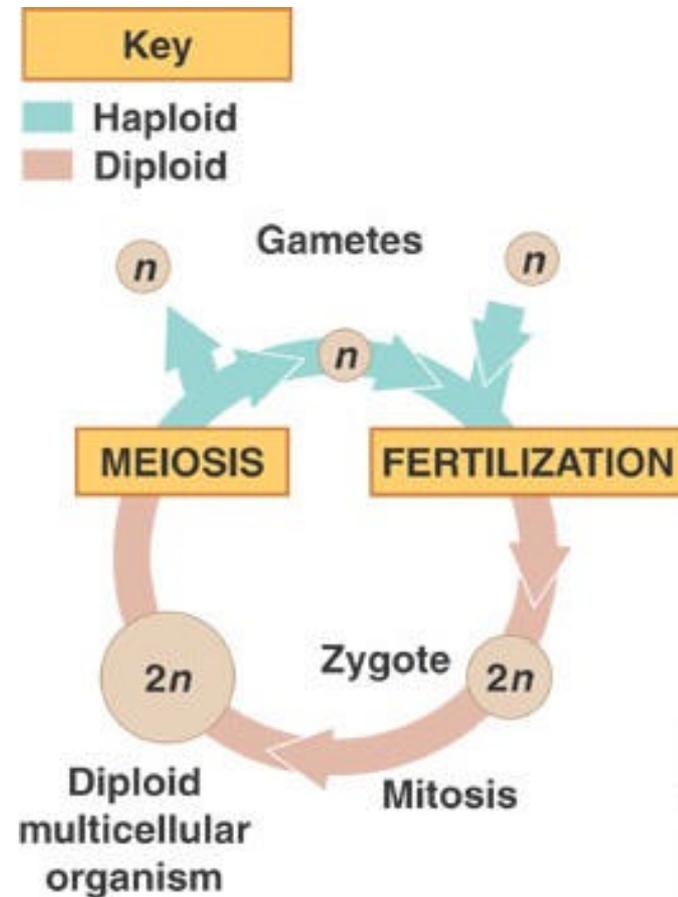


1. haploid
2. diploid



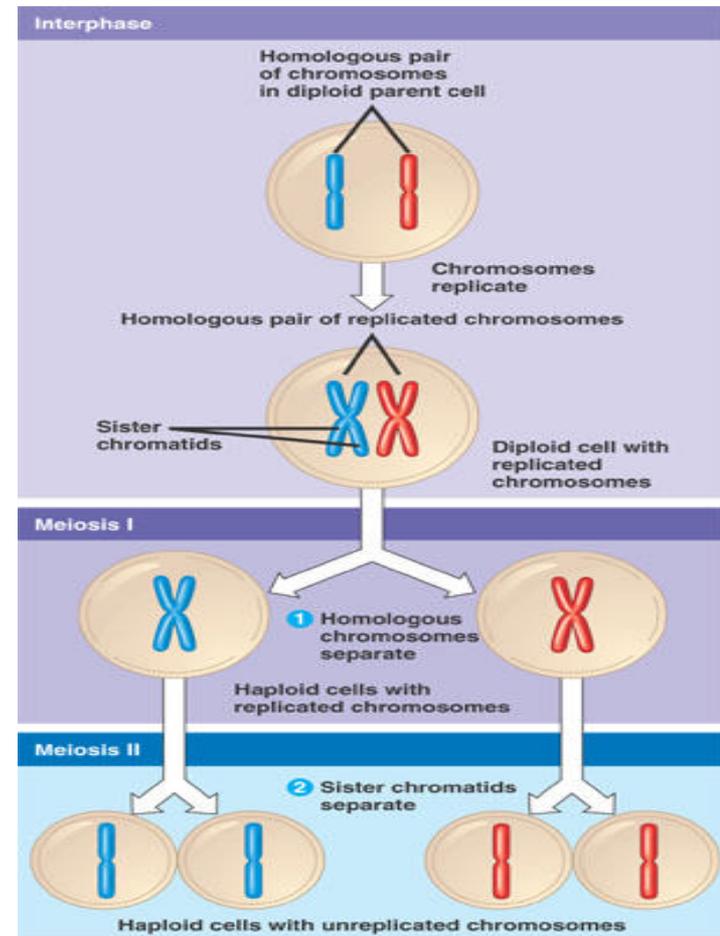
Meiosis and Sexual Reproduction

- Mature gametes (eggs and sperm cells) are produced after meiosis
- Mature gametes (haploid) carry on fertilization to produce a *zygote* (diploid).
- Meiosis ensures that the number of chromosomes is maintained from parents to offspring

