

**(a) Hydra**

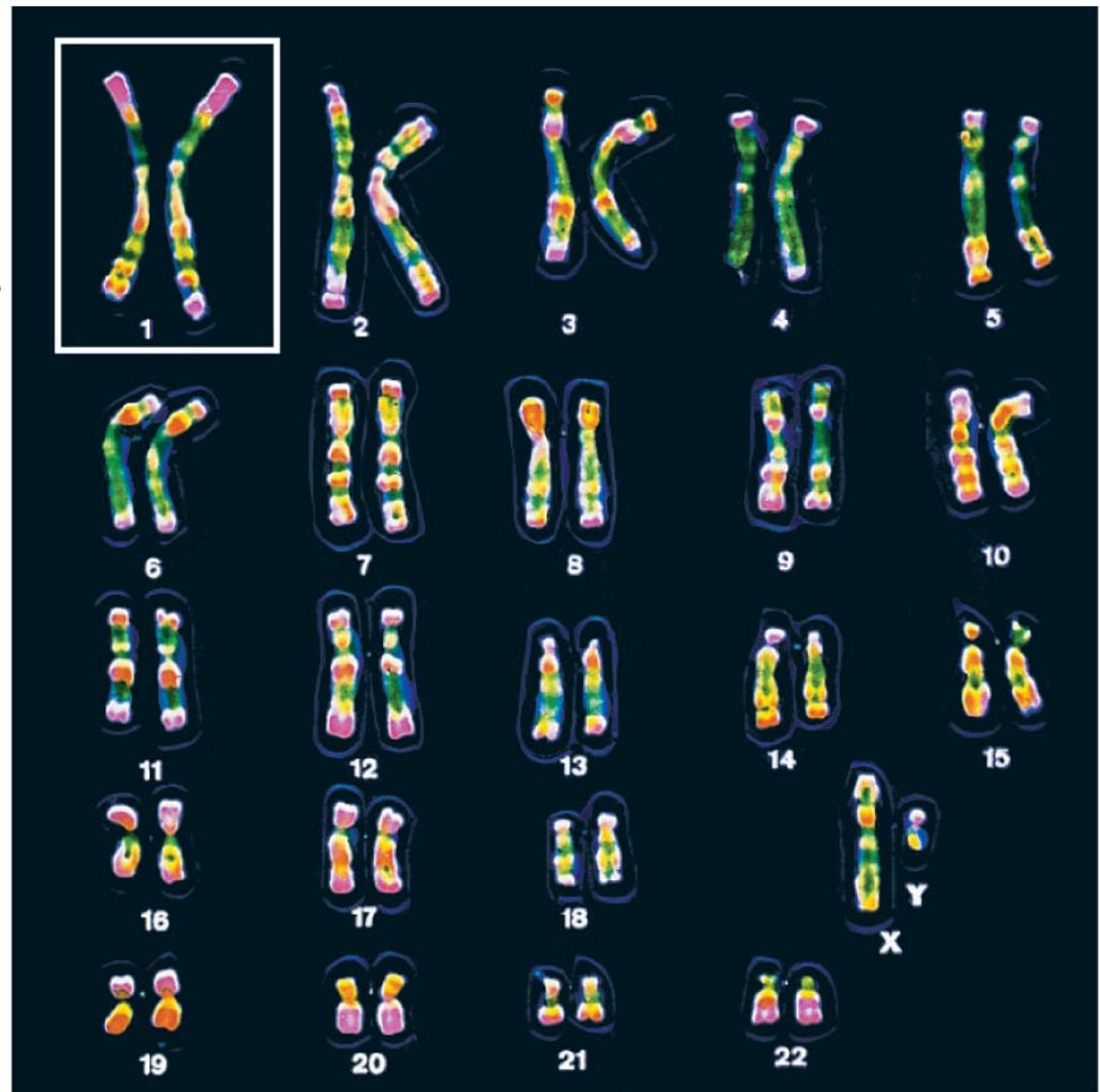
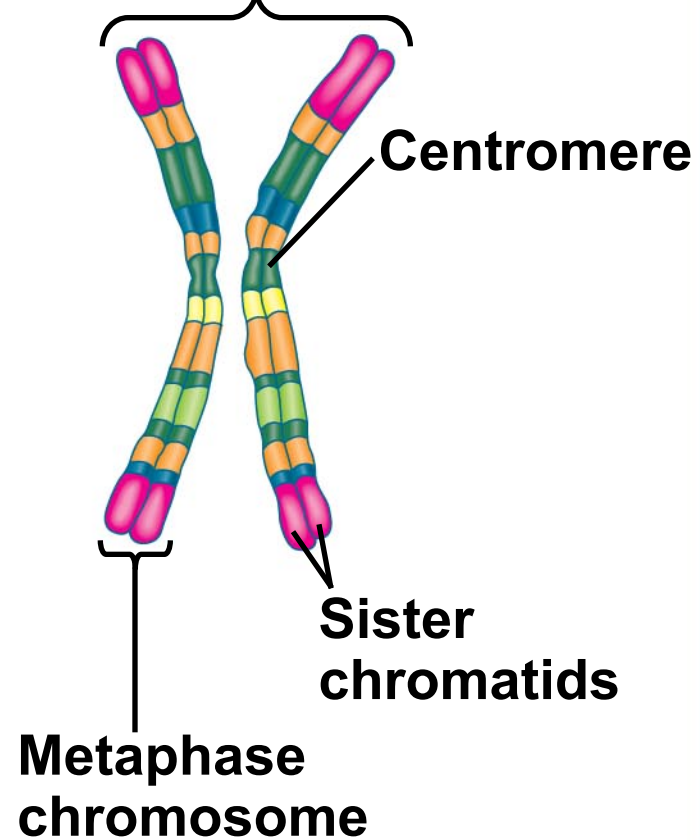
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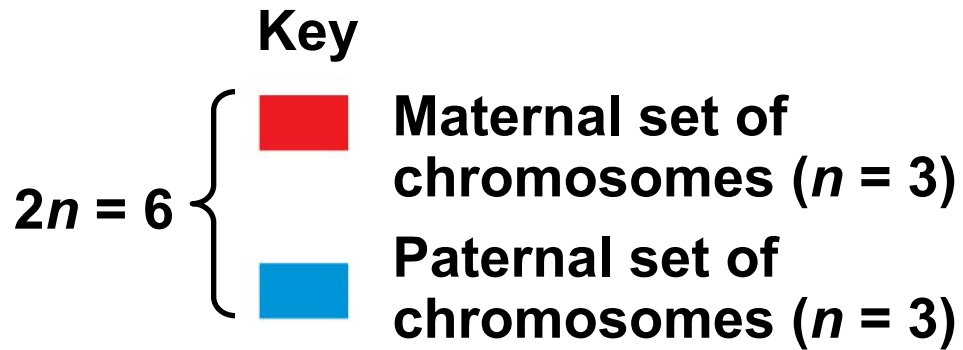


