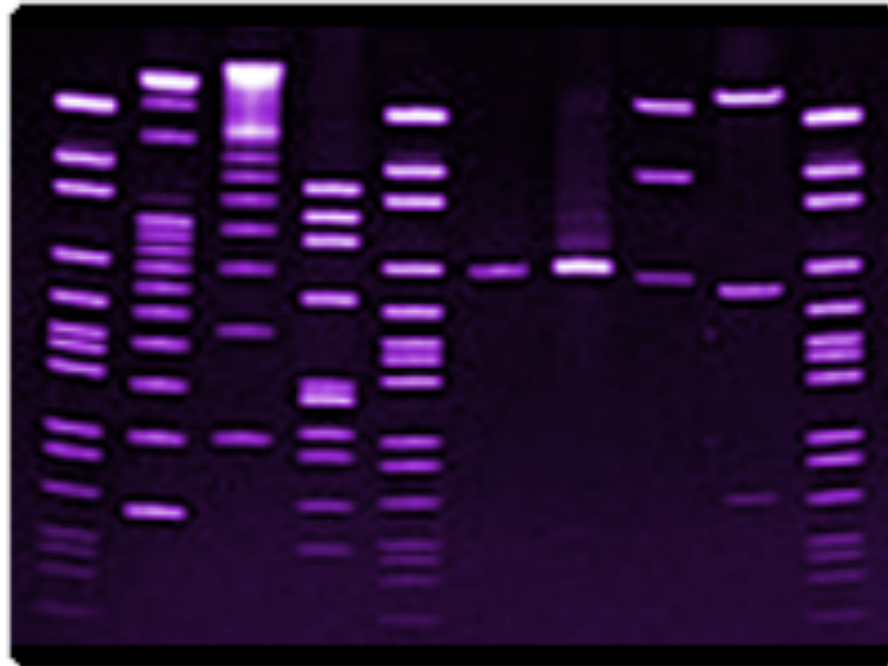


**MINI LESSON#2**

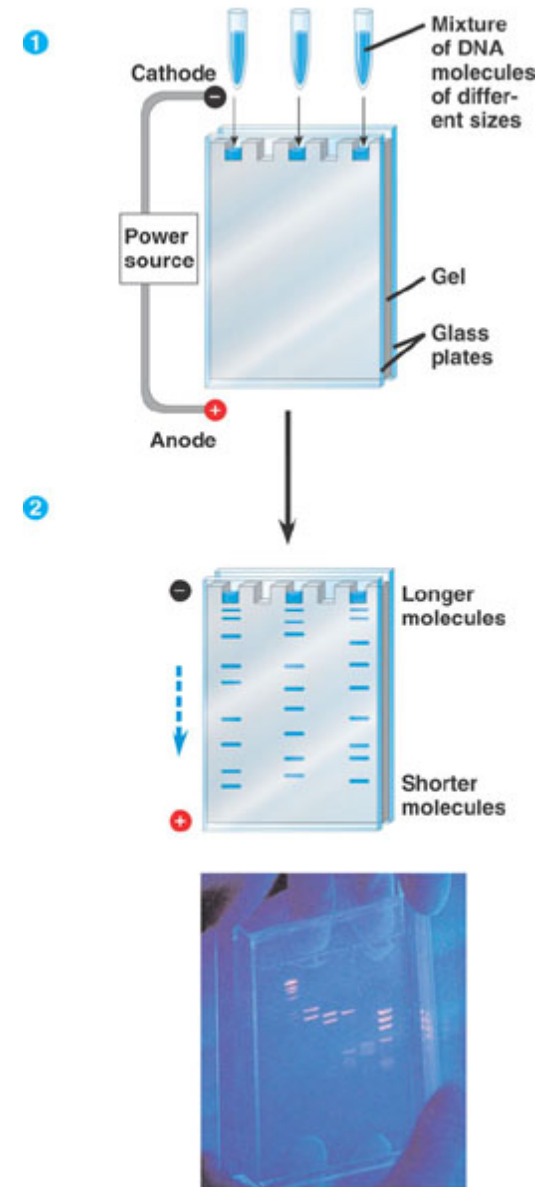
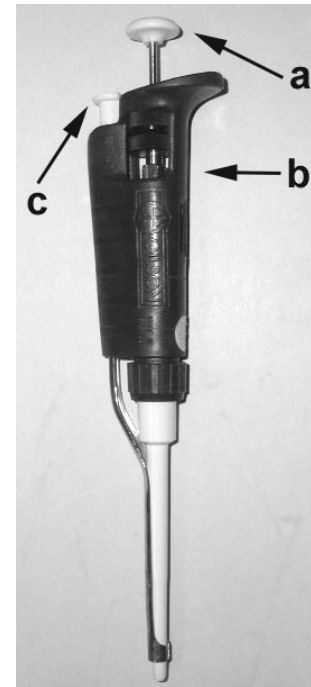
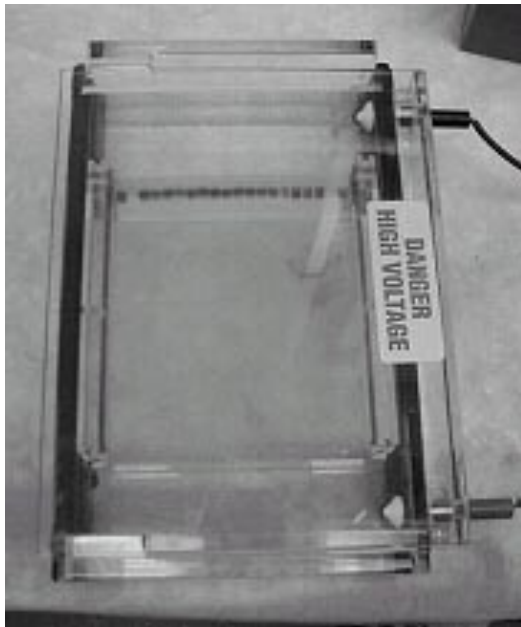
**GEL ELECTROPHORESIS**

