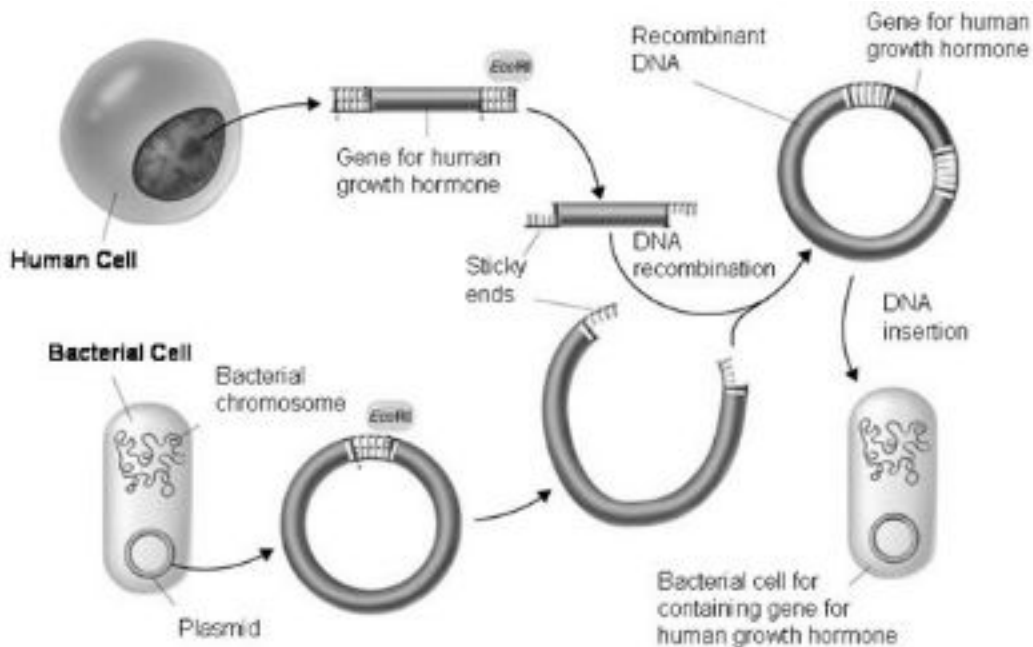


## DNA Technology Notes

**Genetic Engineering** - The process of \_\_\_\_\_ for practical purposes

**Recombinant DNA** - DNA made from \_\_\_\_\_ organisms

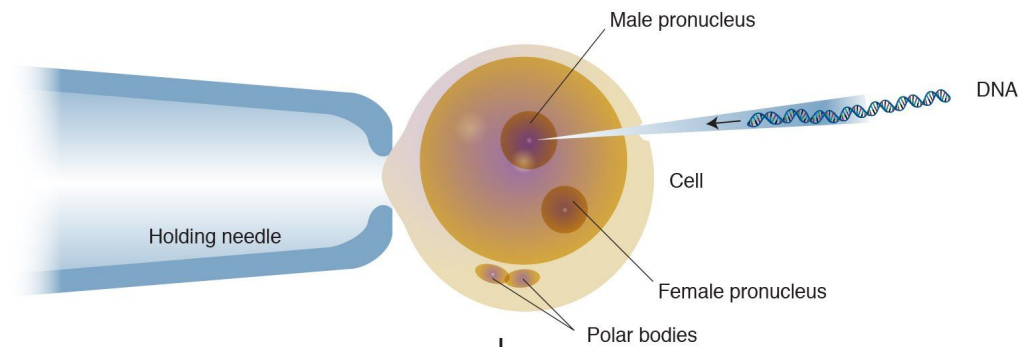
Example – First Genetically Altered Organism - Bacteria produced frog rRNA



**Transgenic organism** - The organism produced through genetic engineering

Trans = Change

Genic = Genes



Transgenic Organism

Examples:

1. Golden rice: modified rice that produces beta-carotene, the precursor to vitamin A.
2. Goats that produce important proteins in their milk: goats modified to produce FDA-approved human antithrombin (ATryn), which is **used to treat a rare blood clotting disorder in humans**.
3. Vaccine producing bananas: genetically engineered bananas that contain a vaccine. Bananas provide an easy means for **delivering a vaccine (especially to children) without the need for a medical professional** that is trained in giving shots. Edible vaccines are still in development.