**(b) Redwoods**

5  $\mu\text{m}$

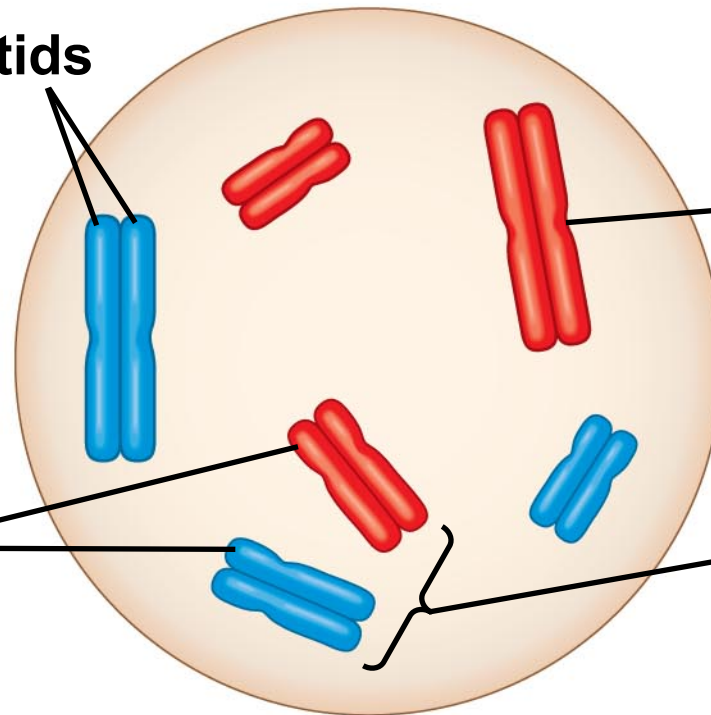
Pair of homologous  
replicated chromosomes