# What is Gel Electrophoresis?

is a laboratory method used to separate mixtures of DNA according to their sizes.



# Gel Electrophoresis

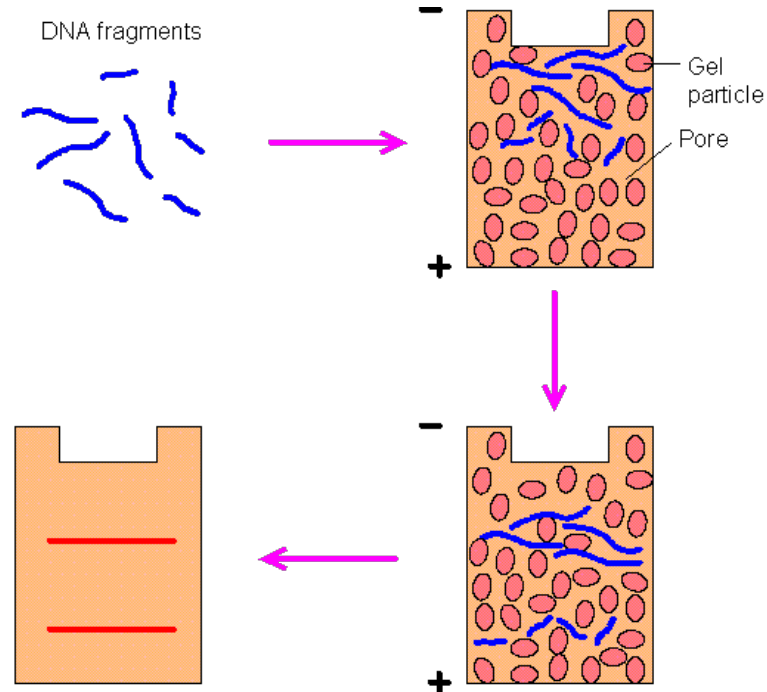


# How It Separates

Separates DNA based on

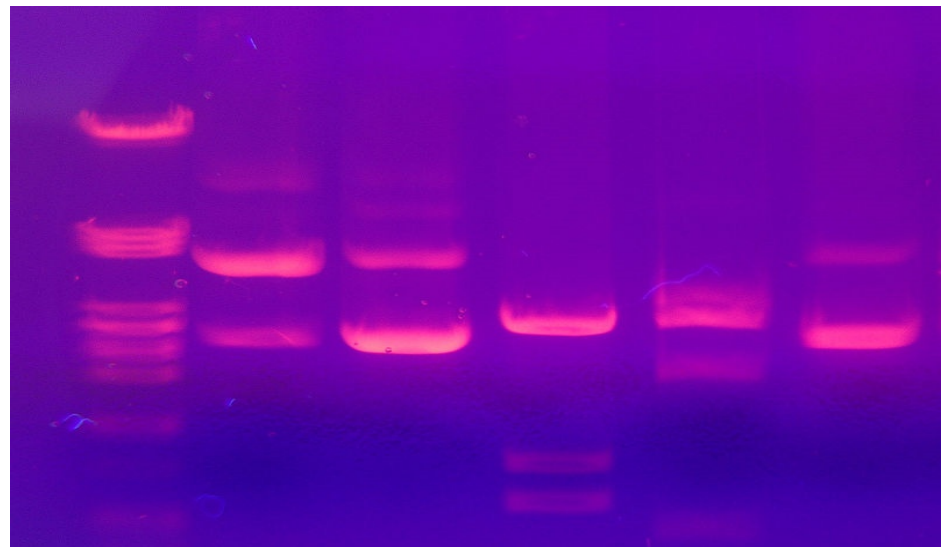
- Size
- Charge

DNA is a Negative charged molecule.



