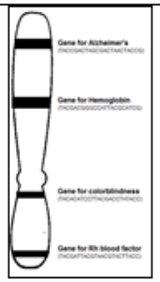
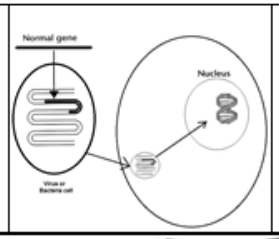
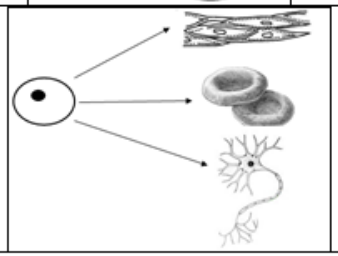
Name:_____Period:_____Date:_____

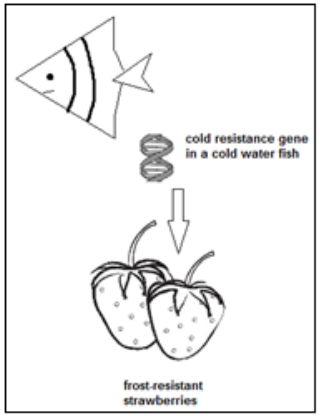
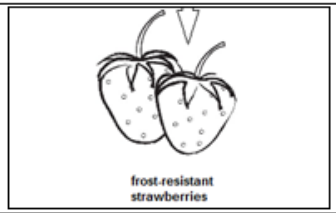
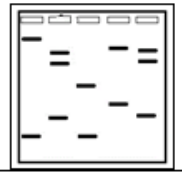
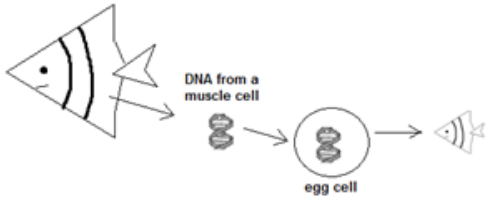
Unit 8 - Biotechnology

Name _____ Biology - Block _____

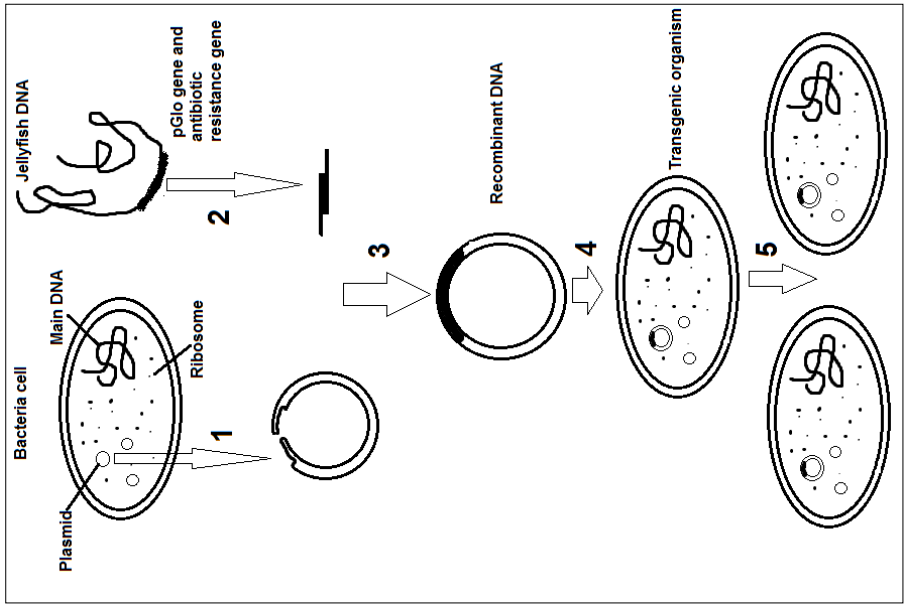
Notes: Introduction to Biotechnology

Terms	Definition	Picture
	Sequenced all the DNA in a human cell (determined order of A's, T's, C's and G's) Goal is to identify and treat diseases and disorders.	
	process by which humans breed other animals and plants for particular traits	 Belgian Blue cattle have been bred for increased meat production
	Inserting a working gene into individuals that have a non-working copy of the gene to try and treat or cure a disease	
	Cells that are not differentiated and can become anything.	

Name _____ Biology - Block _____

	Taking DNA from one organism and putting it into another organism so they exhibit the trait.	
	An organism with DNA from another organism.	
	Shows a pattern of DNA that can be used to identify an individual.	
	Making an identical copy of an organism	

Genetic Transformation



Word	Definition
Plasmid	
Restriction enzyme	

Examples of Transgenic Organisms:

1. **Agriculture**
   a. _____– plants with a gene from a cold-water fish so it to survive in the colder temperatures.

   b. _____ – Instead of spraying pesticides, plants contain a gene to make their own to avoid being eaten by bugs.

   c. _____– Plants with a gene to help survive with less water.