**Two sister chromatids  
of one replicated  
chromosome**

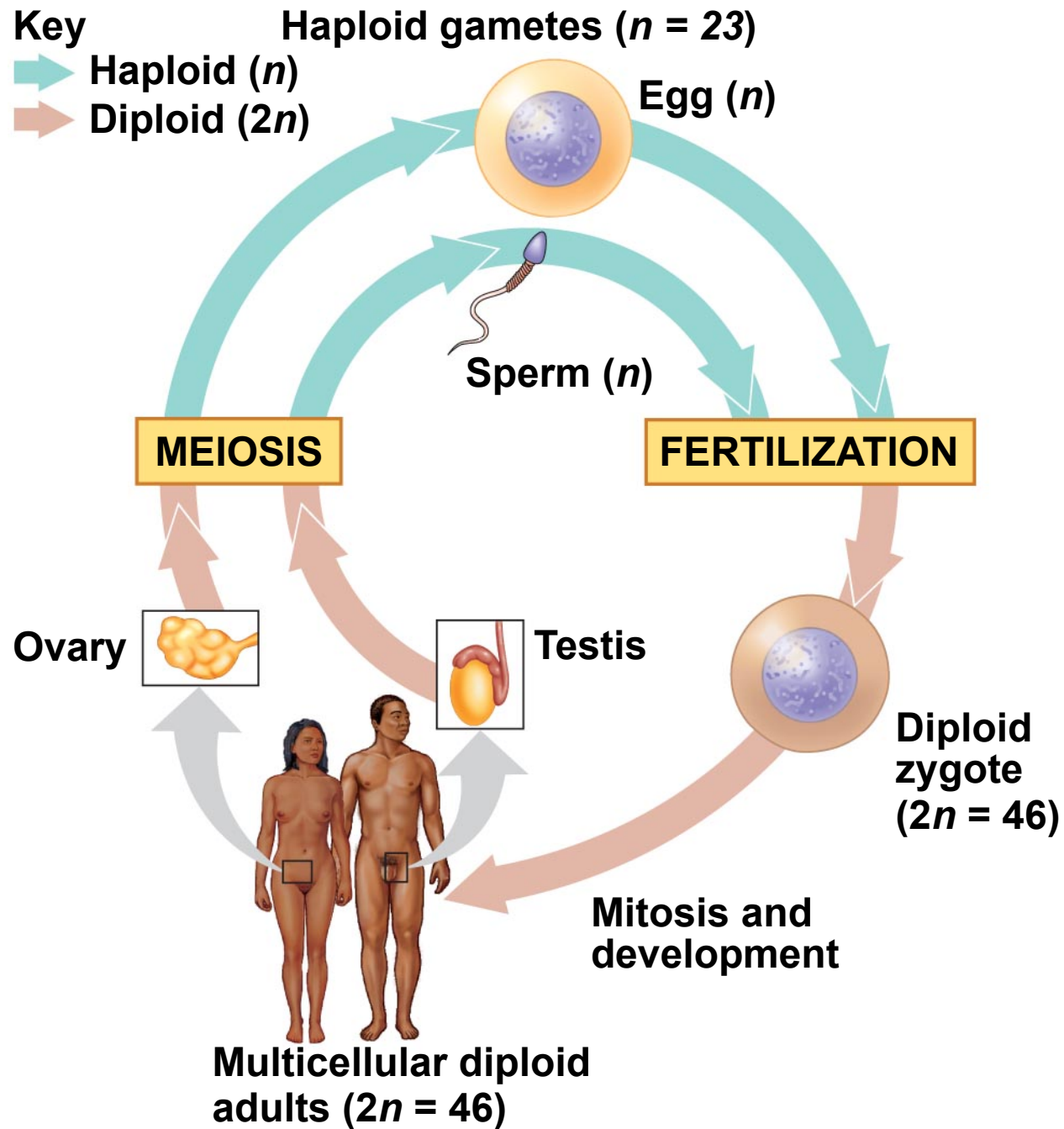
**Two nonsister  
chromatids in  
a homologous pair**