# Uses of Gel Electrophoresis

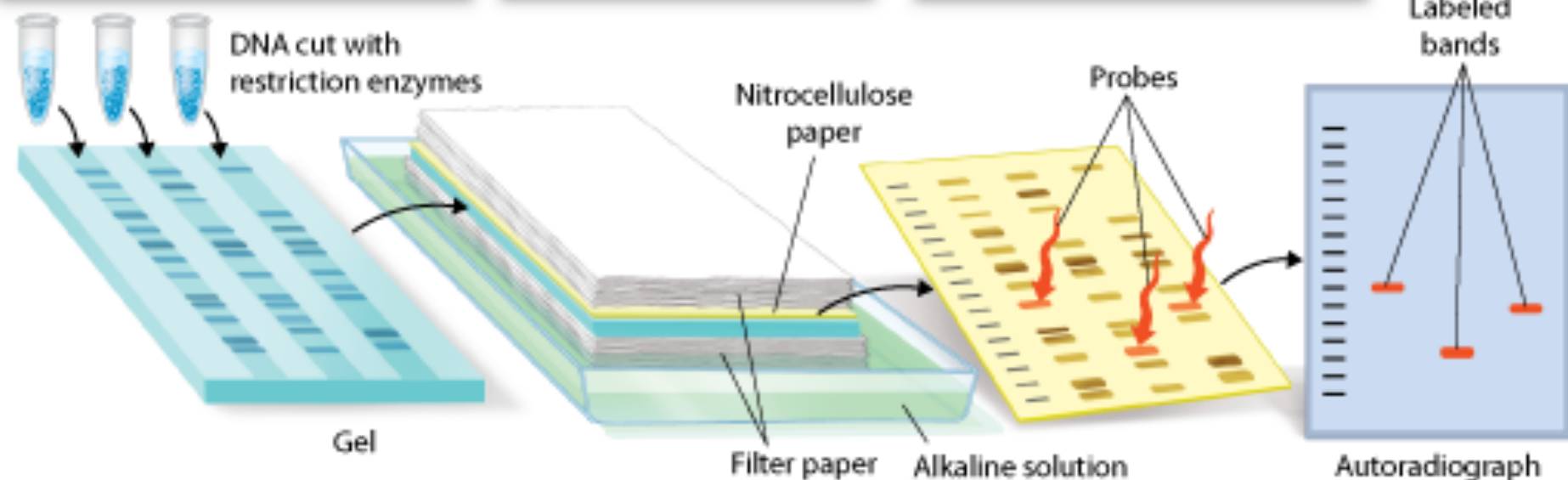
1. **Paternity Test** (to find out who a baby's father is)
2. **Crime scene investigations** (blood, saliva, body fluid)
3. **Evolution** – How closely species are related to each other



1 Gel electrophoresis separates DNA fragments produced by restriction enzymes.

2 Bands on the gel are immobilized by blotting onto nitrocellulose paper.

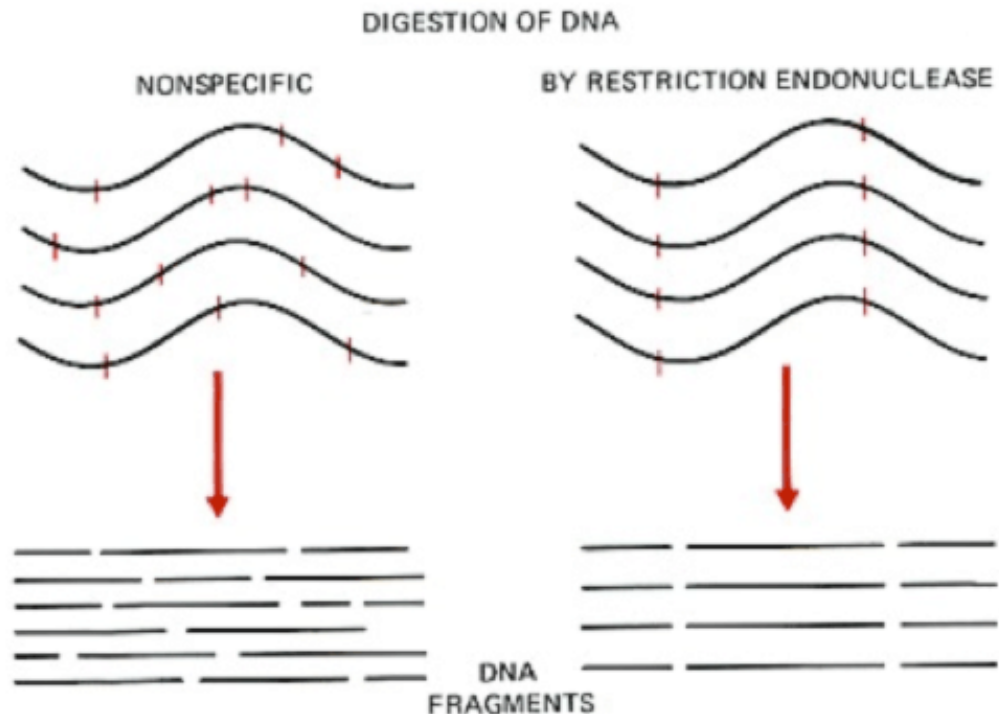
3 Radioactive probes bind to fragments with complementary base sequences.



