

DNA
or
Deoxyribonucleic acid

An acid for life

CLASS

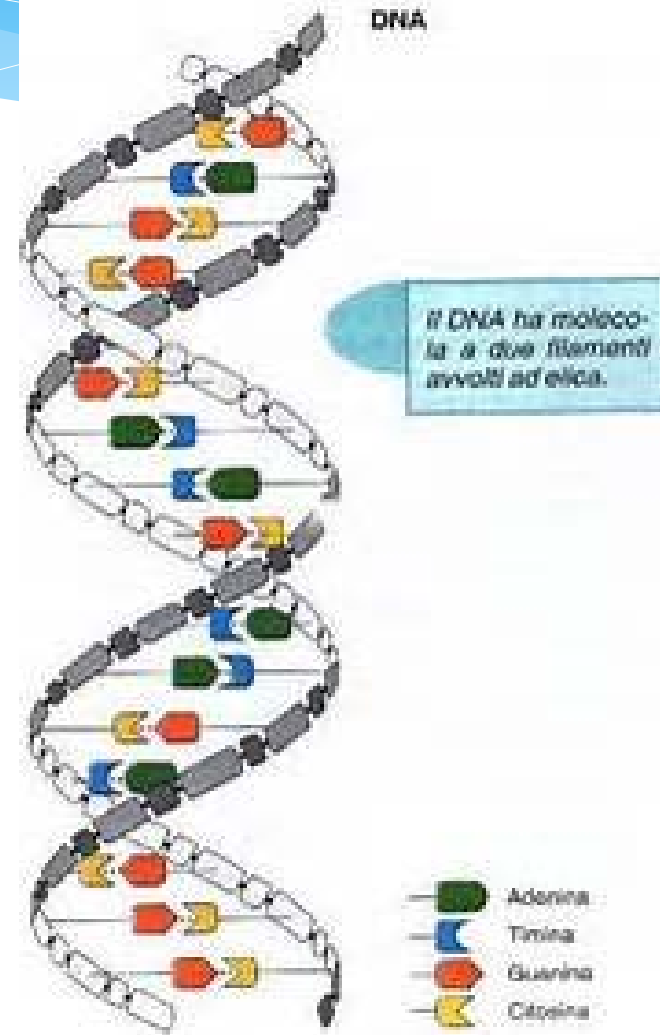
- **V Liceo Scientifico – Organic chemistry
Biochemistry.**
- **II Liceo Scientifico - Biology: organic
molecules in the living matter**
- **III Liceo Scientifico - Genetic mutations**

DNA

DNA is made up with two long polynucleotidic chains, which form a double complementary helix.

A **nucleotide** is formed by three specific components:

- ❖ a **heterocyclic base**;
- ❖ an **aldopentose carbohydrate**;
- ❖ a **phosphate group**.



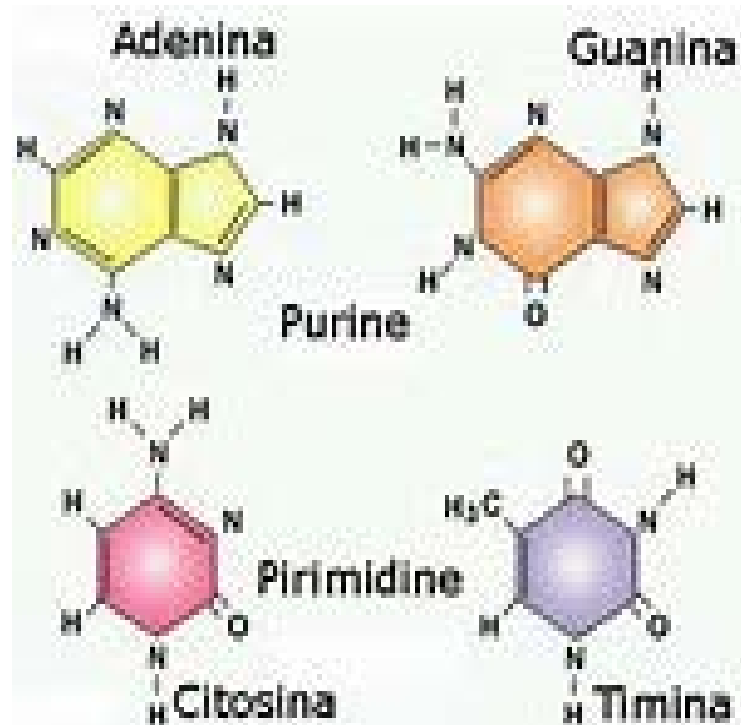
Four *nitrogen bases* are present in *DNA*:

