



Universidade de São Paulo  
Escola de Engenharia de Lorena  
Departamento de Biotecnologia



**Curso: Engenharia Ambiental**

# Ciclo e Divisão Celular

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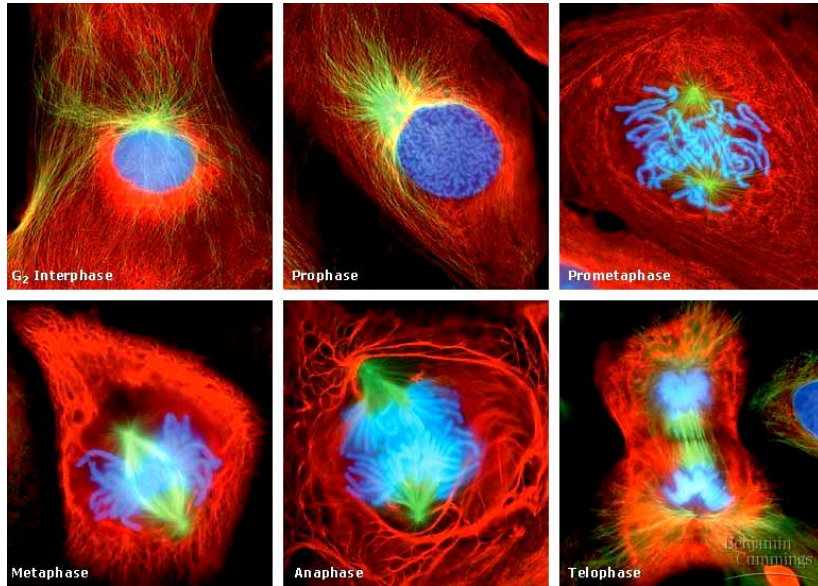
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## Mitose

Eventos principais:

- ✓ Condensação do cromossomo
- ✓ Separação dos centrôssomos
- ✓ Quebra do envelope nuclear
- ✓ Reorganização do RE e Complexo de Golgi
- ✓ Reorganização do citoesqueleto

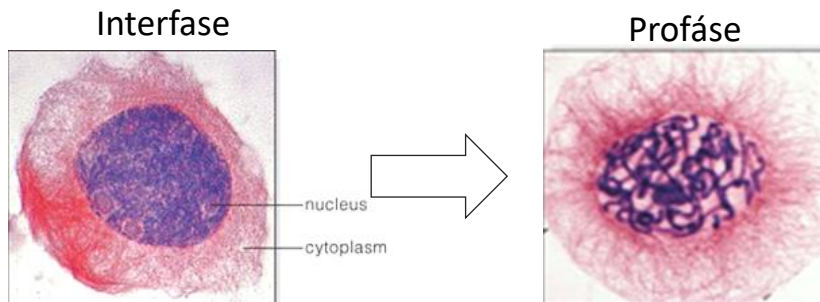
2



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## Mitose: Prófase

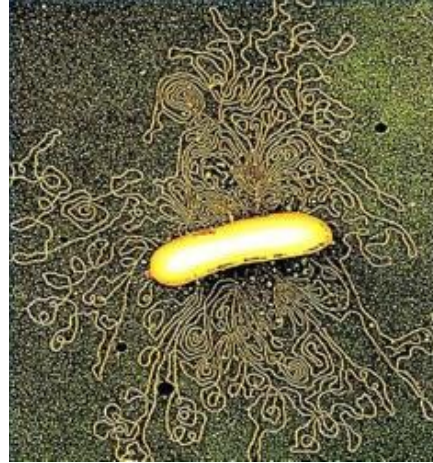
✓ Núcleo: Condensação dos cromossomos duplicados



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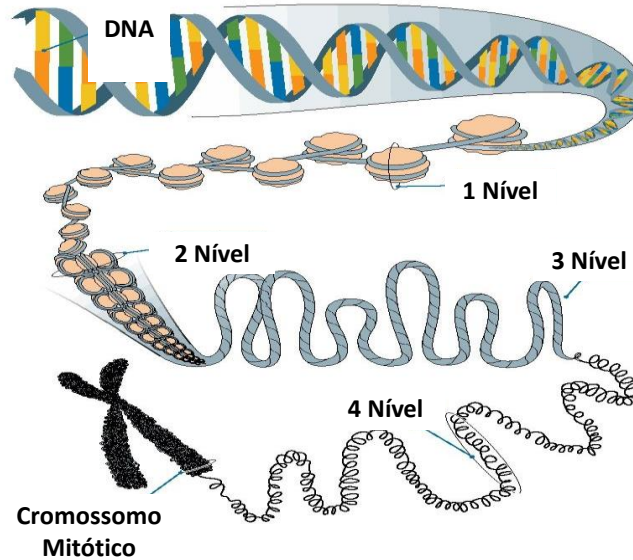
## Necessidade de Compactar o DNA