# Step 1

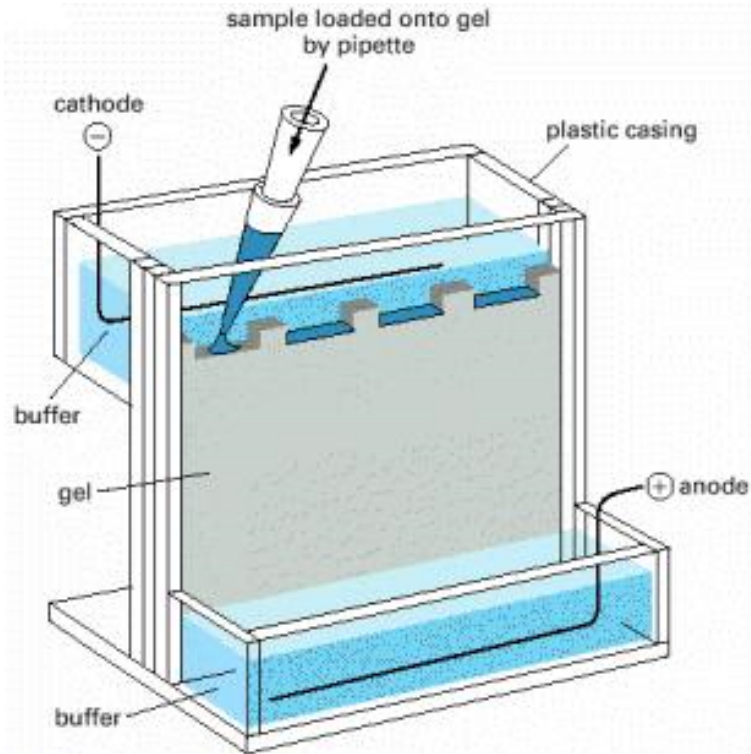
The DNA is cut into fragments using **restriction enzymes**.

Each restriction enzyme cuts DNA at a specific base sequence.



# Step 2

The cut up DNA is placed into wells on a gel



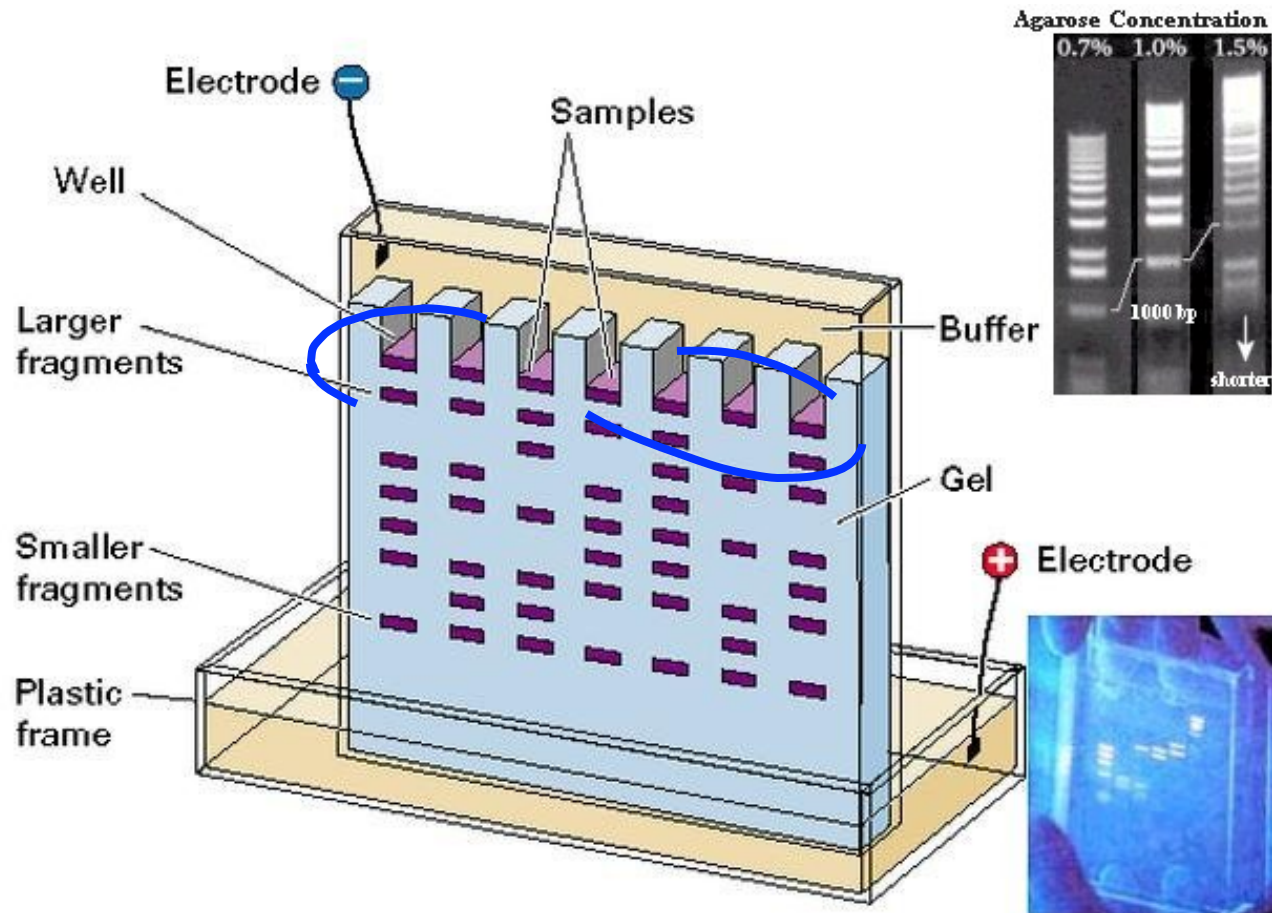
## **An Electrophoresis Apparatus.**

A solution of proteins is applied to indentations made in a thin gel that is held between two clear plates of plastic. An electric current is applied, and over time the proteins separate.



