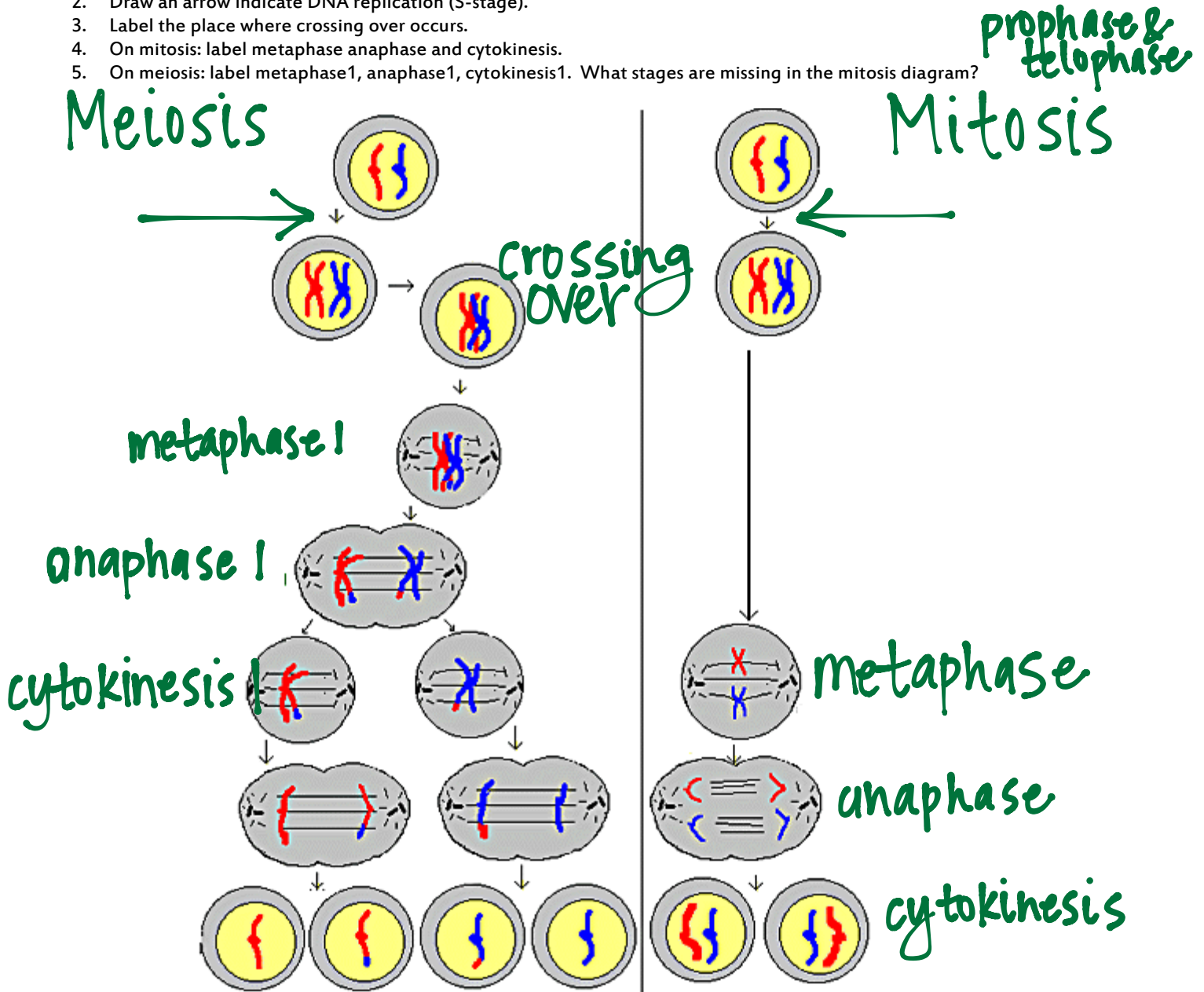


mitosis and meiosis practice packet

Diagram

1. Label the side that is mitosis and meiosis.
2. Draw an arrow indicate DNA replication (S-stage).
3. Label the place where crossing over occurs.
4. On mitosis: label metaphase anaphase and cytokinesis.
5. On meiosis: label metaphase1, anaphase1, cytokinesis1. What stages are missing in the mitosis diagram?