✓ Em Procarioto e Eucarioto



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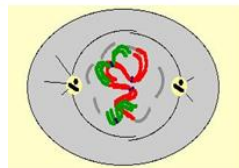
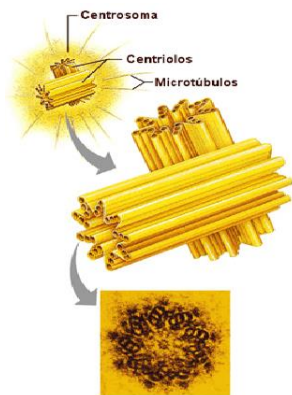
## Cromossomo Eucarioto: Níveis de Compactação do DNA



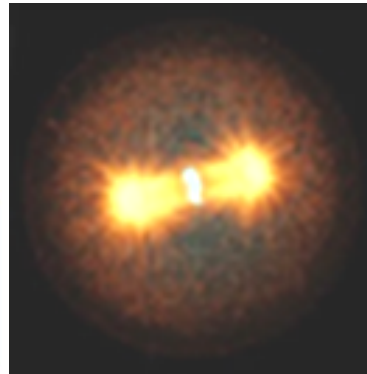
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## Mitose: Prófase

- ✓ Citoplasma: separação dos centrossomos no citoplasma
- ✓ 1 Centrossomo = 2 centríolos



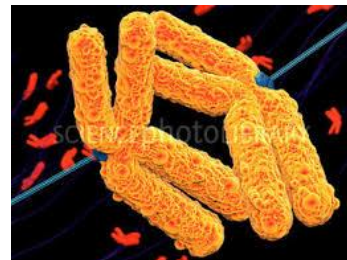
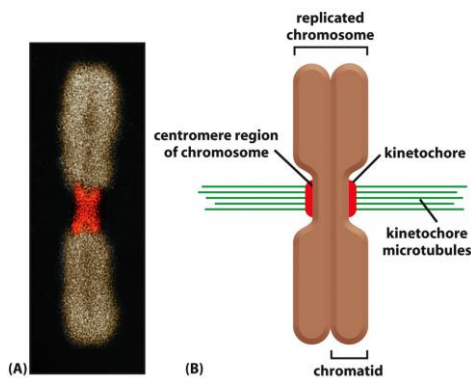
### Profase



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## Mitose: Prometáfase

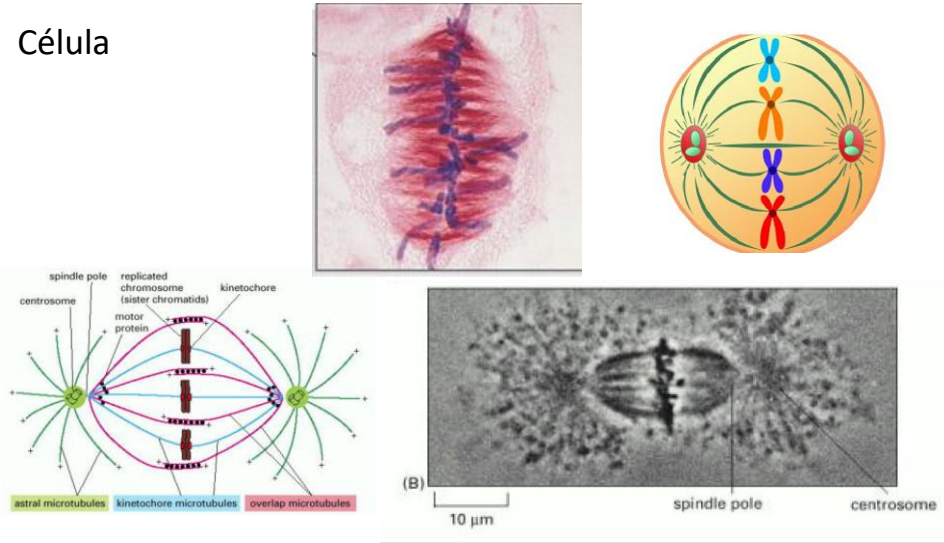
- ✓ Quebra do envelope nuclear
- ✓ Associação do cromossomo (região do centrômero) aos microtúbulo



