

## Cell Cycle and Meiosis Concept Questions

1. What functions does cell division accomplish?
2. Do all of the cells in your body divide at the same rate? Explain.
3. State the phase that is described by each of the following events during mitosis.
  - a) The chromosomes move apart and go to opposite poles of the cell.
  - b) The nucleolus and nuclear envelope reappear.
  - c) The centrioles complete their own replication.
  - d) The cell grows in size.
  - e) The spindle has reached its full development.
  - f) Chromosomes becomes shorter and thicker strands
4. Looking under a microscope, you notice that some cells have several nuclei within the cytoplasm of a single cell. Which phase of the cell cycle is not operating correctly to form such cells?
5. Why must cytokinesis occur after, rather than before, anaphase?
6. Identify the difference between cytokinesis in animal cells and plant cells.
7. A drug interferes with the construction of the mitotic spindle. What effect would this drug have on cells?
8. Why is it so important that DNA replication occur during interphase of cell division?
9. a) Imagine that a drug is developed that forces cells to remain in G1 of the cell cycle. What would be the effect on the cell?
  - b) On the individual?
10. What signals control the growth and division of normal cells?
11. How can mutagens cause cancer?
12. Cancer cells are unusual in a variety of ways: they are immortal, they metastasize, don't perform their normal function, and they can form tumors. Explain each of these characteristics at the cell level.
13. a) What evidence suggests that cells contain a biological clock or counter?
  - b) How might understanding the biological counter help extend human life span?
14. How can stem cells be used in addressing the problems of organ transplantation?
15. What are chromosomes other than sex chromosomes called?
16. Distinguish between haploid and diploid cells in humans. Apply them to the terms "somatic cell" and "sex cell."
17. Do homologous chromosomes have the same number of genes? Do they have identical genes? Explain.
18. a) A cell with 10 chromosomes undergoes mitosis. Indicate the number of chromosomes you would expect in each of the daughter cells.
  - b) What about after meiosis?
19. Match the events to the correct phase of meiosis.
  - a) pairs of homologous chromosomes line up along the equator of the cell
  - b) synapsis occurs and the four chromatids form a tetrad
  - c) replication of the genetic material
  - d) homologous pairs become separated
  - e) sister chromatids split at the centromere and move toward opposite poles
20. Why is there no DNA replication before meiosis II?
21. A muscle cell of a mouse has 40 chromosomes. Indicate the number of chromosomes you would expect to find in each of the following cells of the same mouse
  - a) daughter cell formed after mitosis
  - b) skin cell
  - c) egg cell
  - d) fertilized egg

22. a) If a cell has a diploid number of 32, what would be the chromosome number of a cell in late Prophase I of meiosis?  
b) What about at the end of Telophase II?
23. Compare and contrast meiosis and mitosis.
24. Explain how the production of gametes and sexual reproduction increase genetic variation.
25. Explain how synapsis often leads to the exchange of genetic material between chromosomes.
26. What is a karyotype and for what purpose is it used? Where would one get the cells to make one?
27. Describe nondisjunction and its effect on the chromosomal composition of a cell.
28. As any pair of chromatids can fail to separate during meiosis, theoretically there are 23 possible kinds of monosomy and trisomy. However, monosomies and trisomies for most of the 23 chromosome pairs are quite rare (or unheard of). Why do you think this is so?