Two are called *pyrimidines*:

- *Thymine*
- *Cytosine*

Two are called *purines*:

- *Adenine*
- *Guanine*



DNA

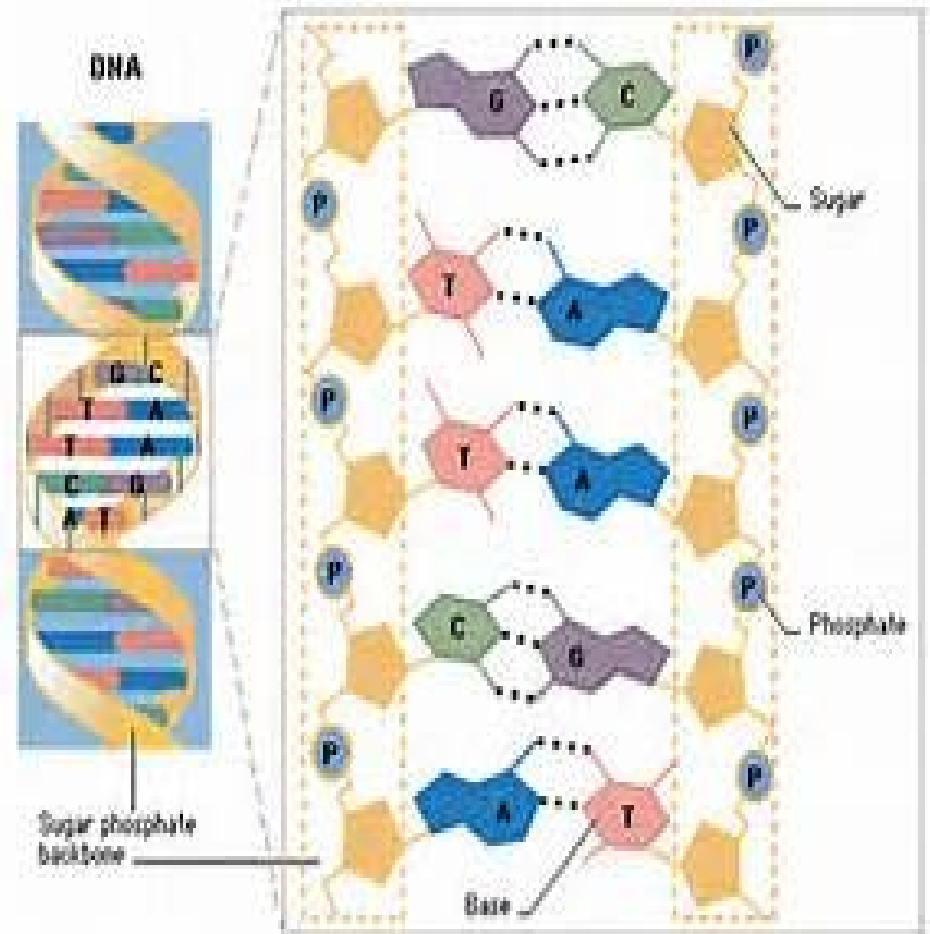
In the double helix, the bases form complementary pairs:

Adenine - Thymine

linked by two hydrogen bonds

Guanine - Cytosine

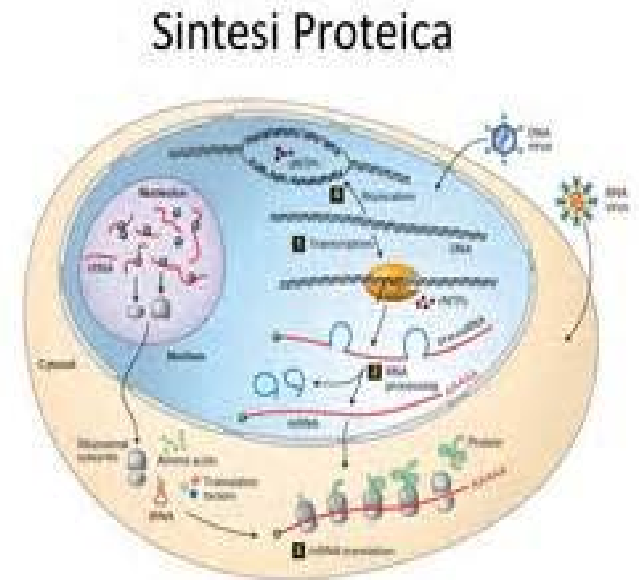
linked by three hydrogen bonds



DNA

DNA is present in the cell nucleus, and in its molecule all the genetic information is coded .

This information is necessary to synthesize all the proteins, that use messenger RNA, transfer RNA and ribosomal RNA



Genetic code

The gene information in DNA is located in the **sequence of bases**.

Genetic code has

64 sequences of three nucleotide bases or **codons**:

- a **start codon** – **AUG**;
- three **stop codons** act as translation termination signals;
- the other 60 codons **encode** the other 19 amino acids.

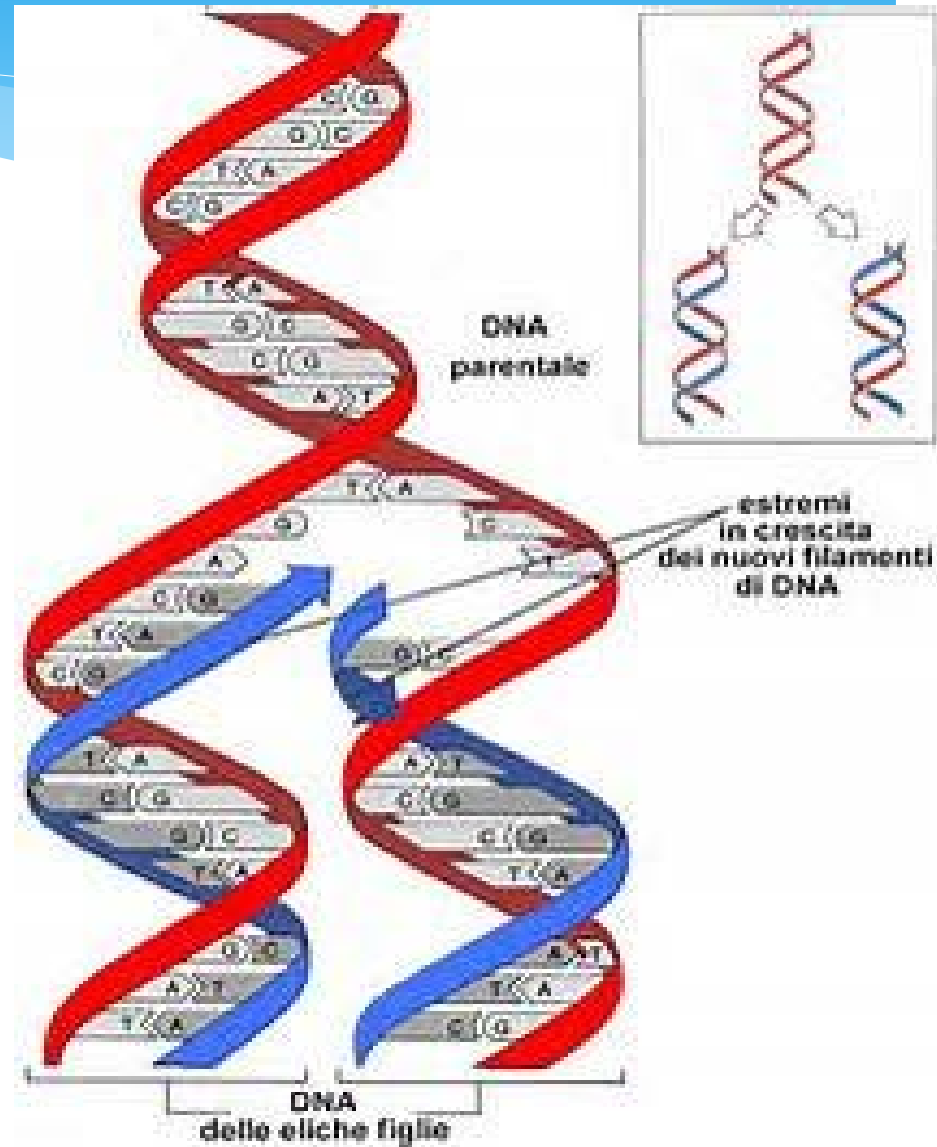
The **Genetic code** is:

- ❖ **Degenerate** same amino acid can be encoded by multiple codons;
- ❖ **Universal** same in all **organisms**.

		Second Letter				
		T	C	A	G	
First Letter	T	TTT } Phe TTC } TTA } Leu TTG }	TCT } TCC } Ser TCA } TCG }	TAT } Tyr TAC } TAA Stop TAG Stop	TGT } Cys TGC } TGA Stop TGG Trp	T C A G
	C	GTT } CTC } Leu CTA } CTG }	CGT } CCC } Pro CCA } CCG }	CAT } His CAC } CAA Gln CAG }	CGT } CGC } Arg CGA } CGG }	T C A G
	A	ATT } Ile ATC } ATA } ATG Met	ACT } ACC } Thr ACA } ACG }	AAT } Asn AAC } AAA Lys AAG }	AGT } Ser AGC } AGA } Arg AGG }	T C A G
	G	GTT } GTC } Val GTA } GTG }	GCT } GCC } Ala GCA } GCG }	GAT } Asp GAC } GAA Glu GAG }	GGT } GGC } Gly GGA } GGG }	T C A G

Replication of DNA

When one cell forms two cells with the same number of chromosomes – **Mitosis** – or when a diploid cell forms four haploid cells – **Meiosis** – a **DNA semiconservative** replication occurs; each parental strand acts as a template for a new one.



The class about DNA had its final step in a lab experiment: ***DNA extraction***

Procedures with chemical features have been used:

- A detergent that has demolished the cell membranes
- Pineapple juice, whose content of bromelain has destroyed the histones linked to DNA
- Preparation of a solution.

It has been possible to exploit the solubility of DNA in the water, but not in the ethanol.

