# REPRODUKSI SEKSUAL & MEIOSIS
# KULIAH BIOLOGI

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# KERAGAMAN DARI SEBUAH KELUARGA

# REPRODUKSI (SEKSUAL VS ASEKSUAL)

- Organisme uniseluler→ reproduksi dengan Aseksual → replikasi DNA → pembelahan sel mitosis → gene yang diwariskan identik
- Pada organisme multiseluler → reproduksi seksual → melibatkan mitosis dan meiosis → lebih komplek → keragaman gene

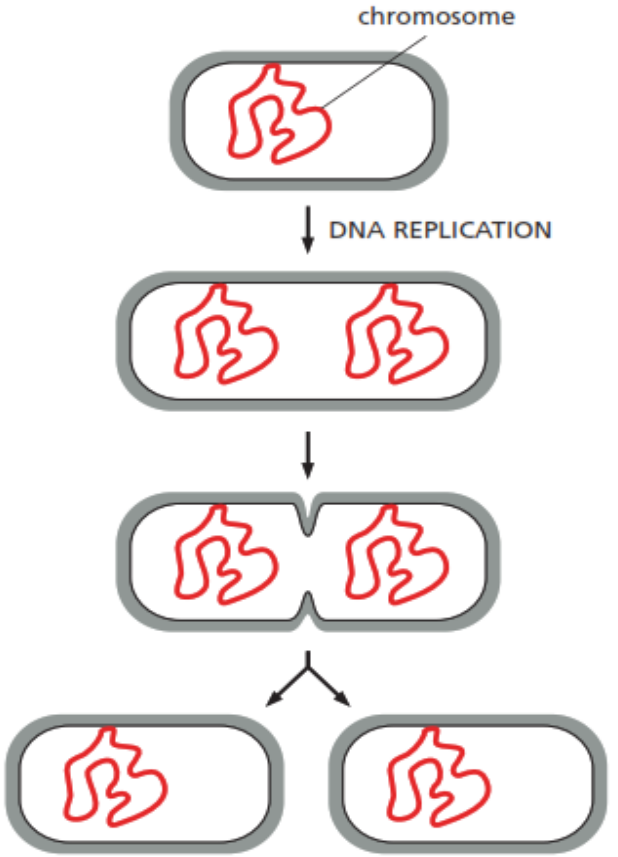
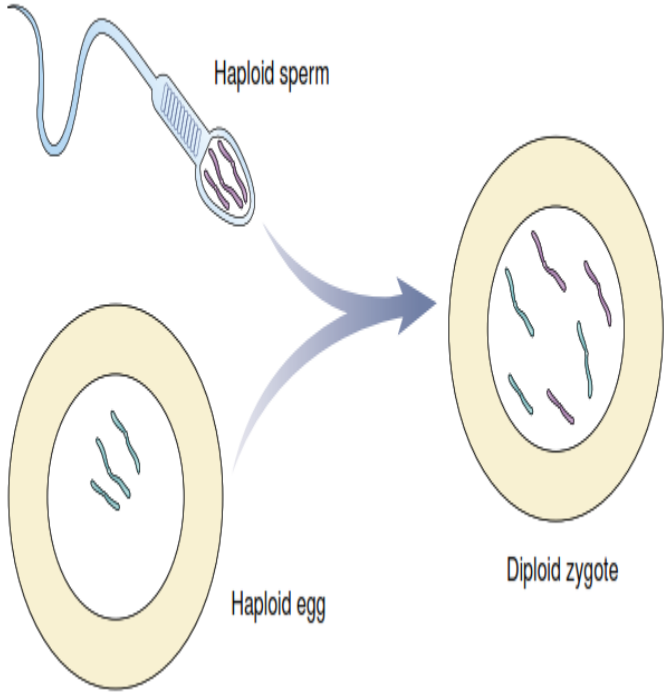



**Figure 19–1 Bacteria reproduce by simple cell division.** The division of one bacterium into two takes 20–25 minutes under ideal growth conditions.




**Diploid cells carry chromosomes from two parents.** A diploid cell contains two versions of each chromosome, one contributed by the haploid egg of the mother, the other by the haploid sperm of the father.

# REPRODUKSI SEKSUAL MELIBATKAN SEL HAPLOID DAN DIPLOID

## Sel Haploid

- Sel yang memiliki 1 set kromosom, biasa disebut juga sel gamet atau germ-cells
- Hampir semua organisme memiliki sel gamet (female dan male yang berbeda), misal pada hewan, sel telur dan sperma yang memiliki perbedaan ukuran
- Dalam peristiwa fertilisasi → penggabungan 2 sel haploid menjadi sel diploid (zygote)
- Hampir seluruh siklus hidup organisme multiseluler merupakan fase diploid sel, hanya saat pembuahan diperlukan sel haploid (gamet)
- Sel haploid dihasilkan dari diploid yang mengalami MEIOSIS

## Sel Diploid

- Sel yang memiliki 2 set kromosom
- Organisme yang melakukan reproduksi seksual memiliki 2 set kromosom → 1 set dari female (maternal chromosome) dan 1 set dari male (paternal chromosome)
- Sel diploid merupakan sel somatik

