

If there are 34 chromosomes in the parent cell- how many are in each of the daughter cells after mitosis?

Check that the study guide is done

What is the definition of cancer?

A Malignant tumor that is made of cells that travel through the blood stream to other areas of the body.

What happens in prophase?

DNA coils up into a chromosome. Nucleus dissolves. Spindle fibers form.

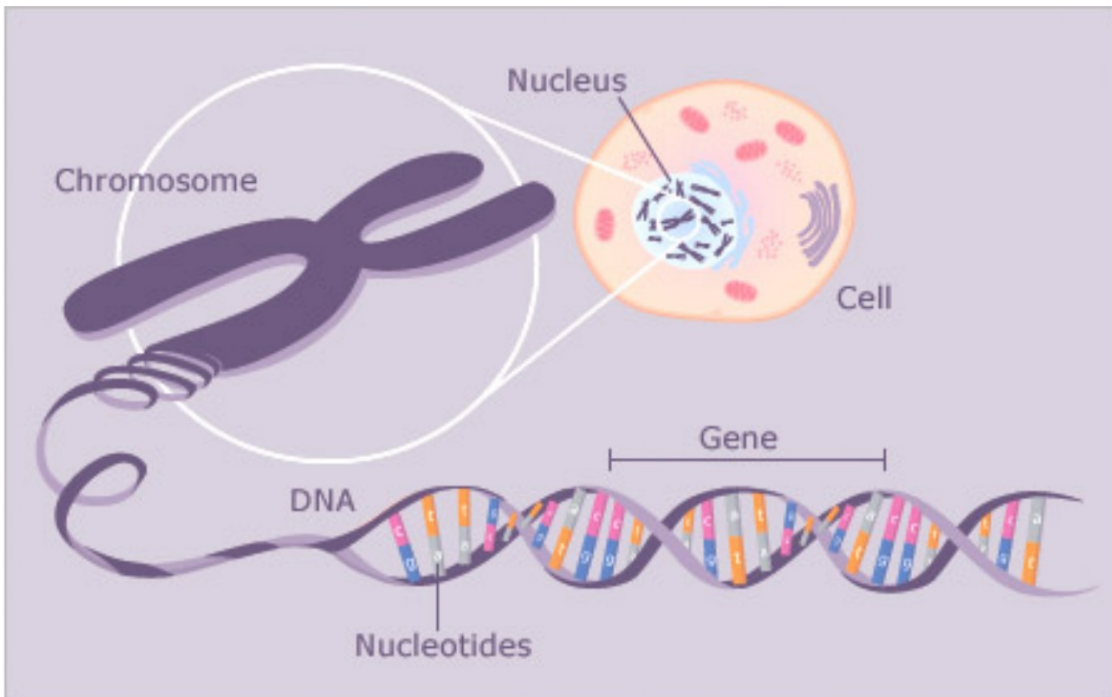
How are a gene, DNA, a chromosome and a trait related?

A gene is a section of DNA that codes for a protein which creates the trait. When DNA coils up in prophase it is called a chromosome.

Objective: The student will be able to identify how a cell moves through the cell cycle

