4.1: Function of the Nucleus within the Cell Name:

**Objectives**: By the end of the lesson you should be able to:

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

**Recall**:

The Cell Theory States:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Parts of the Cell**:

* Draw a rough sketch of both a plant and animal cell below. Label all the parts you can.

**Plant Animal**

**The Nucleus**:

* The nucleus contains the master set of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that determine what the cell will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, how it will function, and when it will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and when it will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Now it is your turn! Complete the chart of the organelles of the cell and label the diagrams of the cells, nucleus, and DNA strand.**

**The Nucleus: Control Centre of the Cell**

**Objectives**: By the end of the lesson you should be able to:

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

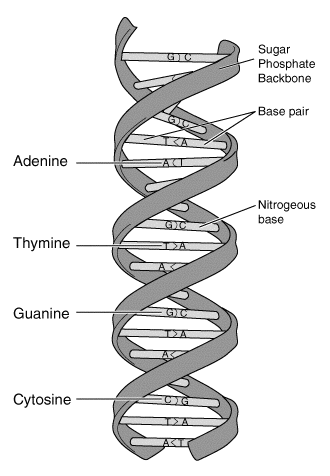
**Draw a rough sketch of a cell’s nucleus below. Label all the parts you can.**

* **Nuclear membrane** – like the cell membrane \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_contents of the nucleus
* **Nuclear pore**- \_\_\_\_\_\_\_\_\_\_\_\_\_ in the membrane that allow only \_\_\_\_\_\_\_\_\_\_ things in and out of the nucleus
* **Nucleoplasm**- \_\_\_\_\_\_\_\_\_ inside the nucleus
* **Nucleolus**- makes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **DNA**- base pairs connected to form a double helix
* **Chromatin**- contains \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Chromosome**- coiled \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forms an “\_\_\_” shape

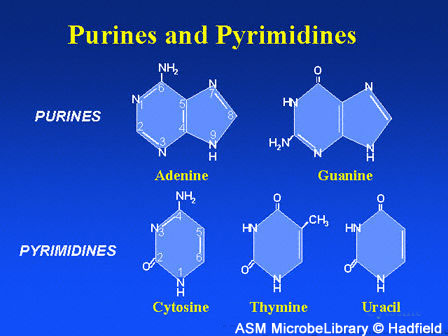
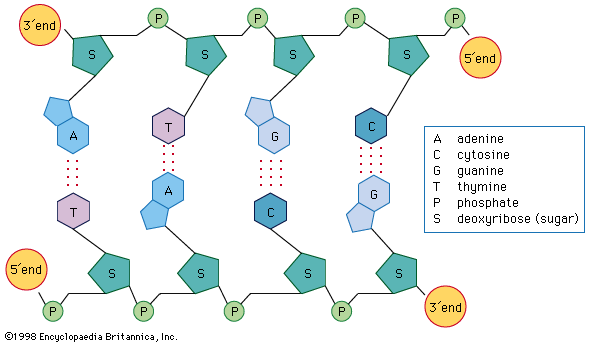
**DNA and Chromosomes**

* DNA: the blueprint of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!
* Located in the nucleus in 46 “chunks” called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Each chromosome has sections that \_\_\_\_\_\_\_\_\_\_ for a specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* These sections are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is found inside the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of animal and plant cells
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during the cycle of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, take the form of chromatin. Chromatin (uncoiled) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (shortens and thickens) during cell division to form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Chromatin is the substance that contains the \_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Within each strand of chromatin is one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of DNA.

**Human DNA and DNA Structure**

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* Humans have \_\_\_\_\_\_\_ chromosomes
* That is: \_\_\_\_\_\_ pairs of chromosomes
* 23 from \_\_\_\_\_\_\_\_\_\_ and 23 from \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Double \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Sugar-phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_ nitrogenous bases
* Complementary base pairing
  + **A goes with \_\_\_; G goes with \_\_\_\_**
* DNA is made of 4 bases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The sequence of the bases codes for a specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

** **

**Making RNA**

* Remember that RNA is just a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a section (gene) of DNA
* To make the RNA the DNA has to split (\_\_\_\_\_\_\_\_\_\_\_) down the middle so the RNA can read the bases and make the copy

**Reading DNA**

* When a photocopy of a gene is taken (RNA!) the DNA has to split so a copy can be made
* If you had to make a copy of a gene could you?? YES!!!
* Lets practice!

