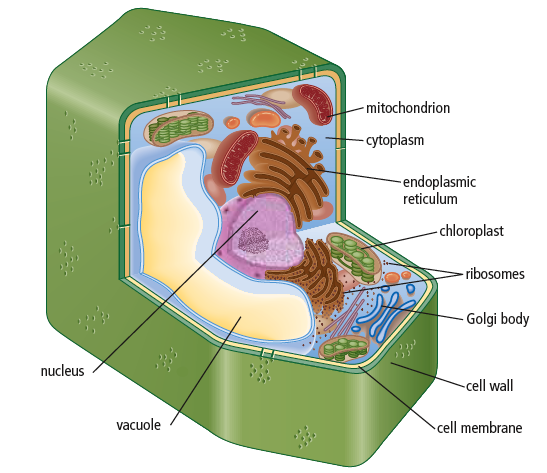
**4.1 The Nucleus and Cell Functions.**

**Cell Parts and Organelles.**

* Animal Cells
  + Animal cells are equipped with

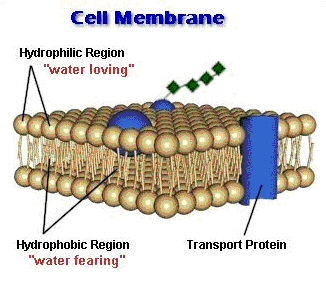
many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that allow

the cell to perform a variety of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

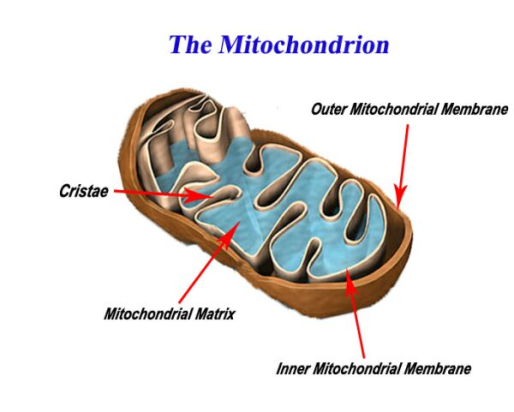
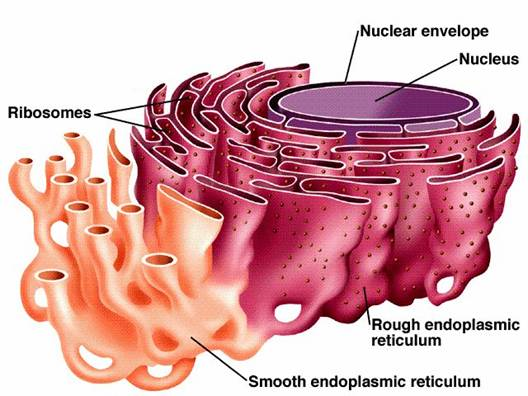
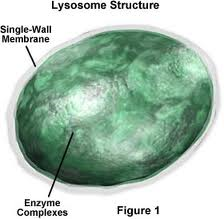
* Plant cells
  + Plant cells are equipped with some  
    structures that animal cells \_\_\_\_\_\_\_\_\_\_\_\_\_\_

have. CAN YOU IDENTIFY HOW

PLANT CELLS **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** FROM ANIMAL CELLS?

* Animal AND Plant cell parts
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - controls all cell activities.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - membrane - free organelle that makes ribosomes.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - protects the contents of the nucleus.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - openings in the nuclear membrane that allow only certain materials to pass.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ -

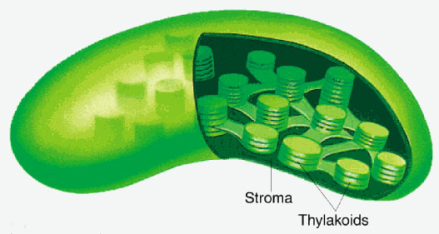
thin covering that controls the flow of materials in and out of the cell.