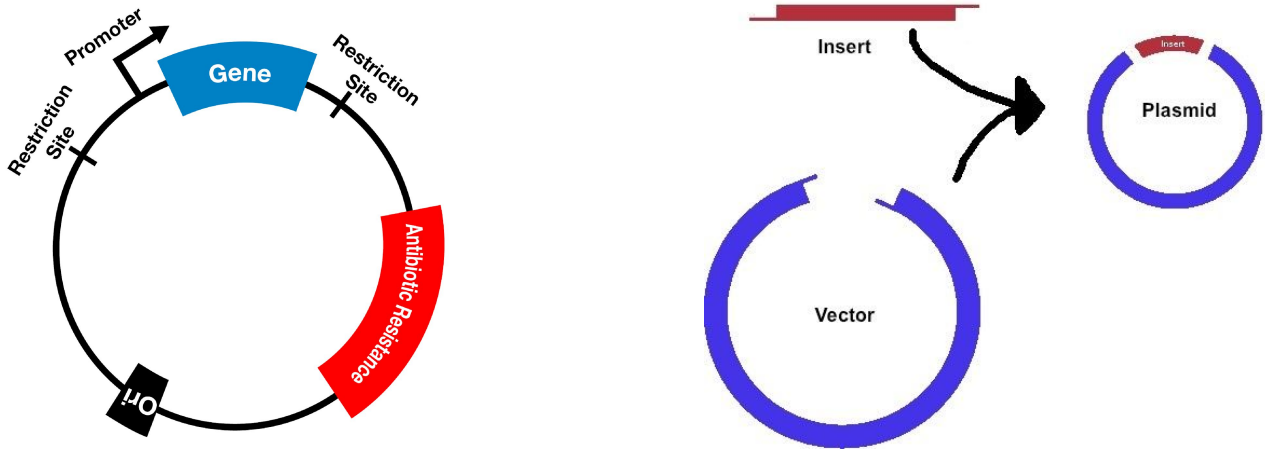
## Process of Genetic Engineering

**Step 1 – Cutting DNA** - Genes of interest cut by \_\_\_\_\_

Restriction Enzymes: Bacterial enzymes that \_\_\_\_\_  
\_\_\_\_\_ nucleotides

Vector: An agent used to \_\_\_\_\_ to another cell

Plasmids: Circular DNA that replicate independently (DNA in prokaryotes since they do not have a nucleus)



**Step 2 – Making Recombinant DNA** - Genes of Interest + Vector = Recombinant DNA

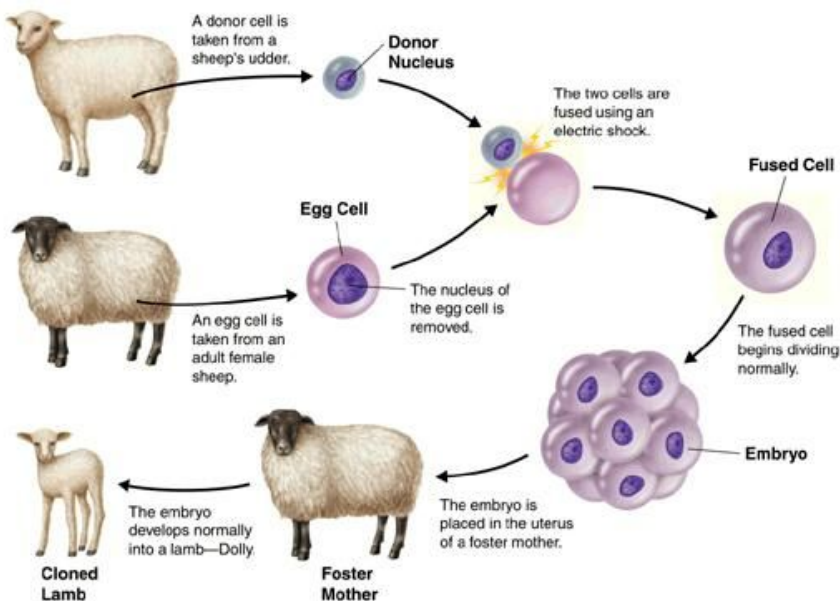
DNA Ligase: Bonds (glues) the \_\_\_\_\_ together

