Name: _____ **AP Biology**

Chapter 10 Active Reading Guide
Meiosis and Sexual Life Cycles

Section 1

1. Let's begin with a review of several terms that you may already know. Define:
   gene:

   locus:

   gamete:

   male gamete:

   female gamete:

   asexual reproduction:

   sexual reproduction:

2. How many chromosomes are in human cells? What is a chromosome?

3. Which type of reproduction will result in genetically identical offspring?

4. What is a somatic cell? Give examples of two human somatic cell types.

5. How does a somatic cell compare to a gamete in terms of chromosome number?

Section 2

6. What is a karyotype? How is it prepared?

7. What are three things that can be determined from a karyotype? (Study the Research Method, Figure 10.3, in your text carefully for this information.)

8. Explain what is meant by homologous chromosomes.

9. Cells that have only one of each homologous pair are said to be haploid, a condition that is represented by n. Cells that have two of each homologous pair are said to be diploid or 2n. For each of the following, is the cell haploid or diploid?

   a. liver cell _____ e. skin cell _____

   b. gamete _____ f. sperm _____

   c. egg cell _____ g. somatic cell _____

   d. zygote _____ h. sex cell _____

10. The muscle cells of a dog have 78 chromosomes. Fill in the correct chromosome number in a

    a. bone cell _____ b. sperm _____ c. haploid cell _____

    d. somatic cell _____ e. zygote _____

11. In Figure 10.4, the chromosomes are shaded in two colors to represent the parent of origin.

    a. How many chromosomes does the cell above have? _____

    b. How many homologous pairs? _____

    c. How many chromatids? _____

    d. Is this cell haploid or diploid? _____

12. Where are the gametes of an animal produced? Be specific as to male and female gametes.

13. By what process are gametes produced? _____

14. What is another term for a fertilized egg? _____

    What is the chromosome number of the fertilized egg? (Answer this in general terms, haploid, n, or diploid, 2n). _____

15. What is the purpose of meiosis?

16. Study Figure 10.6 in your text. You will see that plants have a life cycle that involves spores, which form as a result of meiosis, so these spores are haploid. Notice also that both haploid and diploid cells can divide by mitosis. However, meiosis always begins with cells that are _____, and as a result of meiosis, daughter cells are formed that are always _____. These cells can be gametes (in animals) or spores (in plants).

17. Your study of plants this year will include knowing that they exhibit alternation of generations.
    a. What does this mean?

    b. What are the two generations?

    c. Which is haploid, and which is diploid?

Section 3

18. What are alleles? Give an example.

19. In meiosis, the DNA is replicated during interphase, followed by two divisions. The first division is meiosis I. Study the events of prophase I as they are significant. Explain each of these events:
    synapsis:

    crossing over:

    chiasmata:

20. How is the arrangement of chromosomes different from metaphase of mitosis?

21. There are 2 divisions in meiosis. What will separate in the first division in meiosis I?

22. Now study the chromosomes in anaphase I and telophase I carefully.

    a. How many chromosomes are in each cell at the end of the first meiotic division? _____

    b. Are the resultant daughter cells haploid, or diploid? _____

23. During meiosis I, homologous chromosomes separate. What separates during meiosis II?

24. To check that you have the big picture, here are some quick review questions.

    a. What happens to the chromosome number in meiosis?

    b. During which division is the chromosome number reduced?

    c. What is the purpose of meiosis?

    d. How many times does the cell divide in meiosis?

    e. How many times do the chromosomes duplicate?

    f. How many daughter cells are formed?

    g. What is the chromosome number?

    h. What are homologs (homologous chromosomes)?

    i. What occurs in synapsis?

    j. What is crossing over?

25. Students often get confused about the differences between mitosis and meiosis. To help with this, work through the following chart:

	Mitosis	**Meiosis**
Role in animal body		
Number of DNA replications		
Number of Divisions		
Number of Daughter Cells		
Chromosome number of daughter cells		

26. Synapsis and crossing over are unique to meiosis. During what specific phase do these occur?

27. Explain the physical events of crossing over. You may wish to make a sketch of the event. Include these terms: synaptonemal complex, chiasmata, homologs, sister chromatids.

Section 4

28. An important idea for you to understand is that new alleles arise by changes in the DNA or mutation, but genetic diversity occurs when the deck that is dealt is simply reshuffled. So, there are three ways that sexually reproducing organisms "shuffle the deck." They are listed below. Explain what occurs in each, and how this increases diversity.
    a. independent assortment of chromosomes:

    b. crossing over:

    c. random fertilization:

29. Here is a fun exercise to drive this point home. Pull out your calculator, and try your hand at this. When you were conceived, what were the odds that of the many possibilities, your parents would come up with you?
    a. The number of different gametes that can be formed because of independent assortment is 2n, where n = the number of homologous pairs. Therefore, since humans have 46 chromosomes or 23 homologous pairs, what is the number of possible gametes that can be formed due to independent assortment of chromosomes?
    b. Now, this is the number of unique gametes your mom could have made. Your father could have made the same number. To see the effect of random fertilization, multiply the number of gametes one parent could make by the number of unique gametes the other parent could make.

    Your answer should be in the trillions, and all of this is **without** crossing over. See how special you are?