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - jelly-like substance contains the organelles (specialized cell parts).
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - provide energy for cells.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - membrane-covered channels that act as a transport system for materials made in the cell.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - manufacturing plants for proteins.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - vesicles transport new proteins to the Golgi body.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - sorts and packages proteins for transport.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_ - membrane-bound storage containers.
* Animal organelles NOT found in Plants.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – small vesicles which

have enzymes and that are used for digestion.

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - small structures use

to pull chromosomes apart during cell division.

* Plant organelles NOT found in Animals.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - trap energy from Sun

to make glucose, food for the plant.

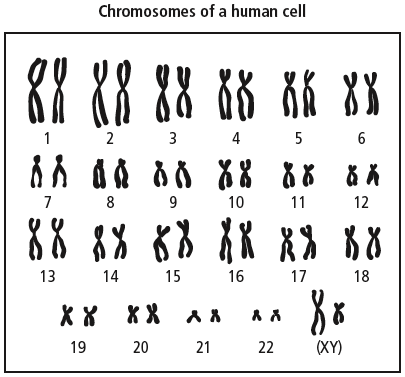
* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - tough, rigid structure

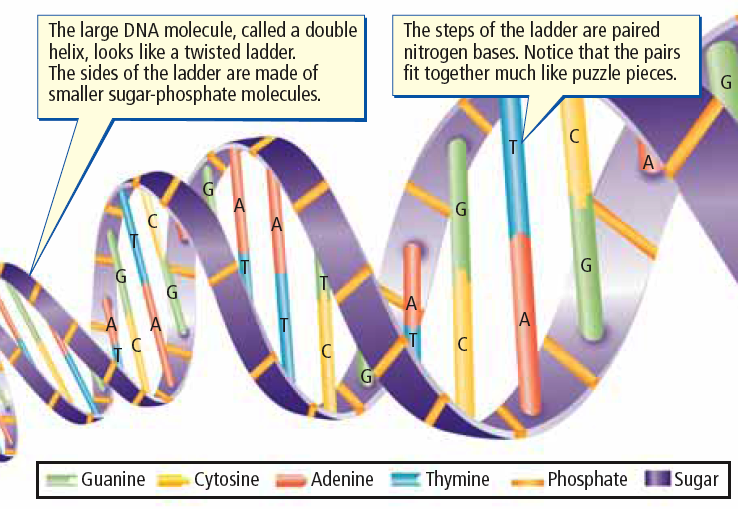
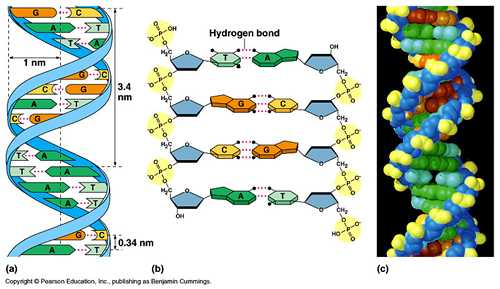
that surrounds cell membrane, provides protection and structural support.

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_- plant cells are equipped with a large vacuole for storing water.

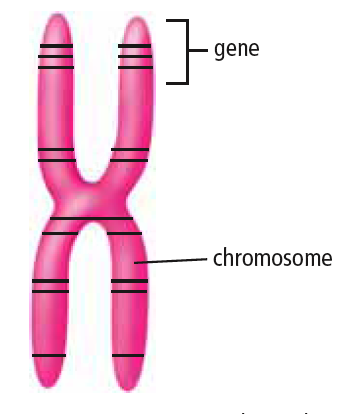
**The Nucleus and DNA.**

* The nucleus contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. DNA is the molecule that has the master set of instructions for how cells function, what they will produce, and when they will die.
* Structure of DNA
* DNA looks like a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - two strands wrap around each other in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The sides of the DNA ladder are made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The steps of the ladder are made of four nitrogen bases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The bases join in a specific way
  + \_\_\_\_ always joins with \_\_\_\_
  + \_\_\_\_ always joins with \_\_\_\_



**DNA in the Nucleus.**

* Most of the time DNA is in the form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
* Chromatin coils tightly into X-shaped \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
* Every organism has a specific number of chromosomes.
* Human cells have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ arranged in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* The 23rd pair determines sex; \_\_\_\_\_\_\_ for females and \_\_\_\_\_ for males.

