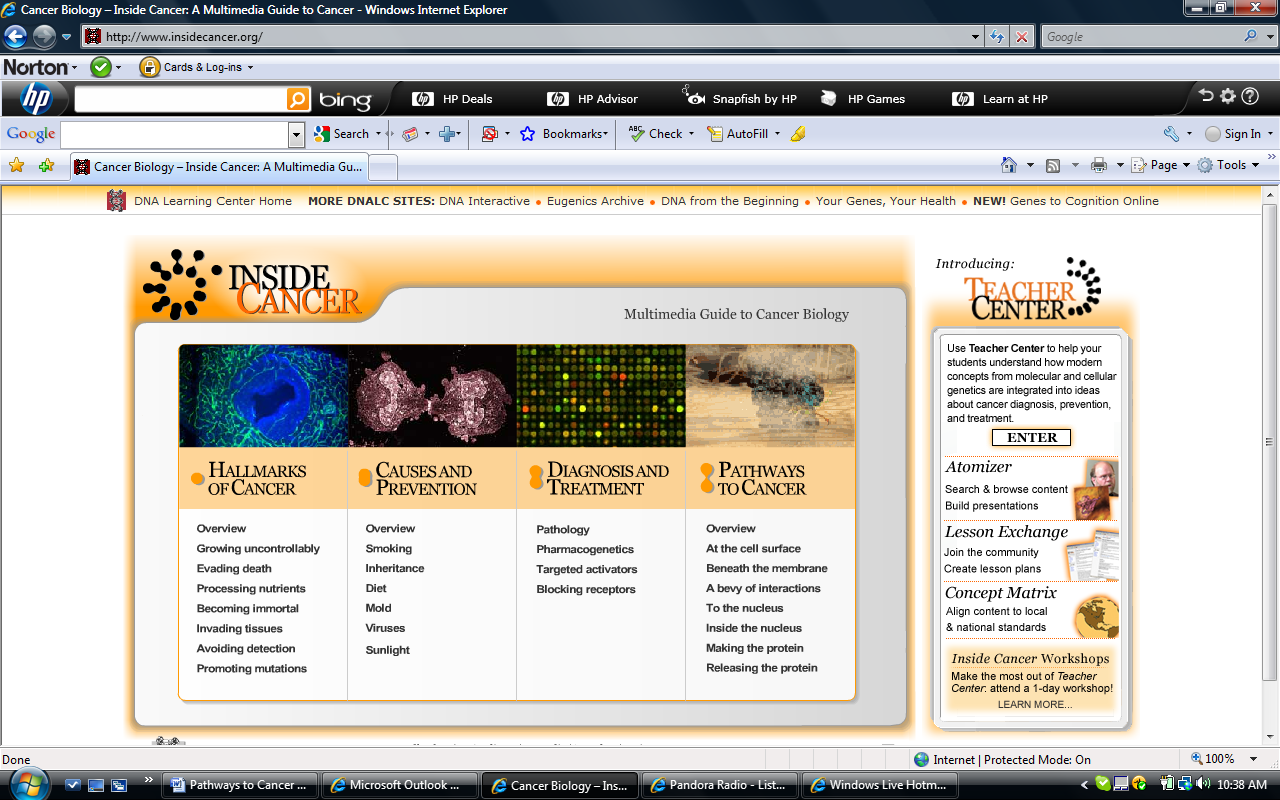
**INSIDE CANCER: Hallmarks of Cancer – Student Worksheet http://www.insidecancer.org/**



