

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Lesson 6: Cell Cycle Checkpoints and Cancer (Complete using your textbook ON Science 10 p.41-44)

### RECALL: Checkpoints in the Cell Cycle

- At each checkpoint, specialized \_\_\_\_\_ act like \_\_\_\_\_ signs.
- Unless they receive specific \_\_\_\_\_ signals, they will not let the cell cycle proceed.
- In general, cell division will not occur if
  - ✓ \_\_\_\_\_
  - ✓ \_\_\_\_\_
  - ✓ \_\_\_\_\_

### Leaving the Cell Cycle: Specialization of Cells

- For many cells, the first checkpoint after mitosis seems to be the most important. Many cells \_\_\_\_\_ the cycle at this point, often just because \_\_\_\_\_ cells of the type are not \_\_\_\_\_. The body does not need that cell to \_\_\_\_\_.
- Cells that leave the cell cycle enter a \_\_\_\_\_ stage.
- \_\_\_\_\_ cells in the human body (eg. all muscle and nerve cells) are in this stage

### Cell Death

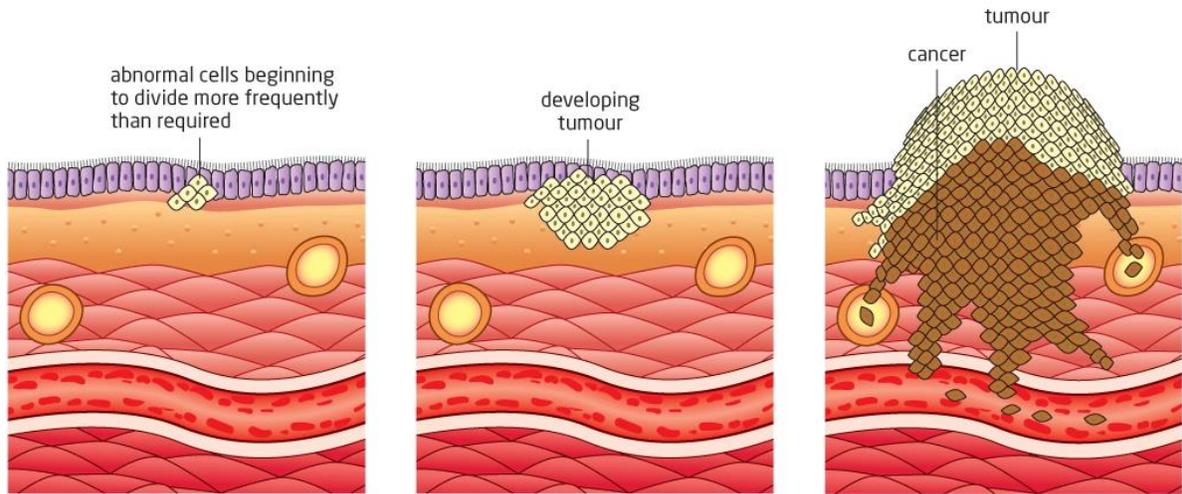
- *Cells do not live forever. In your body, 3 billion cells die every minute.*
- Some cells do not leave the cell cycle to become specialized ---- they leave the cell cycle because it is time for them to \_\_\_\_\_.
- In some cases, this is because they have been \_\_\_\_\_ beyond \_\_\_\_\_, perhaps by \_\_\_\_\_ forces or exposure to \_\_\_\_\_. ***This type of cell death is called NECROSIS.*** The contents of the cells \_\_\_\_\_ often \_\_\_\_\_ surrounding cells, causing \_\_\_\_\_ and \_\_\_\_\_ in that body part.

### Cell Suicide

- **Sometimes cells are too old or are malfunctioning.**
  - In this case, a cell \_\_\_\_\_ in an organized way. Its \_\_\_\_\_ are \_\_\_\_\_ and \_\_\_\_\_ so that other cells can \_\_\_\_\_ them. This type of death is \_\_\_\_\_ into cells, determined by “\_\_\_\_\_”.
- This event is known as APOPTOSIS.*** These genes code for proteins whose job is to \_\_\_\_\_ cells in specific situations such as normal \_\_\_\_\_ and \_\_\_\_\_ development in human embryos OR if a cell were \_\_\_\_\_ with a \_\_\_\_\_.