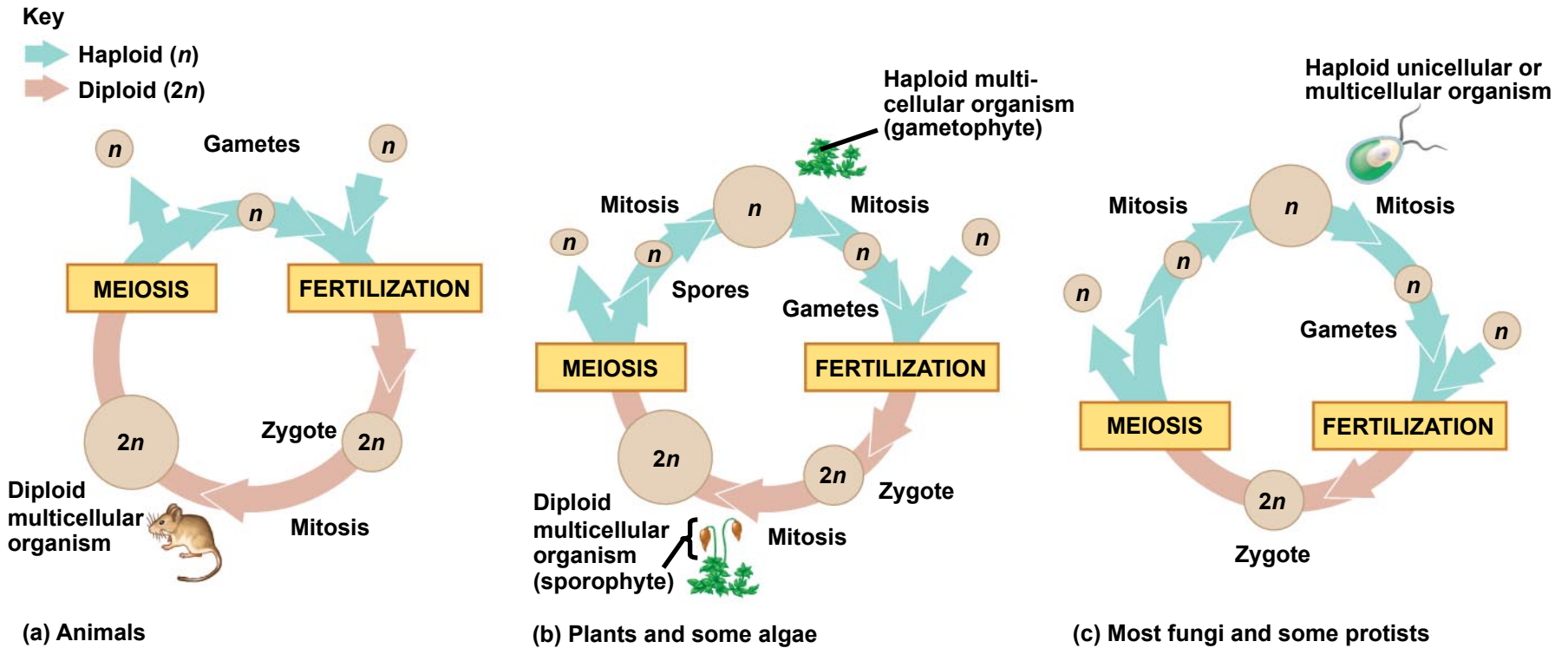
**Centromere**

**Pair of homologous  
chromosomes  
(one from each set)**

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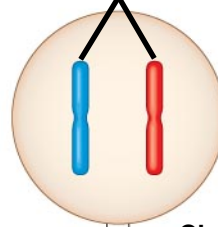