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## Mitose: Metáfase

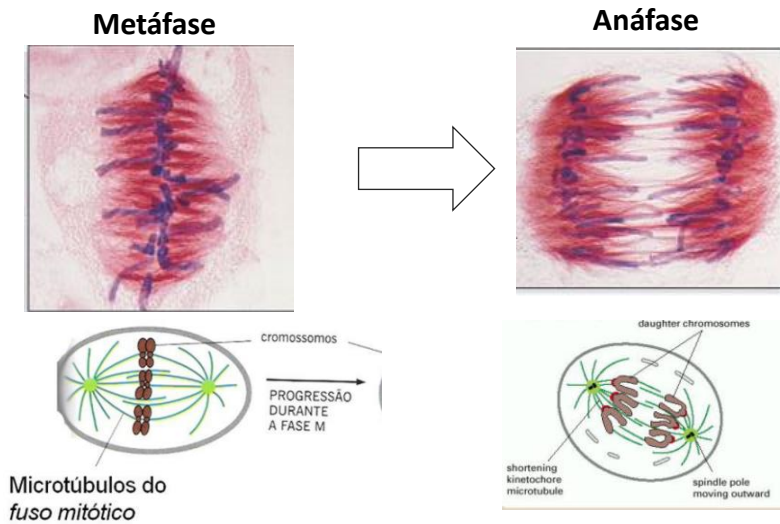
✓ Alinhamento dos cromossomos no plano equatorial da Célula



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## Mitose: Anáfase

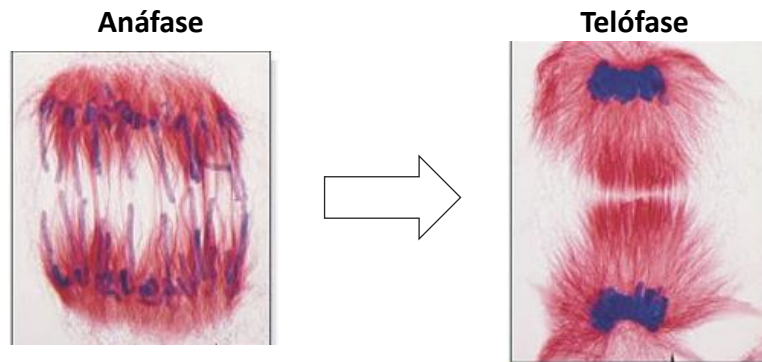
✓ Separação das cromátides irmãs



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## Mitose :Telófase

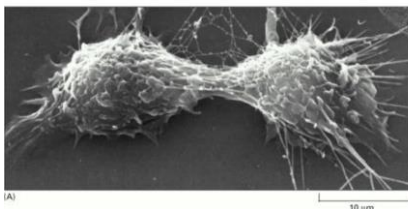
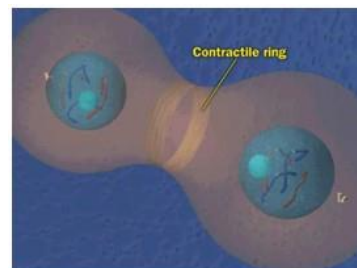
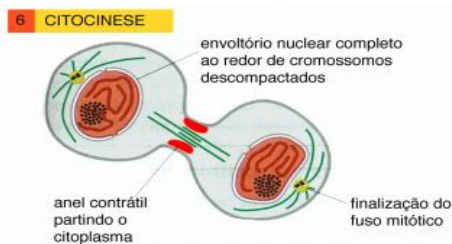
- ✓O conjunto de cromossomo chega aos polos
- ✓Formação da Membrana nuclear



