NAME: _____ DATE: _____

The Cell Cycle

Go to Cells Alive at http://www.cellsalive.com/cell_cycle.htm watch the animation and read the explanations to fill in the blanks.

During development from stem to fully differentiated, cells in the body alternately divide (mitosis) and "appear" to be resting (interphase). This sequence of activities exhibited by cells is called the _____ _____(1).

Interphase, which appears to the eye to be a resting stage between cell divisions, is actually a period of diverse activities. Those interphase activities are indispensible in making the next mitosis possible.

1. Interphase: Interphase generally lasts at least _____(2) to _____(3) hours in mammalian tissue. During this period, the cell is constantly synthesizing RNA, producing protein and growing in size. By studying molecular events in cells, scientists have determined that interphase can be divided into 4 steps: _____(4) (G0), _____(5) (G1), S _____(6) phase, _____(7) (G2).
   a. Gap 0 (G0): There are times when a cell will leave the cycle and quit dividing. This may be a temporary resting period or more permanent. An example of the latter is a cell that has reached an end stage of development and will no longer divide (e.g. neuron).
   b. Gap 1 (G1): Cells increase in size in Gap 1, produce _____(8) and synthesize _____(9). An important cell cycle control mechanism activated during this period (G1 Checkpoint) ensures that everything is ready for _____(10). (Click on the Checkpoints animation, above.)
   c. S Phase: To produce two similar daughter cells, the complete DNA instructions in the cell must be duplicated. DNA replication occurs during this _____(11) phase.
   d. Gap 2 (G2): During the gap between DNA synthesis and mitosis, the cell will continue to _____(12) and _____(13) new proteins. At the end of this gap is another control checkpoint (G2 Checkpoint) to determine if the cell can now proceed to enter _____(14) and divide.

2. Mitosis or M Phase: _____ _____(15) and _____(16) production stop at this stage in the cell cycle. All of the cell's energy is focused on the complex and orderly division into _____(17) similar daughter cells. _____(18) is much shorter than interphase, lasting perhaps only one to two hours. As in both G1 and G2, there is a Checkpoint in the middle of mitosis (Metaphase Checkpoint) that ensures the cell is ready to complete _____(19). _____.

NAME: _____ DATE: _____

Animal Cell Mitosis

Go to Cells Alive at http://www.cellsalive.com/mitosis.htm watch the animation and read the explanations and to fill in the blanks.

This animation demonstrates the stages of mitosis in an animal cell. Use the control buttons in the upper left to run the complete animation. Click on any intermediate stage (for example, Anaphase), and see a representative still

1. Interphase: Cells may appear inactive during this stage, but they are quite the opposite. This is the longest period of the complete cell cycle during which _____(20), the _____(21) divide, and _____(22) are actively produced.
2. Prophase: During this first mitotic stage, the _____(23) fades and chromatin (replicated DNA and associated proteins) condenses into _____(24). Each replicated chromosome comprises two _____(25), both with the same genetic information. Microtubules of the cytoskeleton, responsible for cell shape, motility and attachment to other cells during interphase, disassemble. And the building blocks of these microtubules are used to grow the mitotic spindle from the region of the centrioles.
3. Prometaphase: In this stage the nuclear envelope breaks down so there is no longer a recognizable nucleus. Some mitotic spindle fibers elongate from the centrioles and attach to kinetichores, protein bundles located on the chromosomes. Other spindle fibers elongate but instead of attaching to chromosomes, overlap each other at the cell center.
4. Metaphase: Tension applied by the spindle fibers aligns all _____(26) in one plane at the _____(27) of the cell.
5. Anaphase: Spindle fibers shorten, the kinetichores separate, and the _____(28) are pulled apart and begin moving to the cell _____(29).
6. Telophase: The daughter chromosomes arrive at the poles and the spindle fibers that have pulled them apart disappear.
7. Cytokinesis: The spindle fibers not attached to chromosomes begin breaking down until only that portion of overlap is left. It is in this region that a _____(30) cleaves the cell into two daughter cells. Microtubules then reorganize into a new cytoskeleton for the return to interphase.

A. Control of the Cell Cycle Game
http://nobelprize.org/educational_games/medicine/2001/

1. How many cells are replaced in our body every minute?
2. What type of cells divide more often, skin or liver cells?
3. What are the key molecules that control cell division?
4. Who are you in this game?
5. What is the first step?
6. Before checkpoint 1, what percentage of growth has the cell had?
7. What two things are checked for by the cyclin during G1?
8. What was the second step?
9. What is another name to describe cell duplication?
10. What is the third step in the game?
11. What is the fourth step in the game?
12. How does cancer arise?
13. What is a tumor?
14. Watch the video of cell division.

Cell Growth is the same as _____ phase.
Cell Duplication is the same as _____ phase.
Cell Growth is also the same as _____ phase.
Cell Division is the same as _____ phase.

B. Online Onion Root tip
http://www.biology.arizona.edu/Cell_BIO/activities/cell_cycle/cell_cycle.html

Briefly describe the events that occur at each stage of the cell cycle.

Complete the activity and record your data in the chart below.

	Interphase	Prophase	Metaphase	Anaphase	Telophase	Total
number of cells						36
percent of cells						100%

C. Animation of cell cycle
http://www.cellsalive.com/cell_cycle.htm

D. Cell Cam
http://www.cellsalive.com/cam0.htm

How long does it take for a population of cancer cells growing in a dish to double?
How long for a population of bacteria?

E. Mitosis Animation
http://www.csuchico.edu/~jbell/Biol207/animations/mitosis.html

Go through the animation and take the quiz at the end.