

CHAPTER 19

SEX AND GENETICS

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The Benefits of Sex

- 19-1** Organisms that reproduce sexually _____.
- (a) must be haploid, unlike organisms that reproduce asexually
 - (b) can reproduce only with a partner that carries the same alleles
 - (c) create zygotes that are genetically identical to each other
 - (d) undergo a sexual reproductive cycle that involves an alternation of haploid cells with the generation of diploid cells
- 19-2** Which of the following statements is *true*?
- (a) Another name for the fertilized egg cell is the zygote.
 - (b) Diploid organisms reproduce only sexually.
 - (c) All sexually reproducing organisms must have two copies of every chromosome.
 - (d) Gametes have only one chromosome.
- 19-3** Which of the following statements is *false*?
- (a) Asexual reproduction typically gives rise to offspring that are genetically identical.
 - (b) Mutations in somatic cells are passed on to individuals of the next generation.
 - (c) Sexual reproduction allows for a wide variety of gene combinations.
 - (d) Gametes are specialized sex cells.
- 19-4** Somatic cells _____.
- (a) are not necessary for sexual reproduction in all eucaryotic organisms
 - (b) are used to produce germ line cells when organisms reach sexual maturity
 - (c) leave no progeny
 - (d) do not contain sex chromosomes
- 19-5** Which of the following statements about the benefits of sexual reproduction is *false*?

- (a) Sexual reproduction permits enhanced survival because the gametes that carry alleles enhancing survival in harsh environments are used preferentially during fertilization.
- (b) Unicellular organisms that can undergo sexual reproduction have an increased ability to adapt to harsh environments.
- (c) Sexual reproduction reshuffles genes, which is thought to help species survive in novel or varying environments.
- (d) Sexual reproduction can speed the elimination of deleterious alleles.

19-6 For each of the following sentences, fill in the blanks with the best word or phrase selected from the list below. Not all words or phrases will be used; each word or phrase may be used more than once.

To reproduce sexually, an organism must create haploid _____ cells, or _____, from diploid cells via a specialized cell division called _____. During mating, the father's haploid cells, called _____ in animals, fuse with the mother's haploid cells, called _____. Cell fusion produces a diploid cell called a _____, which undergoes many rounds of cell division to create the entire body of the new individual. The cells produced from the initial fusion event include _____ cells that form most of the tissues of the body as well as the _____-line cells that give rise to the next generation of progeny.

allele	germ	pollen
bivalent	meiosis	somatic
eggs	mitosis	sperm
gametes	pedigree	zygote

19-7 Why is sexual reproduction more beneficial to a species living in an unpredictable environment than to one living in a constant environment?

19-8 Is the following statement *true* or *false*? Explain.

Somatic cells leave no progeny and thus, in an evolutionary sense, exist only to help create, sustain, and propagate the germ cells.

- 19-9** Sexual reproduction is a large drain on the limited resources of an individual. Nonetheless, sexual reproduction is common. In fact, to allow sexual reproduction, organisms have evolved many elaborate anatomical structures, cellular processes, and chemical signals. For example, flowers exist entirely to further the goal of sexual reproduction, and many plants have enlisted the help of bees and birds to aid in the dissemination of their germ cells. Describe one reason why most multicellular organisms have evolved to reproduce sexually instead of relying solely on asexual reproduction.

Meiosis and Fertilization

- 19-10** Indicate whether each of the following is *true* for meiosis, mitosis, both, or neither.
- A. formation of a bivalent
 - B. genetically identical products
 - C. condensation of chromosomes
 - D. segregation of all paternal chromosomes to one cell
 - E. involvement of DNA replication
- 19-11** Meiosis is a highly specialized cell division in which several events occur in a precisely defined order. Please order the meiotic events listed below.
1. loss of cohesins near centromeres
 2. chromatid pairing
 3. chromosome condensation
 4. chromosome replication
 5. degradation of cohesins bound to chromosome arms
 6. formation of chiasmata (chiasmata = plural of chiasma)
 7. homolog pairing
 8. alignment of chromosomes at the metaphase plate
- 19-12** For each of the following sentences, choose one of the options enclosed in square brackets to make a correct statement.

Starting with a single diploid cell, mitosis produces [two/four] [identical/different] [haploid/diploid] cells, whereas meiosis yields [two/four] [identical/different] [haploid/diploid] cells. This is accomplished in meiosis because a single round of chromosome [replication/segregation] is followed by two sequential rounds of [replication/segregation]. Mitosis is more like meiosis [I/II] than