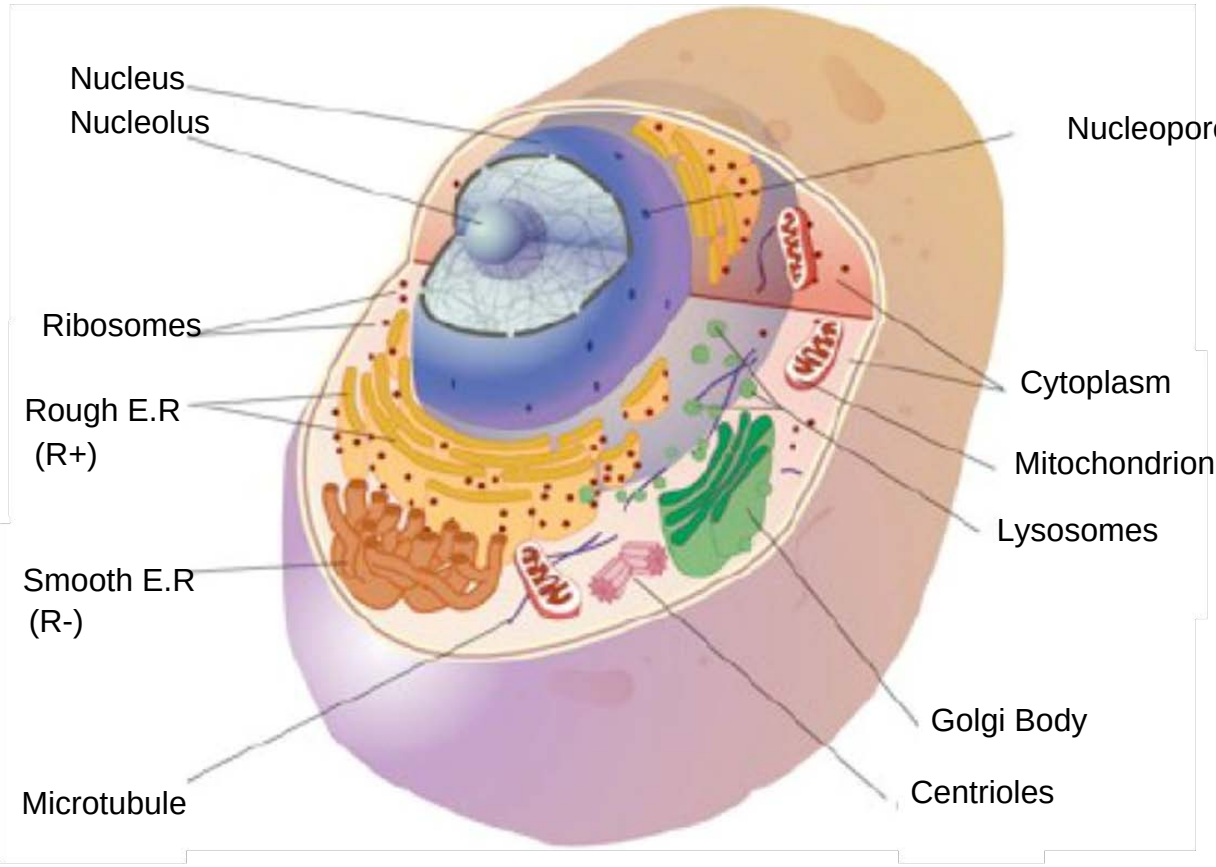
Genetic Part

I- What is a cell?

Animal cells are …Eukaryotic cells……, or cells with a membrane-bound nucleus. Unlike…Prokaryotic cells……., **DNA** in animal cells is housed within the nucleus. In addition to having a nucleus, animal cells also contain other membrane-bound organelles, or tiny cellular structures, that carry out specific functions necessary for normal cellular operation.

Organelles have a wide range of responsibilities that include everything from producing …..hormones……..and …enzymes…… to providing energy for animal cells.



Title : Ultrastructure of an Animal Cell

Organelles and Components

The following are examples of structures and organelles that can be found in typical animal cells:

- Cell Membrane …… - thin, semi-permeable membrane that surrounds the **cytoplasm** of a cell, enclosing its contents.

