CHAPTER 12—MENDEL AND MEIOSIS

MULTIPLE CHOICE

1. When an area of a chromatid is exchanged with the matching area on a chromatid of its homologous chromosome, _____ occurs.
   a. crossing over
   b. mutagenesis
   c. hybridization
   d. fertilization

   ANS: A DIF: B OBJ: 12-4

2. Crossing over results in a _____.
   a. female genotype
   b. male genotype
   c. genetic recombination
   d. phenotype replication

   ANS: C DIF: B OBJ: 12-4

3. The _____ produced by each parent are shown along the sides of a Punnett square.
   a. zygotes
   b. offspring
   c. gametes
   d. hybrids

   ANS: C DIF: B OBJ: 12-2

4. A useful device for predicting the possible offspring of crosses between different genotypes is the _____.
   a. law of dominance
   b. law of independent assortment
   c. Punnett square
   d. testcross

   ANS: C DIF: B OBJ: 12-2

5. Which of the following describes an organism that has the genotype Bb?
   a. homozygous
   b. heterozygous
   c. inbreed
   d. all of these

   ANS: B DIF: B OBJ: 12-2

6. Mendel's law of segregation states that during meiosis, the factors that control each trait separate, and only _____ from each pair is/are passed to the offspring.
   a. one factor
   b. the dominant trait
   c. two factors
   d. the recessive trait

   ANS: A DIF: B OBJ: 12-5

7. The law of independent assortment states that the inheritance of alleles for one trait is not affected by the inheritance of alleles for a different trait if the genes for the traits are on _____.
   a. separate chromosomes
   b. homologous chromosomes
   c. the same chromosome
   d. homozygous chromosomes

   ANS: A DIF: B OBJ: 12-1

8. The passing on of traits from parents to offspring is called _____.
   a. genetics
   b. heredity
   c. inbreeding
   d. gene splicing

   ANS: B DIF: B OBJ: 12-1

9. The statement: "In meiosis, the way in which a chromosome pair separates does not affect the way other pairs separate," is another way of expressing Mendel's law of _____.
   a. dominance
   b. first filial generations
   c. independent assortment
   d. Punnett squares

   ANS: C DIF: B OBJ: 12-5

10. Cells containing two alleles for each trait are described as _____.
    a. haploid
    b. gametes
    c. diploid
    d. homozygous

    ANS: C DIF: B OBJ: 12-3

11. The gamete that contains genes contributed only by the mother is _____.
    a. the sperm
    b. an egg
    c. a zygote
    d. dominant

    ANS: B DIF: B OBJ: 12-3

12. Pollination can best be described as _____.
    a. the fusing of the egg nucleus with the pollen nucleus
    b. the transfer of the male pollen grain to the female organ
    c. the formation of male and female sex cells
    d. the type of cell division that produces diploid gametes

    ANS: B DIF: B OBJ: 12-3

13. A couple has two children, both of whom are boys. What is the chance that the parents' next child will be a boy?
    a. 0%
    b. 50%
    c. 25%
    d. 75%

    ANS: B DIF: B OBJ: 12-2

14. A dog's phenotype can be determined by _____.
    a. looking at the dog's parents
    b. examining the dog's chromosomes
    c. mating the dog and examining its offspring
    d. looking at the dog

    ANS: D DIF: B OBJ: 12-1

15. A female guinea pig homozygous dominant for black fur color is mated with a male homozygous for white fur color. In a litter of eight offspring, there would probably be _____.
    a. 8 black guinea pigs
    b. 4 black and 4 white guinea pigs
    c. 2 black, 4 gray, and 2 white guinea pigs
    d. 8 white guinea pigs

    ANS: A DIF: B OBJ: 12-2

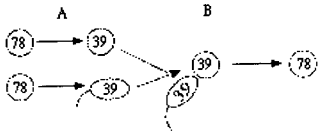

Figure 12-1

16. The numbers in Figure 12-1 represent the chromosome number found in each of the dog cells shown. The processes that are occurring at A and B are _____.
    a. mitosis and fertilization
    b. meiosis and fertilization
    c. mitosis and pollination
    d. meiosis and pollination

    ANS: B DIF: B OBJ: 12-3

17. Genes located on homologous chromosomes may have alternate forms that control different forms of a trait. These alternate forms of a gene are called _____.
    a. alleles
    b. centromeres
    c. phenotypes
    d. gametes

    ANS: A DIF: B OBJ: 12-1

18. A white mouse whose parents are both white produces only brown offspring when mated with a brown mouse. The white mouse is most probably _____.
    a. homozygous recessive
    b. heterozygous
    c. homozygous dominant
    d. haploid