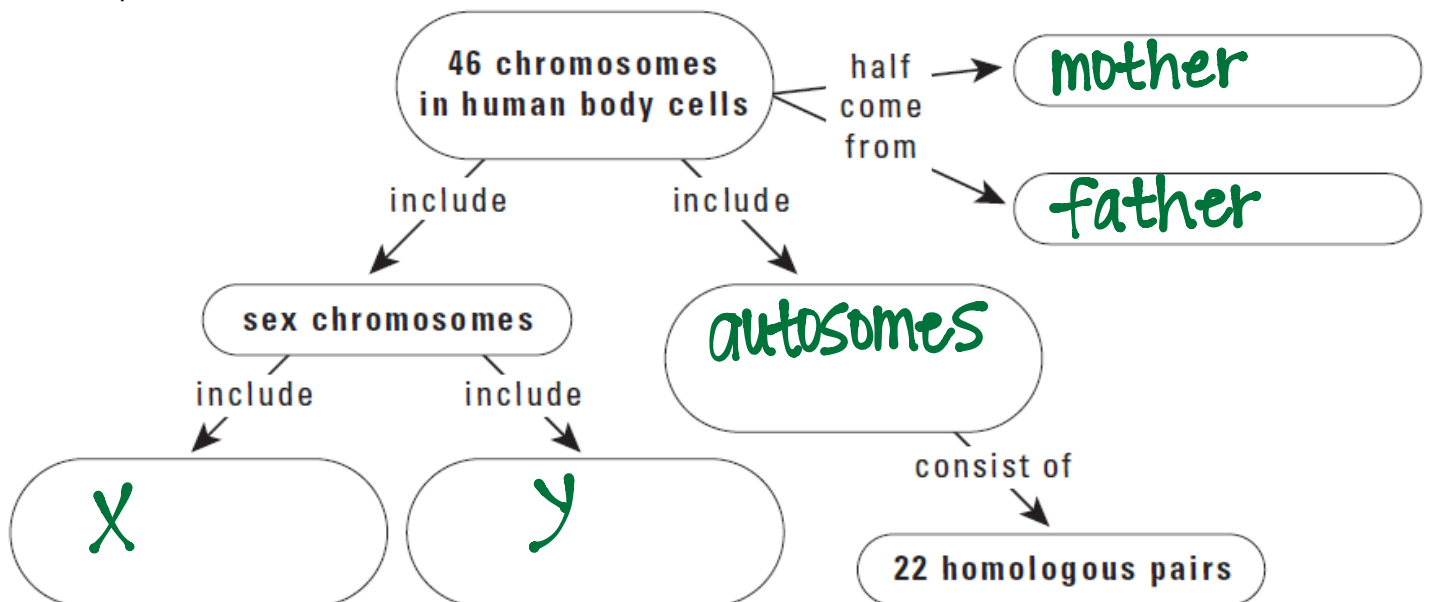
Situational Vocabulary Circle the letter of the situation that most closely relates to each vocabulary word.

- 1) **fertilization:** a) union of gametes; b) division of chromosomes
- 2) **diploid:** a) a dollar; b) fifty cents
- 3) **sexual reproduction:** a) produces genetically identical offspring; b) produces genetically unique offspring
- 4) **trait:** a) inheriting your father's laugh; b) inheriting your father's watch
- 5) **homologous chromosomes:** a) carry the same genes; b) carry identical alleles
- 6) **genome:** a) like a computer hard drive; b) like a computer screen
- 7) **polar body:** a) becomes a baby; b) becomes broken down by the body
- 8) **meiosis:** a) preserves chromosome number; b) reduces chromosome number

Comparing Mitosis and Meiosis

Topic	Mitosis	Meiosis
How chromosomes line up in metaphase (1)	Individually	In tetrads, or homologous pairs
Number of DNA replications	1	1
Number of nuclear divisions	1	2
Number of chromosomes in daughter cells	diploid - $2n - 46$	haploid - $n - 23$
Genetic similarity to parent cell	Identical	Unique
Process of nuclear division	Chromosomes condense, line up, are pulled to the poles, and the nucleus reforms and DNA relaxes.	
Number of cells produced	2	4
Reasons for division	growth & repair	gamete production