Foto- racconto dell'esperimento

Classe V sez.E Liceo Scientifico





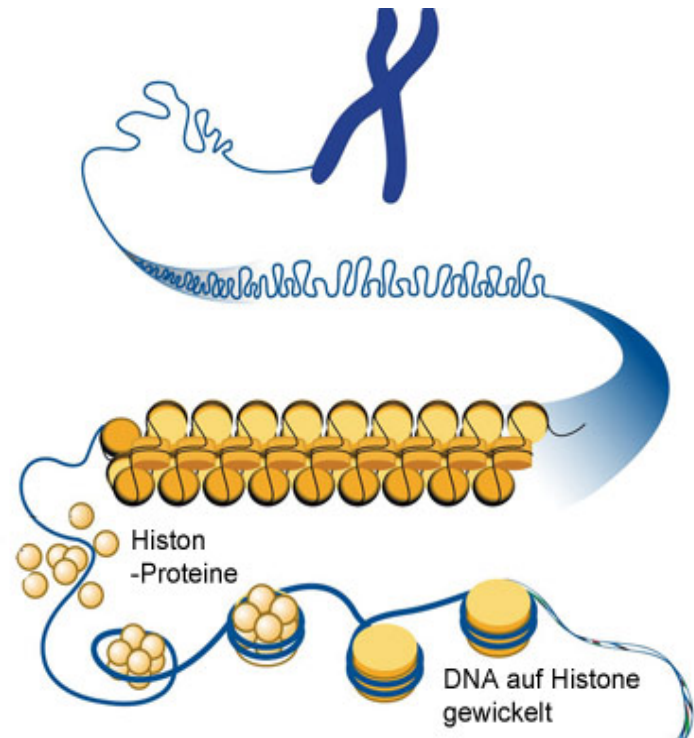
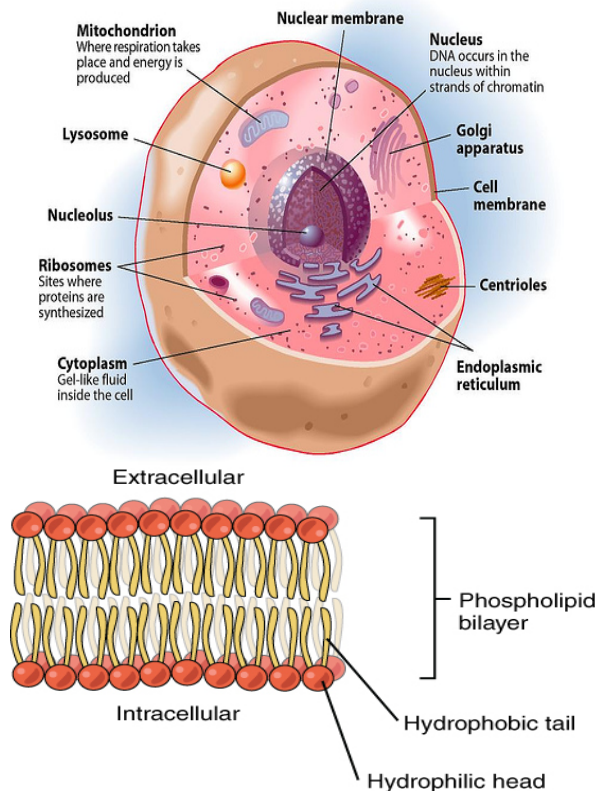
DNA EXTRACTION

Didactic experiment about **DNA** extraction from vegetable cells

Proposed to Lucio Piccolo's students in the school
year 2015/2016

EXPERIMENT'S SCOPE

- * To extract and to examine the **DNA** of vegetal cells, using proceedings that lead to breaking up the membrane's phospholipid bilayer (cellular and nuclear) and freeing the DNA from the histones to whom it is associated



First phase: preparation of the solution to break up cells' membranes

- * Add some water to 3 gr of **sodium chloride** and 10 ml of **detergent**, in the **graduated cylinder**, until you have a 100 ml volume. Shake it to dissolve the salt. This is the **«extration solution»**;
- * Pour the solution in 100 gr of mashed **fruit pulp** and let it work for 5 minutes and then filter it with the strainer.



Protein «Digestion»

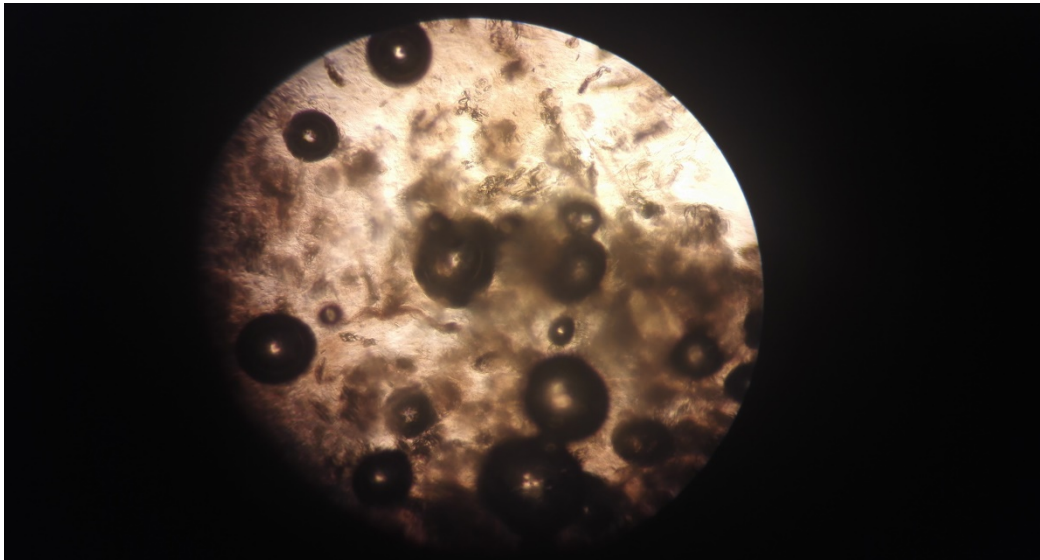
- * Take 25 mL of the filtered solution, put it in the **50 mL test tube** and add 5 mL of **ananas juice**, shaking it slowly, and let it interact for a few minutes to complete the protein degradation