# HAPLOID DAN DIPLOID

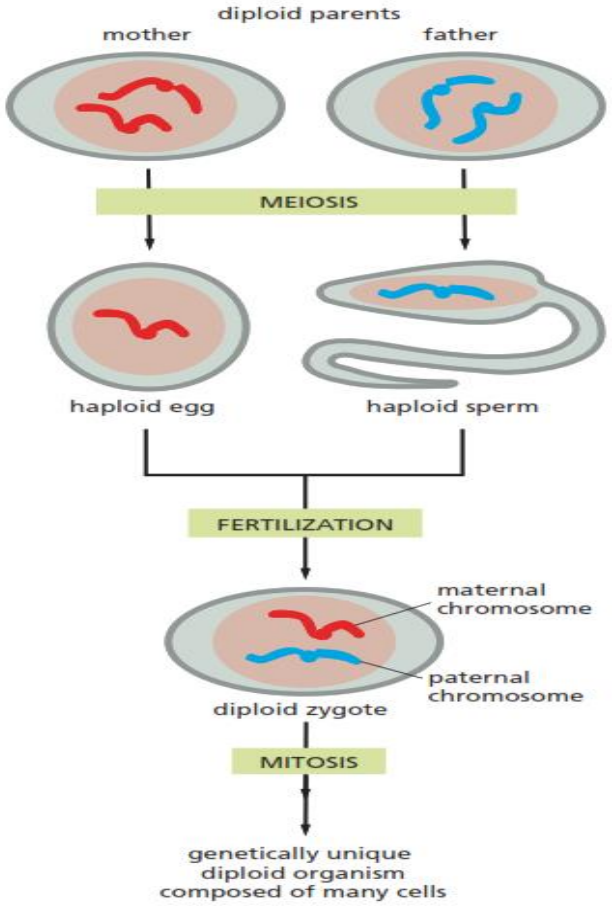
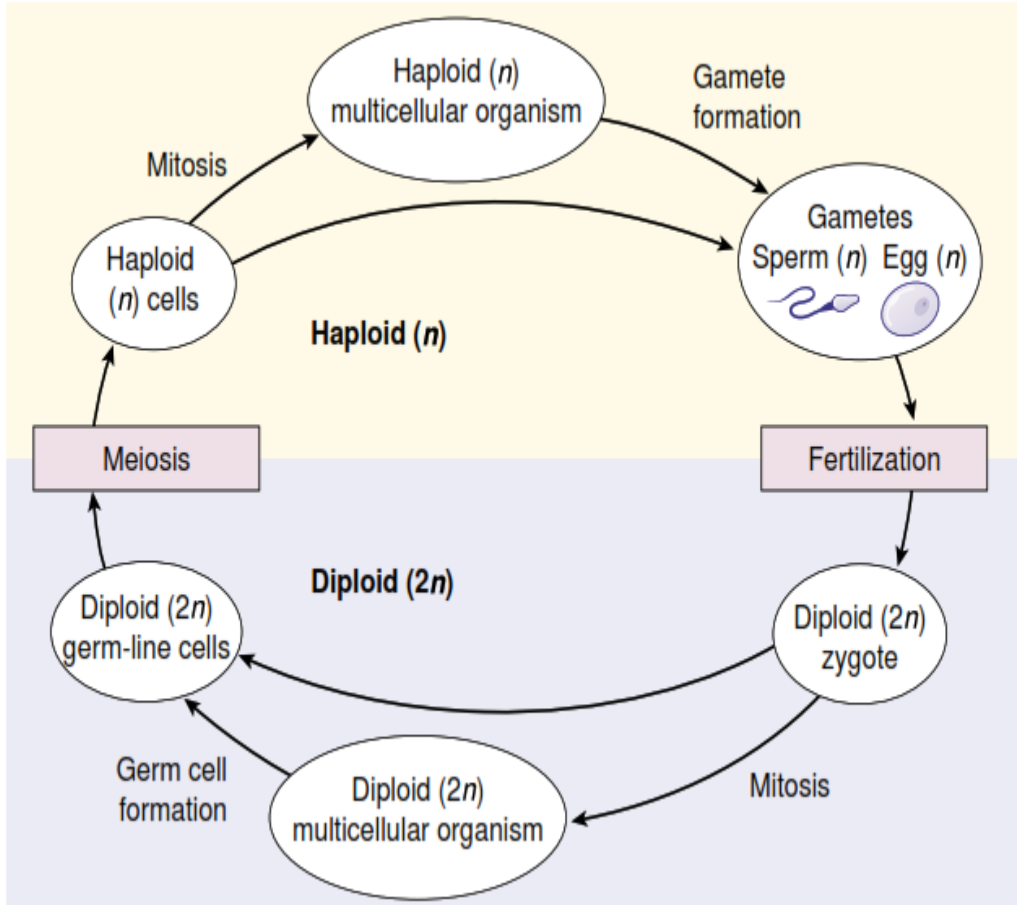



**Figure 19–4 Sexual reproduction involves both haploid and diploid cells.** Sperm and egg are produced by meiosis of diploid germ-line cells. During fertilization, a haploid egg and a haploid sperm fuse to form a diploid zygote. For simplicity, only one chromosome is shown for each gamete, and the sperm cell has been greatly enlarged. Human gametes have 23 chromosomes, and the egg is much larger than the sperm (see, for example, Figure 19–3).