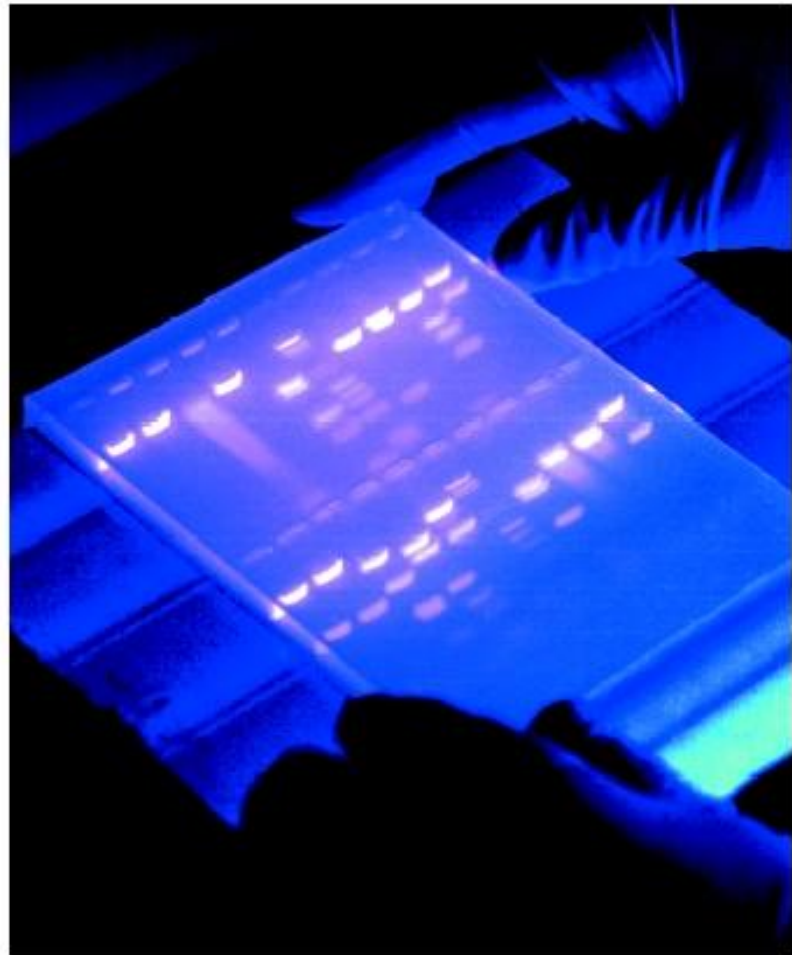
# Step 3

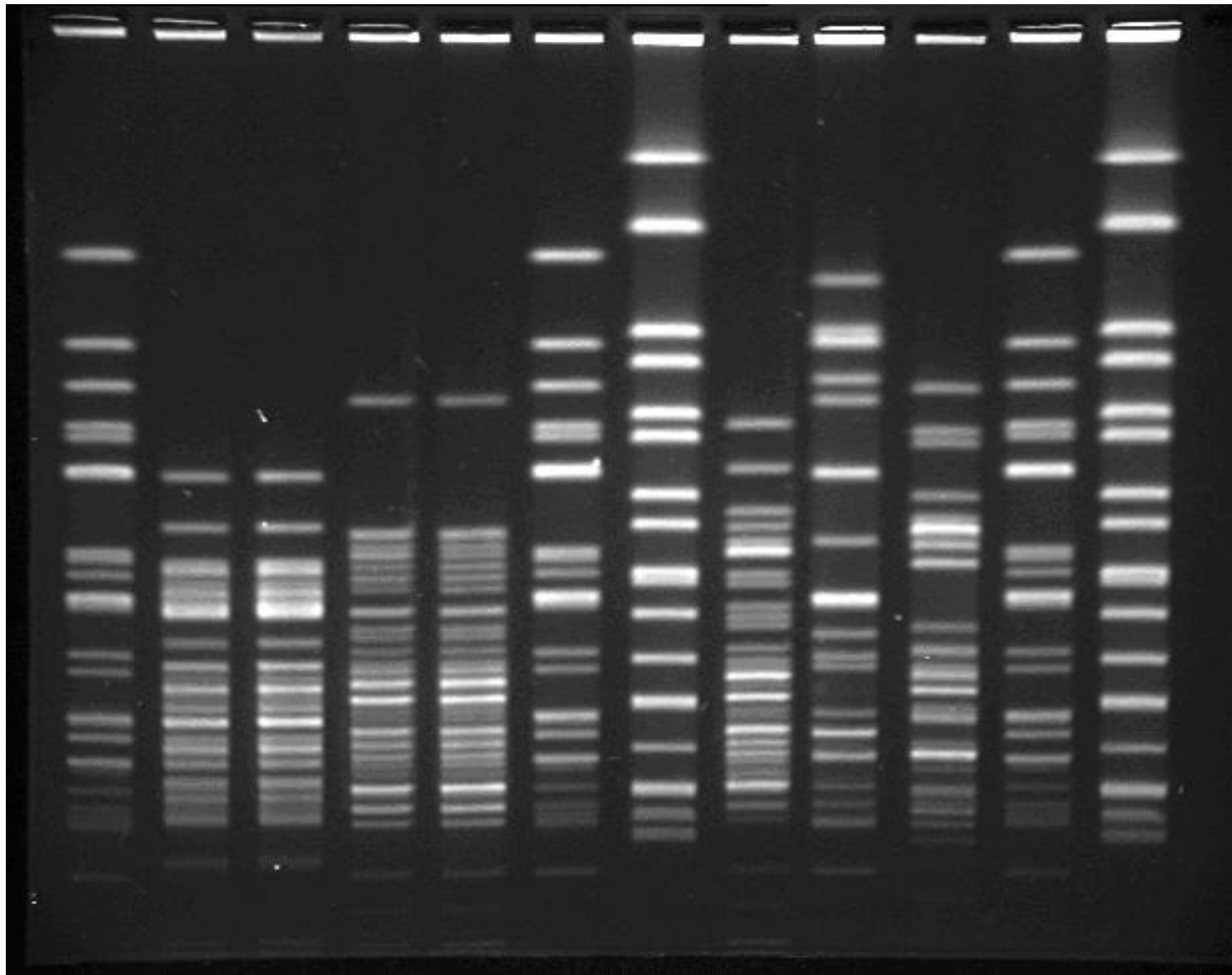
An electric current is passed through the gel  