Observations:

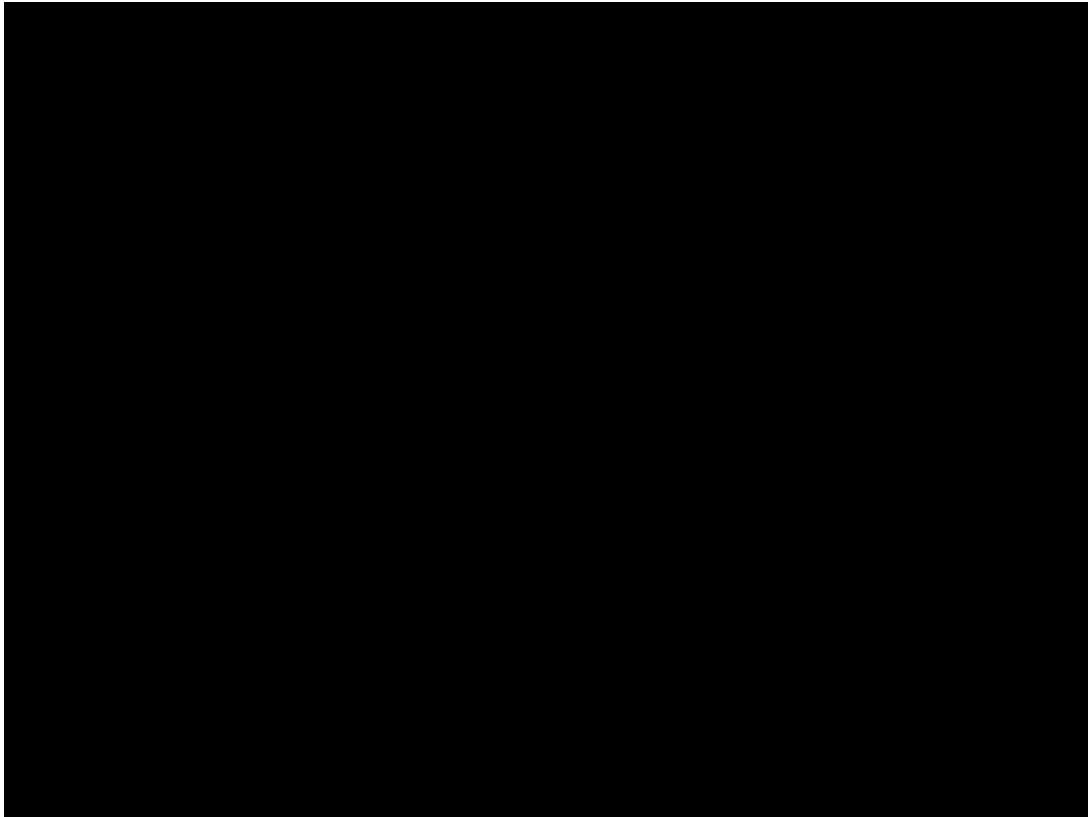
*In the ananas juice there is **bromelain**, that degradates hystones proteins to amino acids, as do some proteolytic enzymes.*