**Genes.**

* **\_\_\_\_\_\_\_\_\_** are small segments of **\_\_\_\_\_\_** located on

a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

* Genes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ needed

to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**

* Each chromosome can carry thousands of genes.
* All your body cells have the same genes, but only

specific genes are “read” in each cell to produce specific proteins.

* Specialized **\_\_\_\_\_\_\_\_\_\_\_\_\_** called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** carry out important specific functions in the body.

**Production of Proteins.**

* Protein production in the cell involves several important steps:
  1. The **\_\_\_\_\_\_\_\_\_\_\_\_** receives a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to make

a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

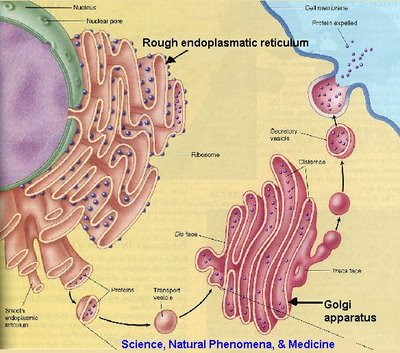
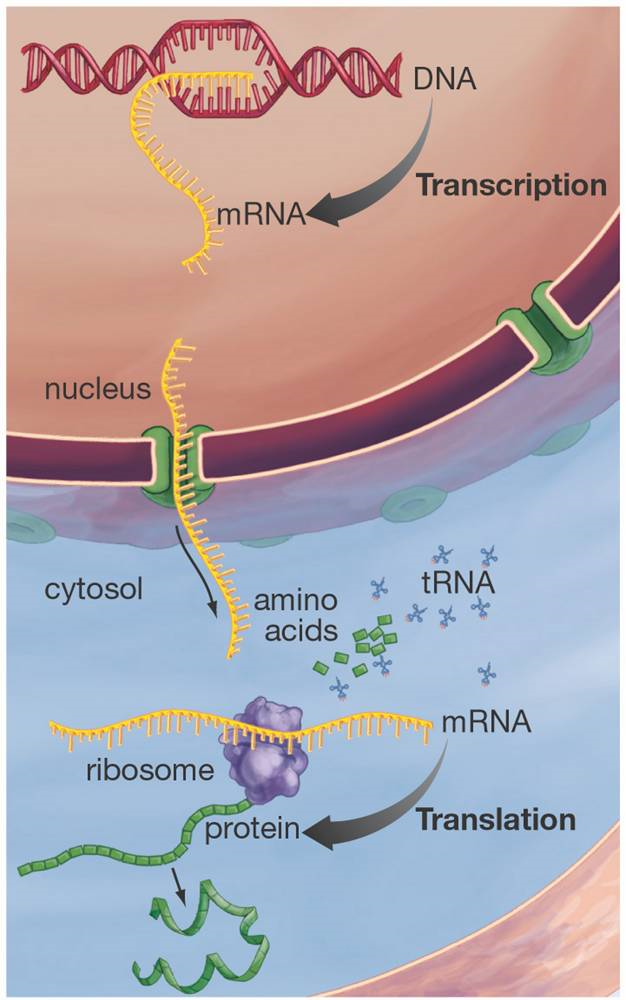
* 1. The **\_\_\_\_\_\_\_** message for the protein is **\_\_\_\_\_\_\_\_\_\_\_** into a small molecule called **\_\_\_\_\_\_\_\_\_\_\_\_.**
  2. RNA **\_\_\_\_\_\_\_\_\_\_** the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** through a nuclear pore.
  3. The RNA message is delivered to a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, the ribosome **\_\_\_\_\_\_\_\_\_\_\_\_** the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  4. The manufactured protein enters the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (ER).
  5. A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** forms at the end of the ER, and carries the protein to

the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

* 1. The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the protein for transport out of the cell.
  2. A **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** forms off the end of the Golgi body to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
  3. The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** attaches to the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, and its protein contents are released out of the cell.

