

Name _____ Period _____

Chapter 12: The Cell Cycle

Overview:

1. What are the three key roles of cell division? State each role, and give an example.

Key Role	Example

2. What is meant by the *cell cycle*?

Concept 12.1 Cell division results in genetically identical daughter cells

3. What is the meaning of *genome*? Compare your genome to that of a prokaryotic cell.
4. How many chromosomes are in a human *somatic cell*?
5. Name two types of somatic cells in your body.
6. What is a *gamete*?
7. Name the two types of gametes.

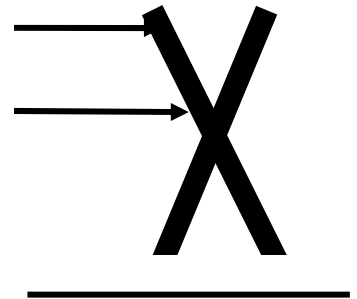
8. How many chromosomes in a human gamete?
9. Define *chromatin*.
10. Think carefully, now. How many DNA molecules are in each of your somatic cells?
11. You are going to have to learn the difference between a number of similar-sounding terms. The sketch that looks like an X represents a *replicated chromosome* that has two *sister chromatids*. The narrow “waist” represents the location of the *centromere*. Students often get all these terms confused, so take time now to label the indicated areas of the figure and then define each of the terms below.

chromosome

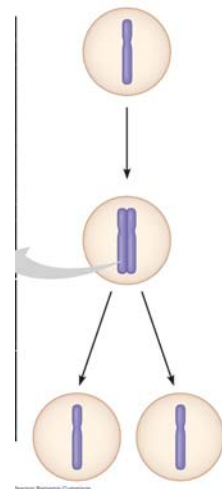
chromatid

centromere

chromatin



12. Study Figure 12.4. Label the figure below, and summarize what occurs at the DNA level in each stage.



13. What is *mitosis*? How is it different from *cytokinesis*?
14. What occurs in *meiosis*? How is the chromosome number of daughter cells different?
15. Select either *mitosis* or *meiosis* to answer the following questions.
- _____ By what process are the damaged cells in a wound replaced?
- _____ By what process are eggs formed?
- _____ By what process does a zygote develop into a multicellular organism?
- _____ In which process are identical daughter cells produced?
- _____ Which process reduces chromosome number of daughter cells?
16. Don't skip the Concept Check Questions! They are a good way to verify your understanding. Here is a variation of question 3. Answer it here: A hedgehog has 90 chromosomes in its somatic cells.
- a. How many chromosomes did the hedgehog inherit from each parent?
- b. How many chromosomes are in each of the hedgehog's gametes?
- c. How many chromosomes will be in each somatic cell of the hedgehog's offspring?

Concept 12.2 *The mitotic phase alternates with interphase in the cell cycle*

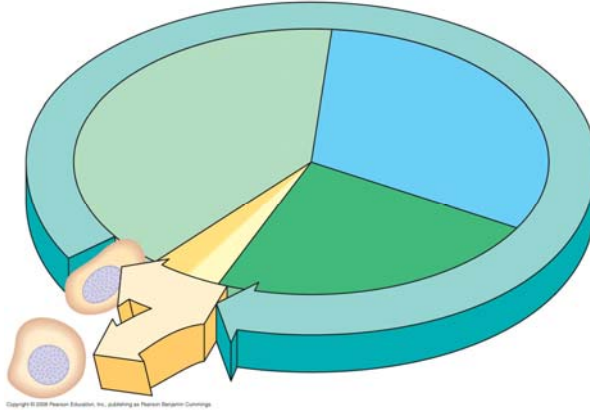
17. Label each of the parts of the cell cycle listed below, and give a brief explanation of what happens in each phase.

G₁

S

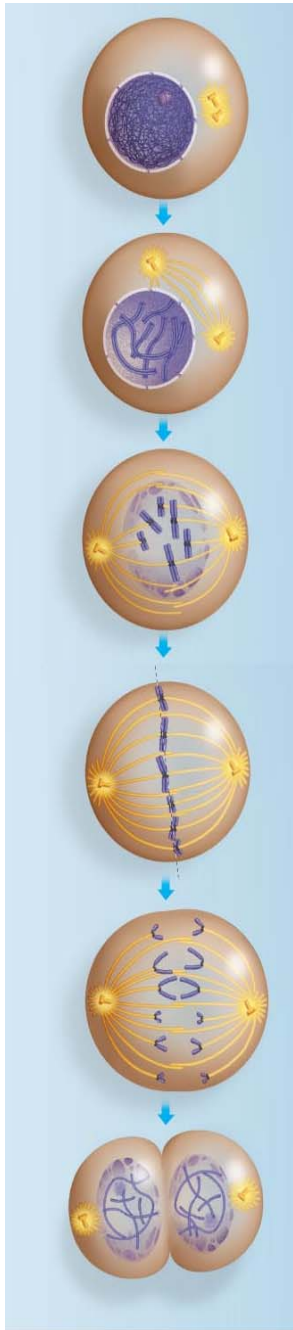
G₂

M



18. What are the components of the *mitotic spindle*? What is the source of these components?
19. In animal cells, the assembly of spindle microtubules starts at the *centrosome*. What is another name for the centrosome?
20. Sketch and label a centrosome with two centrioles.
21. Describe what happens to the centrosome during interphase and then prophase.
22. What is a *kinetochore*? Read your text carefully, and then make a labeled sketch that shows a replicated chromosome with two kinetochores and some attached spindle fibers. Figure 12.7 may help.