    ANS: A DIF: B OBJ: 12-1

19. In chickens, rose comb (R) is dominant to single comb (r). A homozygous rose-combed rooster is mated with a single-combed hen. All of the chicks in the F_1 generation were kept together as a group for several years. They were allowed to mate only within their own group. What is the expected phenotype of the F_2 chicks?
    a. 100% rose comb
    b. 75% rose comb and 25% single comb
    c. 100% single comb
    d. 50% rose comb and 50% single comb

    ANS: B DIF: B OBJ: 12-2

20. In mink, brown fur color is dominant to silver-blue fur color. If a homozygous brown mink is mated with a silver-blue mink and 8 offspring are produced, how many would be expected to be silver-blue?
    a. 0
    b. 3
    c. 6
    d. 8

    ANS: A DIF: B OBJ: 12-2

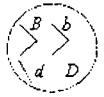

Figure 12-2

21. The diagram in Figure 12-2 shows a diploid cell with two homologous pairs of chromosomes. Due to independent assortment, the possible allelic combinations that could be found in gametes produced by the meiotic division of this cell are _____.
    a. Bb, Dd, BB, and DD
    b. BD, bD, Bd, and bd
    c. BbDd and BDbd
    d. Bd and bD only

    ANS: B DIF: B OBJ: 12-5

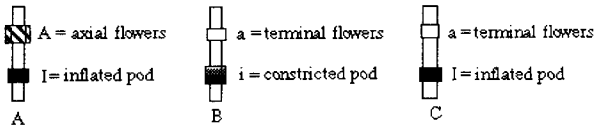

Figure 12-3

22. Using Figure 12-3, which process would result in the formation of chromosome C from chromosomes A and B?
    a. asexual reproduction
    b. independent assortment
    c. crossing over
    d. segregation

    ANS: C DIF: B OBJ: 12-4

MATCHING

Match each item with the correct statement below. Write the answer in the space provided.

a. crossing over
b. meiosis
c. dihybrid
d. heredity
e. haploid
f. homozygous
g. zygote
h. fertilization

1. ____ A cross involving two different traits
2. ____ The exchange of genetic material between homologous chromosomes
3. ____ The uniting of the male and female gametes
4. ____ The cell produced when a male gamete fuses with a female gamete
5. ____ The type of cell division that produces gametes
6. ____ A cell that contains one member of each chromosome pair
7. ____ The alleles present for a trait are the same
8. ____ The passing of characteristics from parents to offspring

1. ANS: c DIF: B OBJ: 12-1
2. ANS: a DIF: B OBJ: 12-4
3. ANS: h DIF: B OBJ: 12-3
4. ANS: g DIF: B OBJ: 12-3
5. ANS: b DIF: B OBJ: 12-3
6. ANS: e DIF: B OBJ: 12-1
7. ANS: f DIF: B OBJ: 12-1
8. ANS: d DIF: B OBJ: 12-1

SHORT ANSWER

1. How does meiosis maintain a constant number of chromosomes in the body cells of organisms that reproduce sexually?

   ANS: Meiosis reduces the number of chromosomes to *n* or half in the sperm and egg. When fertilization occurs, the 2*n* number of chromosomes is restored.

   DIF: A OBJ: 12-5

2. How does the knowledge of the events of meiosis explain Mendel's Law of Segregation?

   ANS: During meiosis, the homologous chromosome pairs line up and split; then in the second division, the chromatids split. This results in only one of the pair of chromosomes (containing the "factors") in a gamete.

   DIF: A OBJ: 12-5

3. Explain how crossing over in meiosis results in genetic variation.

   ANS: In crossing over, genetic information is exchanged between homologous chromosomes. This exchange creates new combinations of genes, leading to increased genetic variation in the offspring.

   DIF: A OBJ: 12-4

4. How does Mendel's Law of Independent Assortment assure genetic diversity?

   ANS: Answers may include: During independent assortment, the homologous chromosomes are assorted independently of one another. This increases genetic diversity.

   DIF: A OBJ: 12-4

5. Analyze the differences between Mendel's Law of Dominance and Law of Segregation.

   ANS: Answers may include: The Law of Dominance deals with individual genes and their influence. The Law of Segregation explains how these genes are separated during meiosis.

   DIF: A OBJ: 12-1

6. Describe how genetic recombination through segregation and crossing over can lead to variations in the offspring.

   ANS: Independent segregation of homologous chromosomes during gamete formation allows for a random assortment of alleles in the sex cells. This allows the members of each pair of alleles to recombine in new ways in the offspring. Crossing over leads to new gene combinations when homologous chromosomes exchange alleles during meiosis. Thus, an allele may be paired with a trait with which it was not previously paired.

   DIF: A OBJ: 12-1