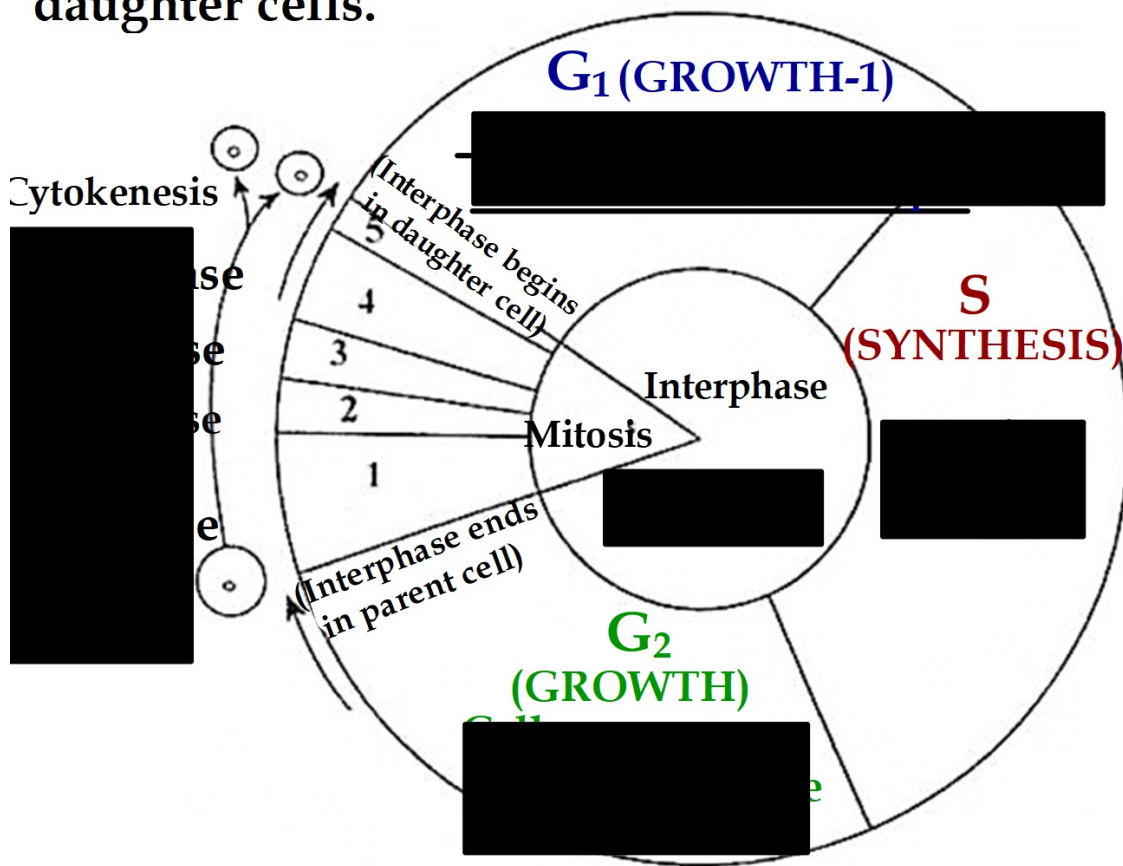
**Agenda: Warm Up
Review
Quiz**

Homework: None

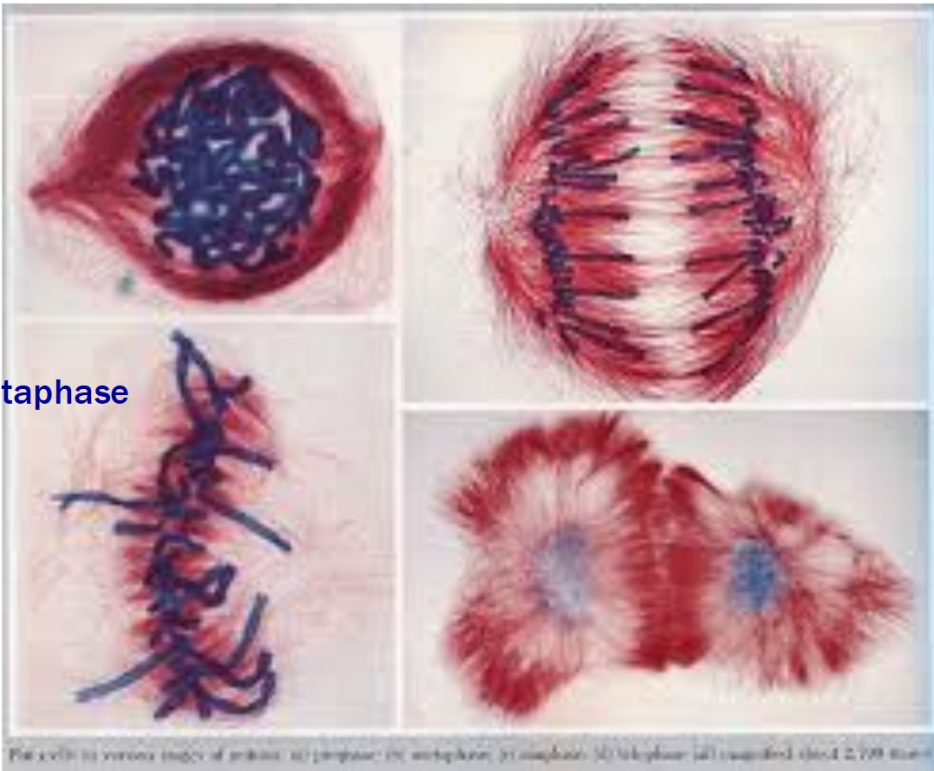


Review dances

Cell Cycle: the series of events that take place in a cell leading to copying its DNA and division to produce 2 daughter cells.