Fill in what you know about chromosomes:



MITOSIS

MEIOSIS

growth, development and normal cell function

DNA duplicates

growth, development and normal cell function

prophase - Condenses to chromosomes

chromosomes pulled to poles

the rest of the cell divides

Cell divides again without duplicating DNA

DNA duplicates

Growth, development and normal cell function (use this twice)

Daughter cells are haploid

Chromosomes are pulled to opposite poles of the cell.

Chromosomes line up individually

Daughter cells are diploid

Prophase - Condenses into chromosomes

The rest of the cell divides.

Chromosomes line up in tetrads

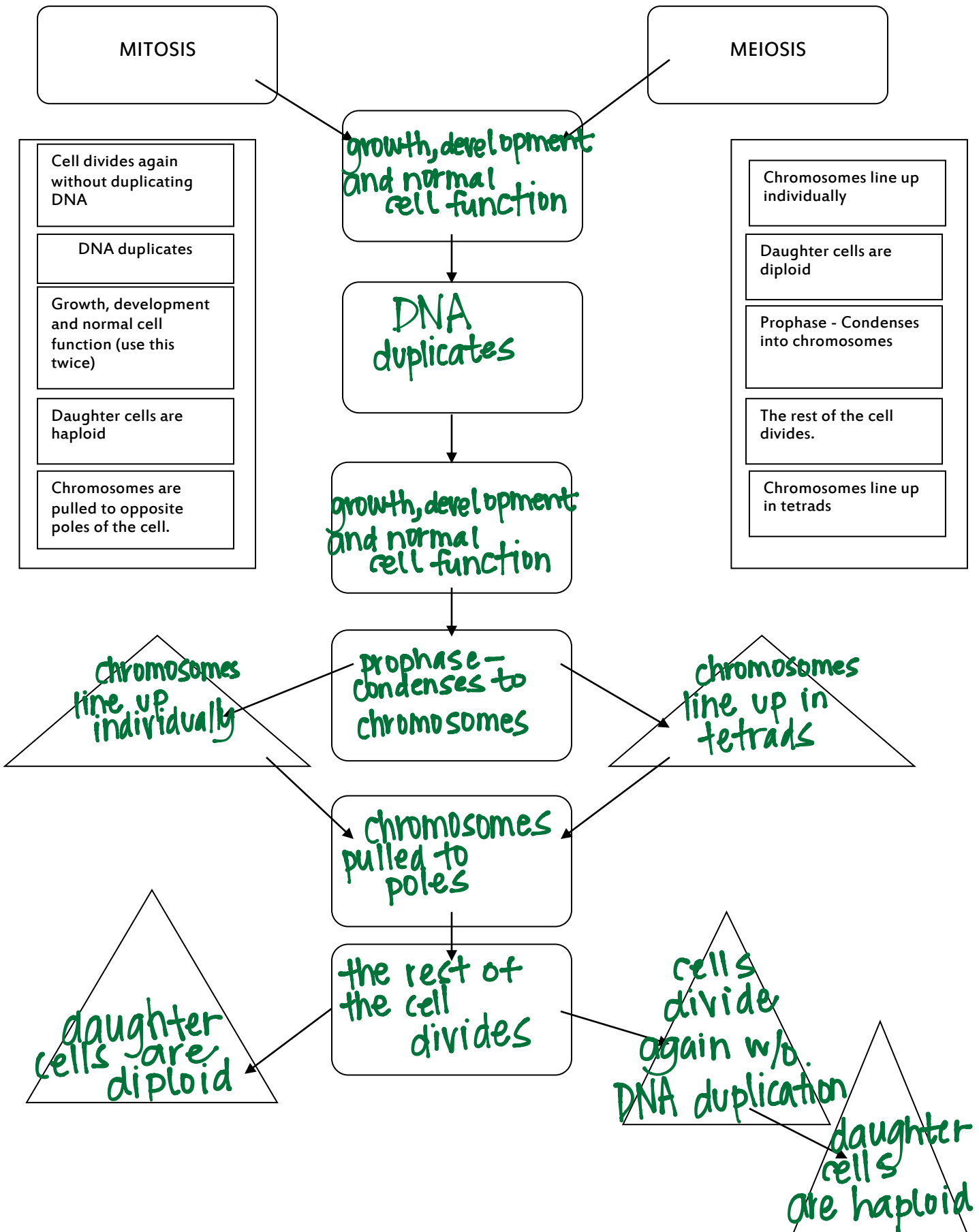
chromosomes line up individually

chromosomes line up in tetrads

daughter cells are diploid

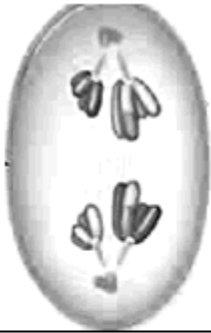
cells divide again w/o. DNA duplication

daughter cells are haploid

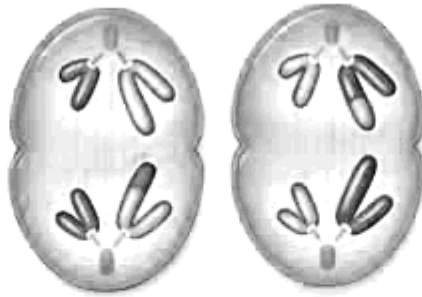


