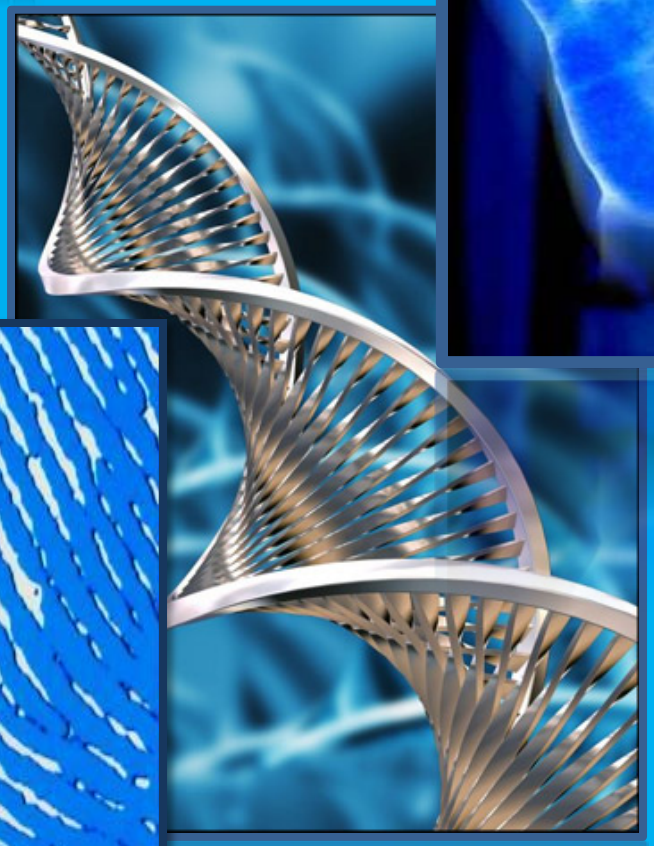
Biotechnology & DNA

Fingerprinting



Exercise 1

- DNA Fingerprinting Tools: **This identifies actual sequences of the nucleotides in the DNA, which allows identification of different people as individuals (or any other organism), can be applied to criminal cases, paternity suits, and the inheritance of certain genetic disorders.**
- PCR (Polymerase Chain Reaction) – How to Clone DNA: **Is the way to make lots of DNA from a small sample. To do this you need Tag DNA Polymerase (an enzyme that duplicates DNA) from the bacteria *Thermus aquaticus*, and a special machine.**

Answer questions 1-5 on page 374

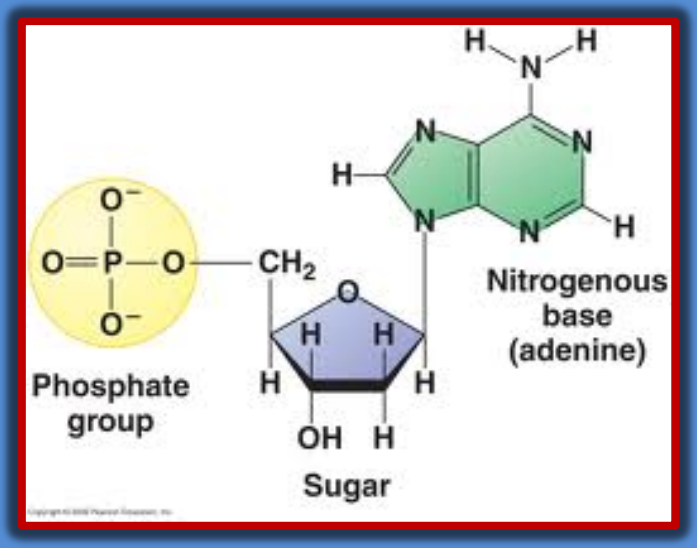
- Restriction Enzymes: **Are enzymes that cut the DNA into shorter sequences at specific places. All seven billion people on this planet are unique in the sites that are cut (recognition sites), unless you are identical twins or are cloned.**

The specific segments cut are called Restriction Fragment Length Polymorphisms **or** RFLP's**, and is what is separated during gel electrophoresis.**

Under procedure, fill-in the DNA fragments for subjects A, B, and C on page 376.

Gel Electrophoresis

- Gel electrophoresis is a method that separates macromolecules of either nucleic acid or protein.
- Electrophoresis describes the migration of charged particle under the influence of an electric field.
- A gel is a colloid in a solid form.