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## Citocinese

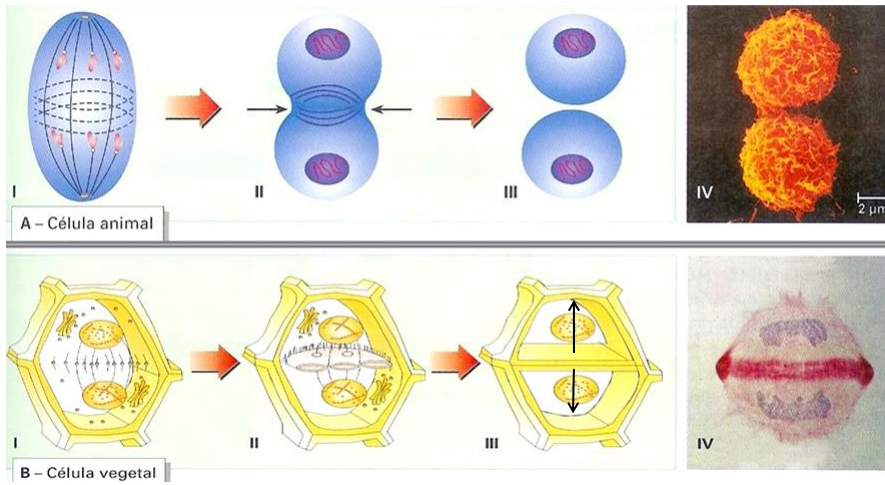
- ✓Célula animal : Formação do Anel contrátil (Actina)
- ✓Divisão do Citoplasma



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## Citocinese em Plantas

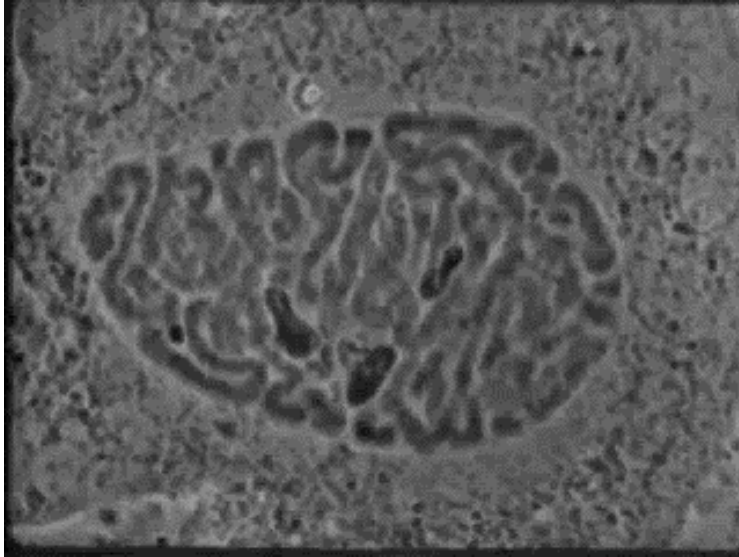
✓ Formação de Placa Celular



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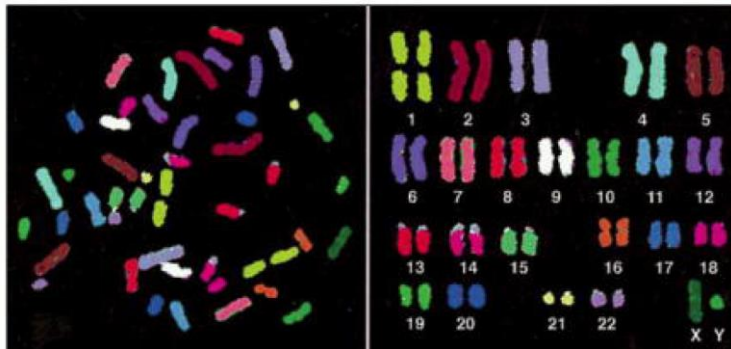
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## DNA Eucarioto – Cariótipo na divisão celular

✓ Cópias do mesmo tipo de cromossomo (Homólogos)

Ex: Homem – diploide (22 pares, 2 sexuais)

Cariótipo – Humano (Hibridização de Fish)

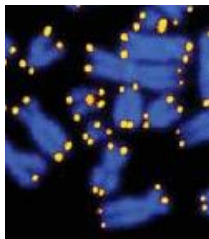


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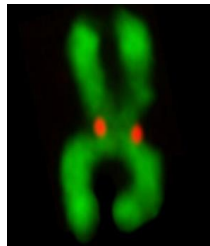


