

# Activity #1: What is Cancer?

Cancer affects over 1.3 million people per year in the United States. Some cases of cancer are linked to lifestyle choices people make and others are not. You are going to take the time to research some of the facts associated with cancer.

Go to: [https://science.education.nih.gov/supplements/webversions/CellBiology/activities/activity2\\_animations.html](https://science.education.nih.gov/supplements/webversions/CellBiology/activities/activity2_animations.html)

source: SEPA: Fat Dogs and Coughing Horses

## Animation 1: Stages of Cancer (1:11)

1. **True or False** The rate and timing of cell division is normally precisely regulated by your body.
2. **True or False** Chemical messengers between neighboring cells keep the rate of cell division equal to the rate of cell death.
3. **True or False** Cells ALWAYS divide normally.
4. **True or False** Cells can break free from the original tissue and move to other parts of the body.
5. It could be said that cells divide: **in a controlled way or in an uncontrolled way**

## Animation 2: Cell Cycle Clock (1:30)

6. **True or False** Scientists now know that the cell cycle clock helps to control cell division.
7. How many stages are in the cell cycle? **1 or 2 or 3 or 4**
8. **True or False** In G1 the cell stays the same size.
9. What gets copied during the S phase? **Entire Nucleus or DNA**
10. What does the G in G1 and G2 stand for? **Growth or Gap**
11. **True or False** Cells ALWAYS go right back into the cell cycle and start dividing all over again.

## Animation 3: PO and TS (0:40)

12. **True or False** Proto-Oncogens (PO) encourages a cell to grow and divide.
13. What gene inhibits (stops) cell division? **PO or TS**

## Animation 4: Mutagens (1:00)

14. **True or False** According to their graph, if something has a high ability to cause a mutation, it will also have a high ability to cause cancer.
15. Do all cancers fit this simple model? **YES or NO**

## Animation 5: PO and TS mutations (1:18)

16. **True or False** If a PO becomes an O it can cause excessive division.

17. **True or False** If a TS becomes inactive, cells will not divide.

18. In many European countries and Australia, smoking in a car with a passenger under the age of 18 is illegal. Do you agree? Take a side on this issue and write a well-developed paragraph as to your viewpoint on this controversial topic. Include statistics or data to support and give validity to your viewpoint.

Now go to: <http://www.cancer.org/Cancer/CancerBasics/what-is-cancer> to answer the following questions:

1. What is metastasis?
2. Compare and contrast a lump that is benign to one that is malignant.
3. Which stage of cancer is the worst, stage 1 or a stage 4?
4. What are the 3 most common cancer treatments?
5. A doctor that treats cancer is called an \_\_\_\_\_.
6. What is a biopsy?

## Activity #2: The Cell cycle and Cancer

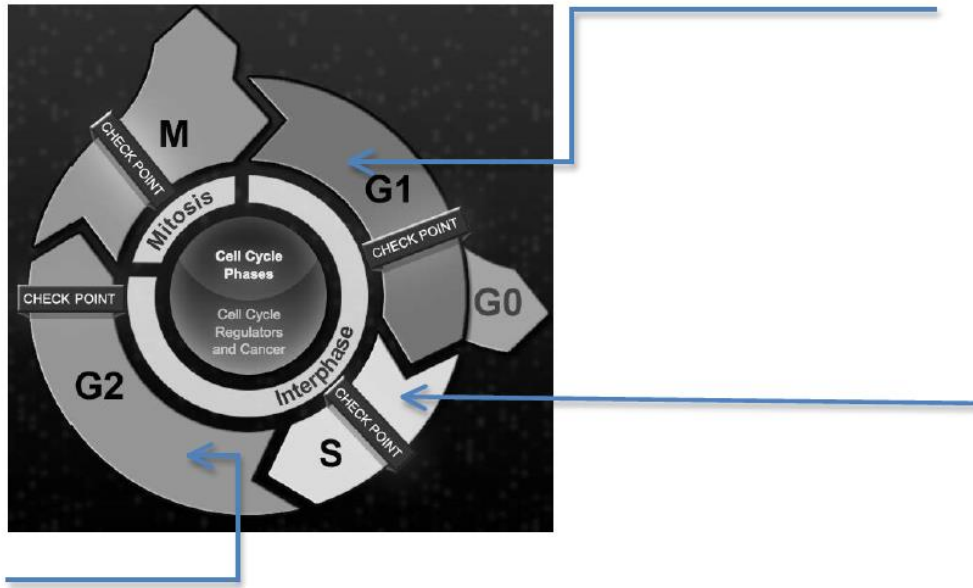
Read through the Click and Learn at <http://www.hhmi.org/biointeractive/eukaryotic-cell-cycle-and-cancer> to learn about the cell cycle. Answer the questions below.