And fragments separate by **SIZE and charge.**



# Step 4

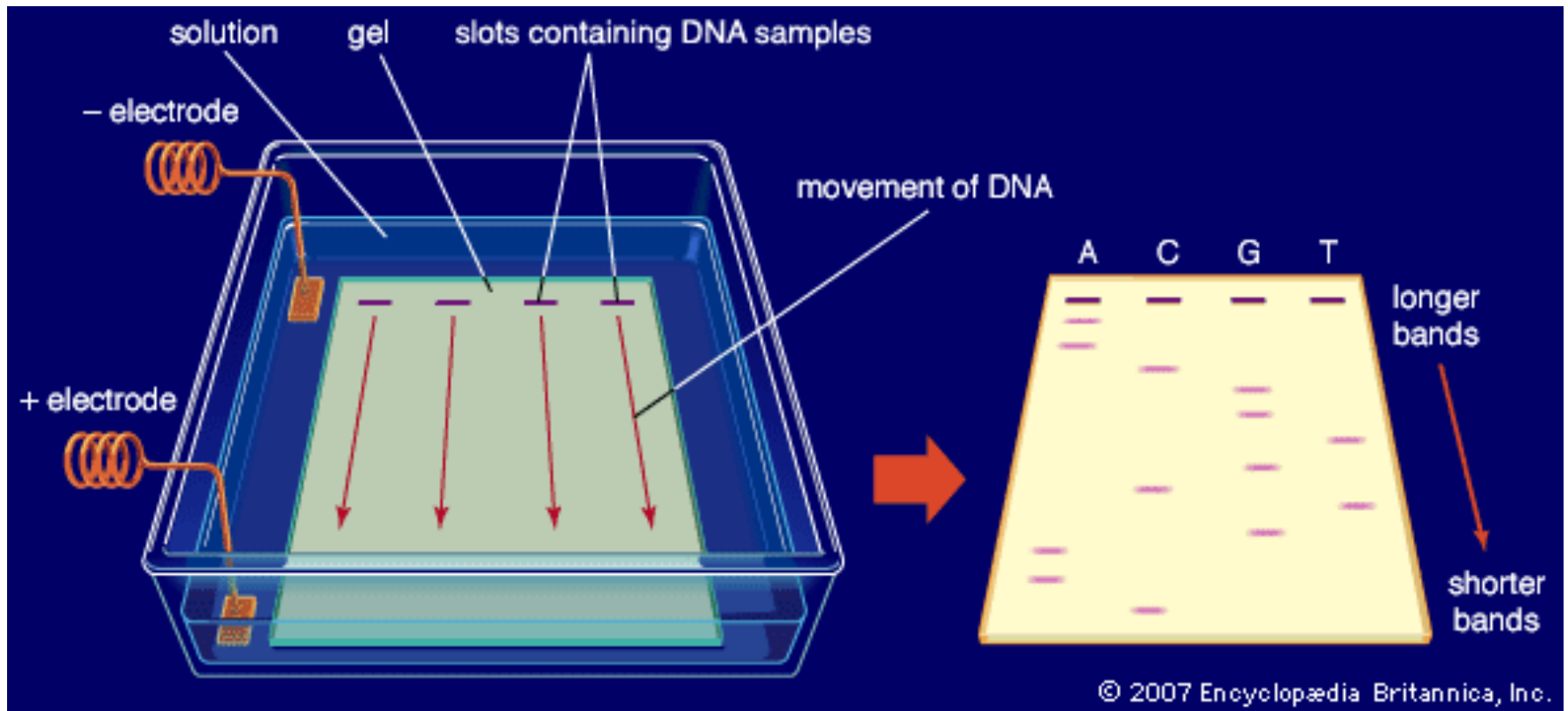
The gel is stained so that you can see where the  
Different bands of  
DNA ended