## Estrutura geral dos Cromossomos Mitóticos

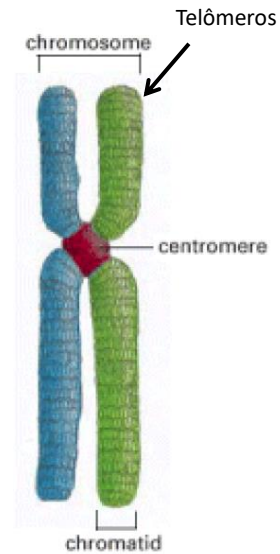
- ✓ Centrômero: mantém as cromátides
- ✓ Telômeros: proteção das extremidades



Telômeros

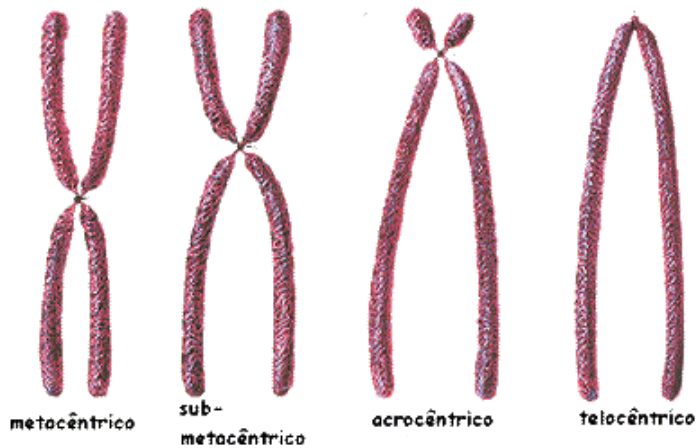


Centrômero



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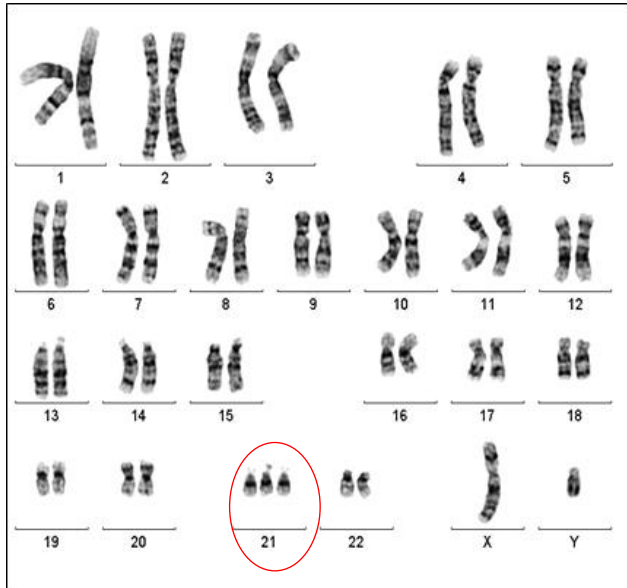
## Tipos de Cromossomos



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## DNA Eucarioto

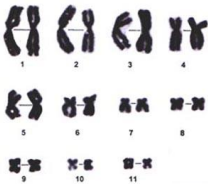
✓ Ex: Trissomia do 21



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## Cariótipo em Diferentes espécies

❖ Sapo



11 pares

❖ Diferentes espécies de Grilo



Fig. 1. *Criantopus collarides*



Fig. 2. *Phyllocyrtus amoenus*

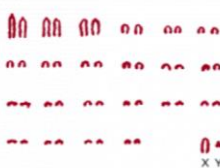


7 pares, 2 sexuais

❖ Diferentes espécies de Cervo



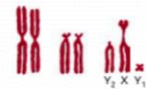
Chinese muntjac



22 pares, 2 sexuais



Indian muntjac

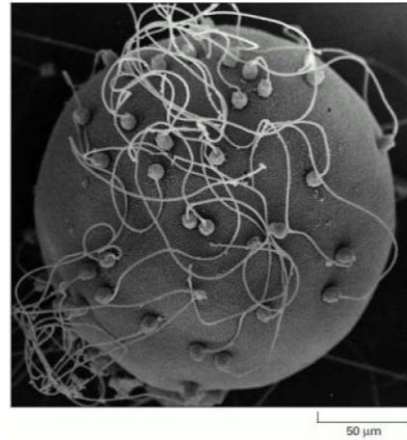
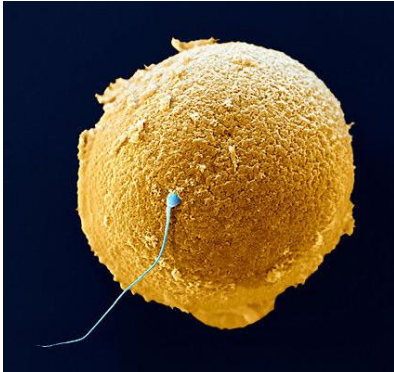