23. You will need to spend some serious time with Figure 12.6. Use it to help you label this figure. Label each phase by name; then label the smaller structures. Finally, make 2 or 3 summary statements that indicate important features to note about the phase.



Phase	Important Feature of Phase

24. Explain the difference between *kinetochore* and *nonkinetechore* microtubules. What is the function of each?

25. What are the components of the *mitotic spindle*?

26. At which end do kinetochore microtubules shorten during anaphase? Explain the data that supports where this shortening occurs.

27. Describe *cytokinesis* in an animal cell. Use a labeled sketch that shows the *cleavage furrow*.

28. Describe cytokinesis in a plant cell. Use a labeled sketch that shows the *cell plate*.

29. How is the cell plate formed? What is the source of the material for the cell plate?

30. Prokaryote reproduction does not involve mitosis, but instead occurs by *binary fission*. This process involves an *origin of replication*. Describe binary fission.

31. Notice that now you are learning a number of differences between prokaryotic and eukaryotic cells. Besides the fact that prokaryotes lack a membrane-bounded nucleus, describe the following differences:

Mode of reproduction?

Number of chromosomes?

Shape of the bacterial chromosome?

Concept 12.3 The eukaryotic cell cycle is regulated by a molecular control system

32. What controls the cell cycle? Study the Inquiry Figure 12.13 to help you answer this question.

33. What is a cell cycle *checkpoint*?

34. Summarize what happens at each checkpoint. You may add to this chart as you study this section.

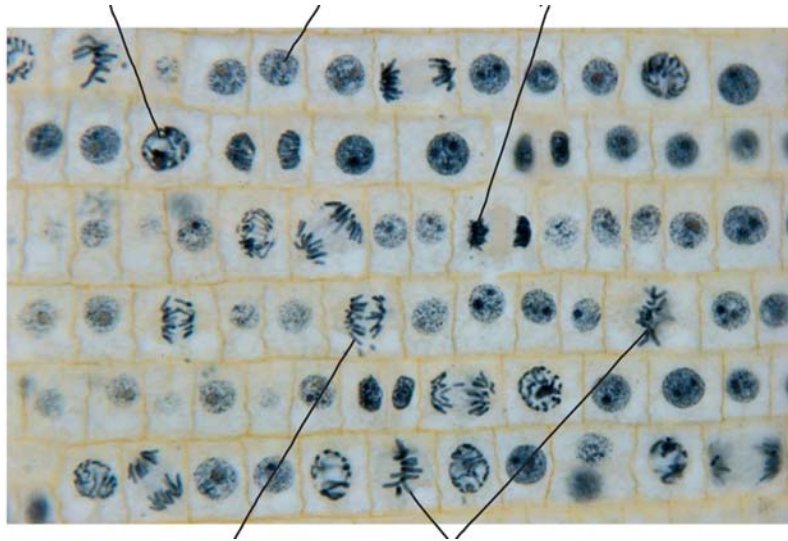
Checkpoint	What happens? How is it controlled?
G₁	
G₂	
M	

35. What is the *G₀ phase*? Describe this phase.

36. What is a *protein kinase*?

37. Kinases drive the cell cycle, but they must be activated by attachment of a _____.
38. The activity of *cyclin-dependent kinases (CDks)* rises and falls. Why?
39. What does *MPF* trigger? What are some specific activities that it triggers?
40. What happens if all the chromosome kinetochores are not attached to spindle fibers? When this occurs, which checkpoint is not passed?
41. What are *growth factors*? How does PDGF stimulate fibroblast division?
42. Cancer cells exhibit different behaviors than normal cells. Here are two normal behaviors they no longer show. Explain each behavior.
- density-dependent inhibition**
- anchorage dependence**
43. Cancer cells also show loss of cell cycle controls and may divide without being checked. The story of HeLa cells is worth noting. What is their source? How old are they? Note that, unlike normal cells, HeLa cells are immortal!
44. What is *transformation*? *metastasis*?

45. Distinguish between a *benign tumor* and a *malignant tumor*.
46. List two specific cancer treatments, and tell how each treatment works.
47. Identify each phase of the cell cycle.



Testing Your Knowledge: Self-Quiz Answers

Now you should be ready to test your knowledge. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____