**Alternation of generations.** In sexual reproduction, haploid cells or organisms alternate with diploid cells or organisms.

# MEIOSIS

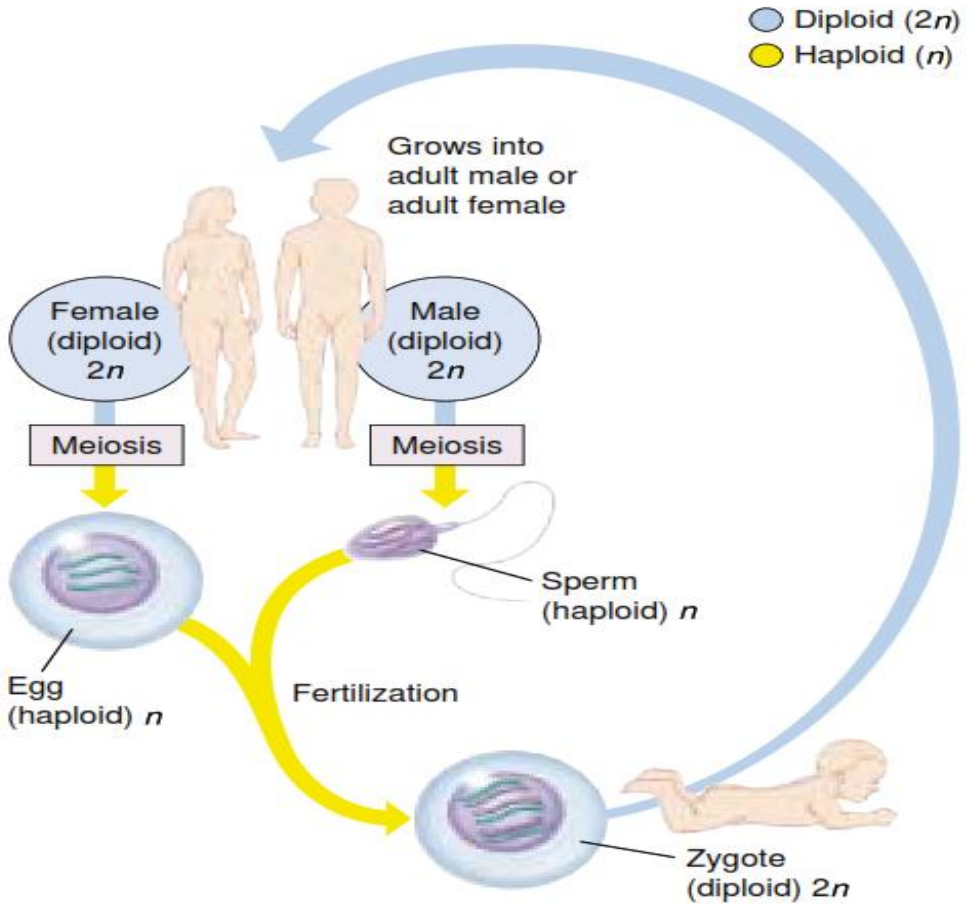
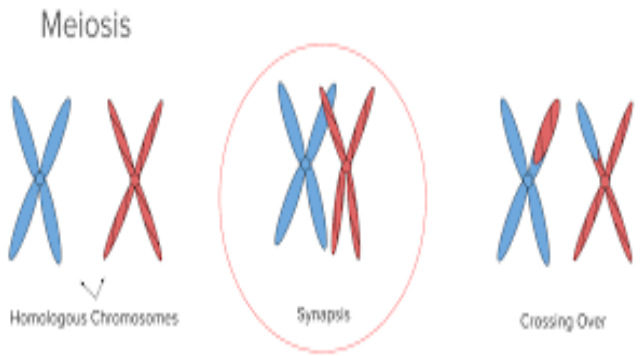


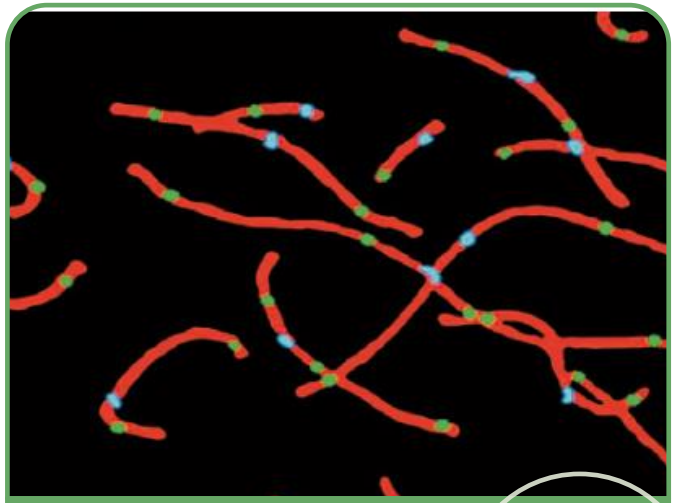

**FIGURE 12.4**
**The sexual life cycle.** In animals, the completion of meiosis is followed soon by fertilization. Thus, the vast majority of the life cycle is spent in the diploid stage.