2 pares, 2 sexuais

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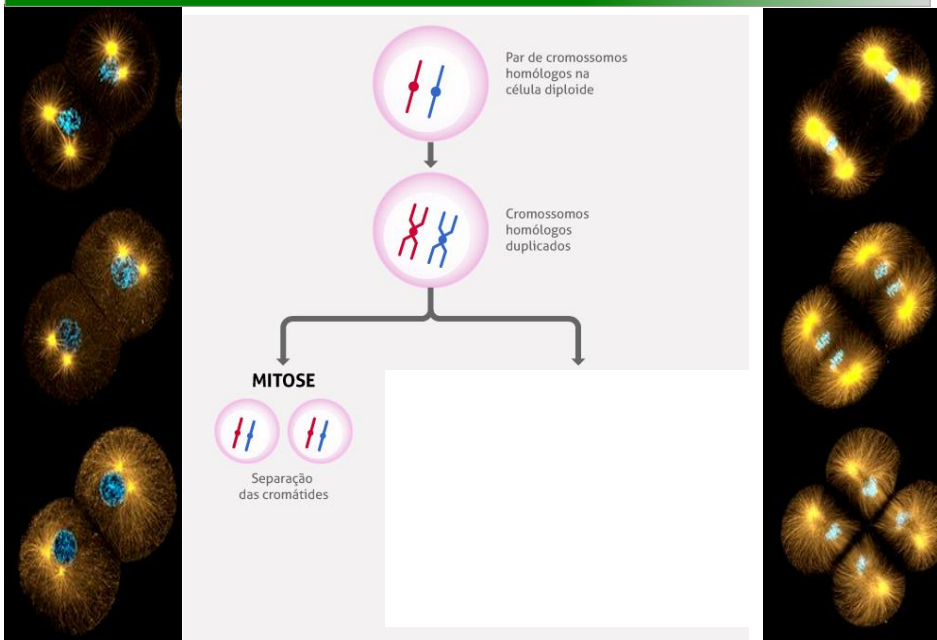
## Meiose

- ✓ Células Germinativas
- ✓ Importância na reprodução
- ✓ 2 divisões consecutivas



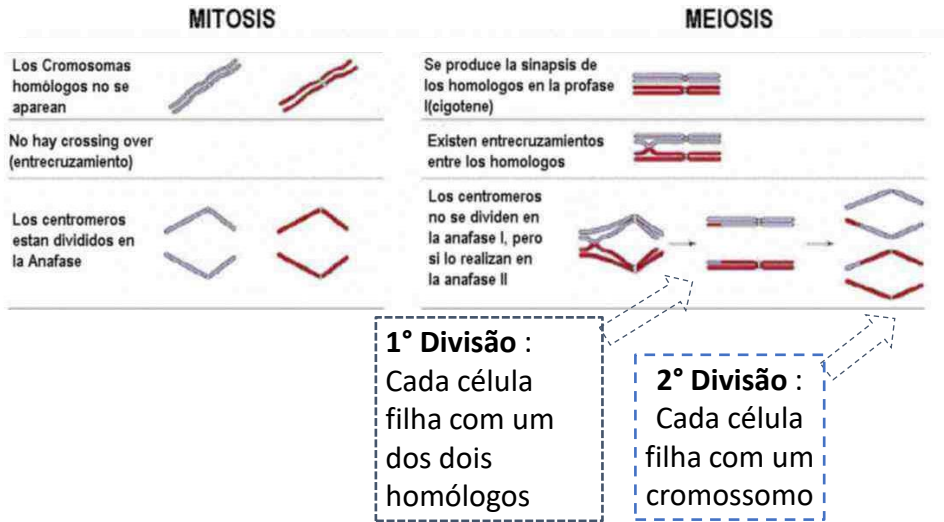
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## Meiose: Separação de Cromossomos Homólogos



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# Meiose: Pareamento de Cromossomos Homólogos



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## Eventos na 1º Divisão: Crossing-over