Name the phase of meiosis in the description or in the picture.

Name of Phase	Description
1. prophase 1	Homologous chromosomes pair up and form tetrad
2. anaphase 1	Spindle fibers move homologous chromosomes to opposite sides
3. telophase & cytokinesis 2	Nuclear membrane reforms, cytoplasm divides, 4 daughter cells formed
4. metaphase 2	Chromosomes line up along equator, not in homologous pairs
5. prophase 1	Crossing-over occurs
6. anaphase 2	Chromatids separate
7. metaphase 1	Homologs line up along equator
8. cytokinesis 2	Cytoplasm divides, 2 daughter cells are formed



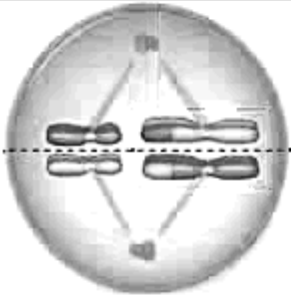
anaphase 1



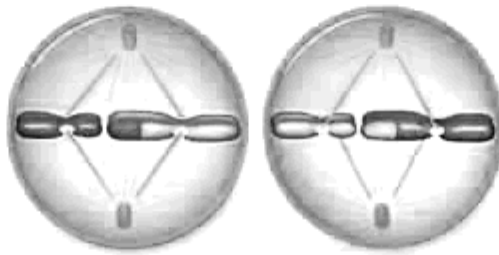
anaphase 2



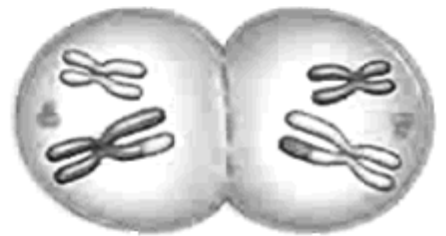
prophase 1



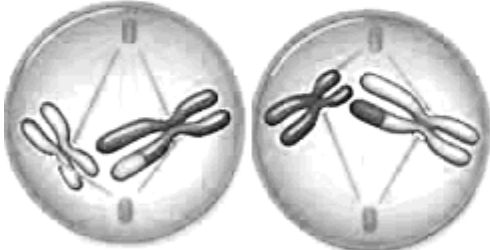
metaphase 1



metaphase 2



telophase 1



prophase 2



cytokinesis 2

For each of the following statements write in the blank if it applies to **mitosis** or **meiosis**.

