

Guided Reading Questions

© 1999-2011 James Bier

Chapter 8

Cellular Basis of Reproduction and Inheritance

- (essay) Define fertilization. What is an organism's life cycle? What are the two stages in the life of a multicellular organism? Contrast sexual versus asexual reproduction.
- (8.1) What does "Like begets like" mean? Why, strictly speaking, does it apply only to asexual reproduction. What are chromosomes? How are the daughters genetically related to the parent? Why does the phrase "Like begets like" not apply as well to sexually reproduced offspring? Again contrast sexual and asexual reproduction?
- (8.2) What did Rudolf Virchow say about cells? What is cell division and what are its roles in the life cycle of multicellular organisms?
- (8.3) Define binary fission. How do prokaryotes divide?
- (8.4) How many genes are in a human and a typical bacterium? Define chromosome and chromatin. How many sister chromatids are in a chromosome? Are chromatids identical? At what location are the chromatids attached? Note that when the chromatids separate, they are each called a chromosome, and that each daughter cell receives a complete and identical set of chromosomes.
- (8.5) Approximately how many cells are in an adult human? What is a cell cycle? In what phase does a cell spend most of its time? What occurs during interphase? What are the three parts of interphase? What occurs during G₁, S and G₂ subphases? Define mitosis and cytokinesis.
- (8.6) What are the five main stages of mitosis? What is the mitotic spindle and what is it made of? What anchors the two ends of the spindle? Examine the figures. In which phase do the chromosomes appear and the mitotic spindle forms? During which phase do the nucleoli and nuclear membranes disappear? In what stage does the mitotic spindle completely form and the chromosomes line up in the middle of the cell? In what stage do the chromatids separate? How are the chromosomes pulled toward the poles? When does anaphase end? What happens to the chromosomes, nuclear membrane, nucleoli, and spindle structure during telophase? With which phase of mitosis does cytokinesis usually occur?
- (8.7) Define cytokinesis. During which stage(s) of mitosis does cytokinesis occur? What are the cleavage furrow and the cell plate? Contrast cytokinesis in plants and animals.
- (8.8) Define growth factor, anchorage dependence, and density-dependent inhibition. How do growth factors control cell division?
- (8.9) What is the cell-cycle control system? What occurs at the checkpoints? What are the three major checkpoints in a cell cycle? What is G₀?
- (8.10) How do cancer cells differ from noncancerous cells? Define tumor, benign tumor, malignant tumor and metastasis? Define carcinoma, sarcoma, leukemia and lymphoma. What have scientists learned about cancer cells in culture? How does radiation therapy and chemotherapy work? What are taxol and vinblastin, and how do they work?
- (8.11) What three things does mitosis allow organisms to do?
- (8.12) Define somatic cell, homologous chromosomes, locus, autosomes and sex chromosomes. How many pairs of homologous chromosomes are present in the somatic cells of humans? What types of sex chromosomes do mammalian females and mammalian males have?

- Contrast the X and Y chromosomes. How many chromosomes does a child inherit from its mother and from its father?
- (8.13) Define diploid cells, gametes and haploid cells. How are diploid and haploid abbreviated? What are the diploid and haploid numbers for human cells? Define fertilization and zygote. What process makes haploid gametes from diploid cells?
- (8.14) What are the two divisions of meiosis called? How many daughter cells result from meiosis and mitosis? Is each daughter cell resulting from meiosis haploid or diploid? In which division does the halving of chromosomes occur? What is the longest and most complex phase of meiosis? What occurs during synapsis? Define tetrad and crossing over. What else occurs during prophase I? What is the arrangement of the chromosomes during metaphase I? How are the homologues held together? What separates during anaphase I? Are the cells at the end of telophase I haploid or diploid? Contrast meiosis II and mitosis.
- (8.15) Contrast mitosis and meiosis, i.e., state how they are similar and how they are different. In regards to this, answer the following questions. How often do chromosomes replicate for both meiosis and mitosis? How many divisions and how many daughter cells are produced by each process? What events occur during meiosis I that do not occur during mitosis? How are mitosis and meiosis II similar and how are they different?
- (8.16) What is the original source of genetic variation? How is the orientation of tetrads during metaphase I determined? How many different gametes are possible from a cell with four chromosomes? How many different gametes can a single human produce? What many different zygotes can a single mother and single father produce?
- (8.17) How are different versions of the same gene represented in fig. 8.17A?
- (8.18) Define crossing over and chiasma (pl. chiasmata). When does crossing over occur? What are the four steps in crossing over? How do they lead to greater variation among gametes? Define genetic recombination. How often do crossover events occur per each chromosome? What are the three sources of variation among offspring from a single pair of parents?
- (8.19) Define karyotype. During what stage is mitosis stopped? In the fifth picture in Figure 8.19, note the difference in size between the X and Y chromosomes.
- (8.20) What is trisomy 21 and Down syndrome? What happens to most zygotes that are conceived with an abnormal number of chromosomes? How does the incidence of offspring with Down syndrome relate to the age of the mother?
- (8.21) Define nondisjunction. During which phase of meiosis can nondisjunction occur? When does meiosis begin in women? When is it completed?
- (8.22) Is an abnormal number of sex chromosomes fatal? What happens to extra X chromosomes in a cell? What is the cause and what are the symptoms of Klinefelter's syndrome? What are the effects of XYY and XXX? What genetic condition causes Turner syndrome? How many Y chromosomes are necessary to produce a male?
- (8.23) Define polyploid. How common is polyploidy in plants? How might polyploidy arise?
- (8.24) Define deletion, duplication and inversion in chromosomes. Which of these has the most serious effects? Define translocation. How can chromosomal changes affect health?