**Mutations**:

* If there is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of the DNA bases the amino acids will be different (and so will the proteins – thus, they may not be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!)

***4 Types of Mutations*:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

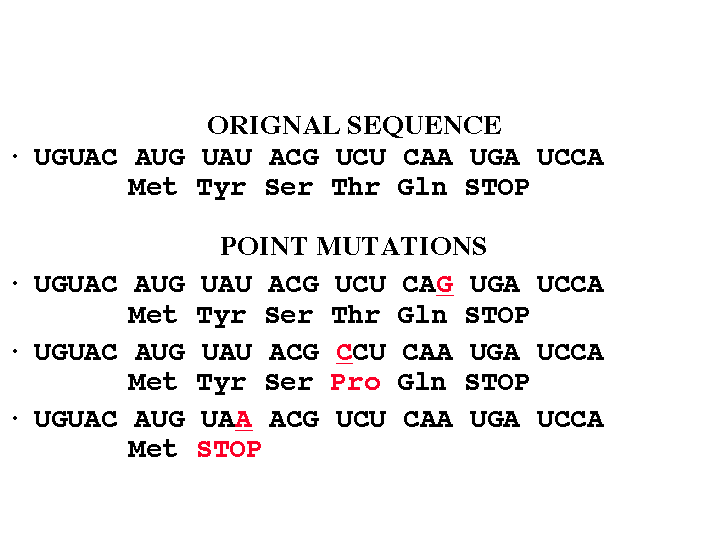
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Point Mutations**:

* Change occurs at some point in the DNA sequence
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Effects range from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ depending on the \_\_\_\_\_\_
* EX: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (an A was replaced with a T in one location)



**Chromosomal Mutations**:

* Mutation in an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_chromosome – present at conception
* Many genes affected (\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
* Effects range from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (almost always an effect)
* EX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *– an extra X chromosome*

**Body Cell Mutation**:

* Mutations of the body cells
* These are ­­­­­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Effects range from nothing to lethal
* EX.­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Sex Cell Mutations:**

* Mutations in the sex cells
* These mutations \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* These do not affect the person with the sex cells but can severely affect their \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Diagram of UV Radiation
  Mutating DNAEX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!

**Mutagens** = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. ­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_: they simply happen randomly

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ : knocks holes in DNA

- \_\_\_\_\_\_\_\_\_\_ = sunlight 🡪 skin cancer

- \_\_\_\_\_\_\_\_\_\_ = dentists and hospitals

- \_\_\_\_\_\_\_\_\_\_ = radiation for cancer

- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = none in BC

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: - \_\_\_\_\_\_\_\_\_\_\_\_ = Illegal (PCP, LSD, Heroin, Cocaine)

= Legal (thalidomide)

- \_\_\_\_\_\_\_\_\_\_\_\_ = formaldehyde, benzene, acetone, carbon tetrachloride

**Effects of Mutations:**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: organism benefits from the mutation
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: organism is harmed by the mutation
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: organism is not harmed or helped by the mutation
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Correcting Mutations:**

* Normally through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* New technique = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Replace a mutated gene with a healthy one
  + NOT EASY!!!

**Gene Therapy**:

1. Inactive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is inserted with healthy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Virus is shot (very difficult) into the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of millions of target \_\_\_\_\_\_\_\_ (unhealthy gene)
3. Patient must be able to “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” the healthy gene
   1. Requires healthy gene to become attached to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Healthy gene must be \_\_\_\_\_\_\_\_\_\_\_\_\_ correctly
   3. Healthy protein must be made – in the correct \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Let’s Talk!**

* Activity 4-2B pg 143
* Bioengineered Bananas??
* Pg. 145 even numbered questions