

Introduction to Botany. Lecture 15

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Outline

1 Questions and answers

- Quiz

2 Life cycle

- Syngamy and meiosis
- Basics of life cycles



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Questions and answers

Quiz



Final question (2 points)

How do male and female gametes split their job?



Final question (2 points)

How do male and female gametes split their job?

- Male gender invests in numbers to increase probability of syngamy
- Female gender invests in resources to increase probability of zygote survival



Life cycle

Syngamy and meiosis



Some useful terms: checklist

- Gene
- Protein
- Enzyme
- Genotype
- Phenotype
- Genome
- Population
- Mutation
- Syngamy



Ploidy, or chromosome set

- In diploid ($2n$) organisms, chromosomes form pairs
- Paired chromosomes (XX) are **homologous**
- In haploid (n) organisms, all chromosomes are single
- In mitosis, ploidy will be the same: $2n \rightarrow 2n + 2n$
- In syngamy, ploidy will increase: $n + n \rightarrow 2n$
- In meiosis, ploidy will reduce: $2n \rightarrow n + n$

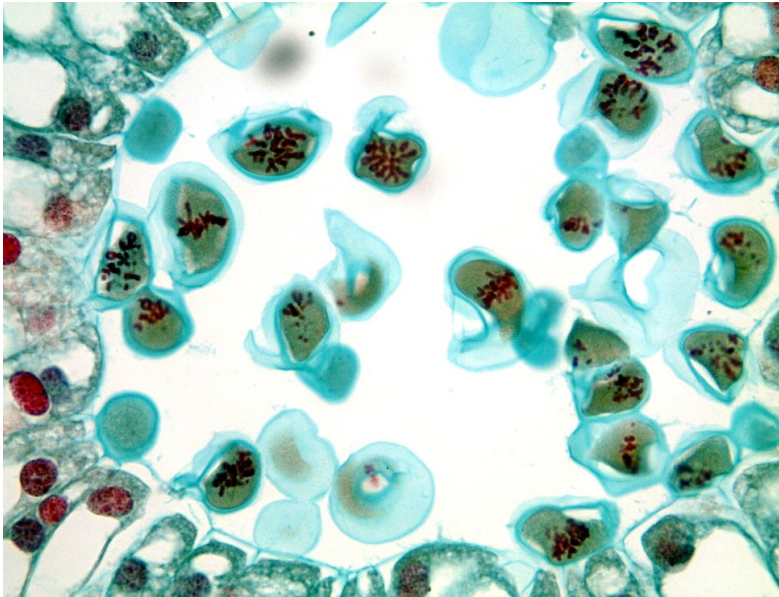


Stages of meiosis

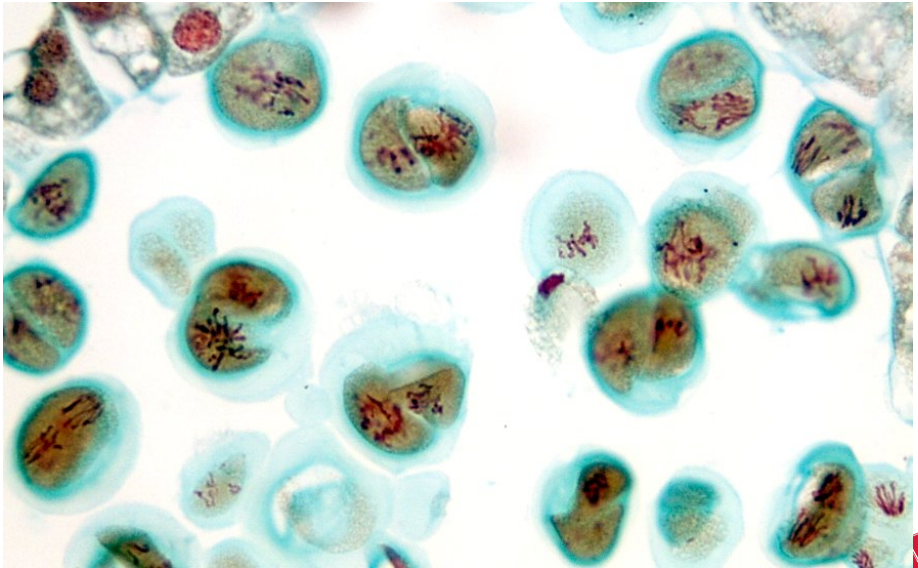
- First division: reductive part
 - Prophase I: homologous chromosomes form pairs (**synapses**) and start to exchange DNA (**crossing-over**)
 - Metaphase I
 - Anaphase I: homologous chromosomes will go *independently* to different poles
 - Telophase I becomes Prophase II, without interphase (and typically without cytokinesis)
- Second division: equal part (similar to mitosis)
 - Prophase II
 - Metaphase II
 - Anaphase II
 - Telophase II



Real-world meiosis, 1st division



Real-world meiosis, 2nd division



Polyploids

- If for some reason, meiosis will not run correctly, one of resulted cells could receive double set of chromosomes ($2n$ instead of n)
- If this cell goes to syngamy, resulted zygote will have $3n$ chromosomes
- Cells with $> 2n$ chromosomes are **polyploids**

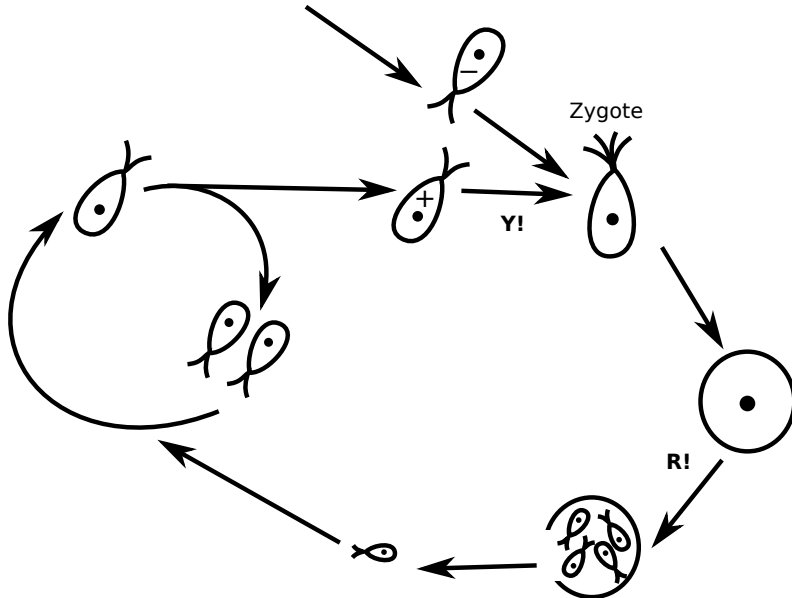


Life cycle

Basics of life cycles



Simple life cycle: unicellular organism



Final question (2 points)



Final question (2 points)

Before the meiosis, the cell had 6 picograms of DNA. How much DNA will be in the each daughter cells after meiosis?



Summary

- **Mitosis** is a equal division of DNA, **ploidy does not change**, **genotype does not change**
- **Syngamy** is a sexual process of cell fusion, **ploidy doubles**, **genotype changes**
- **Meiosis** is a process of reduction of DNA amount, **ploidy halves**, **genotype changes**
- Meiosis has two stages: first to reduce ploidy, second to split exact copies of DNA



For Further Reading



A. Shipunov.

Introduction to Botany [Electronic resource].

Mode of access:

http://ashipunov.info/shipunov/school/biol_154