<http://bcs.whfreeman.com/thelifewire/content/chp16/1602001.html>

## Gel Electrophoresis Animation



# Uses of DNA Profiling

- DNA profiling is used to solve **crimes** and **medical problems**



# Crime

- Forensic science is the use of scientific knowledge in legal situations.
- The DNA profile of each individual is highly specific.
- The chances of two people having exactly the same DNA profile is 30,000 million to 1 (except for identical twins).



# Biological materials used for DNA profiling

- Blood
- Hair
- Saliva
- Semen
- Body tissue cells
- DNA samples have been obtained from vaginal cells transferred to the outside of a condom during sexual intercourse.



# DNA Profiling can solve crimes

- The pattern of the DNA profile is then compared with those of the victim and the suspect.
- If the profile matches the suspect it provides strong evidence that the suspect was present at the crime scene (**NB:it does not prove they committed the crime**).
- If the profile doesn't match the suspect then that suspect may be eliminated from the enquiry.





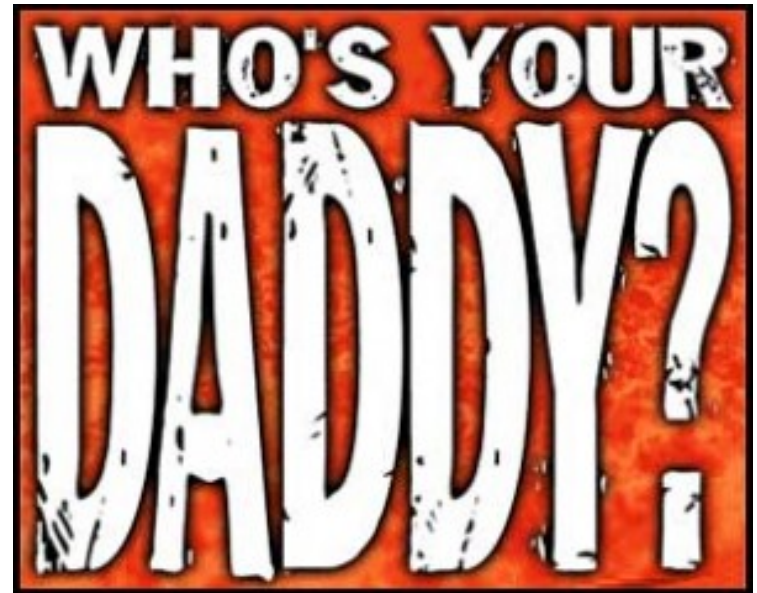
# Solving Medical Problems

DNA profiles can be used to determine whether a particular person is the parent of a child.

A child's paternity (father) and maternity(mother) can be determined.