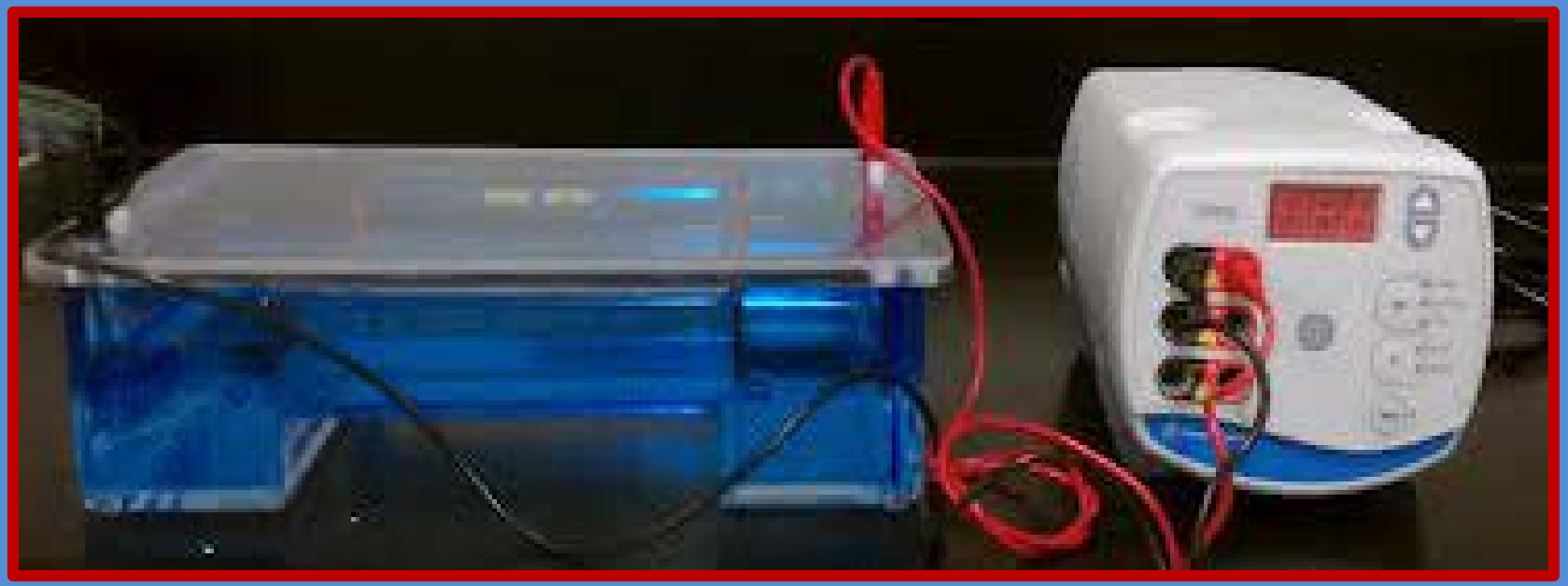
Because DNA is negatively charged overall (it's an acid and releases H^+'s into solution – note the negative oxygen's on the phosphate group in yellow), it will migrate from a negative pole to a positive pole, with the smaller fragments migrating farther and faster.

***Used in "DNA-fingerprinting," because everybody's DNA is different.**

Answer questions 1-8 on pages 377-378

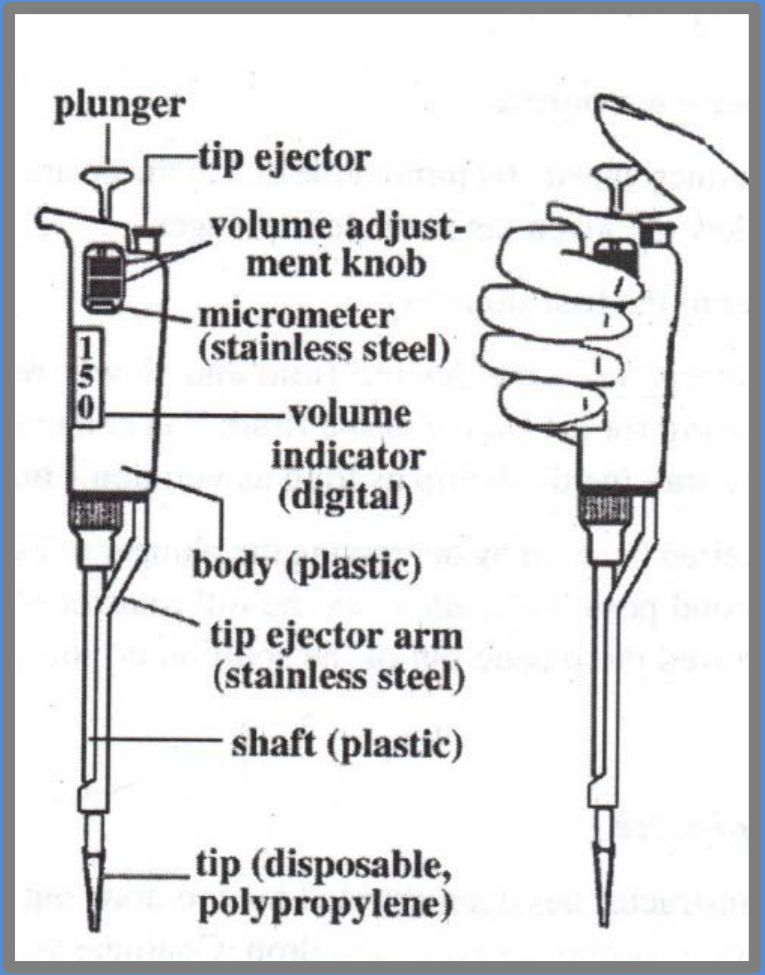
- **Radioactive and Fluorescent Probes:** **Answer questions 1-3 on page 378.**