- Meiosis is a process of cell division in which the number of chromosomes in certain cells is halved during gamete formation.
- In the sexual life cycle, there is an alternation of diploid and haploid generations.
- Only a few years after Walther Fleming's discovery of chromosomes in 1882, Belgian cytologist Pierre-Joseph van Beneden was surprised to find different numbers of chromosomes in different types of cells in the roundworm
- Specifically, he observed that the gametes (eggs and sperm) each contained two chromosomes, while the somatic (nonreproductive) cells of embryos and mature individuals each contained four.

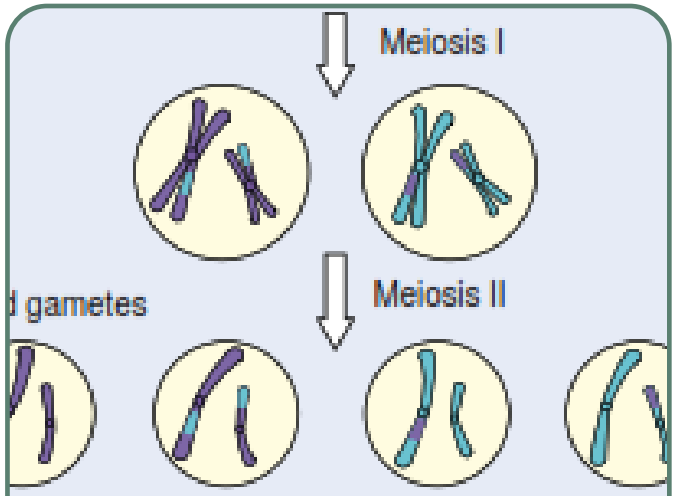
# MEIOSIS MEMILIKI 3 KARAKTERISTIK




Sinapsis



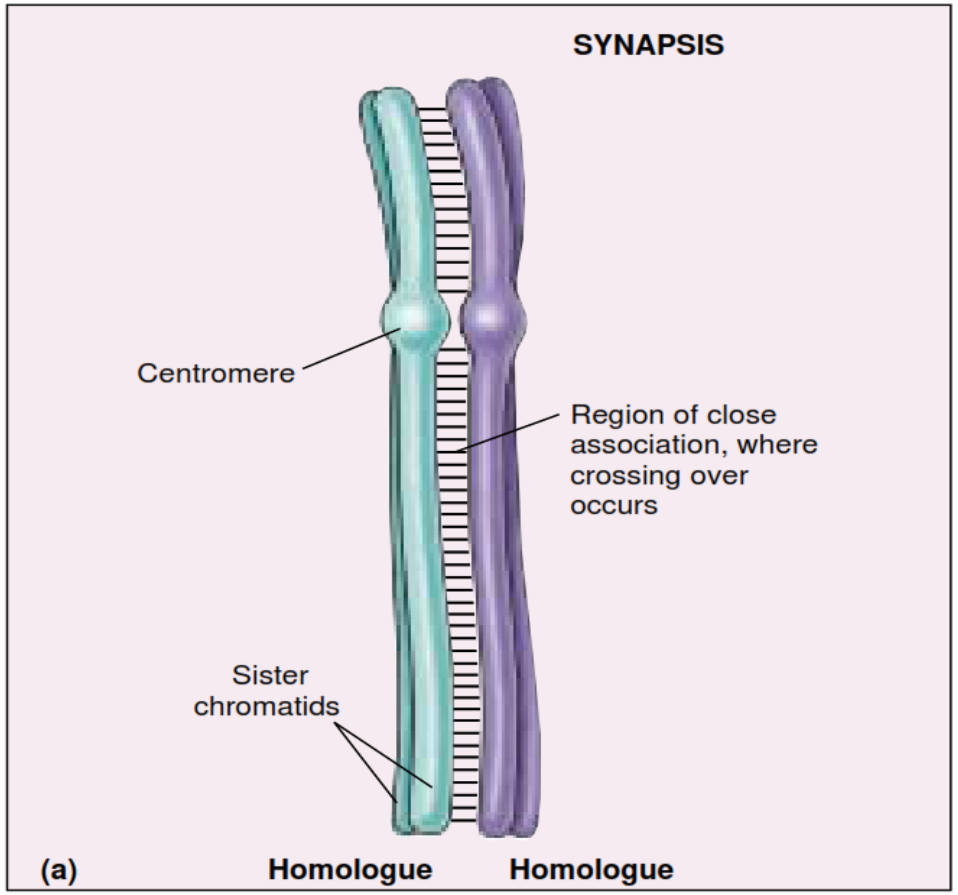
Rekombinasi homolog




Reduction division

# SYNAPSIS

- The first unique feature of meiosis happens early during the first nuclear division. Following chromosome replication, homologous chromosomes, or homologues, pair all along their length.
- The process of forming these complexes of homologous chromosomes is called synapsis