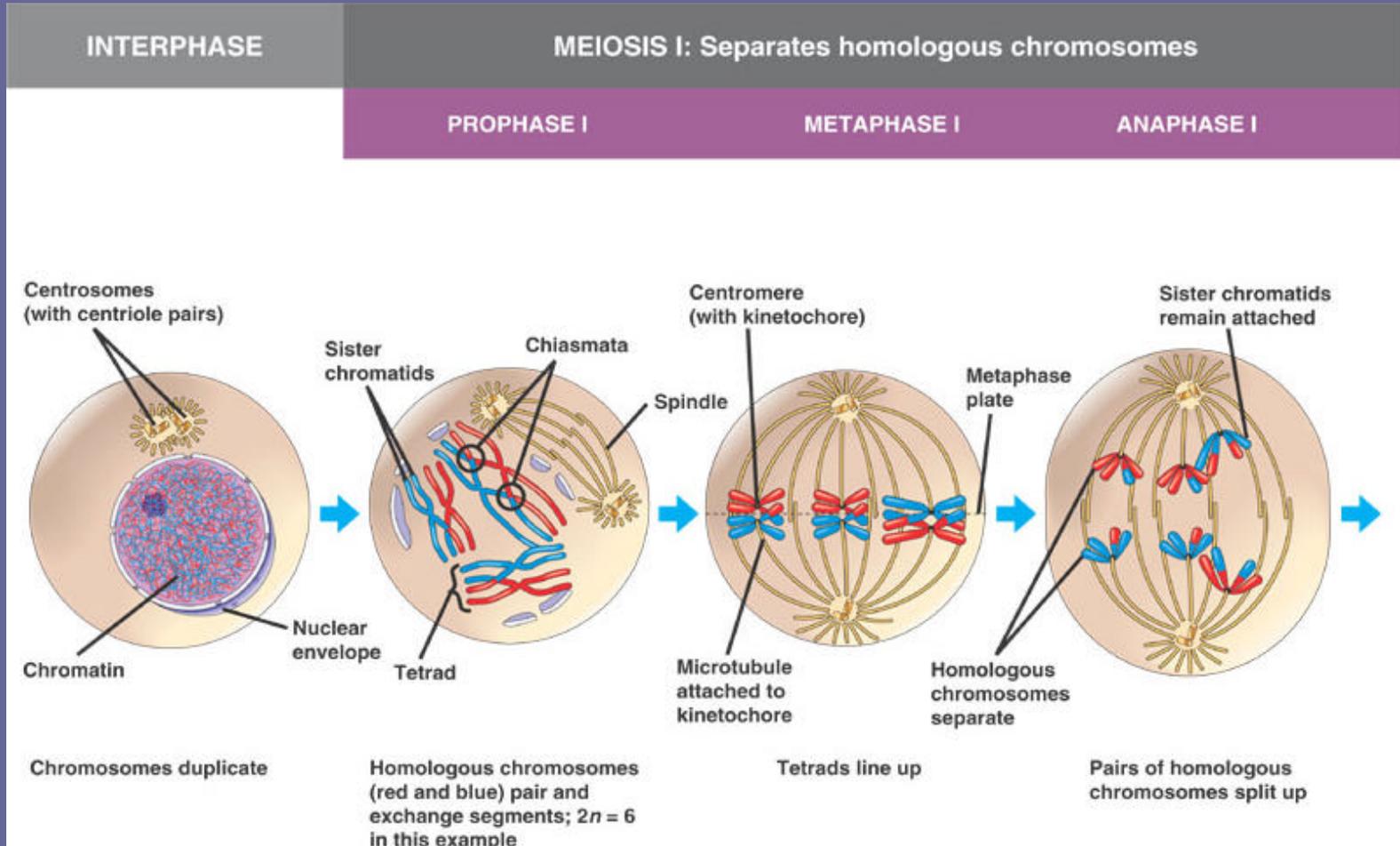


Meiosis: An Overview

- Meiosis consists of Meiosis I and Meiosis II. Cytokinesis follows after each phase