1. Makes 4 daughter cells meiosis
2. Has 2 phases meiosis
3. Has one nuclear division mitosis
4. Is used to make gametes meiosis
5. Is used for division of somatic cells mitosis
6. Has 2 nuclear division meiosis
7. Allows for crossing over meiosis
8. Daughter cells are diploid mitosis
9. Daughter cells are all genetically identical mitosis
10. Daughter cells are haploid meiosis
11. Daughter cells have half the chromosomes of the parent cell meiosis
12. Makes 2 daughter cells mitosis
13. Daughter cells have 2 sets of chromosomes mitosis
14. In humans, makes cells that have 23 chromosomes meiosis
15. In humans, makes cells that have 46 chromosomes mitosis

Explain crossing over:

The exchange of genetic information. A piece of two homologous chromosomes are swapped at a synapse during Prophase I of meiosis

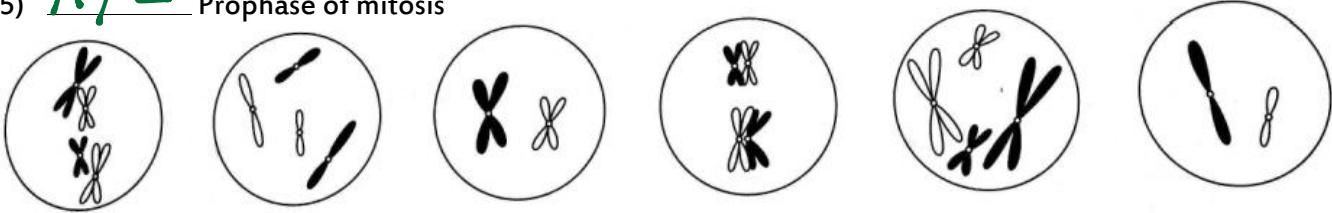
The relationship between DNA, genes and chromosomes. DNA is made up of nucleic acids. Genes are made up a selected set of DNA. Chromosomes are many genes put together.

Analogy – It is like a bookcase – The words in the book are like DNA – made up of letters (nucleic acids) to tell a story or give directions. A book is a gene. It is a set of DNA that is put together and all works together to give one big set of directions. The chromosome is the whole bookcase. It is many genes put together.

Make up your own analogy for DNA, genes, and chromosomes. It can't be a bookcase. Tell what part of your analogy corresponds to the DNA, the gene and the chromosome and explain why that works. (It should look just like the one above)

The cell model used in this exercise has two pairs of homologous chromosomes, one long pair and one short pair. Match the descriptions to the letters beneath each picture in the following sketches.

- 1) C One cell at the beginning of meiosis II
 2) F A daughter cell at the end of meiosis II
 3) D Metaphase I of meiosis
 4) B G1 in a daughter cell after mitosis
 5) A/E Prophase of mitosis



- 6) How many chromosomes are present in cell E? 4
 7) How many chromatids are present in cell E? 8
 8) How many chromatids are present in cell C? 4
 9) How many chromatids are present in cell D? 8
 10) How many chromosomes are present in cell F? 2

Meiosis is like mitosis in some ways, but the result is different. As in mitosis, a(n) diploid cell duplicates its DNA in S stage. The two DNA molecules and associated protein stay attached at the centromere, the notably constricted region along their length. For as long as they remain intact we call them sister chromatids.

With meiosis, however, the chromosomes go through two consecutive division that end with the formation of four haploid nuclei. The germ cell does not enter interphase between the two nuclear divisions, where are known as meiosis 1 and meiosis 2.

In meiosis I, each duplicated chromosome aligns with its pair, homologue to homologue. After the two chromosomes of every pair have lined up with each other, they are moved apart. Next, during meiosis 2, the sister chromatids of each chromosome are separated from each other.

Matching: Match the terms with the appropriate statement

- | | |
|------------------------------------|--|
| 1) <u>D</u> Haploid | A) A pair of chromosomes that have the same assortment of genes |
| 2) <u>E</u> Diploid | B) Duplicated chromosomes that are attached at the centromere |
| 3) <u>B</u> Sister chromatids | C) Occurs when offspring inherit the same number and kinds of genes from a single parent |
| 4) <u>A</u> Homologous chromosomes | D) A cell that contains one of each type of chromosomes |
| 5) <u>C</u> Asexual reproduction | E) A cell that contains two of each type of chromosome |
| 6) <u>F</u> Sexual reproduction | F) Involves meiosis, gamete formation, and fertilization |