



## HUMAN GENETICS

3rd STAGE / MEDICAL LAB. TECHNIQUES  
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# Lab.2

## INSTRUMENT AND MATERIAL USED IN GENETIC LAB

### Refrigerator

The device is used for storage of stock solutions, chemical, kit, and PCR products that should be maintained at certain temperature.

Refrigerator (Beko)



Deep freezer



### Deep freezer

\*It is used to store mammalian cell stock culture, it is a device used to store materials when should be kept at low temperature (cell, tissues, enzyme, protein, etc.)

\*This instrument is defined as freezers for -80 to -85°C and the inner volume inside are in general between 300 and 800 L.

\* **Uses:** for long term storage for biological samples like DNA, RNA, proteins, cell extracts, or reagents. To reduce the risk of sample damage, these types of samples need extremely low temperatures as -80 to -85°C.

### **Magnetic stirrer.**

Is advice used which proved mixing and keeping chemical solution at a certain time and temperature by the help of magnetic bar.

### **vortex**

\*It consists of an electric motor and attached to a cupped rubber piece.

\* It used to mix sample at certain speed and duration, is a simple device used commonly in laboratories to mix small vials of liquid.



## **Gel electrophoresis**

### **1. Major components**

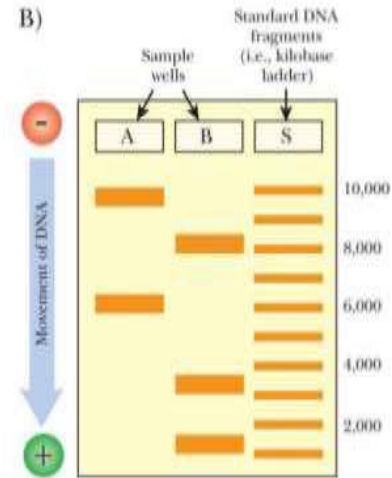
- Box to hold the gel
- Comb to create small wells in the agarose gel to put the DNA sample
- Power supply
- Gel photo imaging system

# Gel Electrophoresis Equipment

Electrophoresis apparatus is used for the separation of charged molecules in an applied electric field.



# Principle



## Applications of Gel Electrophoresis

DNA can be separated by electrophoresis to

- 1- Verify amplification by PCR or sequencing reactions
- 2- Check the quality and quantity of genomic DNA after DNA extraction
- 3- Used for investigating the DNA
- 4- Complex mixtures can be separated to very high resolution by this process .

## Staining of gel

One of the most important aspects of gel electrophoresis technique is staining. once sample molecules have separated in the gel matrix it is necessary to visualize their position. This is achieved by staining with an agent appropriate for the sample.

Stain	Used	Detection limited (ng)
Amino black	Protein	400
Coomassie blue	Protein	200
SYPRO red	Protein	0.5
Sliver chloride	Protein /DNA	1
Ethidium bromide	DNA /RNA	10

## Gel documentation

This device used to display DNA fragment after electrophoresis



## PCR (thermal cycler or DNA amplifier):

This device is used for the amplification of specific region of any DNA sample with polymerase chain reaction in test tube. It is also used for detection and constituent of genetically modified organisms as well as other genetic analyses .

### Thermal Cycler (Agilent)



**Principle of PCR (polymerase chain reaction):** a small fragment of the DNA section which needs to be identified and serve as template for producing many copies of the same DNA fragment.

## Applications.

- ❖ Genome mapping and gene function determination
- ❖ Biodiversity studies ( e.g. evolution studies )
- ❖ Diagnostics (prenatal testing of genetic diseases, early detection of cancer, viral infections, mutation detection ... )
- ❖ Detection of drug resistance genes
- ❖ Forensic ( DNA fingerprinting ), molecular cloning , recombinant DNA.

## pH Meter

Biological functions are very sensitive to changes in pH and hence, buffers are used to stabilize the pH. A pH meter is an instrument that measures the potential difference between a reference electrode and a glass electrode.



## pipette

Is a laboratory tool commonly used in chemistry, biology and medicine to transport a measured volume of liquid.

Pipette type	Volumes ( $\mu\text{L}$ )	Tip color
P 10	0.5-10	white
P20	2-20	yellow
P 200	20-200	yellow
P 1000	100-1000	blue

## Micro centrifuges

Is a piece of laboratory equipment, driven by a motor, which spins liquid samples at high speed, there are various types of centrifuges, depending on the size and the sample capacity, laboratory centrifuges work by the sedimentation principle, where the centripetal acceleration is used to separate substances of greater and lesser

density. devices for small tubes from 0.2 ml to 2.0 ml (micro tubes), with accelerate 30,000 g used to isolate nucleic acids such as DNA.

**Electronic balances:** - use to quickly and accurately measure the mass of a substance. This important in experiments that require precise amounts of each substance to achieve the desired results.



**Micro centrifuges**



**Electronic balances:**

### UV and Visible Spectroscopy

- ❖ UV–VIS (Visible) spectroscopy is used to detect the presence of chromophores like dienes, aromatics, polyenes, and conjugated ketones, etc
- ❖ It uses light in the visible and adjacent ranges.
- ❖ The absorption or reflectance in the visible range directly affects the perceived color of the chemicals involved.
- ❖ This technique is complementary to fluorescence spectroscopy.