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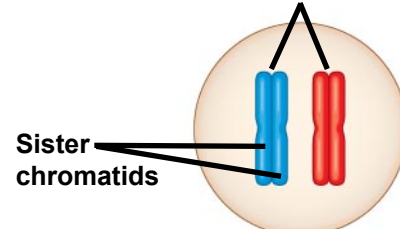
## Interphase

Homologous pair of chromosomes  
in diploid parent cell



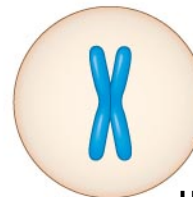
Chromosomes  
replicate

Homologous pair of replicated chromosomes

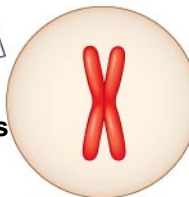


Diploid cell with  
replicated  
chromosomes

## Meiosis I

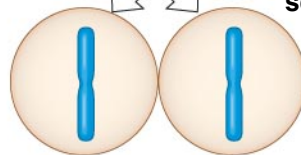


① Homologous  
chromosomes  
separate

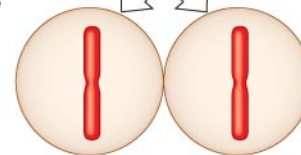


Haploid cells with  
replicated chromosomes

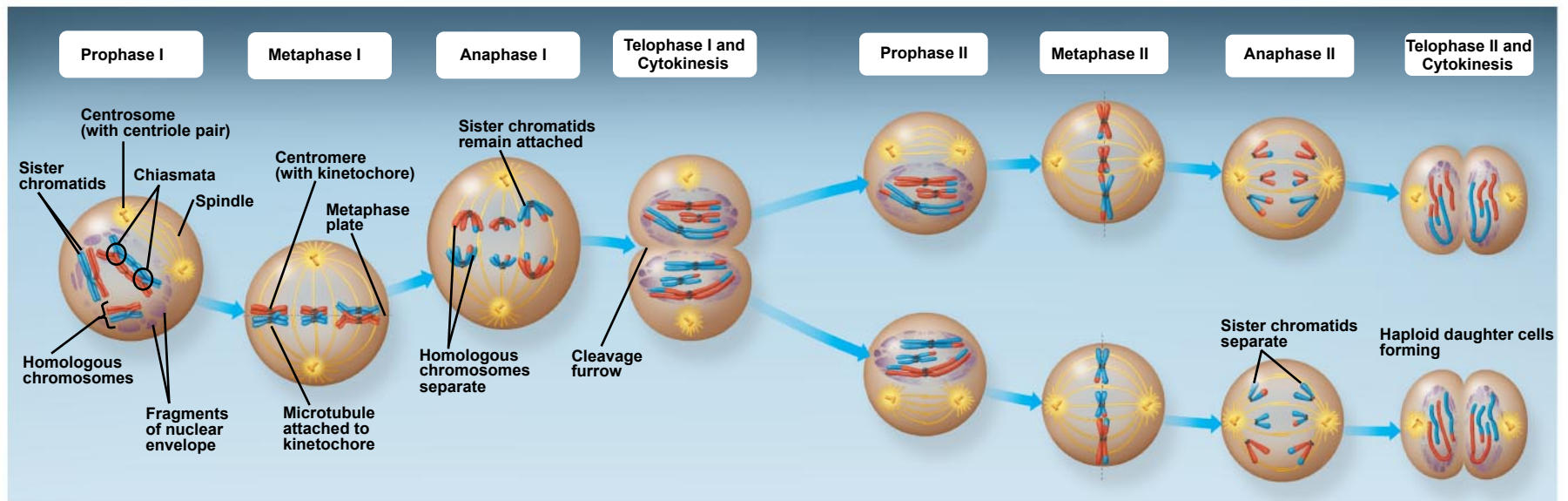
## Meiosis II



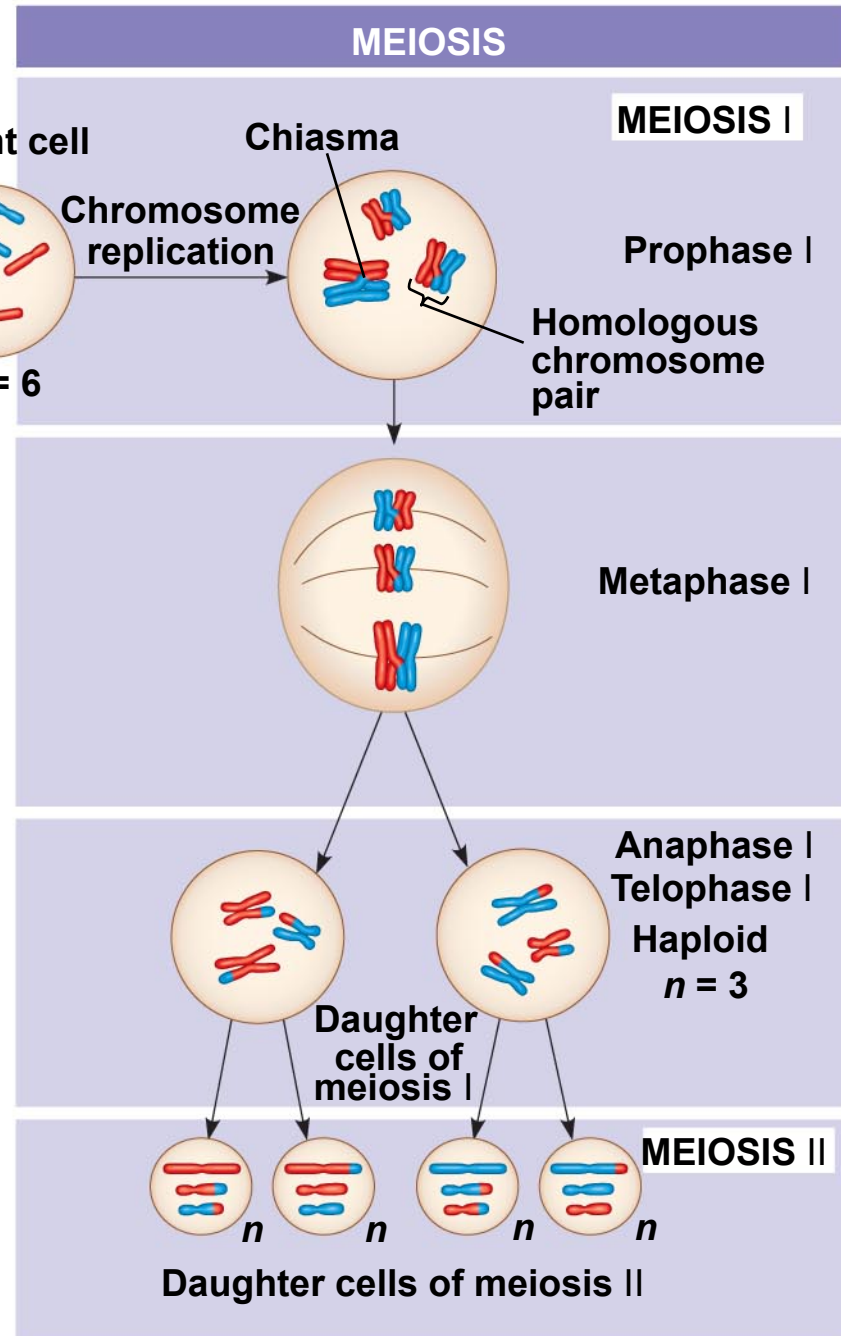
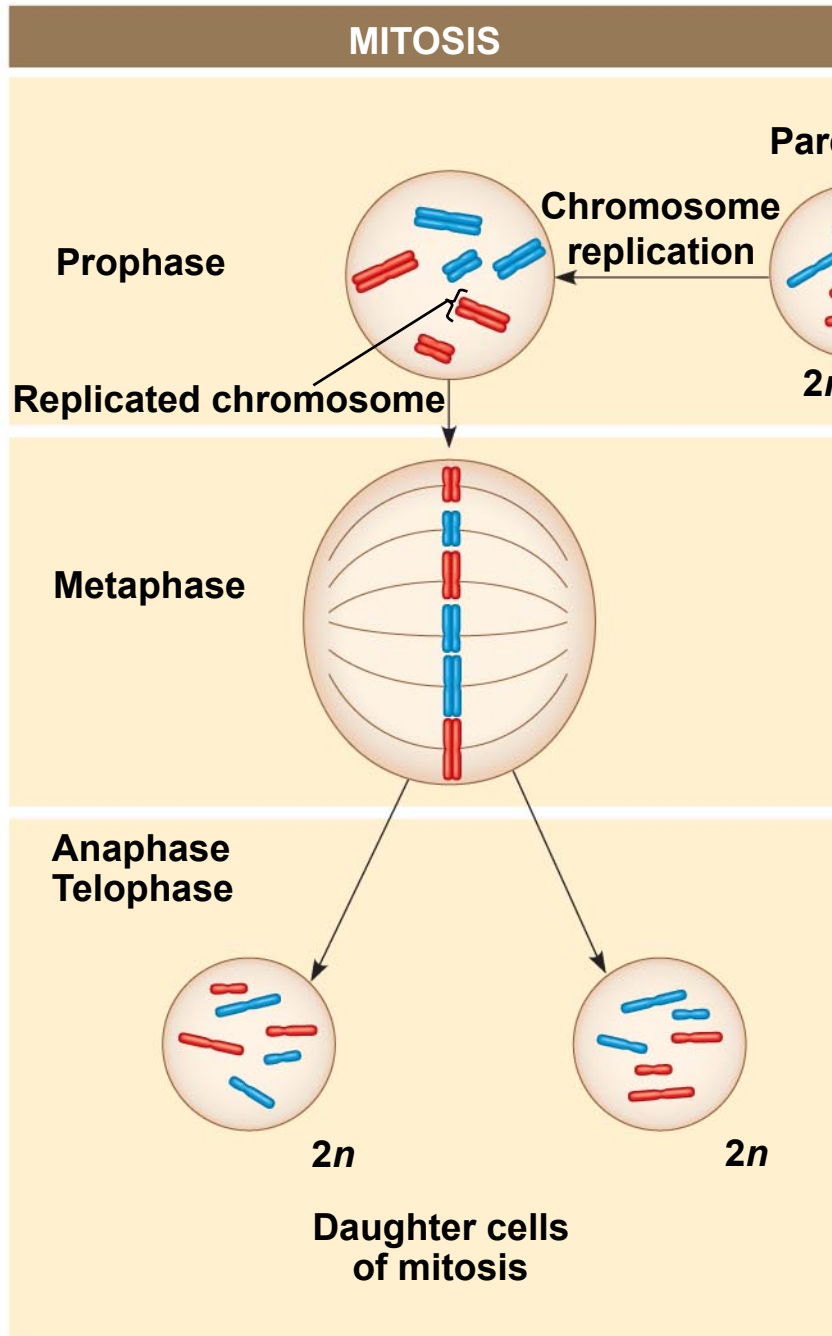
② Sister chromatids  
separate