Prophase



Anaphase

Metaphase

Telophase/Cytokinesis

FIG. 1.10. Various stages of mitosis: (a) prophase; (b) metaphase; (c) anaphase; (d) telophase. All magnified about 2,000 times.

All cells respond to stimuli. The mechanism by which cells regulate their cell cycle is essential and involves three classes of genes.

Tumor Suppressor genes

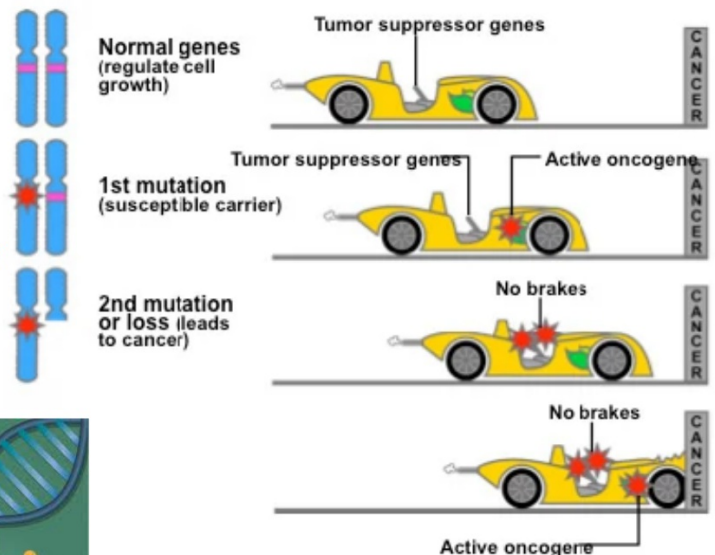
Stops cell from going on in cell cycle until it needs to

Proto-oncogenes (when normal)/
oncogenes (when mutated)

Pushes cell through cell cycle

DNA Repair genes

Fixes DNA damaged from environment or replication errors



Cell Cycle and Causes of Cancer Quiz Review

Name: _____

1. Explain the relationship between a gene, DNA, and a chromosome.

A gene is a section of DNA that codes for a protein. When DNA coils it is a chromosome

2. Where is a gene found?

A gene is found on DNA

3. Genes are the "blueprint" or code to make what type of molecule?

Genes are the blueprint to make protein

4. Where are chromosomes found in the cell during interphase?

DNA is found in the nucleus during interphase

- 5) Put the steps of the cell cycle in order?

G1, S, G2, Mitosis (Prophase, Metaphase, Anaphase, Telophase)

6) Before mitosis can begin, what must occur in the S phase?

DNA Replication (Chromosomes duplicate)

7) In what phase of the cell cycle does a cell spend most of its time (Interphase or mitosis)?

Interphase

8) Why do cells undergo mitosis?

To replace worn out/damaged cells or to grow

9) What happens during the mitosis phase of the cell cycle?

The nucleus divides

10) What happens in the G1 and G2 phase of interphase?

The cell grows

11) What happens in the S phase of interphase?

DNA replication

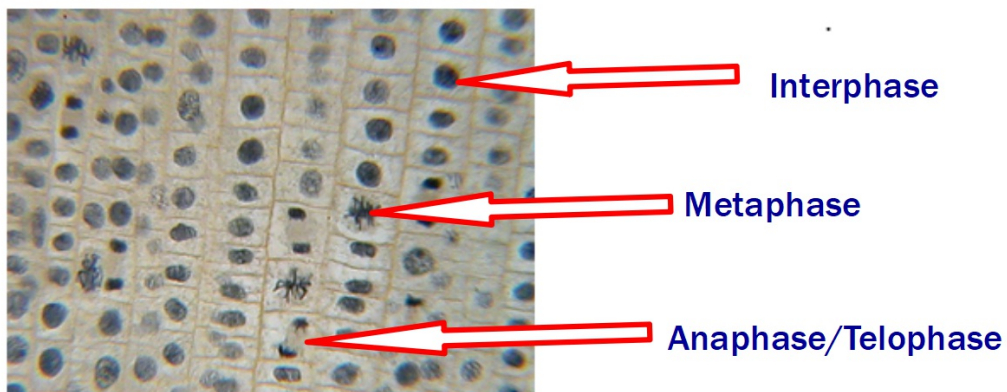
12) What types of molecules check to make certain that the cell has grown to its full size, the DNA has replicated correctly, and that the nucleus is ready to divide?