Host cells take up the \_\_\_\_\_ to pass on the genetically modified DNA

## Step 3 – Cloning

As host cell reproduces – exact copies of the genes of interest are replicated

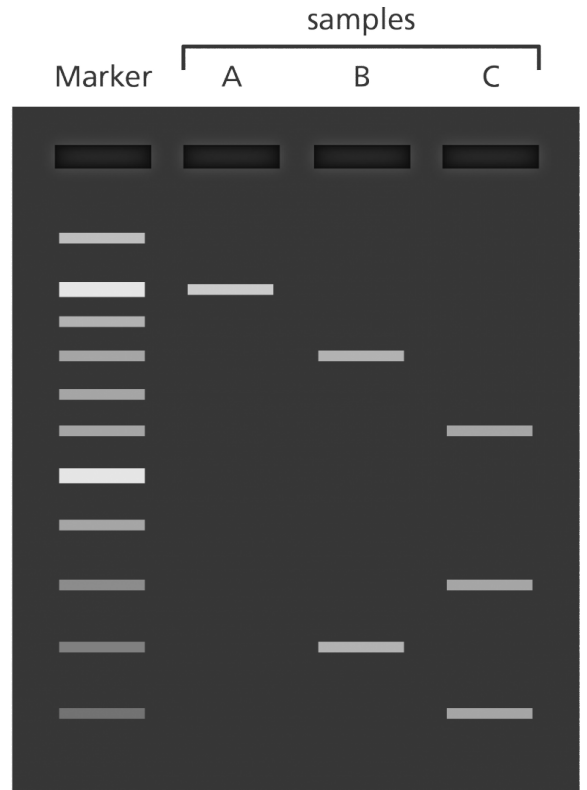
**Gene of interest and plasmid are both replicated**



**Gel Electrophoresis**

1. Electric field that separates molecules by size
  - a. **Small bands move the fastest**
  - b. **Large bands move the slowest**
2. DNA is separated into single strands by gel
3. DNA is **negatively charged** – migrates to positive pole
  - a. **Top =**
  - b. **Bottom =**

1,200 bp  
1,000 bp  
900 bp  
800 bp  
700 bp  
600 bp  
500 bp  
400 bp  
300 bp  
200 bp  
100 bp



**DNA Fingerprinting (Gel Electrophoresis)**

A pattern of dark bands on X-ray film

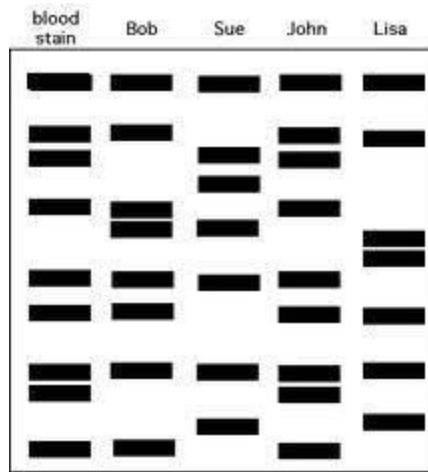
**Purpose:**

Make a sample of DNA to \_\_\_\_\_ to another sample

Uses:

- 1.
- 2.

**Practice Problem**



**Human Genome Project** - A project that links over 20 genetic labs in six different countries

The purpose: **Identify all 3.2 billion base pairs of the human genome**

Human DNA Facts:

6 feet long

30,000 to 40,000 genes

Expected Number: 120,000 (Which is actual the number of mRNA molecules)

Why do we need to know our genome?

## Genetically Engineered Drugs (GEDs)

Bacteria is the source for many GEDs

These drugs are \_\_\_\_\_ for all body types and that's why they work

### Genetically Engineered Medicines

Medicine	Uses
Growth Factors	
Human Growth Hormones	
Insulin	

## Technology in Farming

### Growth Hormone in Cows

- Increases milk production
- Introduced through \_\_\_\_\_ in their diet
- Now naturally in pigs

### Transgenic Organisms

- Human \_\_\_\_\_ introduced to \_\_\_\_\_ to produce \_\_\_\_\_ in milk