Haploid cells with unreplicated chromosomes



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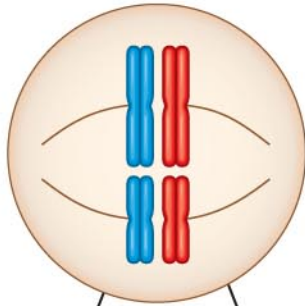




SUMMARY		
Property	Mitosis	Meiosis
DNA replication	Occurs during interphase before mitosis begins	Occurs during interphase before meiosis I begins
Number of divisions	One, including prophase, metaphase, anaphase, and telophase	Two, each including prophase, metaphase, anaphase, and telophase
Synapsis of homologous chromosomes	Does not occur	Occurs during prophase I along with crossing over between nonsister chromatids; resulting chiasmata hold pairs together due to sister chromatid cohesion
Number of daughter cells and genetic composition	Two, each diploid ( $2n$ ) and genetically identical to the parent cell	Four, each haploid ( $n$ ), containing half as many chromosomes as the parent cell; genetically different from the parent cell and from each other
Role in the animal body	Enables multicellular adult to arise from zygote; produces cells for growth, repair, and, in some species, asexual reproduction	Produces gametes; reduces number of chromosomes by half and introduces genetic variability among the gametes

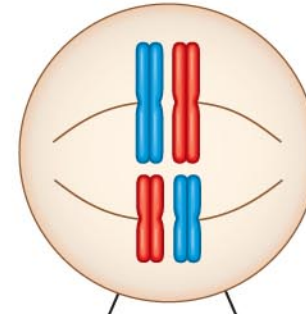
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### Possibility 1

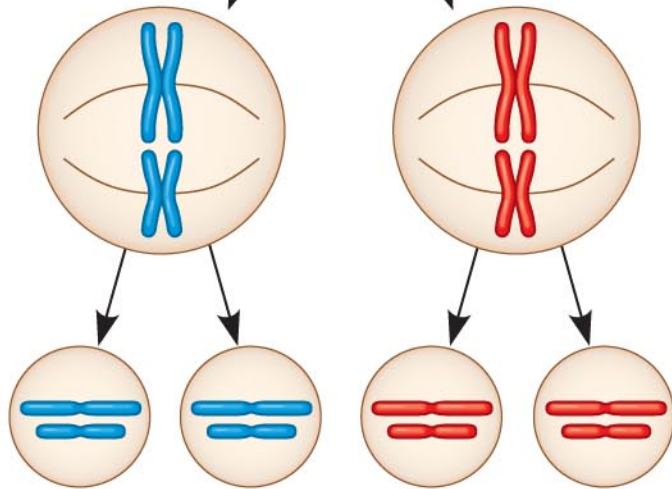


Two equally probable  
arrangements of  
chromosomes at  
metaphase I

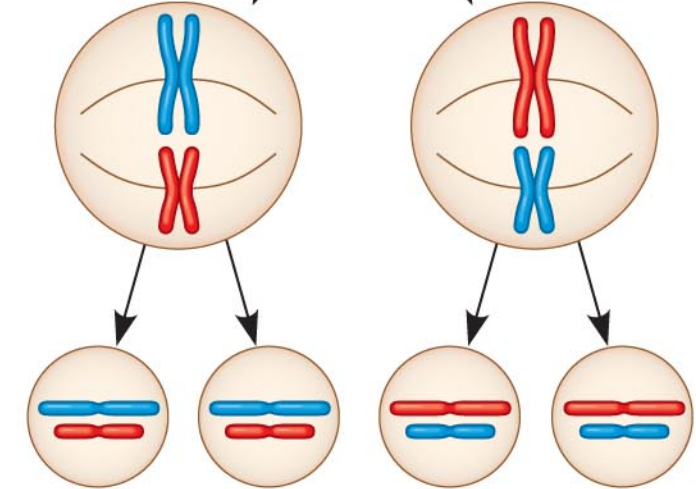
### Possibility 2



Metaphase II



Combination 1    Combination 2



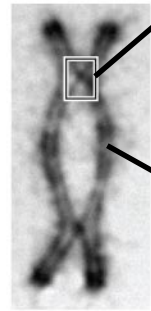
Combination 3    Combination 4

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**Prophase I  
of meiosis**

**Pair of  
homologs**

**Nonsister  
chromatids  
held together  
during synapsis**



TEM

**Chiasma**

**Centromere**

**Anaphase I**

**Anaphase II**

**Daughter  
cells**

**Recombinant chromosomes**

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