Proteins (enzymes)

13) If the normal chromosome number is 40. How many chromosomes will be in each of the two cells after the cell undergoes mitosis?

Each cell will have 40 chromosomes.

Identify cells in mitosis and in interphase



14. What is the definition of cancer?

A Malignant tumor that is made of cells that travel through the blood stream to other areas of the body.

15. How do tumor suppressor genes affect the cell cycle?

Tumor suppressor genes stop cells from going through the cell cycle.

16. How do oncogenes affect the cell cycle?

Oncogenes encourage the cell to go through the cell cycle more often

17. What is the importance of DNA proofreading genes? **DNA Repair**

DNA repair genes check to make sure that there are no mistakes in the nucleotide pairs. It cuts out and fixes mistakes.

18. A tumor is formed when what type of gene works incorrectly?

All of the genes will have mutations (DNA repair genes, tumor suppressors and oncogenes)

19. What is the role of CDK and cyclin in the cell cycle?

CDK and cyclin act as checkpoints to make sure that the cell is ready to continue each phase in the cell cycle.

20. What happens in each phase of mitosis?

Prophase:

DNA coils up, Nucleus dissolves and the spindle fibers form

Metaphase:

Chromosomes line up in the middle of the cell

Anaphase:

Sister Chromatids pull apart

Telophase:

Chromosomes start to uncoil, nucleus reforms, spindle fibers disappear

Cytokinesis- Cytoplasm splits

Put your phone in the phone holder. If you only place your case in the holder you will get a 0 for the quiz.

Quiz- Bubble in Key ID

After you are done read and highlight the front page of your lab

Name _____ Period _____ Date _____

Read the front page of the lab. Highlight and underline important information

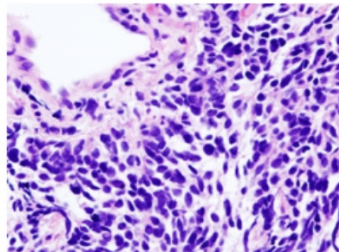
Cell Differentiation and Gene Expression

In most human cells, the nucleus contains a full set of 23 pairs of chromosomes, which carry 20,000-25,000 genes. These genes are identical from cell to cell. Through the process of protein synthesis with transcription and translation is how genes are transcribed to produce Ribonucleic acid (RNA). This RNA is in then translated to produce proteins. If all cells in the same organism have the same genes, why don't they all make the same proteins?

Some proteins are made by almost every cell because they are needed for basic cell functions. Other proteins are made by only one type of cell or small groups of cells. Only white blood cells, for example, make antibodies, the proteins that help the body fight infections. Each of the more than 220 kinds of specialized cells in the human body makes a characteristic group of proteins.

Although the two human cells shown have the same genes in their nuclei, they are specialized to make different proteins.

Lung Cells



The lung cells are specialized for surfactant protein B, a protein found in the lung which is vital for reducing surface tension in the lungs and allowing for the oxygen change in the alveoli to take place.

The bone cell is a cell that is responsible for the breakdown of bone tissue and makes large amounts of the protein integrin.

Bone Cells



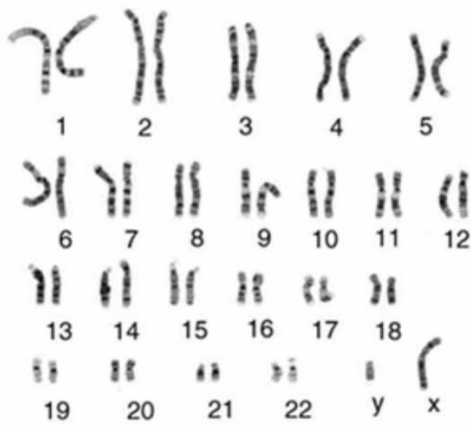
In each cell, only some of the genes are active, or expressed. The activity of genes in a cell is called gene expression. In this activity, you will explore how some genes are turned on and off by molecules called transcription factors. These molecules control the transcription of DNA into RNA.

