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



**Direction: Go to the website above and navigate through the Hallmarks of Cancer section to answer the following questions for each section.**

**OVERVIEW**

1. In a single cell, what do all cancers begin with? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. What are the two causes of these and which is more common?
2. DNA changes may result in a change in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ produced.
3. Demonstrate the three different types of mutations by writing an example of the resulting new DNA strand in the table below. (Circle the point where the mutation occurred.)

|  |  |  |
| --- | --- | --- |
| **Type of Mutation** | **Original DNA sequence** | **New DNA sequence** |
| Single Nucleotide Change (aka Point Mutation) | CAGGCGCAT |  |
| Deletion | CAGGCGCAT |  |
| Duplication | CAGGCGCAT |  |

1. Explain why cancer incidence increases with age.

**GROWING UNCONTROLLABLY**

1. What normally regulates cell growth and division in typical cells?
2. What are two ways cancer cells are able to grow continuously?

**EVADING DEATH**

1. What is apoptosis?
2. What are the roles of proteases and enzymes in cell death?
3. What eventually happens to dead cells or cellular remains?
4. Why would a cell commit suicide?

**PROCESSING NUTRIENTS**

1. What does angiogenic mean?
2. Why do cancer cells need a blood supply?
3. What are some of the nutrients a cancer cell needs?
4. What are some of the waste products a cancer cell produces?
5. What types of cancers would be unlikely to undergo angiogenesis and why?
6. Extend your thinking: The outer layer of your skin (the epidermis) does not have a direct blood supply. How do you think this affects the growth rate of skin cancers compared to other cancers?

**BECOMING IMMORTAL**

1. What is a telomere?
2. What are two things that happen to telomeres as cells undergo cell divisions?
3. What is the role of telomer*ase*?
4. Where and/or when is telomer*ase* typically expressed?

**INVADING TISSUES**

1. What is usually the cause of people *dying* from cancer?
2. Cells normally stay in one site or one tissue type. Why can cancer spread to other tissues?
3. What happens to body tissues as a result of cancer that classifies cancer as a disease?

**AVOIDING DETECTION**

1. How does the appearance of a cancer cell compare to a normal cell?
2. What body system is responsible for detecting precancerous cells? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Describe the two adaptive immune responses (B cells and T cells) that respond to changes in cells in our body such as infections or cancer.
4. Describe what adjuvant therapy is.

**PROMOTING MUTATIONS**

1. One way mutations are acquired in cancer cells is during the process of \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. WATCH THE DNA REPLICATION ANIMATION:
	1. What is the role of helicase?
	2. One strand of DNA is copied continuously. How is the other strand copied?
	3. Each DNA molecule formed has \_\_\_\_\_\_\_\_ original strand(s) and \_\_\_\_\_\_\_new strand(s).
3. What often happens once new daughter cells are formed and the copied DNA is separated?
4. What are cancer cells unable to do?
	1. What does this result in?
5. What is the estimated average number of mutations required to develop cancer?