Chapter 11 **Introduction to Genetics** **Name _____**

Worksheet Meiosis and Sexual Reproduction

Introduction

The cells of plants and animals have a characteristic number of chromosomes. The term "**ploidy**" refers to the number of sets of chromosomes in a cell. If a cell has two sets of chromosomes, it is said to be **diploid**, or **2n**. The diploid cell received a **maternal set** of chromosomes from mother's egg and the **paternal set** came from father's sperm. The diploid cell will have matching pairs of chromosomes. Such chromosome pairs are called **homologous chromosomes,** or homologues. **Homologues** are similar in size, shape and function. If a cell has only one set of chromosomes, it is said to be **haploid** (monoploid), or **1n**. In a haploid cell there are no homologous pairs of chromosomes. There is only one of each pair. Gametes are examples of cells that are haploid.

In all forms of sexual reproduction, there is a union of two sex cells, or **gametes**. The union of two sex cells is called **syngamy**, or **fertilization**. The cell formed as the result of this union is called the **zygote**. The zygote will have double the number of chromosomes of each gamete, therefore making it diploid, or 2n. **Meiosis** is the process by which the number of chromosomes in a cell is reduced by one half the diploid count. In man, the 2n number is 46 chromosomes. After meiosis takes place, the resulting cells, egg or sperm, will not have any homologous pairs. The egg or sperm of humans will have one set of chromosomes.

Questions to Answer

1. The 2n number of chromosomes is also called the _____ number.
2. The 1n number of chromosomes is also called the _____ or _____ number.
3. Sexual reproduction involves specialized sex cells, or _____ .
4. Why is meiosis necessary in sexually reproducing organisms?

Meiotic Cell Division

In mitotic cell division, or **mitosis**, the chromosomes replicate once and the cell divides once. The chromosome content of the two daughter cells is identical to that of the parent cell. In meiotic cell division, or **meiosis**, the chromosomes replicate once, but there are two cell divisions that produce a total of four cells. Each of the four cells produced has one half of the number of chromosomes as the original diploid parent cell had.

The First Meiotic Cell Division

During **prophase I** of meiosis, pairs of homologous chromosomes join together, forming a structure called a **tetrad** (since it consists of four chromatids, two in each chromosome). This process is called **synapsis**. It is the tetrads that move to the equator of the cell at metaphase. Then, during anaphase, the tetrads are pulled apart. One homologous chromosome of the pair moves to one pole of the dividing cell, while the other homologous chromosome moves to the other pole. As a result, when the cell divides, each daughter cell receives only one chromosome from each homologous pair. It will then have one half as many chromosomes as the parent cell had.

Questions to Answer

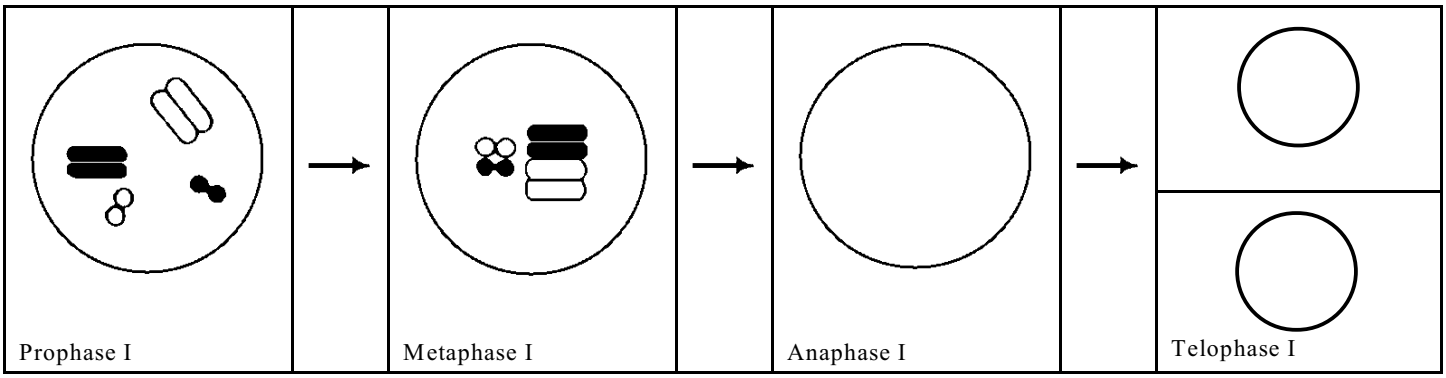
5. What is synapsis?
6. How is the arrangement of chromosomes at metaphase different in mitosis than it is in the first meiotic cell division?

The Second Meiotic Cell Division

The second meiotic cell division follows the first almost immediately. It is **similar** to mitosis. In both of the cells produced by the first division, the **sister chromatids** line up at the metaphase plate. The chromatids separate, and move to opposite poles of the cell. The cell divides in two. Each daughter cell receives a haploid set of chromosomes.

The drawings below represent meiosis in an organism with four chromosomes. Fill in the proper chromosome arrangements in the blank circles.

First Meiotic Division



Second Meiotic Division