# HOMOLOGUE RECOMBINATION

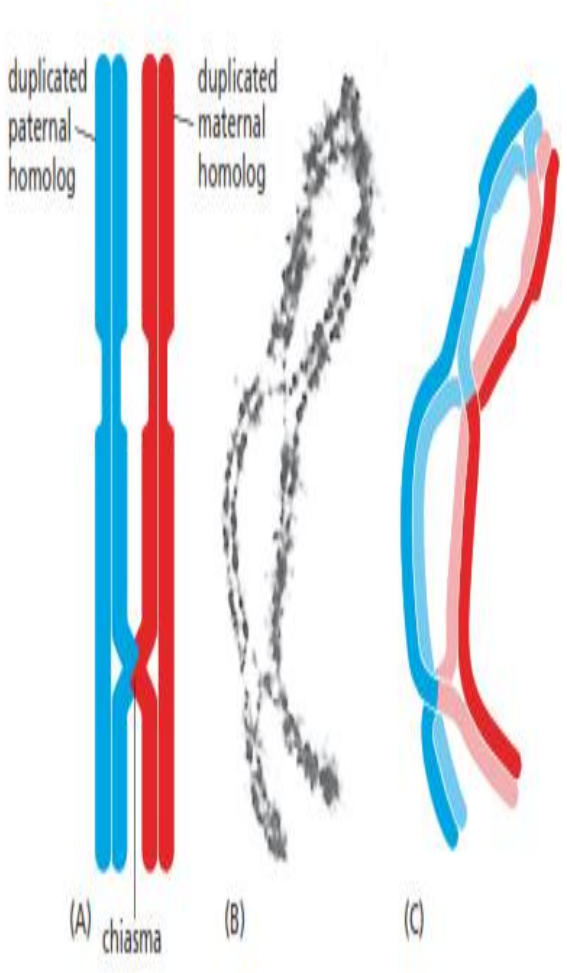



**Figure 19-11 Crossover events create chiasmata between non-sister chromatids in each bivalent.** (A) Schematic set of paired homologs in which one crossover event has occurred, creating a single chiasma. (B) Micrograph of a grasshopper bivalent with three chiasmata. (C) As the maternal and paternal homologs start to separate in meiosis I, chiasmata like those shown here help to hold the bivalent together. (B, courtesy of Bernard John.)

- **Homologue recombination** a process in which two identical or very similar nucleotide sequences exchange genetic information→ meiosis I Prophase
- The exchange process that occurs between paired chromosomes is called **crossing over**