DNA downfall with ethyl alcohol

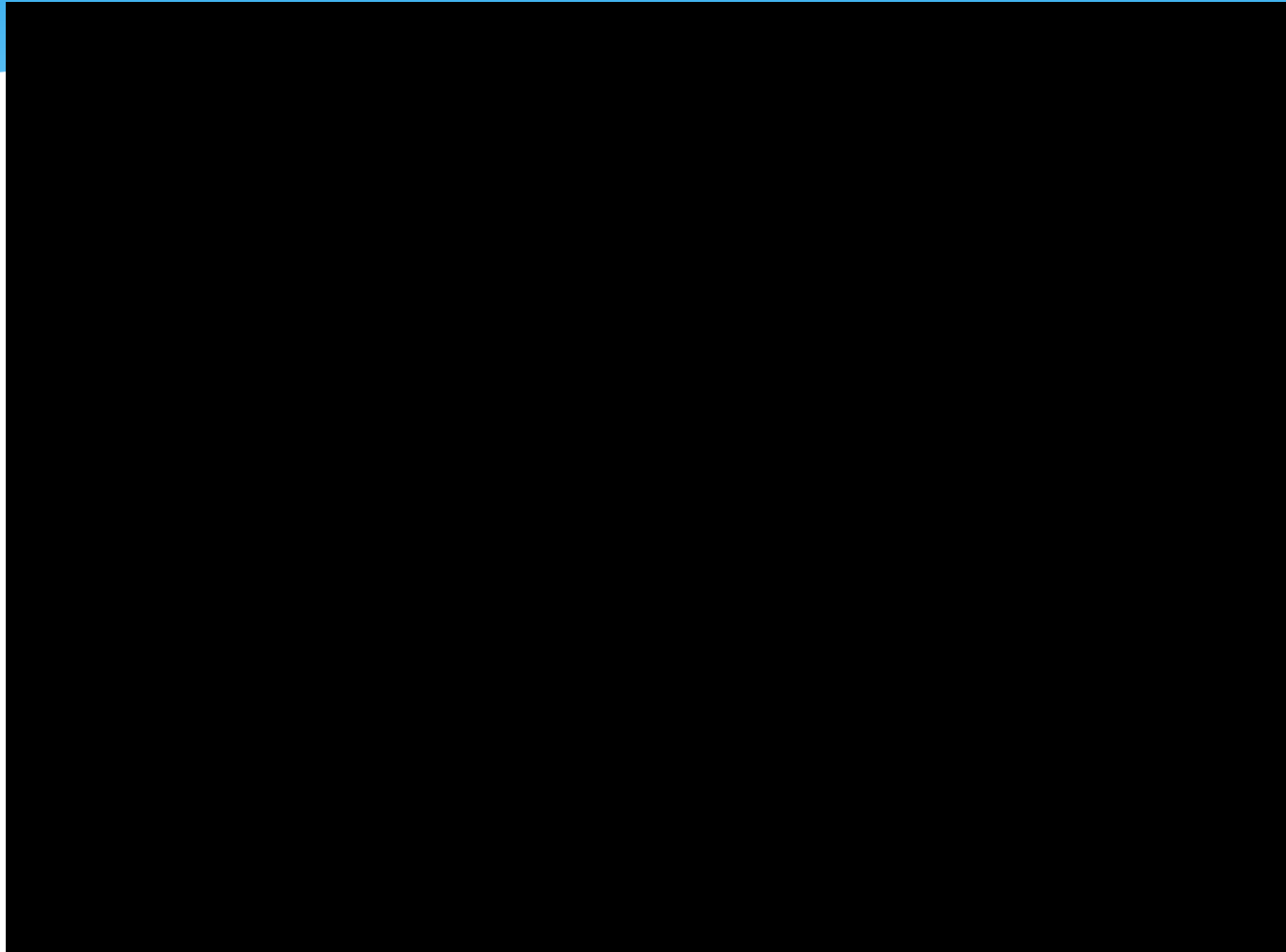
- * Take 6 mL of the solution and put it in the **20 mL test tube**, add 6 mL of freezing **ethyl alcohol**, pouring it slowly on the test tube's edge;
- * There will be some bubbles on the surface and than the DNA will appear as a see-through substance.



Experiment



Experiment' end



Work realised by Science Teacher NUNZIATA FONTI
Translation by English Teacher MARIA PIA COCIVERA