

BIOL191: Genetics and Inheritance- Meiosis and Mitosis

BIOL 191/Spring 2020

Review exercise for Meiosis and Mitosis

Guidance on how to use this activity:

- *In this activity, students will compare and contrast the mechanism of meiosis and mitosis. They will also complete a concept map to review the steps of meiosis. This is designed to be completed AFTER the material has been presented and assessed through homework. This in-class activity is designed to help students synthesize the material.*
- *This is a short ~20 minute in-class assignment completed with their peers.*
- *This assignment will not be submitted or graded.*

Learning Objective(s)

After completing this assignment, students will be able to:

- Compare and contrast homologous chromosomes versus sister chromatids and identify how many of each would be present at different phases of the cell cycle.
- Compare and contrast mitosis and meiosis. Identify which steps account for the different outcomes.
- Compare and contrast the key steps of meiosis I versus meiosis II. Explain what is the purpose of each phase, and identify which step leads to reductive division.
- Outline the steps of crossing-over and describe its outcome: in your answer, be able to use the terms synapsis, crossing-over, tetrads, and DNA recombination.

Assignment completion instructions

1. Planning
 - a. *The instructor brings printed copies of the review worksheet to class, one per student.*
 - b. *The exercise takes ~20 minutes of class time for students to complete.*
2. Source Material(s) for the activity (created by or provided by the instructor)
 - a. *Word and PDF copies of the activity provided*

3. Source Material(s) for activity for students (not created by or provided by the instructor)

a. Students will have read the OpenStax textbook on these topics

4. Introduction and Warm-up/practice activity for the students

a. Introduction

i. Instructor distributes worksheet

b. Warm-up/practice

i. Clicker question showing phase of meiosis. Ask students which phase is shown.

ii. Show slide instructing students to complete the worksheet.

iii. Inform students that after the worksheet, clicker questions used to assess student understanding.

5. Main Activity: The following questions are provided on a worksheet for students:

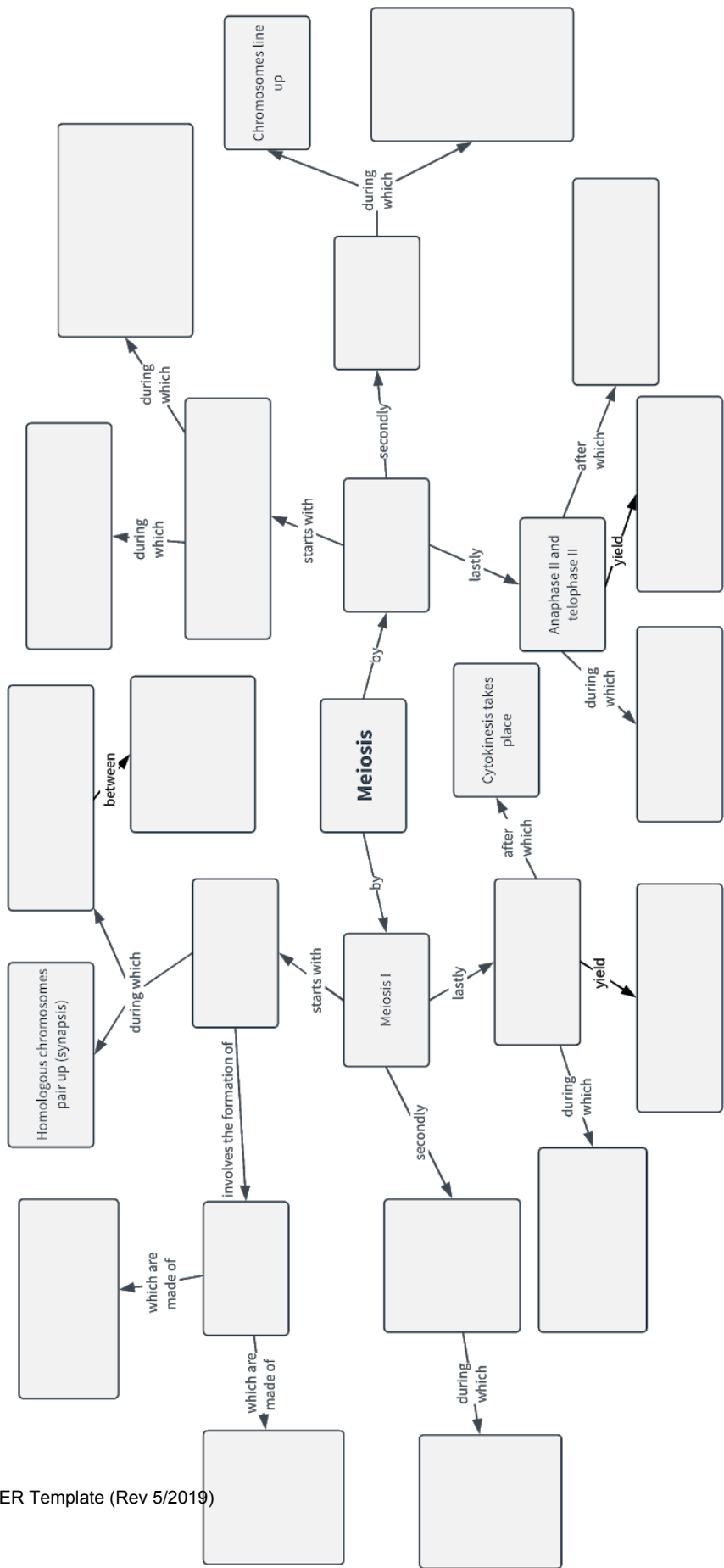
Mitosis and Meiosis Review

	Mitosis	Meiosis
Purpose		
Which cells do this? (Somatic cells? Germ cells? Both?)		
Number of divisions		
Number of cells produced		

Chromosome number of daughter cells (haploid or diploid? $2n$ or $1n$?)		
Type of cells produced		
Pairing of homologous chromosomes? (yes or no) If yes, when?		
Generates genetic variation? (yes or no) If yes, HOW?		

Word bank for concept map:
Use each term ONCE

● Meiosis II ● Metaphase I ● Metaphase II ● Prophase I ● Prophase II ● Anaphase I and telophase I ● Tetrads ● 4 chromatids ● 2 homologous chromosomes ● 2 haploid cells ● 4 haploid cells	● Non-sister chromatids ● Independent Assortment ● Crossing over occurs ● Chromosomes are still made of sister chromatids ● Sister chromatids are attached to opposite poles ● Cytokinesis takes place ● Sister chromatids separate ● Homologous chromosomes separate ● Spindle fibers attach to kinetochores
---	---



I. Wrap-up/reflection:

A. Classroom polls (via Clicker system) to assess understanding:

During which mitotic phase(s) are paired sister chromatids present?

A. Telophase

B. Prophase and metaphase

C. Only during prophase

D. Anaphase

Which phase of meiosis is shown?

A. Metaphase of mitosis

B. Metaphase I of meiosis

C. Metaphase II of meiosis

D. Anaphase I of meiosis

E. Anaphase II of meiosis

Here is a file that contains meiosis images that can be used and remixed with attribution.

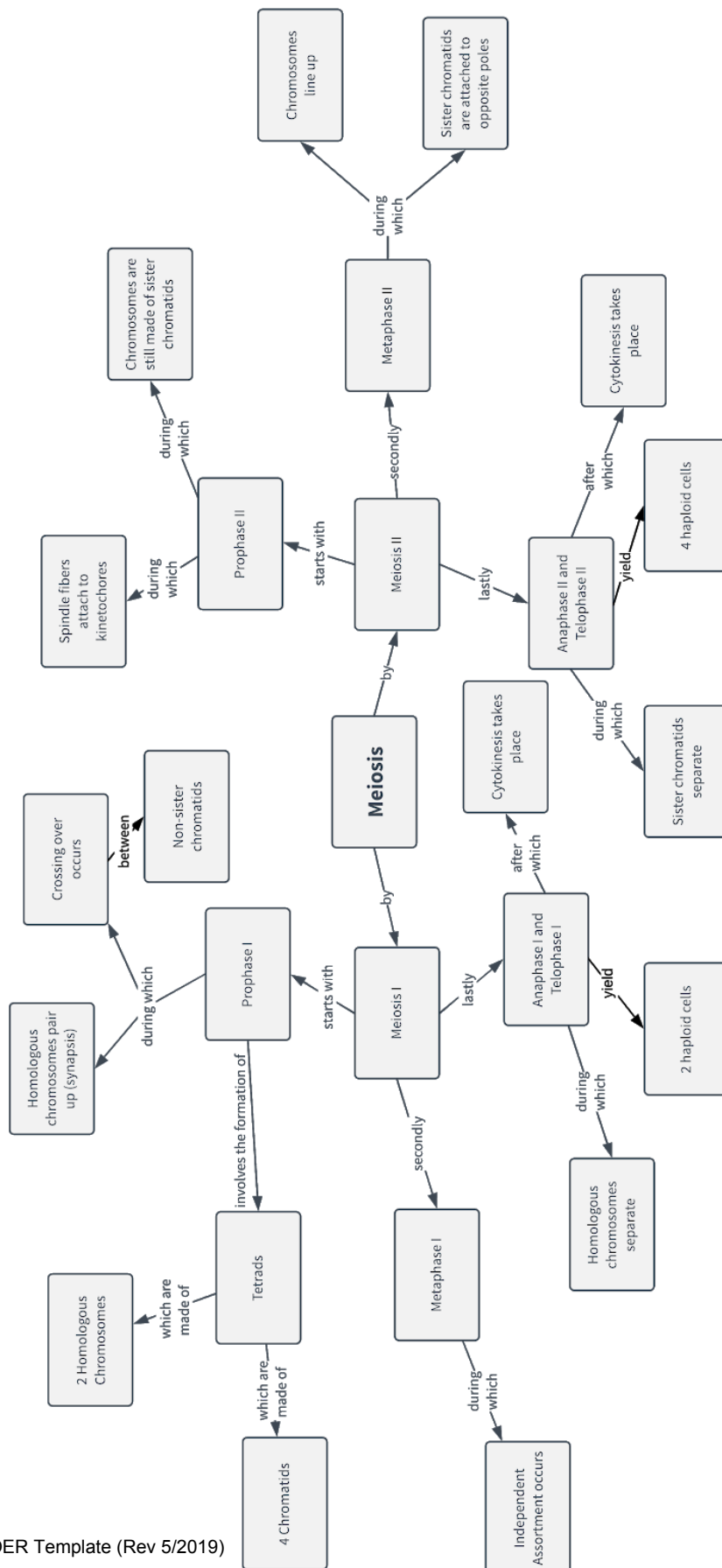
https://commons.wikimedia.org/wiki/File:Meiosis_Stages_-_Numerical_Version.svg

“A diagram of meiosis stages” by Ali Zifar is licensed as a CC-BY image.

B. Post keys on LMS for students to review

	Mitosis	Meiosis
<i>Purpose</i>	<i>Generate genetically identical daughter cells-maintain/regenerate/grow parts of organism</i>	<i>Generate reproductive cells that can be used for sexual reproduction</i>

<i>Which cells do this? (Somatic cells? Germ cells? Both?)</i>	<i>Both somatic cells and germ cells</i>	<i>Only germ-line cells</i>
<i>Number of divisions</i>	<i>One</i>	<i>Two</i>
<i>Number of cells produced</i>	<i>Two</i>	<i>Four</i>
<i>Chromosome number of daughter cells (haploid or diploid? $2n$ or $1n$?)</i>	<i>Diploid-$2n$</i>	<i>Haploid-$1n$</i>
<i>Type of cells produced</i>	<i>More somatic cells or more germ cells</i>	<i>Gametes (sperm and egg)</i>
<i>Pairing of homologous chromosomes? (yes or no) If yes, when?</i>	<i>No</i>	<i>Yes- during meiosis 1</i>
<i>Genetic variation increased? (yes or no) If yes, HOW?</i>	<i>No</i>	<i>Yes- crossing over and independent assortment</i>



Conclusion and moving forward for the Ancillary Learning Material

This activity provides an opportunity for students to review the material before summative assessment.