Exporting the Protein

Making the Protein

**Why do we need Proteins?**

* **\_\_\_\_\_\_\_\_** of your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is made of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Everything from \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, and even \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are the building blocks of proteins and we get our amino acids from many different sources of protein.
  + Can you think of any good sources of protein in our diets?

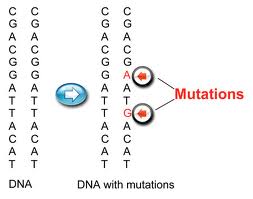
**Some Important Proteins in our Body.**

**Structural:**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ under skin, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in our skin, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in our tendons, **\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_** in muscles.

**Functional:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to fight infection (antibodies), **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to carry oxygen, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** like adrenalin and insulin, \_\_\_\_\_\_\_\_\_\_\_\_\_ like maltase, trypsin, amylase for digesting food, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to make our skin darker (pigment) to protect from UV rays.

**4.2 Mutations.**

* A gene mutation involves a change in the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (A,C,T,G) that make

up the gene. There are several types of gene mutation:

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (base missing)
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (extra base added)
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (base substituted for another)
* Gene mutations may produce proteins that

are \_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

to the organism, or may have \_\_\_\_\_\_\_\_\_\_\_\_\_\_ at all.

* Example: a particular **mutated gene** produces

white coat Kermode bears - they occur as only a

small percentage of the population (they are normally black in colour).



**Effects of Mutations.**

* Positive Mutations
  + When a gene mutation

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the individual.

* + Example: Some plants have developed

resistance to bacterial and fungal infections.

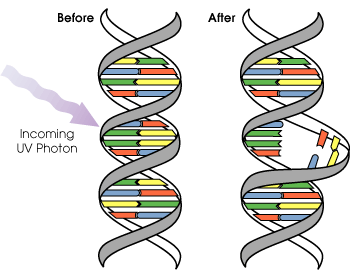
* **Negative Mutations**
  + When a gene mutation \_\_\_\_\_\_\_\_\_\_\_\_\_ the individual
  + Example: **Sickle** **cell** genes in affected humans

cause blood cells that are abnormally shaped.

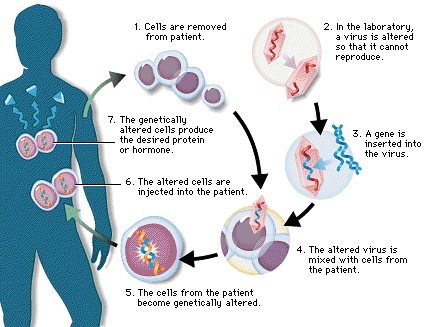
* + **Hemophilia** disorder when clotting does not occur.
* **Neutral Mutations**
  + When a gene mutation has
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_on the individual
  + Example: The white **Kermode** **bear** or

frog with an **extra leg**, or humans with **webbed** **toes**.

**Mutagens & Mutation Repair.**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are substances or factors that cause mutations
* ****Environmental mutagens such as \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can cause mutations.

****

* Correcting mutations is difficult, but new techniques such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ offer hope.
* Gene therapy is complicated and experimental:
  + A \_\_\_\_\_\_\_\_ is engineered to carry a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The normal gene must then \_\_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The normal gene must then be “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” so that the replacement normal gene produces the proper \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It is also important that the normal gene make the correct amount of healthy protein.