## Cancer and the Cell Cycle

- Some cells start out normally, but then they \_\_\_\_\_ the stop signs of the cell cycle. Instead of leaving the cell cycle to die, they \_\_\_\_\_ repeatedly and excessively, forming a clump of cells called \_\_\_\_\_. These abnormal cells, with further \_\_\_\_\_, can become \_\_\_\_\_.
- Some cancers can \_\_\_\_\_ to \_\_\_\_\_ body parts and continue dividing \_\_\_\_\_ there. Tumours reduce the \_\_\_\_\_ of other body tissues. *This is referred to as the process called **METASTASIS**.*



Sometimes cells lose the normal constraints on their rate of division. They begin to divide much more often and no longer function normally. All the cells that result from their division also divide uncontrollably, so the abnormal cells multiply rapidly.

The mass of rapidly dividing cells grows to form a tumour. Further changes to the cells can produce cancer. The cancer cells invade and destroy neighbouring cells.

Eventually, some cancer cells may break away, move into the circulatory system, and spread to a new location in the body, where they again begin to divide uncontrollably.

## RELATED TERMINOLOGY:

**Tumour:** an \_\_\_\_\_ clump or group of cells

### **Types of Tumours:**

#### **1-Benign Tumour:**

- ✓ **not cancerous**; does not spread to other tissue
- ✓ can grow large and crowds nearby cells and affect the normal function

#### **2-Malignant Tumour:**

- ✓ **cancerous**; can break away from primary (original) tumour to a different parts
- ✓ interferes with functions of nearby cells and may destroy nearby tissues

**Cancer:** cells with \_\_\_\_\_ genetic material that are dividing \_\_\_\_\_ and can \_\_\_\_\_ to other body parts

## Losing Control

- If a normal cell senses that it is not \_\_\_\_\_ (to a surface), it stops \_\_\_\_\_. Many cancer cells have a \_\_\_\_\_ that allows them to \_\_\_\_\_ dividing.
- Most normal cells can undergo \_\_\_\_\_ to \_\_\_\_\_ rounds of cell division. Any more divisions might result in \_\_\_\_\_ cells. At this point, a normal cell carries out \_\_\_\_\_. In many cancer cells, mutations do not allow them to \_\_\_\_\_ or \_\_\_\_\_-causing proteins.
- Cancer cells must have \_\_\_\_\_ mutations before control of cell division is completely \_\_\_\_\_. Some mutations occur by \_\_\_\_\_ and are \_\_\_\_\_. Others can be \_\_\_\_\_ from parents. Contact with \_\_\_\_\_ such as asbestos, tobacco smoke, and the \_\_\_\_\_ virus can lead to cancer.

## Common Cancer Treatments - Risks and Benefits:

<b>Treatment</b>	<b>Radiation Therapy</b>	<b>Chemotherapy</b>	<b>Surgery</b>
<b>What is it?</b>	Use <b>radiation</b> to kill cancer cells	Take <b>chemical drugs</b>	<b>Remove</b> tumour
<b>Advantages</b>	Useful when <b>surgery</b> cannot be carried out	Slow down or control the <b>spread</b> of cancer	If found out early, tumour can be <b>removed</b> .
<b>Disadvantages</b>	Can <b>damage</b> normal cells; <b>Side effects:</b> nausea, vomiting, skin redness or skin pain	<b>Toxic</b> to normal cells; <b>Painful</b> side effects: feeling weak & sick, hair loss	May not be possible <b>if cancer has spread</b> ; <b>Painful recovery</b>

## New Hope in the Fight against Cancer:

### **Biological Therapy:**

- Give **“chemicals”** to help your **immune system** to fight cancer (**cancer vaccines**)
- Doctors are not sure how the therapy helps your immune system fight cancer. But they think it may:
  - ✓ Stop or slow the growth of cancer cells.
  - ✓ Make it easier for your immune system to destroy, or get rid of, cancer cells.
  - ✓ Keep cancer from spreading to other parts of your body.

### **Biophotonics:**

- Use light to help diagnose cancer
  - When light shines on cells, particles of light are scattered by atoms and molecules of the cells
  - Special devices records these scatter pattern
  - Abnormal cells give a different pattern than normal cells
- Allows **early detection**, has **fewer** side effects, target cancerous tissues more **accurately**