Part A: Gene Expression in Differentiated Cells

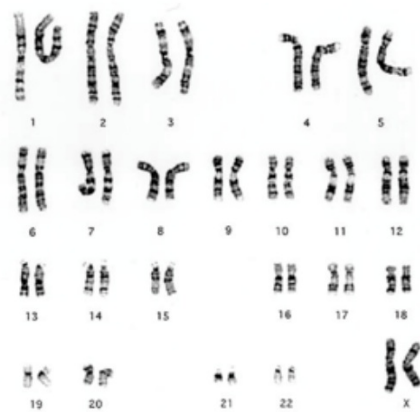
1. Each member of your group will look at gene activity in **one of four kinds of specialized cells** shown below. With your group, decide who will investigate each type of cell.

Location in body	Cell Type	Function	Student Name
	Beta cell in the pancreas 	Beta cells in the pancreas which produce the protein hormone insulin, which regulates cellular uptake and metabolism of sugars and fats	
	Red blood cell (circulatory system) 	Red blood cells produce hemoglobin, a transport protein that carries oxygen to every other cell in the body.	
	Intestinal lining cell 	Intestinal lining cells produce enzymes that contribute to specific steps of digestion	
	Smooth muscle cell in the digestive system 	Smooth muscle cells in the digestive system contract or relax in waves that move food through the digestive tract	

2. You will look at a small number of genes on two human chromosomes: Chromosome 2 and 11. Identify these chromosomes in the diagrams below and circle both pairs.



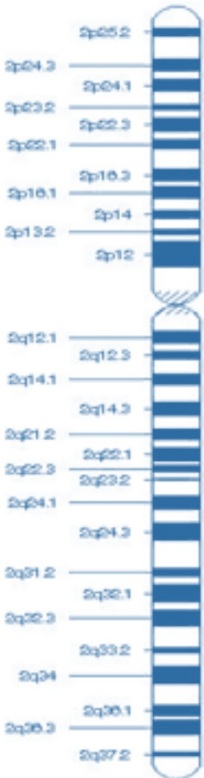
Human male karyotype



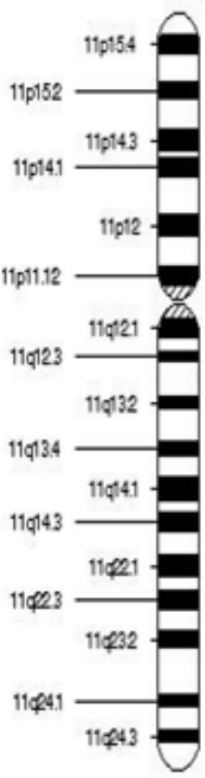
Courtesy of Dr. K. Phelan, Greenwood Genetic Center.
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Human female karyotype

Chromosome 2

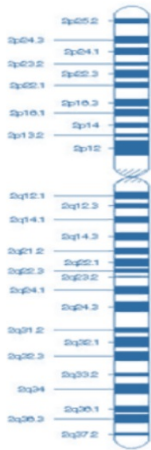


Chromosome 11



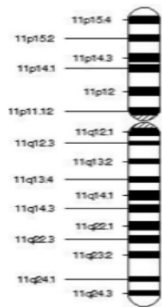
Chromosomes 2 and 11

Chromosome 2
Read and underline
the important
function of
each
protein.



Genes Expressed in Four Types of Human Cells					
Key: + = active gene, - = repressed gene					
Chromosomes 2					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Ribosome protein S7	+	+	+	+	Needed by ribosomes, which are essential for protein synthesis
Protein synthesis initiator	+	+	+	+	Controls the beginning of protein synthesis
Actin, smooth muscle type	-	-	-	+	Most cells produce actin for cell movement and cell division, but muscle cells produce large amounts of specific types of actin
Cellular respiration enzyme	+	+	+	+	Catalyzes reactions for aerobic respiration in the mitochondria
Lactase	-	-	+	-	Required for digestion of lactose, the sugar in milk
AGA enzyme	-	-	-	-	Breaks down fats and some toxic substances