**Click on the "Background" tab on the right side. Read the information and watch the videos.**

1. Why does cell division remain important to an adult organism even after it is fully developed?  
\_\_\_\_\_
2. What is apoptosis? What is its purpose? \_\_\_\_\_  
\_\_\_\_\_
3. What are cell cycle regulators? \_\_\_\_\_

4. What happens if cell cycle regulators don't function properly? \_\_\_\_\_

5. Fill in the details about what happens during the three phases of interphase labeled in the diagram below.



6. In general, what is the purpose of a checkpoint in the cell cycle? \_\_\_\_\_

7. What is the G0 phase of the cell cycle? Which factors determine whether a cell enters G0? Can cells leave G0? \_\_\_\_\_

Using the cell cycle diagram and both links in the center purple circle, complete the table below for each phase. Use bullet points and focus on major events that occur during each phase, checkpoint, and regulatory process. Complete the entire row before moving on to the next phase.

PHASE	PHASE EVENTS	CHECKPOINT EVENTS	REGULATORY PROCESSES
G1			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
S			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
G2			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
(mitosis)			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

**Click on “Cell Cycle Regulators and Cancer” in the center purple circle. Read the Regulators Overview and then read through the Cancer Overview and watch the videos.**

8. Cell cycle regulators:

a. Stimulatory proteins are encoded by \_\_\_\_\_.

Examples include: \_\_\_\_\_

b. Inhibitory proteins are encoded by \_\_\_\_\_.

Examples include: \_\_\_\_\_

9. Normally, proto-oncogenes stimulate the cell cycle. What are oncogenes and how do they affect the cell cycle?

\_\_\_\_\_

\_\_\_\_\_

10. Normally, tumor suppressor genes inhibit the cell cycle. How do mutated tumor suppressor genes affect the cell cycle? \_\_\_\_\_

\_\_\_\_\_

**Now that you have finished the Click and Learn, use your knowledge to answer the following questions.**

11. p53 is a tumor suppressor gene, and some scientists refer to it as “the guardian of the genome.”

a. Explain its normal role and why scientists would regard it as the “guardian of the genome.”

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

b. Explain what happens to the cell cycle if both p53 genes are mutated. \_\_\_\_\_

\_\_\_\_\_

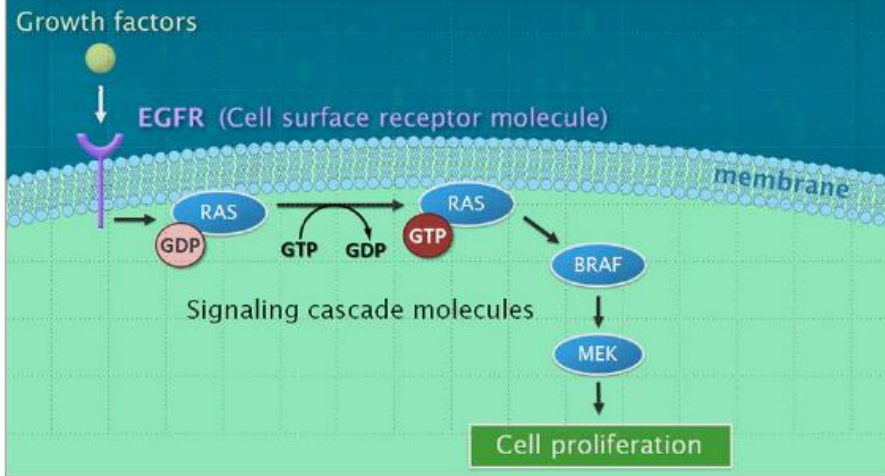
12. Explain why people who inherit one mutated copy of the BRCA1 gene have a higher likelihood of developing cancer.

\_\_\_\_\_

\_\_\_\_\_

## Cell Growth and Survival Genes

Many participate in the signaling pathway that promotes cell division



13. Mutations in the genes that code for proteins in the pathway above have been linked to various types of cancer (RAS-pancreatic, BRAF-colorectal, MEK-melanoma, EGFR – lung). If you were developing a new cancer drug, what would be an appropriate target protein for the new drug therapy? Justify your answer.

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