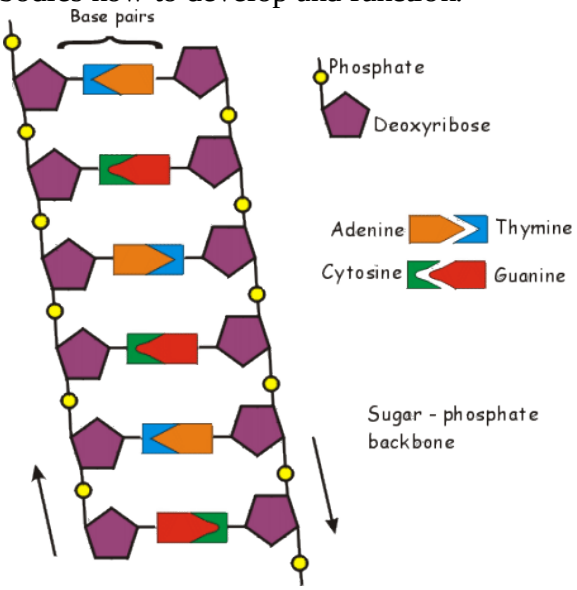
- Centrioles ..... - cylindrical structures that organize the assembly of microtubules during **cell division**.
- Hyaloplasm ..... - gel-like substance within the cell.
- Endoplasmic Reticulum .....- extensive network of membranes composed of both regions with ribosomes (rough ER) and regions without ribosomes (smooth ER).
- Golgi Body ..... - also called the Golgi apparatus, this structure is responsible for manufacturing, storing and shipping certain cellular products.
- Lysosomes ..... - sacs of enzymes that digest cellular macromolecules such as **nucleic acids**.
- Microtubules ....., - hollow rods that function primarily to help support and shape the cell.
- Mitochondrion ..... - Cell components that generate energy for the cell and are the sites of **cellular respiration**.
- Nucleus ..... - Membrane bound structure that contains the cell's hereditary information.
    - Nucleolus ..... - Structure within the nucleus that helps in the synthesis of ribosomes.
    - Nucleopore ..... - tiny hole within the nuclear membrane that allows nucleic acids and proteins to move into and out of the nucleus.
- Ribosomes ..... - consisting of RNA and proteins, responsible for protein assembly.

II- What is a nucleus?

Nucleus contains most of the cell's genetic material..., organized as multiple long linear D.NA..... molecules in complex with a large variety of proteins....., such as **histones**, to form chromosomes..... The genes..... within these chromosomes are the cell's nuclear genome. The function of the nucleus is to maintain the integrity of these genes and to control the activities of the cell by regulating gene expression..... The nucleus is, therefore, the control center of the cell

III- What is DNA? DNA = DesoxyriboNucleic Acid

DNA is an essential molecule for life. It acts like a recipe holding the instructions telling our bodies how to develop and function.



a- What is DNA made of?

DNA is a long thin molecule made up of something called nucleotides. There are four different types of nucleotides: adenine, thymine, cytosine, and guanine. They are usually represented by their first letter:

- A- Adenine.....
- T- Thymine.....
- C - Cytosine.....
- G - Guanine.....

Holding the nucleotides together is a backbone made of **phosphate** and **deoxyribose**. The nucleotides are sometimes referred to as **"bases".**

b- Shape of the DNA Molecule

Although DNA looks like very thin long strings under a microscope, it turns out that DNA has a specific shape. This shape is called a ……Double Helix……. On the outside of the double helix is the backbone which holds the DNA together. There are two sets of backbones that twist together. Between the backbones are the nucleotides represented by the letters A, T, C, and G. A different nucleotide connects to each backbone and then connects to another nucleotide in the center.

> Only certain sets of nucleotides can fit together: A only connects with T and G only connects with C.
>. U (Uracile) only connects with G…….

IV- What is a gene?

Within each string of DNA are sets of instructions called genes. A gene is transcribed to an RNA which may then be translated to a protein. Proteins are used by the cell to perform certain functions, to grow, and to survive.

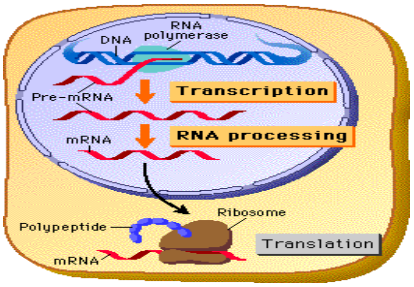
a- How do cells know what to do?