This information can be used in

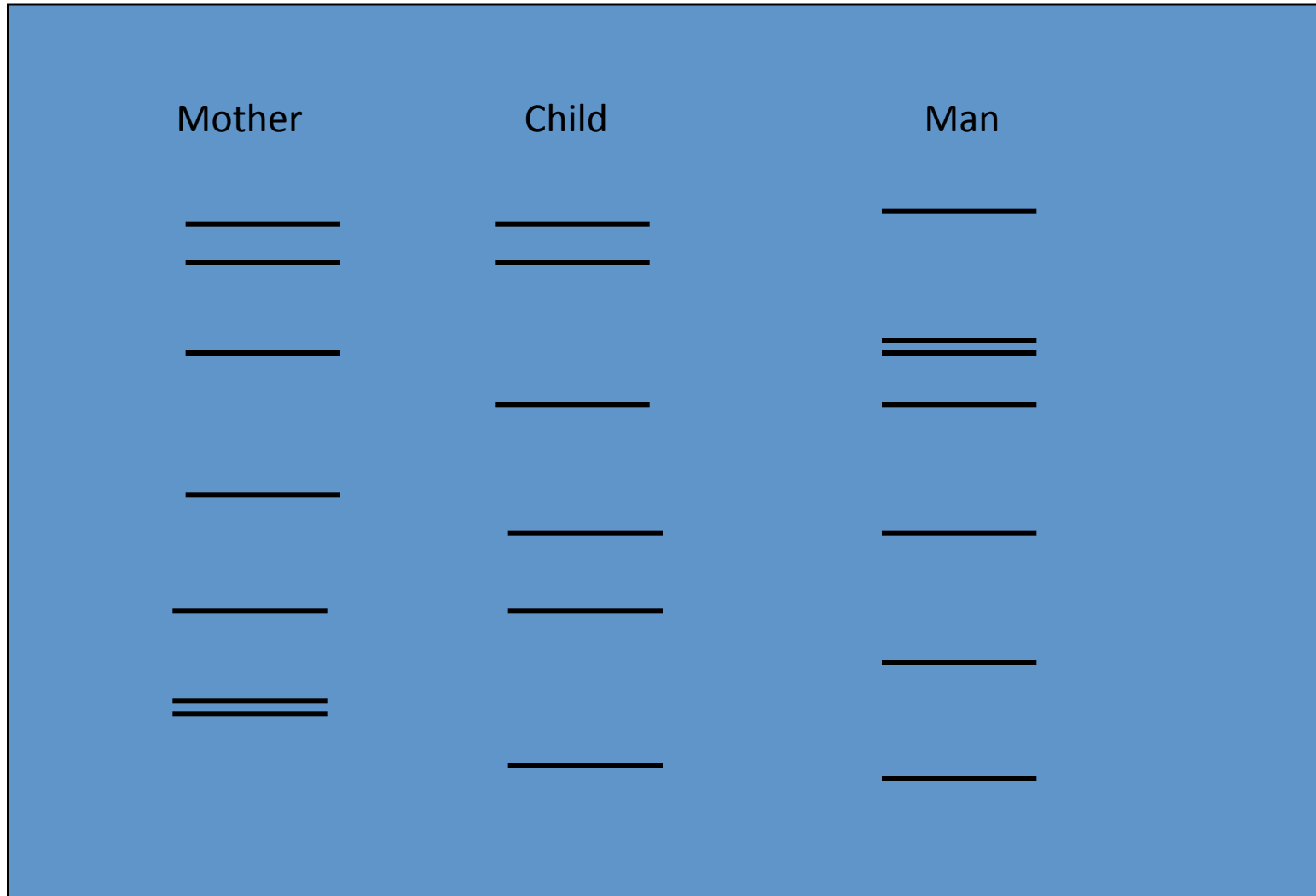
- Paternity suits
- Inheritance cases
- Immigration cases



# Example: A Paternity Test

- By comparing the DNA profile of a mother and her child it is possible to identify DNA fragments in the child which are absent from the mother and must therefore have been inherited from the biological father.

# Is this man the father of the child?



# Famous cases

- In 2002 Elizabeth Hurley used DNA profiling to prove that Steve Bing was the father of her child Damien



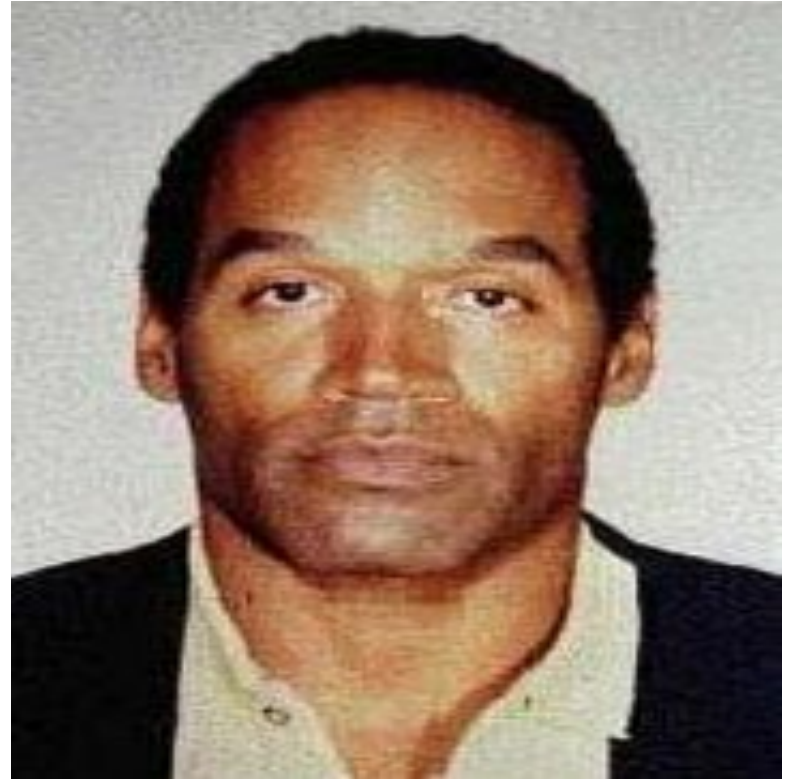
# Famous Cases

- Colin Pitchfork was the first criminal caught based on DNA fingerprinting evidence.
- He was arrested in 1986 for the rape and murder of two girls and was sentenced in 1988.



# Famous Cases

- O.J. Simpson was cleared of a double murder charge in 1994 which relied heavily on DNA evidence.
- This case highlighted lab difficulties.



# Who took my lollypop?

- <http://www.pbs.org/wgbh/nova/education/body/create-dna-fingerprint.html>

# Gel Electrophoresis Virtual Lab

- <http://learn.genetics.utah.edu/content/labs/gel/>