# HOMOLOGUE RECOMBINATION

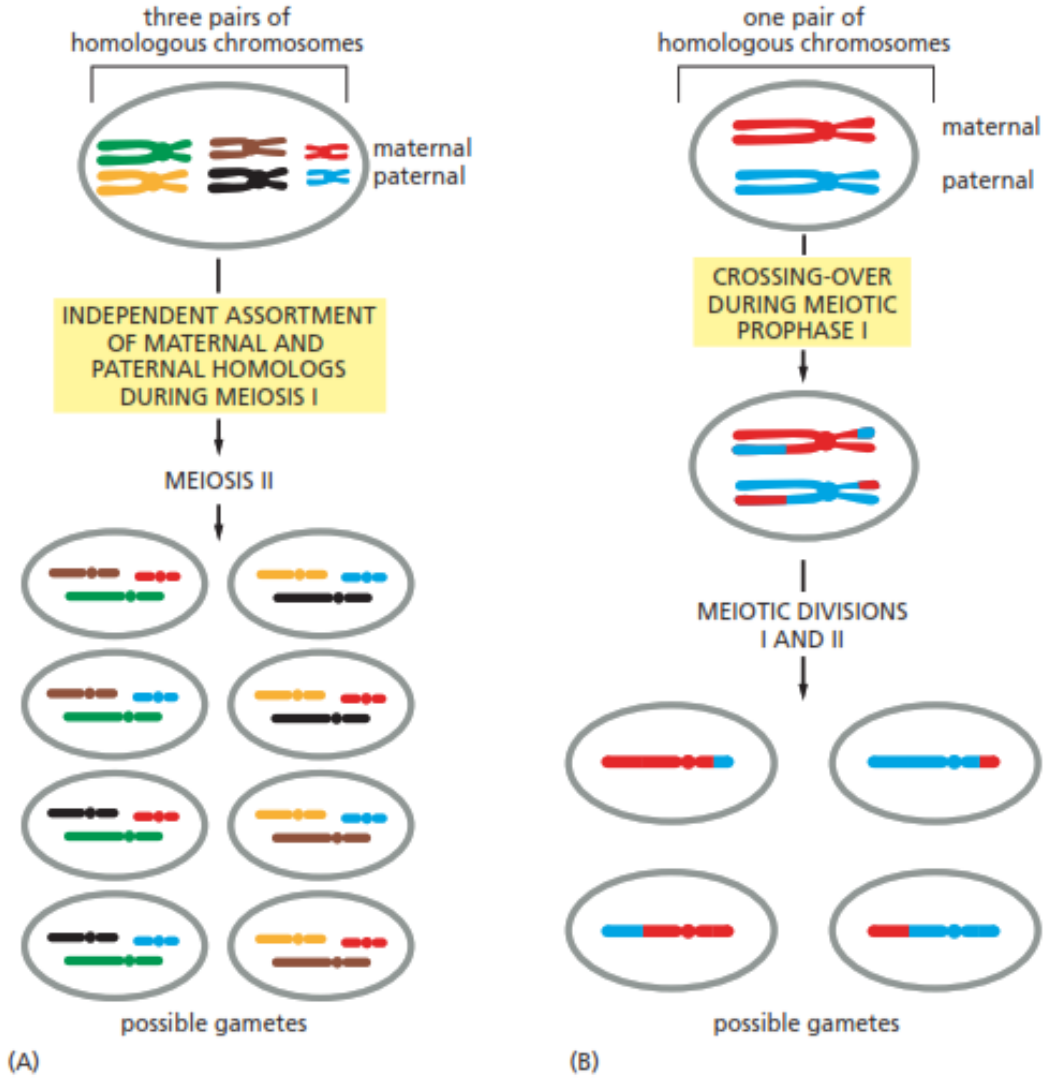



**Figure 19–15 Two kinds of genetic reassortment generate new chromosome combinations during meiosis.** (A) The independent assortment of the maternal and paternal homologs during meiosis produces $2^n$ different haploid gametes for an organism with $n$ chromosomes. Here $n = 3$, and there are $2^3$, or 8, different possible gametes. For simplicity, chromosome crossing-over is not shown here. (B) Crossing-over during meiotic prophase I exchanges segments of DNA between homologous chromosomes and thereby reassorts genes on each individual chromosome. For simplicity, only a single pair of homologous chromosomes is shown. Both independent chromosome assortment and crossing-over occur during every meiosis.