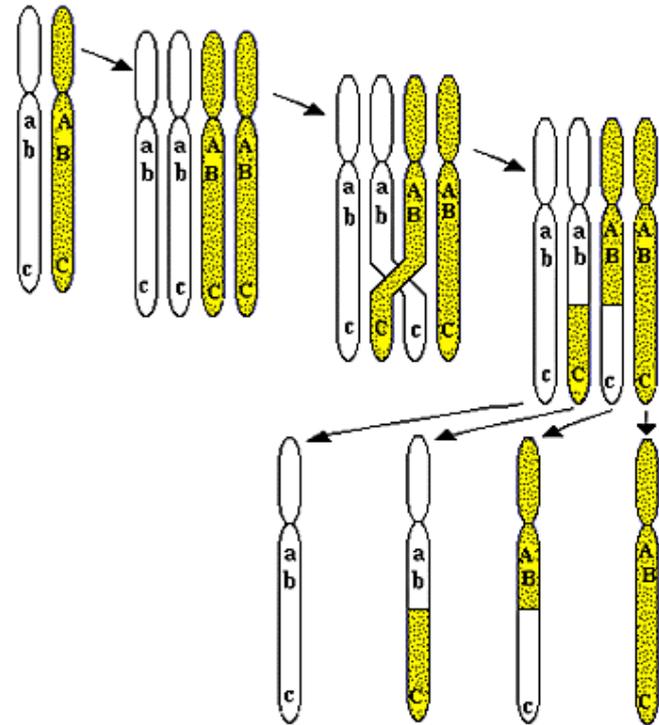


Phases of Meiosis I



Crossing Over (Prophase I)

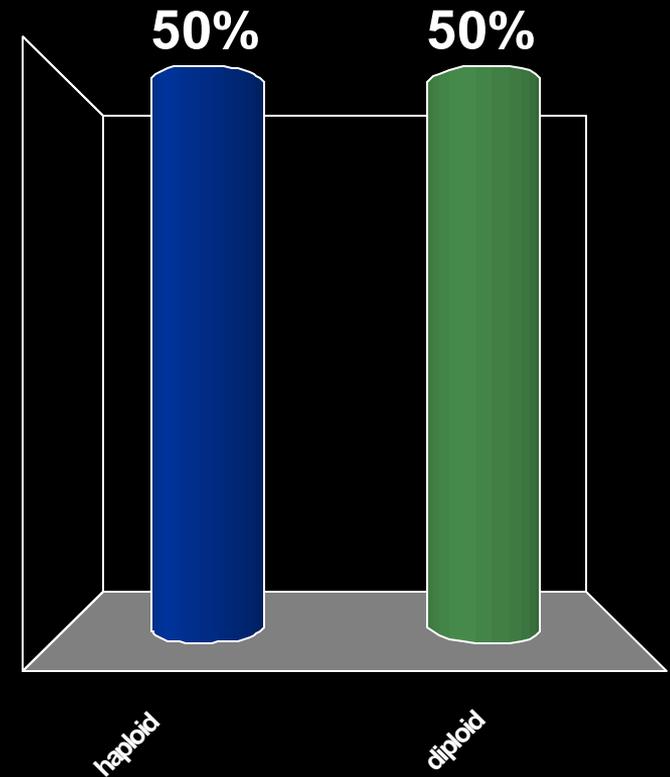
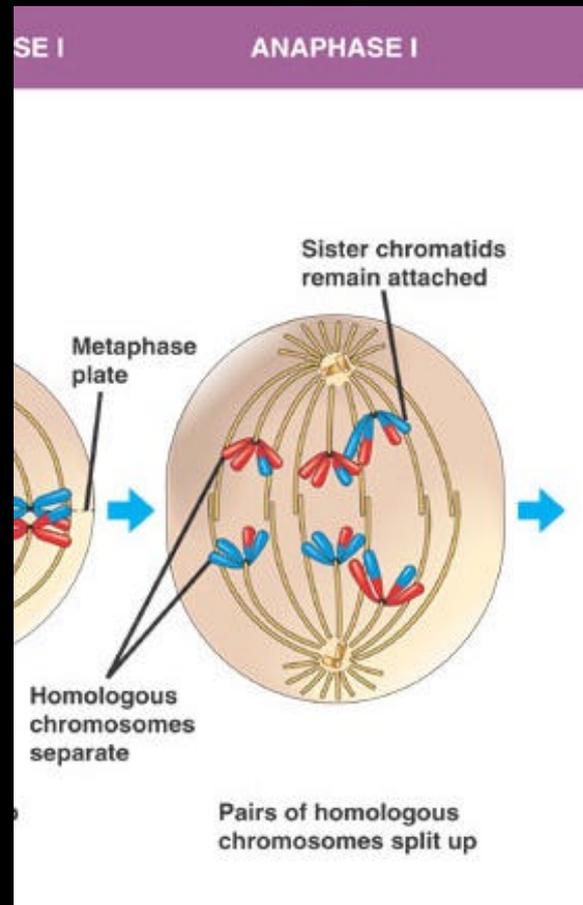
- Crossing over is the interchange of genetic material between homologous chromosomes
- Crossing over occurs during prophase I
- After crossing over, sets of four chromosomes or *tetrads* are formed



