Multiple Choice: Read the instructions for each section carefully. Circle the best answer to each question. (2 pts. Each)

The image below represents a karyotype from a human cell. Use this image to respond to questions 1 and 2 below.

3 8 9 10 11 12 7 R н τι. 16 17 15 18 13 14 11 88 43 bā. у 21 22 19 20

- 1. Which of the following correctly identifies the type of cell and the gender shown in the karyotype above?
 - a. somatic cell; male
 - b. somatic cell; female
 - c. gamete; male
 - d. gamete; female
- 2. The karyotype seen above, shows chromosomes "paired up". How do we refer to these pairs and what do they represent in the cell?
 - a. heterozygous pairs; chromosomes with alleles for the same traits
 - b. homozygous pairs; chromosomes with alleles for different traits
 - c. heterologous pairs; chromosomes with alleles for different traits
 - d. homologous pairs; chromosomes with alleles for the same traits
- 3. A genetic exchange between homologous chromosomes often occurs during meiosis. What is this event and why is it most likely to occur during prophase?
 - a. crossing over; homologous chromosomes form pairs that are physically close together
 - b. monosomy; homologous chromosomes are lined up in the middle of the cell
 - c. spontaneous mutations; homologous chromosomes are pulled apart so an exchange takes place
 - d. independent assortment; homologous chromosomes form pairs that are physically close together



The illustration below represents a summary of both meiosis and mitosis. Compare and contrast these two types of cell reproduction, by responding to question 10 below.

- 4. Note the cells labeled with the letters "A" and "B" in the illustration above. What is the chromosome number associated with each type of cell?
 - a. cell A is 2n; cell B is 2n
 - b. cell A is 2n; cell B is 1n
 - c. cell A is 1n; cell B is 1n
 - d. cell A is 1n; cell B is 2n
- 5. What sex chromosome conditions determine female gender in humans?
 - a. two Y chromosomes (YY)
 - b. The absence of a Y chromosome
 - c. A single X chromosome, whether or not Y chromosomes are present.
 - d. A single Y chromosome, whether or not X chromosomes are present.
- 6. In humans, how many chromosomes come from the father and the mother EACH?
 - a. Father 20; Mother 26
 - b. Father 23; Mother 23
 - c. Father 32; Mother 32
 - d. Father 46; Mother 0

The illustration below represents the sequence of events that occur during meiosis. Use this labeled illustration to respond to questions 16 and 17 below.



- a. Insert into cell #2
- b. Insert into cell #3
- c. Insert into cell #5
- d. Insert into cell #6

9. The image below shows cells in various stages of cellular reproduction. Which of the following accurately describes what we see in this image?



- a. These are human cheek cells undergoing mitosis
- b. These are human cheek cells undergoing meiosis
- c. These are onion root tip cells undergoing meiosis.
- d. These are onion root tip cells undergoing mitosis.
- 10. If an organism's diploid number is 12, its haploid number is
 - a. 12.
 - b. 6.
 - c. 24.
 - d. 3.

11. Gametes have

- a. Homologous chromosomes
- b. Twice the number of chromosomes found in body cells
- c. Two sets of chromosomes
- d. One allele for each gene
- 12. Gametes are produced by the process of
 - a. Mitosis
 - b. Meiosis
 - c. Crossing-over
 - d. Replication
- 13. Unlike mitosis, meiosis results in the formation of
 - a. Two genetically identical cells
 - b. Four genetically different cells
 - c. Four genetically identical cells
 - d. Two genetically different cells
- 14. Chromosome number is reduced by meiosis because between meiosis I and meiosis II
 - a. Crossing-over occurs
 - b. Metaphase occurs
 - c. Replication occurs twice
 - d. Replication does not occur

15. What process is occurring in the picture below?



- a. Independent assortment
- b. Anaphase I of meiosis
- c. Crossing-over
- d. Replication

Modified True/False Directions: Indicate whether the sentence or statement is true or false. If false, change the underlined word or phrase to make the sentence or statement true.

- 16. An organism with a dominant allele for a particular form of a trait will sometimes have that form.
- 17. If an organism has 16 chromosomes in each of its egg cells, the organism's diploid number is 8.
- 18. Mitosis results in two cells, whereas meiosis results in one cell.
- 19. The different forms of a gene are called alleles.
- 20. Humans have 46 chromosomes, which means they have 23 pairs of homologous chromosomes.

Read each question carefully. Choose 3 out the 4 essays to complete. You may answer all for essays for extra credit.

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PSI Biology

Mitosis & Meiosis

- 21. There are numerous ways in which homologous chromosomes can be combined during independent assortment. We can quantify this by using the following formula: Given n pairs of chromosomes, there are 2^n ways of combining homologous chromosomes. Use this information to answer the following questions about an organism with a haploid number of 4.
 - a. What is this organism's diploid chromosome number?
 - b. How many pairs of chromosomes does this represent?
 - c. How many different ways can the homologous chromosomes, in this organism, assort independently of each other?

22. Suppose that the homologous chromosomes that make up a tetrad fail to separate during anaphase I of meiosis. What is this phenomenon called? Draw a picture of how each daughter cell will look.

23. Explain why the daughter cells produced by meiosis are genetically different from each other, whereas the daughter cells produced by mitosis are not.

24. What is the purpose of mitosis? What is the purpose of meiosis? Use the Venn Diagram below to write the similarities and differences between mitosis and meiosis.