

Level 2 Learning Concepts

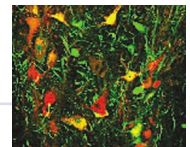
1. What events occur during meiosis that contribute to genetic recombination? Explain the importance of the genetic recombination that occurs during meiosis.
2. Place these steps in the correct sequence. What process is being described?
 - a. Chromosomes line up in center of cell.
 - b. Nuclear envelope forms and chromosomes uncoil.
 - c. Chromosomes condense and spindle fibers form.
 - d. Sister chromatids separate and move to opposite poles of cell.
3. Place these steps in the correct sequence. What process is being described?
 - a. Homologous chromosomes move toward opposite poles of cell; chromatids do not separate.
 - b. Chromosomes gather together at two poles of cell, and nuclear membranes reform.
 - c. Homologous chromosomes pair and exchange segments.
 - d. Homologous chromosomes align on a central plane.
 - e. Haploid cells separate completely.
4. Compare the cells that result from mitosis with those that result from meiosis. How are they different?
5. Which of the following is most similar in terms of DNA nucleotide sequence? Explain your answer.
 - two nonhomologous chromosomes
 - two nonsister chromatids of homologous chromosomes
 - sister chromatids
6. An organism has a diploid chromosome number of $2N = 4$. The chromosomes are called A, B, C, and D, and the homologous pairs are AC and BD. What possible chromosome combinations could exist in the sex cells of this organism?

Level 3 Critical Thinking and Life Applications

1. The amount of DNA per nucleus was measured on several hundred cells from the tip of the root of a plant. The amount of DNA ranged from 10 to 20 picograms (pg). (A picogram is a trillionth of a gram.) Describe the cell-cycle stage(s) (including cell division) that each of these cells is in:
 - A cell with 20 pg of DNA
 - A cell with 10 pg of DNA
 - A cell with 15 pg of DNA
2. The amount of DNA per nucleus was measured on several hundred cells in the testes of a Rhesus monkey. The amount of DNA ranged from 20 to 80 pg. Describe the cell-cycle stage(s) that each of these cells is in:

• A cell with 40 pg of DNA	• A cell with 20 pg of DNA
• A cell with 49.3 pg of DNA	• A cell with 80 pg of DNA
3. The cells in the ovaries of an organism contain four total chromosomes (labeled AA, aa, BB, bb) prior to meiosis. Each letter corresponds to a chromatid, and paired letters correspond to a chromosome with two chromatids. The homologous pairs are AA–aa and BB–bb. What possible chromosome combinations could exist in the sex cells she produces at the end of meiosis?
4. If cells in interphase are subjected to colchicine, a drug that interferes with the functioning of the spindle apparatus, at which stage will mitosis be arrested (stopped)?
5. While looking at an unknown cell under a high-powered microscope you observe that it is in metaphase, but you don't know whether it is metaphase of mitosis or metaphase I or II of meiosis. Could you decide which it is? Explain.
6. The meiotic division of a human sperm-producing cell produces two normal haploid sperm cells, one cell that has an extra chromosome, and another cell that is lacking the same chromosome. What may have gone wrong in the meiotic process to produce these four cells? What would result if each of the above cells were to fertilize an egg cell that had the normal complement of chromosomes?
7. Scientists have discovered a number of drugs that prevent angiogenesis (the growth and infiltration of blood vessels into body tissues). How might these drugs be useful in fighting cancer?

In The News Critical Thinking



STEM CELL SHAKES

Now that you understand more about cell reproduction and the cell cycle, reread this chapter's opening story about stem cells. To develop an informed and thoughtful stand on this issue, it may help you to follow these steps:

1. Review your immediate reaction to the opening story that you wrote when you began reading this chapter.
2. Based on your current understanding, identify the issue concerning stem cell research, using either a statement or a question. An issue is a point on which people hold differing views.
3. Collect new information about the issue. Visit the *In The News* section of this text's companion Web site at www.wiley.com/college/alters and watch the "Stem Cell Shakes" video. Then use the "summary" link to read the accompanying story and access related links. Use this information, the links provided, and other online and library resources to find updates about this issue. State the sources of your information. Explain why you think the information is accurate. Also determine whether the information expresses a particular point of view or is biased in any way.
4. Determine which individuals, groups, or organizations have a stake in the issue. What does each stand to gain or lose depending on the outcome?
5. List possible outcomes (resolutions) of the issue. List the pros and cons of each outcome.
6. Which outcome do you think would be best? Why? Note whether your opinion differs from or is the same as what you wrote when you began reading this chapter. Give reasons for your views and for any changes in them based on the additional information you have collected and the analysis you have done.