# REDUCTION DIVISION

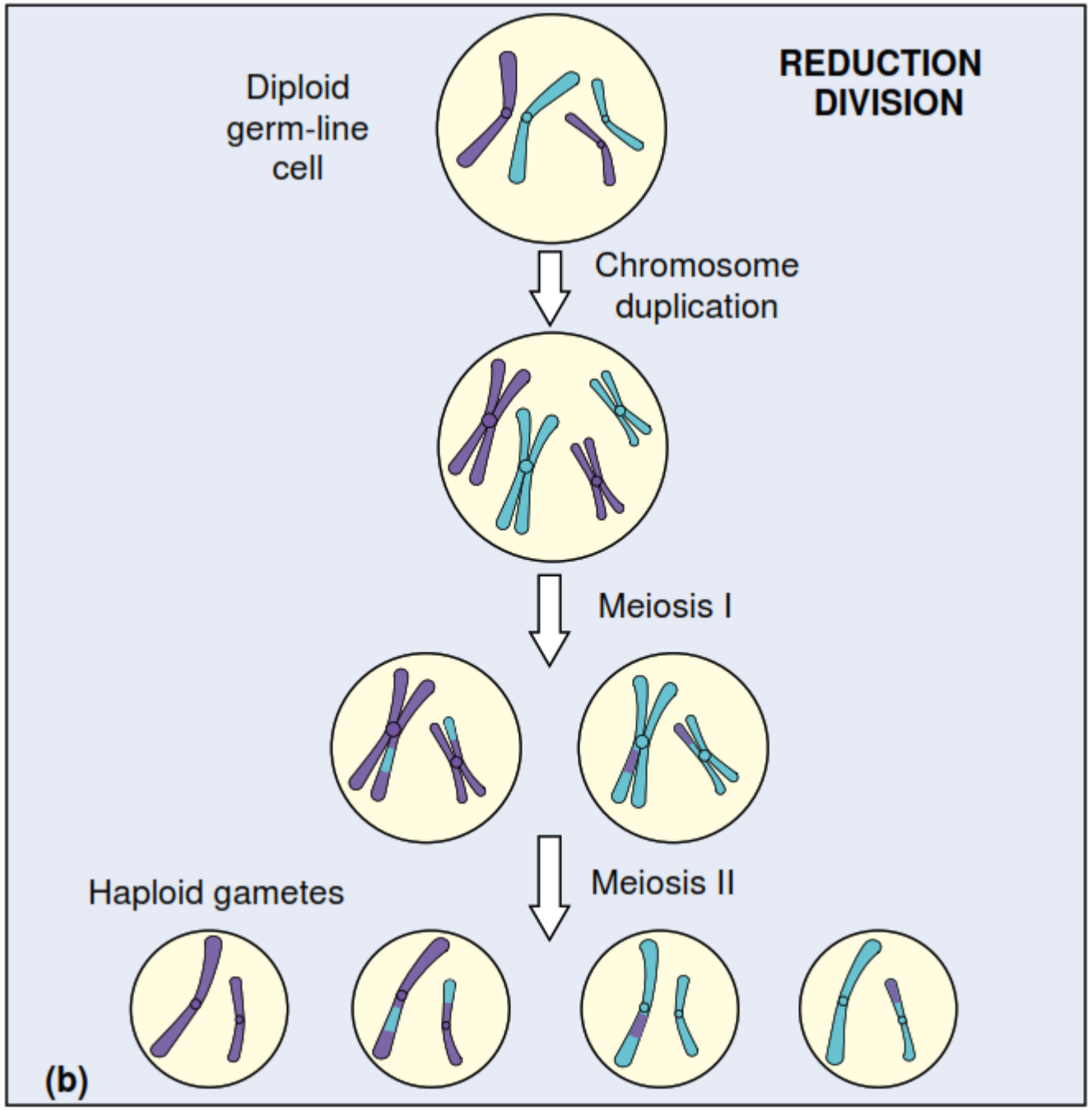
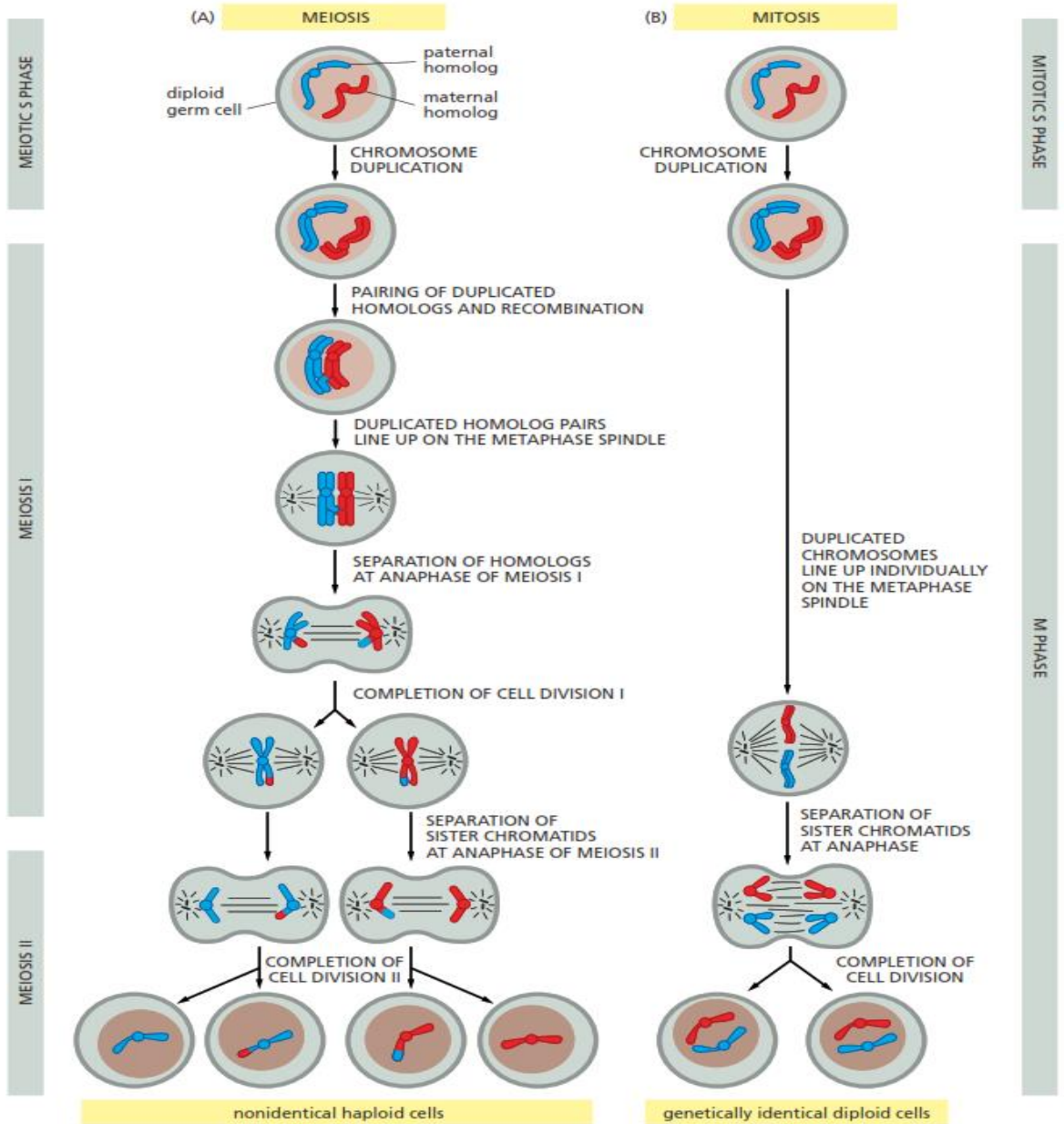



**Figure 19–15 Two kinds of genetic reassortment generate new chromosome combinations during meiosis.** (A) The independent assortment of the maternal and paternal homologs during meiosis produces $2^n$ different haploid gametes for an organism with $n$ chromosomes. Here $n = 3$, and there are $2^3$, or 8, different possible gametes. For simplicity, chromosome crossing-over is not shown here. (B) Crossing-over during meiotic prophase I exchanges segments of DNA between homologous chromosomes and thereby reassorts genes on each individual chromosome. For simplicity, only a single pair of homologous chromosomes is shown. Both independent chromosome assortment and crossing-over occur during every meiosis.