**Part 3: Cell Cycle and Cancer –Student Worksheet**

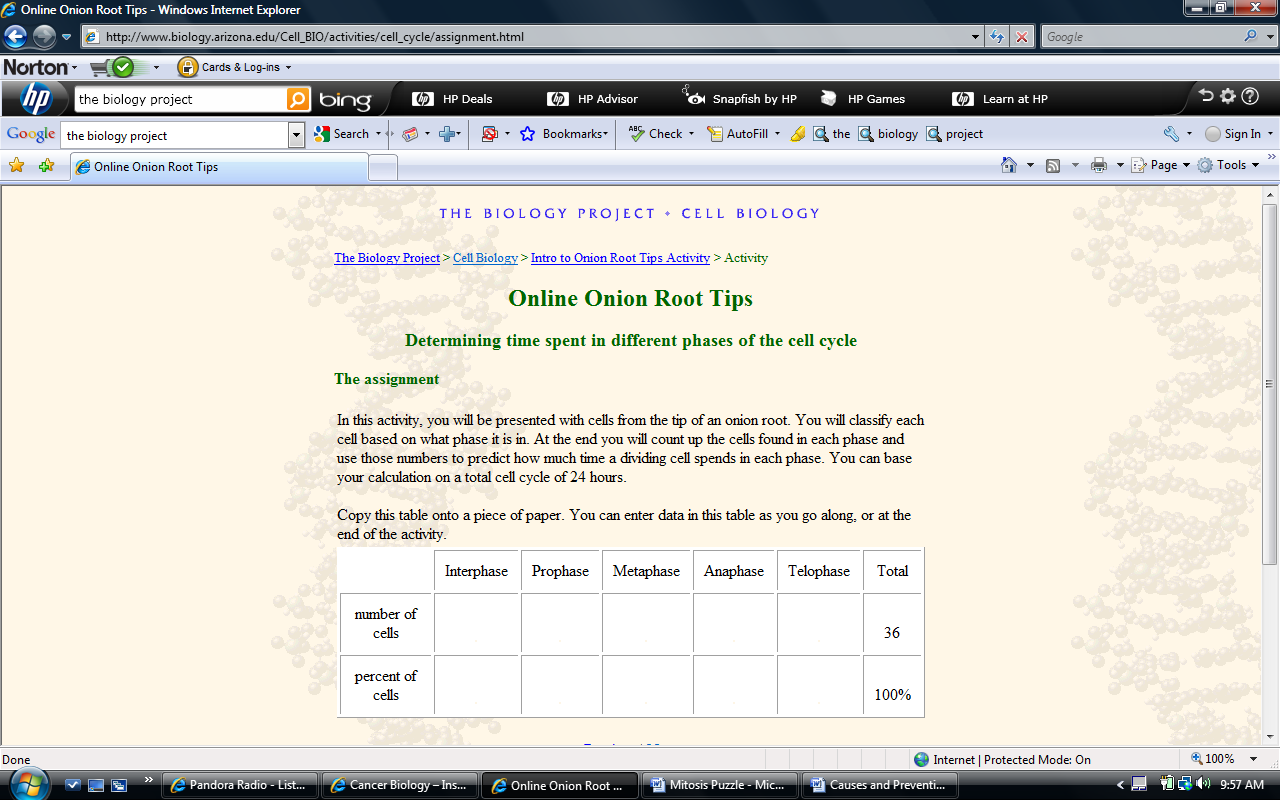
**Go to: http://www.biology.arizona.edu/Cell\_BIO/activities/cell\_cycle/activity\_description.html**

**Directions:**  For review on the stages of mitosis, go through the activity to identify the state of the cell cycle for each of the cells sampled from the onion root tip.



The picture of the cell that you are trying to identify is small and is located here.

1. Table: The Time Spent in Different Phases of the Cell Cycle.

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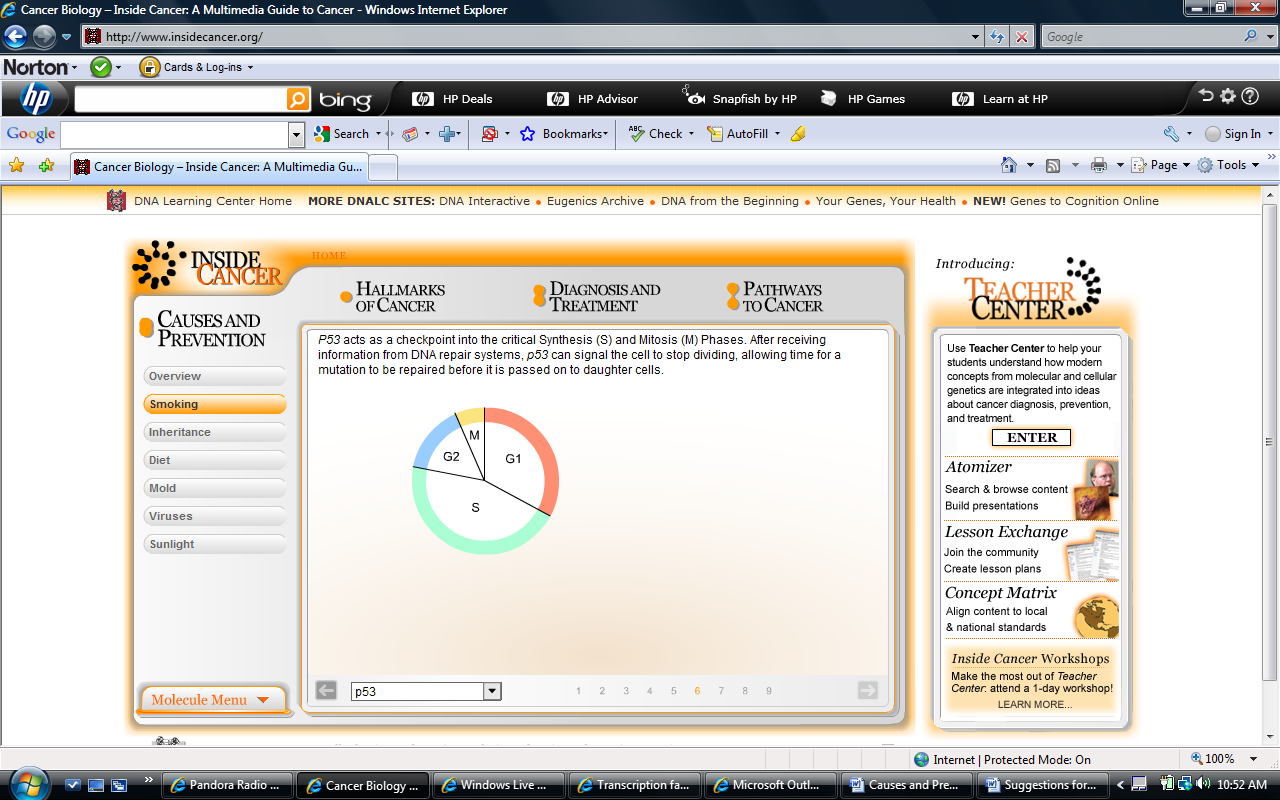
1. What stage is the cell in most of the time? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The number of times you see a cell in a particular stage gives you an idea of how often the average cell spends in a particular stage. Use the blank pie chart below to draw in the approximate % of the stages you calculated. Make sure the numbers add up to 100%.
3. These numbers reflect the activity going on in cells in the root tip of an onion. What would you expect to see to the amount of time devoted to Interphase if you looked at cells further away from the tip? Why is this?