- ✓ Recombinação entre cromossomos homólogos (Metáfase I)
- ✓ Variabilidade Genética

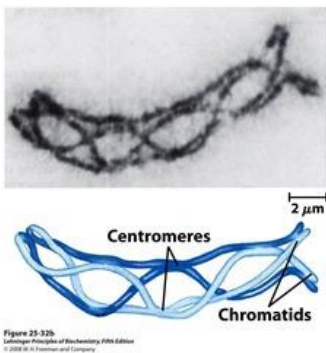
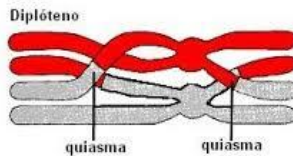
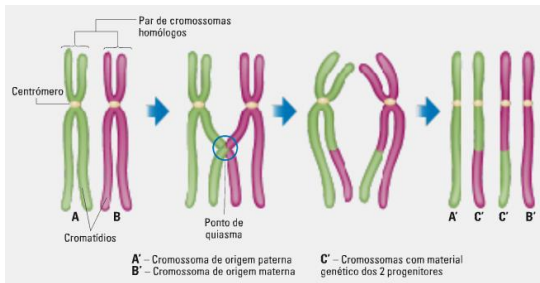
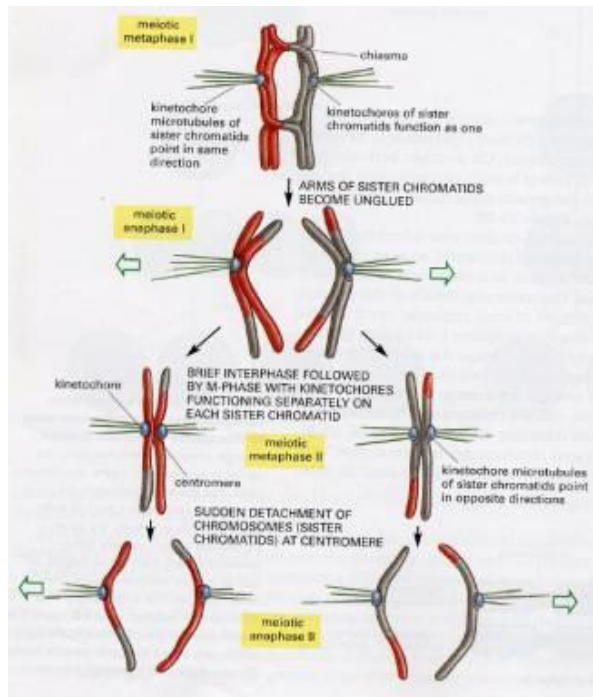


Figure 25-32b  
Lehninger Principles of Biochemistry, Fifth Edition  
© 2008 W. H. Freeman and Company

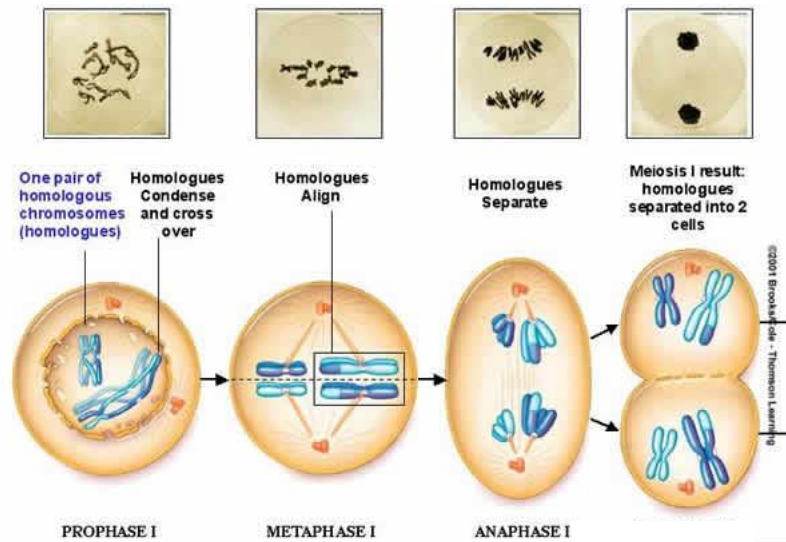


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## Meiose: 1<sup>o</sup> Divisão



**MEIOSIS I: Separate the Homologues**

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## Meiose: 2<sup>o</sup> Divisão