2. **Industry & Medicine**
   a. Bacteria contain genes to digest _____.

   b. _____ and _____– both of these can be made by taking the gene from a human and inserting it into bacteria. Now the bacteria can make these proteins for us.

Steps to Genetic Transformation (see the picture)

Step # ____: The glowing gene is spliced (placed) into plasmid matching up sticky ends.

Step # ____: Bacteria cell with new gene divides and these cells are able to glow when the gene is turned on.

Step # ____: Plasmid is removed from bacteria cell and is cut with a restriction enzyme.

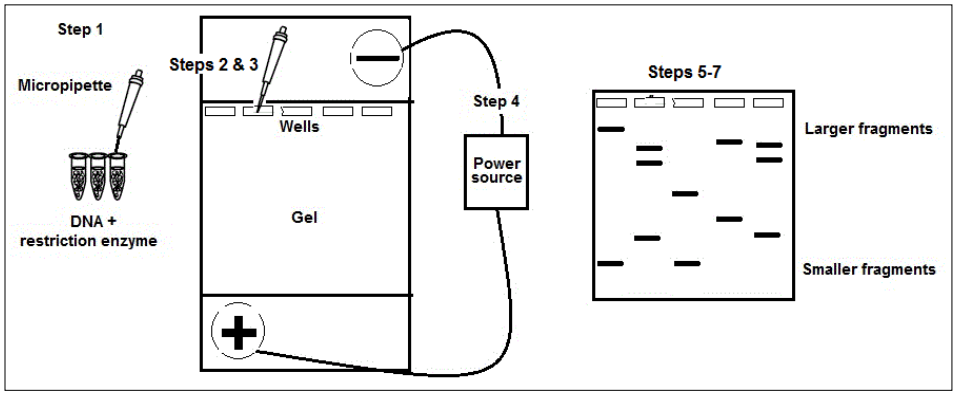
Step # ____: The glowing gene is cut out of the jellyfish DNA using the same restriction enzyme.

Step # ____: The plasmid is put back into the bacteria cell.

- Why might it be important to use the same enzyme in step 1 and step 2?

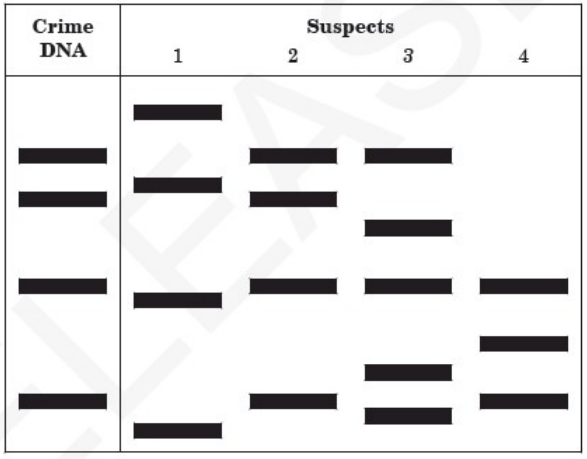
- This process worked on a bacteria cell, but would it work on a larger organism like a human? Why or why not?

DNA Fingerprinting



Reasons for DNA Fingerprinting:

- Determine who committed a _____.
- _____ - Used to free individuals who have been wrongly accused of a crime.
- Determine parents of a child - _____ (father) and _____ (mother).
- Identify how closely _____ organisms are. Organisms that are more closely related have _____ DNA bands in common.



1. Label the positive and negative ends of the gel.
2. Which suspect has the smallest DNA fragment? _____
3. Which suspect committed the crime? _____

Steps of DNA fingerprinting	Why is each step performed? Think back to the gel electrophoresis lab and paper activity you did.
1. DNA from blood or other tissues is placed into a tube. Restriction enzymes are also added to the tube. • Why do we add restriction enzymes to the DNA? • Do we add the same or different restriction enzymes to each setup? Why?	
2. A gel electrophoresis chamber has been set up. There is a gel that has wells in it at the negative end of the chamber. • What are the wells and what do we put in them?	
3. Small amounts of DNA are placed inside each of the wells using a micropipette. Each time a new sample is loaded, a new tip is placed on the end of the micropipette. • Why is it important to change tips on the micropipette?	
4. Once all the wells are loaded, the chamber is then hooked up to an electrical source. • Why do we connect the chamber to a power source?	
5. The DNA begins to move towards the positive side of the chamber. • