Meiosis Model

Overview

Students use the chromosome and gene models to explore meiosis and see where the variation occurs in sexual reproduction.

Textbook References

McDougal Littell

Unit C Chapter 4, pp. 117-122, Meiosis Is a Special Form of Cell Division

Prentice Hall

Chapter 14, Section 5 pp. 546-550, The Cell and Inheritance

Materials

*Materials to be supplied by the teacher or the students are marked with an asterisk.

Materials for the whole class

- 1 transparency of *Chromosome Models for Meiosis*
- 1 transparency of *Meiosis Answer Key* (at the very end of this teachers guide)
- 1 transparency of *Possible Sex Cells*
- 1 transparency of *Possible New Plants—Genotypes and Phenotypes*

Materials for small groups

- 1 set of Bead Boxes including magnetic beads (2 boxes per set)

Materials for individual students

- 1 long blue pipe cleaner
- 1 long pink pipe cleaner
- 1 short blue pipe cleaner
- 1 short pink pipe cleaner
- 1 *Meiosis cut-out sheet*
- 1 *Possible New Plants—Genotypes and Phenotypes*
- *science notebook

Procedure

- Start with a short discussion reviewing the observations we have made about parents passing their traits to their offspring. How is this accomplished, and how can there be so much mixing so that the offspring can be so different even from the same parents?

- Ask students to build the chromosome models as shown on the transparency *Chromosome Models for Meiosis*.

- Ask students to work with their neighbor and to pretend that one is the pollen and one is the egg and ask them to cross breed by combining their chromosomes. *"What is the result?"* [If the pollen and the egg simply added their chromosomes

together, the new plant cell would now have 8 chromosomes instead of 4.] *"What would happen if this generation bred?"* [16 chromosomes] *"And the next and the next?"* [32, 64, etc.]

- Ask students to get their original chromosome back and to think about a solution to this problem. The parents have 4 chromosomes, 2 long and 2 short, and the offspring need the same complement of chromosomes, 2 long and 2 short. The trick is to get *half* from each parent. Tell them that organisms make special sex cells to do just that.

- Ask students to cut out the *Meiosis* puzzle pieces and put them together in a logical order that will produce sex cells. The rules are that the sex cells must have half of the original number of chromosomes (2 instead of 4), but they must have all of the kinds of chromosomes (one long and one short).

- Have the students compare their puzzles with a partner and discuss any differences.

- Ask the group for any observations they have about the puzzle pieces and a logical sequence.

- During the next part of the lesson, use the transparency *Meiosis Answer Key* and the pipe cleaner chromosome models to lead the students through the whole meiosis process step by step. This is similar to what they did with mitosis in an earlier lesson. Explain the mechanics and importance of each step as you move through each puzzle piece and have the students use their pipe cleaner models.

- Ask students to work in pairs and add centromeres (the magnetic beads) to their original chromosomes to simulate replication. Once they have the replicated chromatids, walk them through the steps of meiosis, referring to their puzzle piece pictures.

- *"How many different types of sex cells can be produced with your chromosome models?"* [There are 4 possible sex cells.]

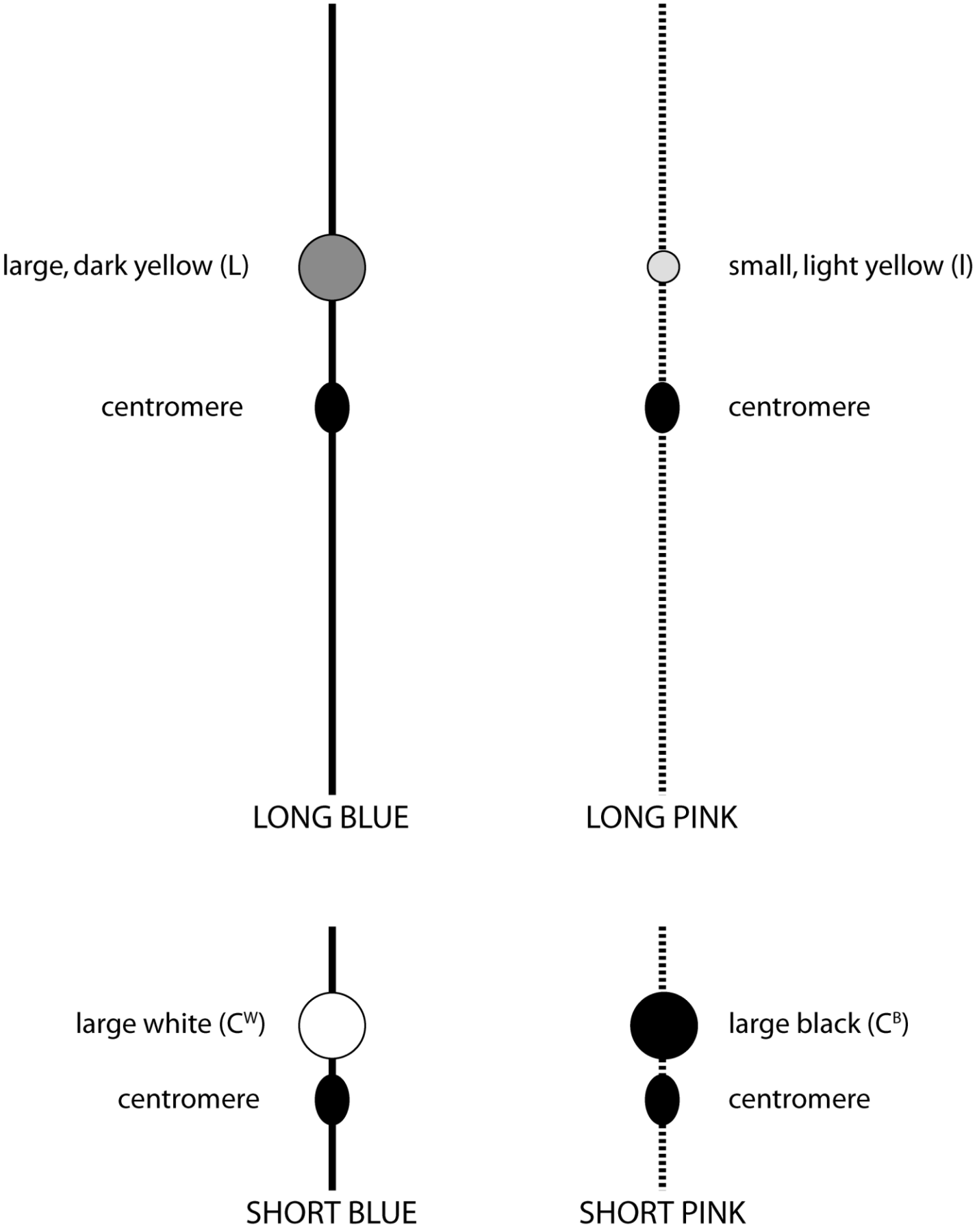
- *"Look back at your original chromosome models. What leaf shape would your original plant have had?"* [Long]

- *"What color flower would your original plant have had?* [Gray]

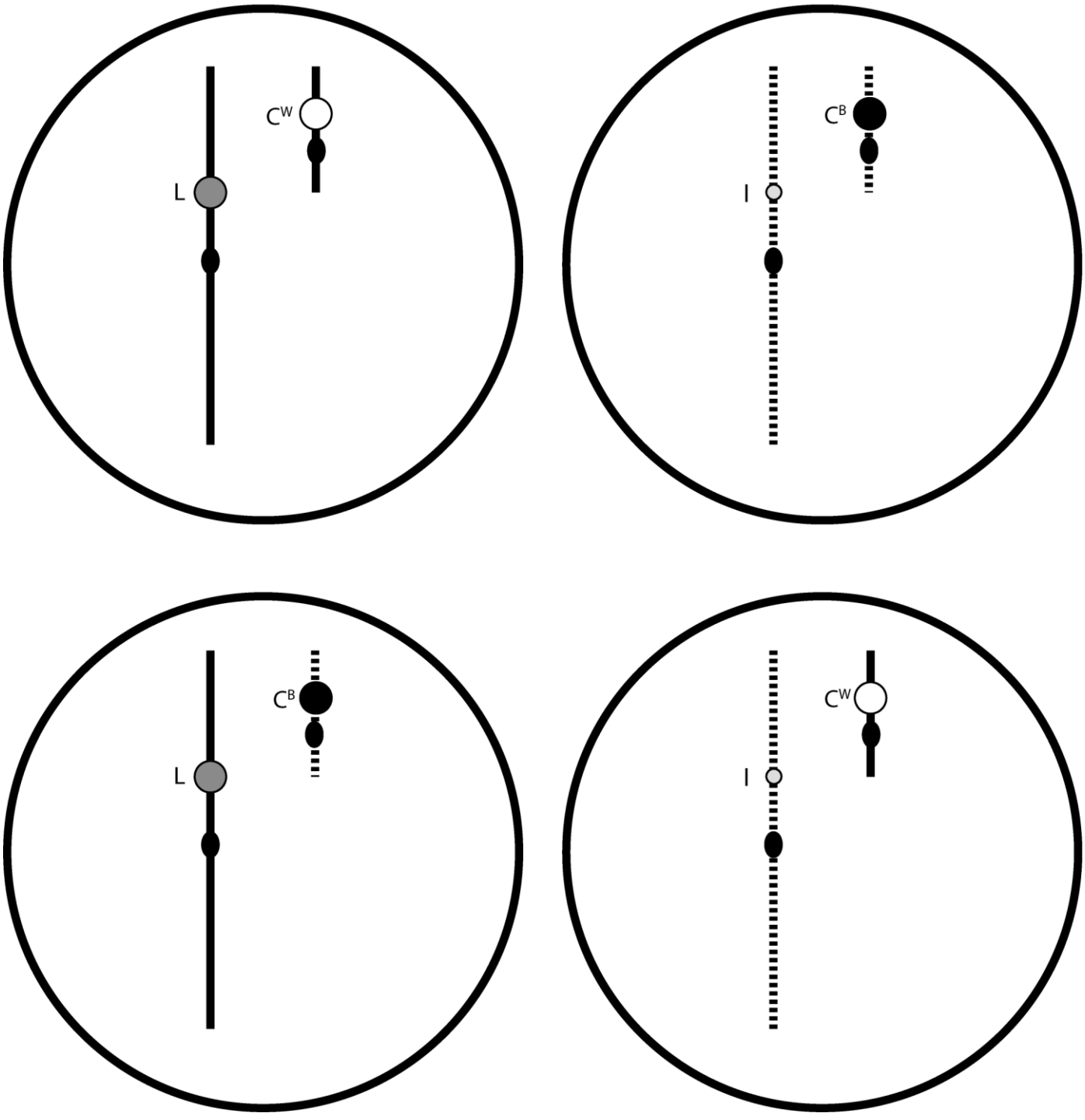
- Ask students to consider the sex cells they produced and to determine what kind of plants could result from crossing with the sex cells of another pair of students. *"How many different genetic combinations are possible and how many different phenotypes are possible."* This variety would come from two similar plants.

- Hand out copies of *Possible New Plants—Genotypes and Phenotypes*. Ask students if they found all of these combinations. [NOTE: The two genotypes at the bottom of each column are identical, but they come from combining different sex cells!] Ask students to fill in the genotypes and phenotypes.

Chromosome Models
Meiosis



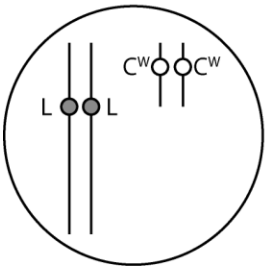
Possible Sex Cells



Possible New Plants
Genotypes and Phenotypes

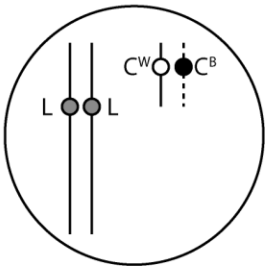
Name _____

Date _____



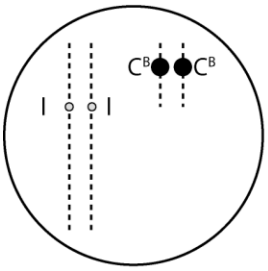
Genotype _____

Phenotype _____



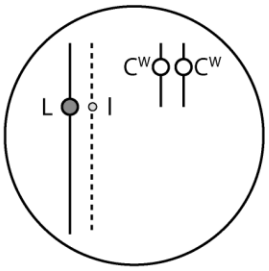
Genotype _____

Phenotype _____



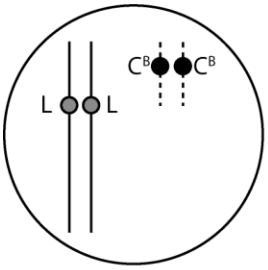
Genotype _____

Phenotype _____



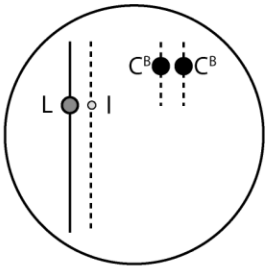
Genotype _____

Phenotype _____



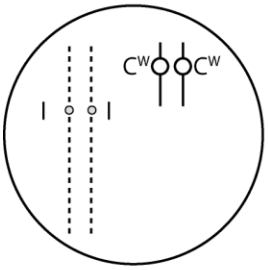
Genotype _____

Phenotype _____



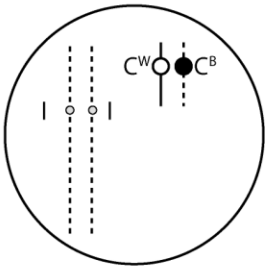
Genotype _____

Phenotype _____



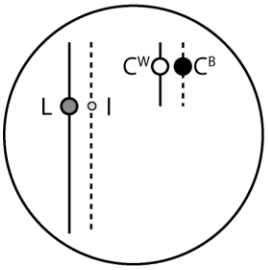
Genotype _____

Phenotype _____



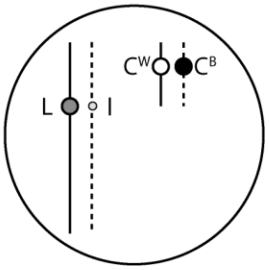
Genotype _____

Phenotype _____



Genotype _____

Phenotype _____



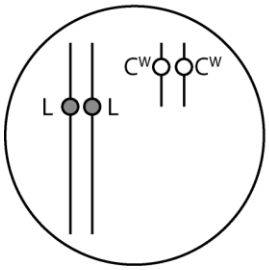
Genotype _____

Phenotype _____

Possible New Plants
Genotypes and Phenotypes

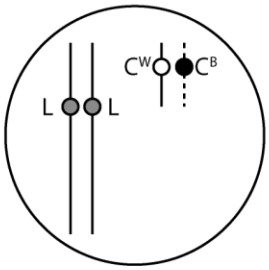
Name _____

Date _____



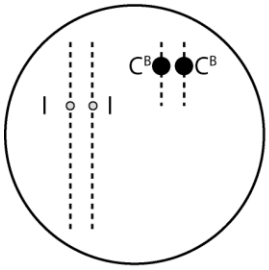
Genotype LL C^WC^W

Phenotype long, white



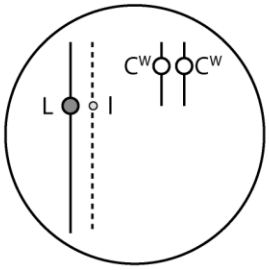
Genotype LL C^WC^B

Phenotype long, gray



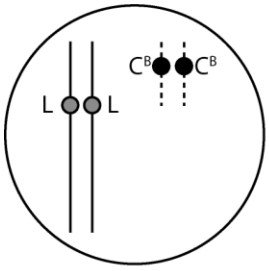
Genotype ll C^BC^B

Phenotype round, black



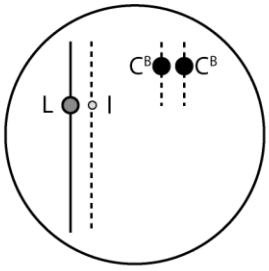
Genotype Ll C^WC^W

Phenotype long, white



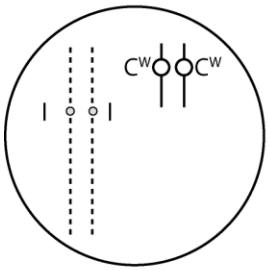
Genotype LL C^BC^B

Phenotype long, black



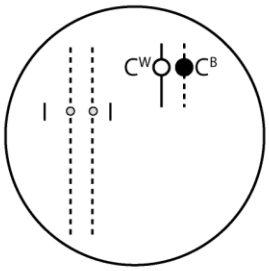
Genotype Ll C^BC^B

Phenotype long, black



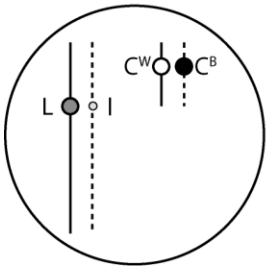
Genotype ll C^WC^W

Phenotype round, white



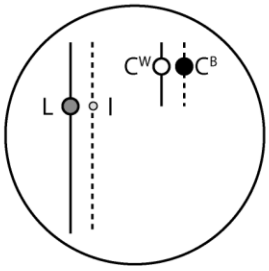
Genotype ll C^WC^B

Phenotype round, gray



Genotype Ll C^WC^B

Phenotype long, gray



Genotype Ll C^WC^B

Phenotype long, gray