Chromosome 11



Chromosome 11					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Cell growth controller	+	+	+	+	Prevents cells from dividing unless more cells are needed, helps prevent certain cancers
Hemoglobin B	-	+	-	-	Carries oxygen to the cells throughout the body
Insulin	+	-	-	-	A hormone that regulates the metabolism of sugars and fats
Fat and protein breakdown enzyme	+	+	+	+	Catalyzes one step in the breakdown of proteins and fats in the diet so they can be used for energy
DNA repair protein	+	+	+	+	Repairs damage to DNA

3) You will investigate the expression of only 11 of the approximately 25,000 human genes. Review the proteins these 11 genes produce and their functions in the two tables below.

Determine which of the 11 genes on chromosome 2 and 11 are expressed in your cell.

Genes Expressed in Four Types of Human Cells					
Key: + = active gene, - = repressed gene					
Chromosomes 2					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Ribosome protein S7	+	+	+	+	Needed by ribosomes, which are essential for protein synthesis
Protein synthesis initiator	+	+	+	+	Controls the beginning of protein synthesis
Actin, smooth muscle type	-	-	-	+	Most cells produce actin for cell movement and cell division, but muscle cells produce large amounts of specific types of actin

Scan **ACROSS** the rows. If it is active in **ALL 4** cells circle the + in orange

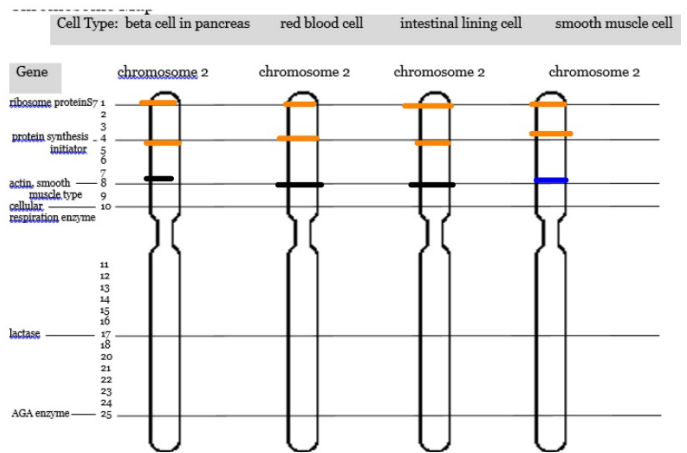
Genes Expressed in Four Types of Human Cells					
Key: + = active gene, - = repressed gene					
Chromosomes 2					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Ribosome protein S7	+	+	+	+	Needed by ribosomes, which are essential for protein synthesis
Protein synthesis initiator	+	+	+	+	Controls the beginning of protein synthesis
Actin, smooth muscle type	⊖	⊖	⊖	+	Most cells produce actin for cell movement and cell division, but muscle cells produce large amounts of specific types of actin

Circle all repressed genes (-) with a black (pencil) circle

Genes Expressed in Four Types of Human Cells					
Key: + = active gene, - = repressed gene					
Chromosomes 2					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Ribosome protein S7	+	+	+	+	Needed by ribosomes, which are essential for protein synthesis
Protein synthesis initiator	+	+	+	+	Controls the beginning of protein synthesis
Actin, smooth muscle type	-	-	-	+	Most cells produce actin for cell movement and cell division, but muscle cells produce large amounts of specific types of actin

Scan ACROSS the rows. If a gene is active in ONLY 1 type of cell, circle it in Blue

Genes Expressed in Four Types of Human Cells					
Key: + = active gene, - = repressed gene					
Chromosomes 2					
Protein Produced by the Gene	Beta Cell in Pancreas	Developing Red Blood Cell	Intestinal Lining Cell	Smooth muscle Cell in the Digestive System	Function of the Protein
Ribosome protein 57	+	+	+	+	Needed by ribosomes, which are essential for protein synthesis
Protein synthesis initiator	+	+	+	+	Controls the beginning of protein synthesis
Actin, smooth muscle type	-	-	-	+	Most cells produce actin for cell movement and cell division, but muscle cells produce large amounts of specific types of actin



Draw a line on the gene in chromosomes 2 and 11 that match the colors that you used in your chart. If you circled the gene in orange, draw a line in orange on the chromosome.