Exercise 2: DNA Fingerprinting Simulation



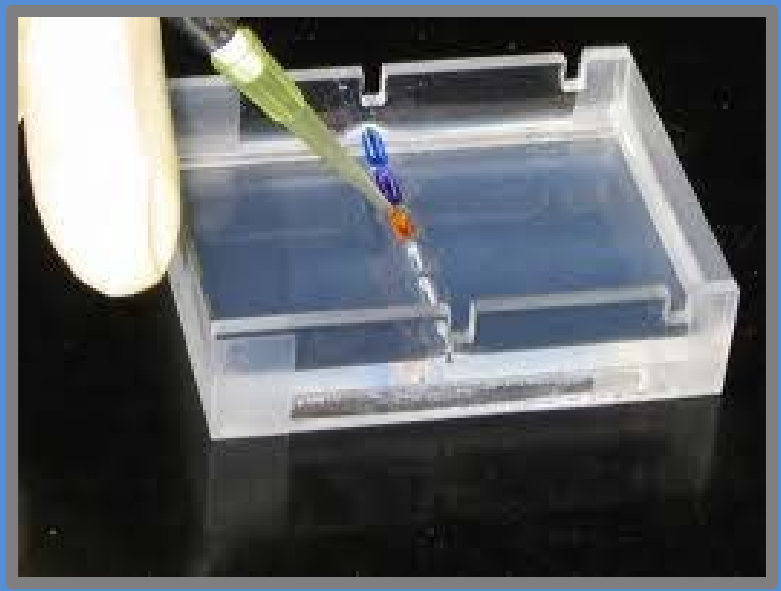
Gel Electrophoresis Apparatus

Black is positive (+) pole and **Red** is negative (-) pole.



Note – Plunger as two stops:

1. **To obtain desired amount: insert into solution, go to first stop, and release.**
2. **When you push-out into wells, go through both stops**



Which suspect matched the crime scene evidence?

Exercise 3: DNA Isolation from Human Cheek Cells

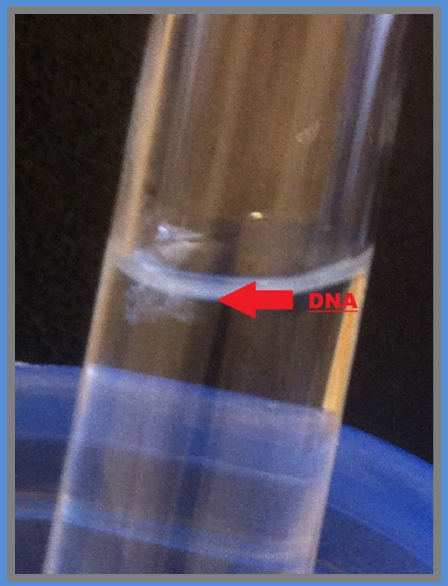
-Collect cheek cells

-Break open cheek cells with sodium dodecyl sulfate (SDS) dissolving the membrane.

-Add some salt: making DNA less soluble by neutralizing some of the charges.

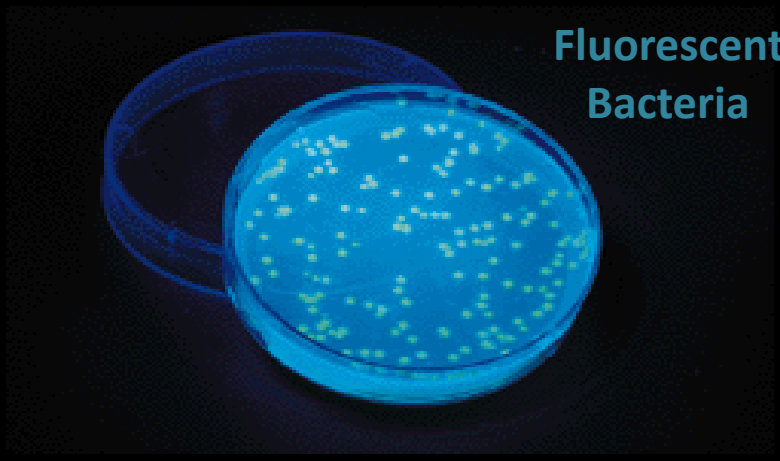
-Poor alcohol over the top of your sample: look for the strings.

-Store DNA in a Microfuge Tube.



Answer questions 1 and 2 on page 386.

Exercise 4: Recombinant DNA



Answer questions 1-4 on page 387.

How the brain works is poorly understood and, as a consequence, scientists have decided that they are not getting much traction trying to figure out the human brain, which consists of literally billion and billion of neurons, and have decided to work on a medium size brain, like that of the Fruit Fly (*Drosophila melanogaster*), whose brain is but a mere 100,000 neurons big. To do this they have inserted a fluorescent gene in the neurons, which lights up when in use.