Remember that that the actual process of cell division does not begin until Prophase. So what exactly goes on during Interphase? The stages of Interphase can actually be broken down into three other stages: G1, S, and G2. To learn more about these stages and why they are important continue on to the *Inside Cancer* website.

**Directions:** Go to the *Inside Cancer* website (www.insidecancer.org). Navigate through the “Causes and Prevention” tab. Select “Smoking” and scroll to the “p53” link to answer the following questions:

1. Mutations in the p53 gene are found in what percentage of lung tumors? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The p53 protein is a tumor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that is involved in detecting damage to \_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Using the diagram below, write a caption highlighting the cellular events for each of the stages in the cell cycle:

CELL CYCLE



1. In the above diagram, label the two checkpoints that p53 patrols with a \*.
2. If p53 is capable of stopping cell division to allow time for DNA repairs, at which checkpoint would this be appropriate? S or M (choose one)
3. If the DNA damage is not repairable what will p53 initiate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What happens to a cell’s DNA over time if p53 is mutated and nonfunctional?

COMPARE THIS INFO TO THE CELL CYCLE OF THE ONION ROOT TIP.

* + - 1. How does the Interphase stage from the onion root tip compare to the Interphase of the cell cycle diagram above?
      2. Some cells in the human body reach a point when they become so specialized that they usually lose their ability to divide, such as brain cells called neurons or even most skeletal muscle cells. If these cells are “suspended” in the cell cycle, at what stage would you expect to see them?
      3. Cancer can also result when a cell’s genome, or DNA, is unstable. This can happen from having too few or too many chromosomes. Can you think of a mutation involving one of the key players (organelles) in mitosis that could result in abnormal numbers of chromosomes in daughter cells?

*FOR MORE ON CANCER CONTINUE NAVIGATING THE “CAUSES AND PREVENTION” TAB & “SMOKING”*

*Nicotine Connection*

1. Nicotine and nitrosamines bind to what type of cell membrane proteins?
2. Akt is a protein kinase that activates other molecules (“substrates”) that then go on to influence cellular processes. What are the three different cellular processes mentioned that Akt can indirectly influence?
3. What effect does nicotine activation of Akt have on a cell?
4. When DNA damage is not repaired, Akt probably plays a role in deciding whether or not to undergo which cellular process?

*Prevention*

Use the information Dr. Glorian Sorenson presents as she discusses an anti-smoking campaign to answer the following questions.

1. Who is the audience public health researchers are targeting for their anti-smoking campaigns?
2. What was one reason these people gave for why they were not concerned about quitting tobacco use?
3. Define the following in the study:
   1. Manipulated (independent) variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Responding (dependent) variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Experimental Control: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What do you suppose two controlled variables must have been? (describe/explain them)
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. What did researchers conclude from this study?