**Figure 19–7 Meiosis generates four nonidentical haploid cells, whereas mitosis produces two identical diploid cells.** As in Figure 19–4, only one pair of homologous chromosomes is shown. (A) In meiosis, two cell divisions are required after chromosome duplication to produce haploid cells. Each diploid cell that enters meiosis therefore produces four haploid cells, whereas (B) each diploid cell that divides by mitosis produces two diploid cells. Although mitosis and meiosis II are usually accomplished within hours, meiosis I can last days, months, or even years, because of the long time spent in prophase I.



# MEIOSIS

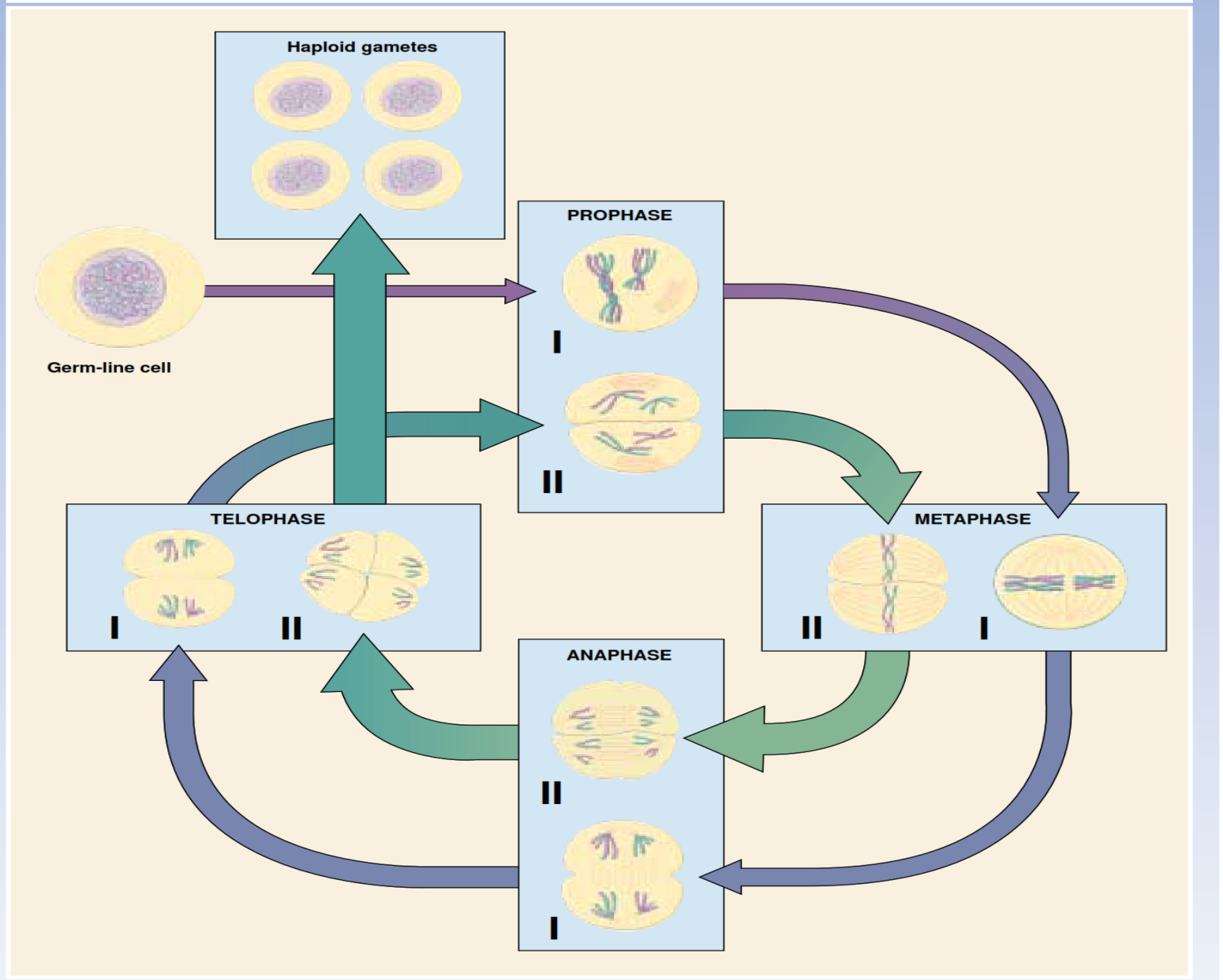



**FIGURE 12.15**