>> The DNA Code

The DNA code is held by the different letters of the nucleotides. As the cell "reads" the instructions on the DNA the different letters represent instructions. Every three letters makes up a word called **a codon**. A string of codons may look like this:

ATC TGA GGA AAT GAC CAG

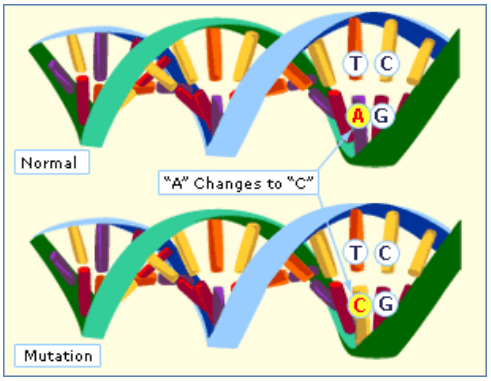
>> Gene expression



It first involves .transcription……., in which DNA is used as a template to produce RNA. In the case of genes encoding proteins, that RNA produced from this process is ……messenger R.N.A.…… , which then needs to be translated…….. by .ribosomes……to form a protein. As ribosomes are located outside the nucleus, mRNA produced needs to be exported.

V- What is a mutation?

Mutation is a permanent alteration in the DNA sequence that makes up a gene, such that the sequence differs from what is found in most people. Mutations range in size; they can affect anywhere from a single DNA building block (gene mutation) to a large segment of a chromosome that includes multiple genes (chromosome mutations).



VI- What is a chromosome?

When a cell is not dividing (interphase of the cell cycle), the chromosome is in its chromatin form. In this form it is a long, very thin, strand. When the cell begins to divide, that strand replicates itself and winds up into shorter tubes. Before the split, the two tubes are pinched together at a point called the centromere. The shorter arms of the tubes are called the "p arms" and the longer arms are called the "q arms."

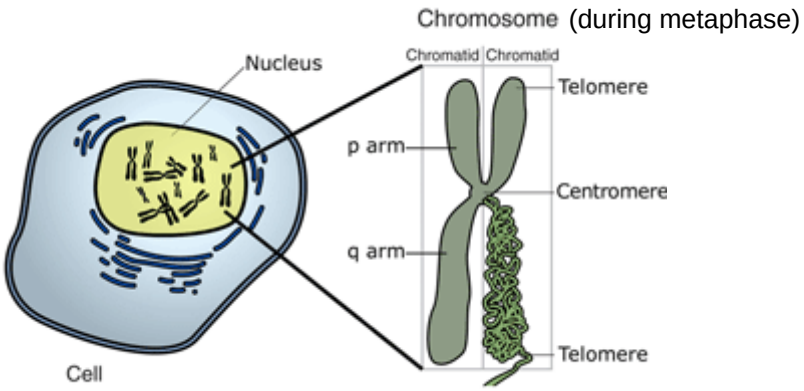
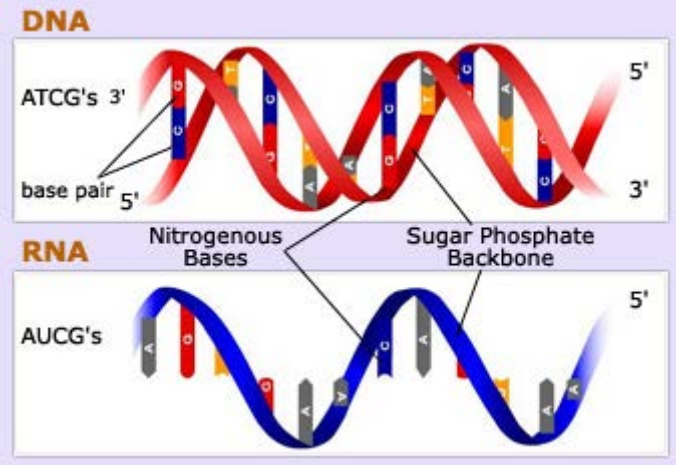


Image adapted from: National Human Genome Research Institute.

Where is the mistake on this figure?

We can't see the chromosomes inside the nucleus

Activity : Compare between DNA and RNA:



Similarities:

1. They are both made of building blocks , called nucleotides

2. Each nucleotide is made of a base attached to a piece of backbone

3. Nucleotides in both DNA and RNA are complementary base pairs : C pairs with G and A with T (or U)

Differences:

1. The backbones of DNA and RNA are slightly different in their chemical makeup
2. The bases in DNA are G C A T and the bases in RNA are : G C A U
3. In DNA , each base is paired with another along the entire length of 2 strands

In RNA , only certain bases are paired with their complement

4. DNA molecules have a regular uniform shape ; RNA molecules have an irregular varied shape
5. DNA molecules are huge , typically made of billions of nucleotides

RNA // // much smaller , made of hundreds of nucleotides

- **Question:** can we use the presence of DNA as an argument to say that an organism is living?

YES*

* celui qui a la reponse et la justification me la donne sivouplait car jlai pas