**How Can Cancer Cells Be Recognized?**

**I. Introduction**

 Does cell cycle control matter? If you ask an oncologist – a doctor who treats cancer patients – she or he will likely answer with a resounding *yes*.

 Cancer is basically a disease of uncontrolled cell division. Its development and progression are usually linked to a series of changes in the activity of [cell cycle regulators](https://www.khanacademy.org/science/biology/cellular-molecular-biology/stem-cells-and-cancer/a/cell-cycle-regulators). For example, inhibitors of the cell cycle keep cells from dividing when conditions aren’t right, so too little activity of these inhibitors can promote cancer. Similarly, positive regulators of cell division can lead to cancer if they are too active. In most cases, these changes in activity are due to mutations in the genes that encode cell cycle regulator proteins.

 In this investigation you will explore the similarities and differences between the cell cycles of normal cells and cancer cells.

**II. Procedure**

 1. Start the activity by going to the following website :

<http://glencoe.mheducation.com/sites/dl/free/0078802849/383933/BL_23.html> .

 2. Click the TV/VCR. Then click the “Play” button on the video controller. Watch the video

 about the cell cycle.

 3. Click “More Information” to read about cancer statistics and risk factors.

 4. On the Biology Laboratory Navigation Screen, click the microscope to analyze tissue samples

 under the microscope. Click the slide carousel to view actual slides of normal and cancerous

 tissues.

 5. Microscopic View : Click the microscope to see microscopic views of tissue sample.

 6. Click a picture on the Table Of Contents to get information about one of the five cell phases.

 Use the forward and back pointers to move between cards. Click the up arrow to return to the

 Table Of Contents.

 7. Compare the normal lung-tissue cells shown through the microscope with the cell phase

 pictures in the Table Of Contents.

 8. Label the cells with empty label boxes below them. Decide which phase a particular cell is

 in. Go to the information card that corresponds to that phase of the cell cycle. Click and drag

 the corresponding label from the top of the information card to the label box below the cell.

 9. Repeat the labeling procedure for each of the five cells. Click the “Check” button.

 10. Click and drag new labels to any of the cells that are labeled incorrectly. Incorrectly labeled

 cells will be highlighted in yellow.

 11. After you have correctly labeled the five cells, labels will appear below the other cells in the

 microscopic view. Count the number of cells in each phase. Record the data in the Table.

 Enter the number of cells that are in each phase. Calculate the percentage of cells dividing

 (cells in mitosis) and percentage of cells at rest (cells in interphase).

 12. Examine other tissues by clicking the “Tissue Slides” box and selecting a tissue sample.

 Repeat the labeling, checking, and recording procedures for each of these tissues.

 13. Click “Reset” at any time to erase your labels on the cells in the microscopic view and get a

 new set of lung, ovary, and stomach tissue samples. Click the “Return” button at any time to

 save the placement of your labels and the present tissue samples and to return to the Biology

 Laboratory Navigation Screen.

 14. Slide Carousel : Click the slide carousel to view photographs of actual lung and stomach

 tissues.

 15. Click a slide and drag it to the slide carousel. Repeat this procedure for each of the four

 slides. Click the “Return” button to return to the Biology Laboratory Navigation Screen.

**III. Data**

 1. Record the number of cells in each phase of the cell cycle.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Interphase | Prophase | Metaphase | Anaphase | Telophase | % CellsDividing | % CellsAt Rest |
| NormalLung |  |  |  |  |  |  |  |
| CancerousLung |  |  |  |  |  |  |  |
| NormalStomach |  |  |  |  |  |  |  |
| CancerousStomach |  |  |  |  |  |  |  |
| NormalOvary |  |  |  |  |  |  |  |
| CancerousOvary |  |  |  |  |  |  |  |

**IV. Analysis & Conclusions**

 1. Based on your data and observations, what are some of the differences between normal cells

 and cancer cells?

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2. Which type of cancer shows the most aggressive growth? Explain.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3. When studying cell division in tissue samples, scientists often calculate a mitotic index, which

 is the ratio of dividing cells to the total number of cells in the sample. Scientists often

 calculate the mitotic index to compare the growth rates of different types of tissue. Which

 type of tissue would have a higher mitotic index, normal tissue or cancerous tissue? Explain.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_