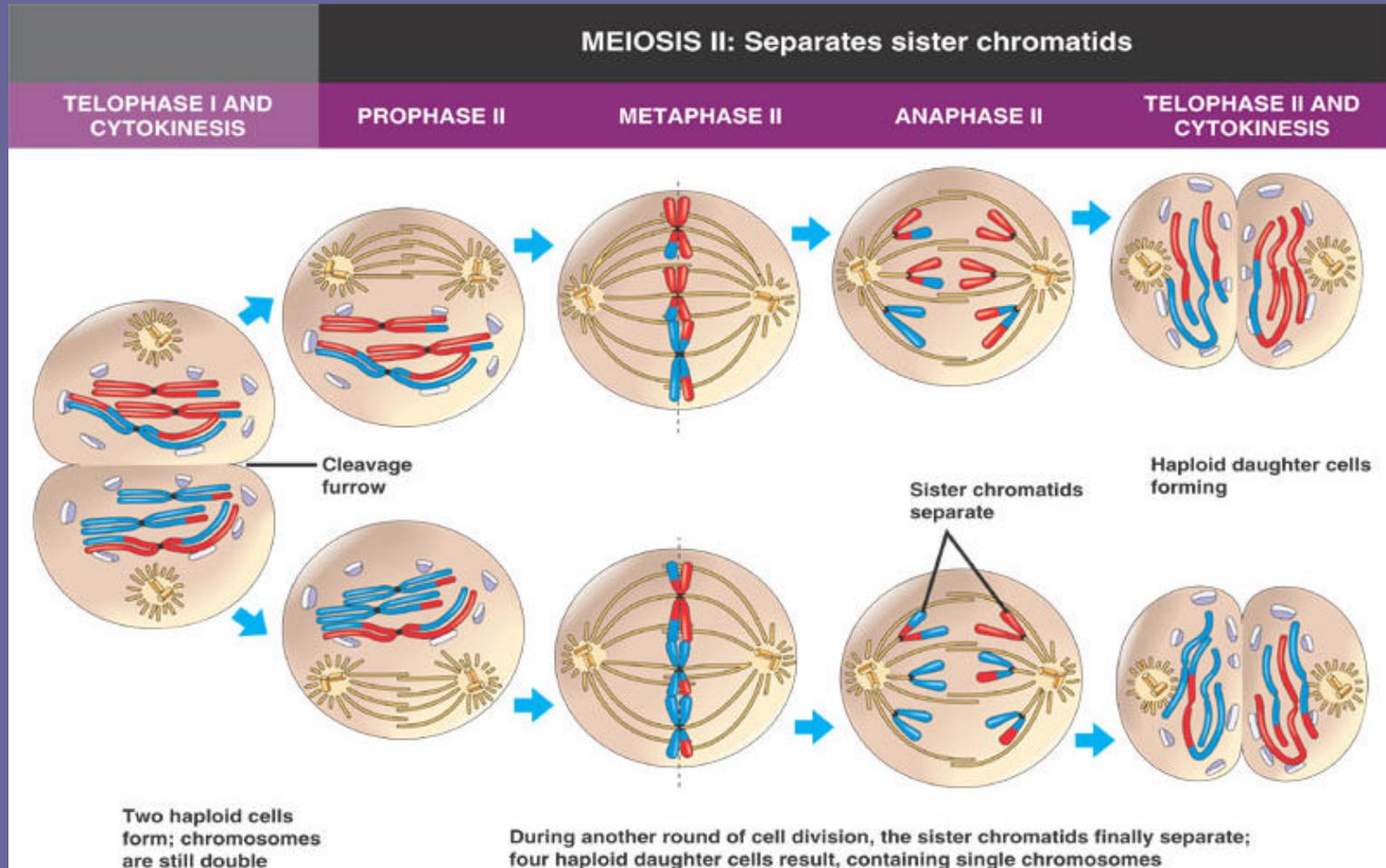
Crossing-over and recombination during meiosis

At the end of anaphase I, is the cell haploid or diploid?

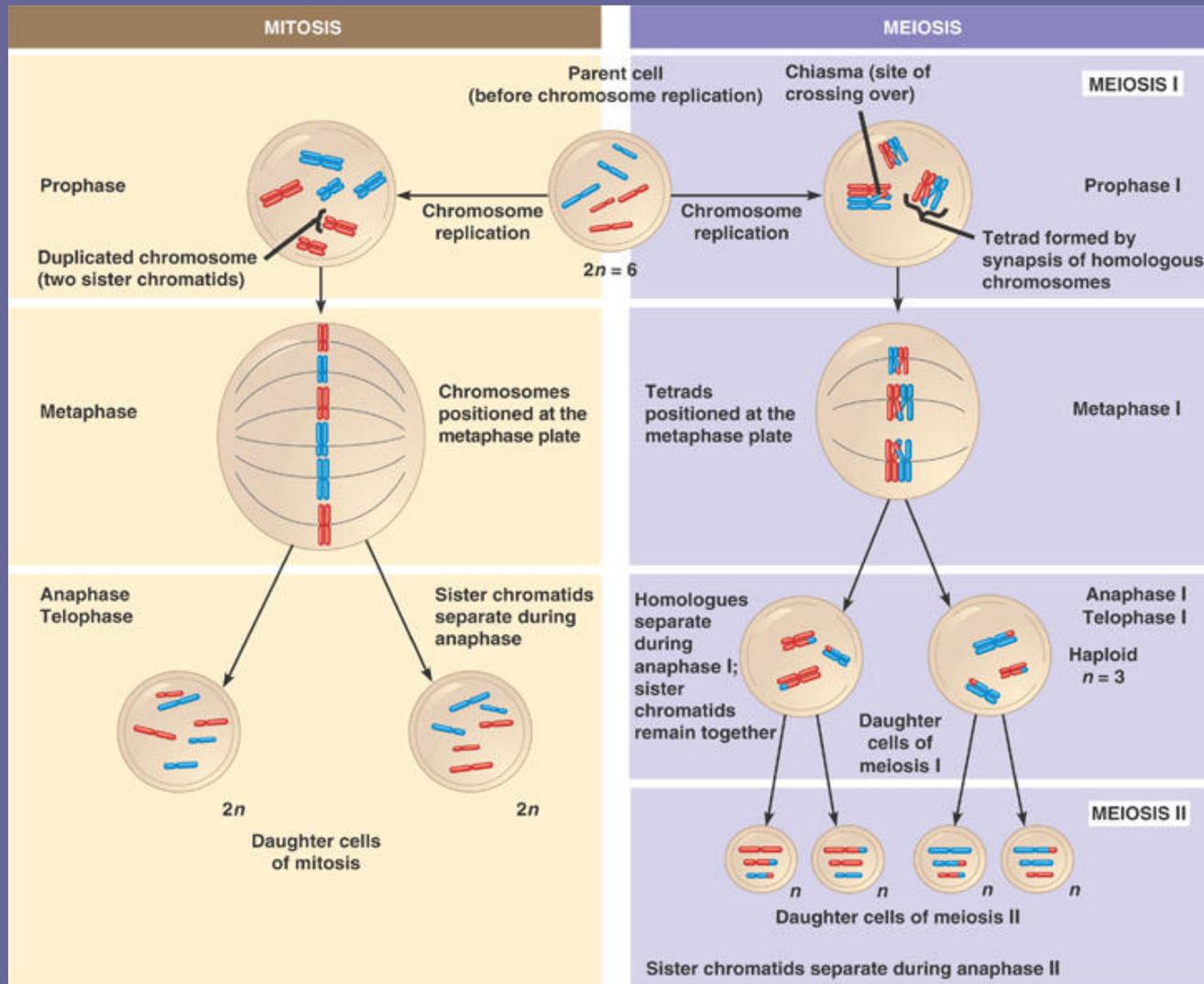
1. haploid
2. diploid



Phases of Meiosis II

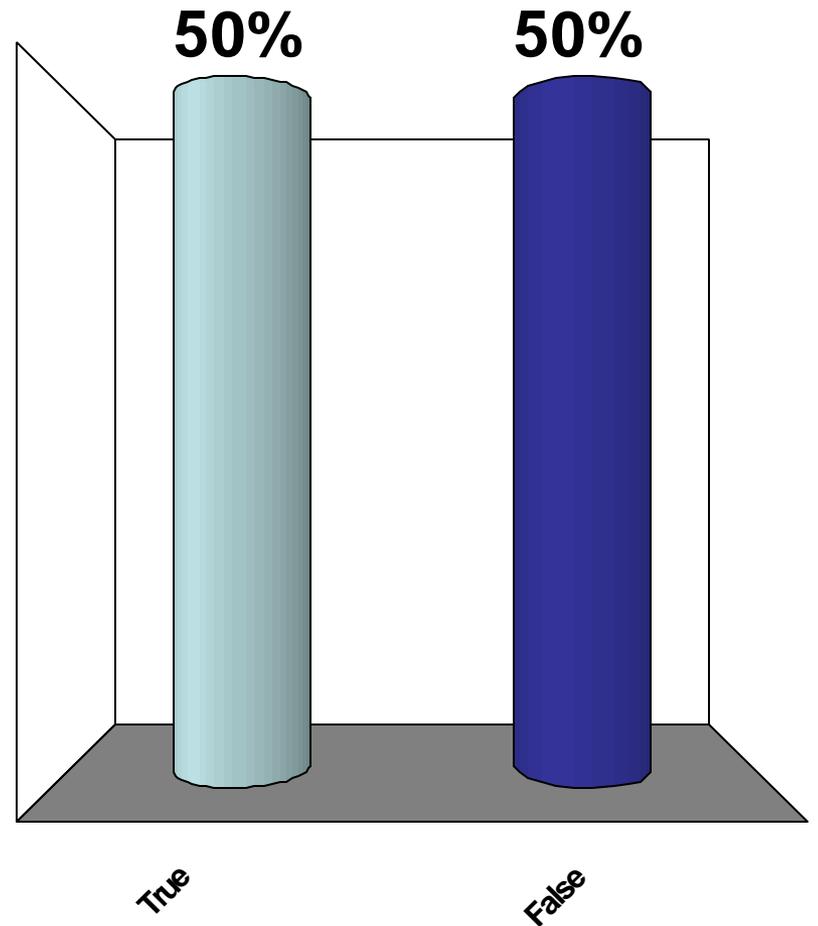


Mitosis and Meiosis Compared



At the end of meiosis I, two haploid cells are produced

1. True
2. False



At the end of meiosis II, two haploid cells (gametes) are produced

1. True
2. False

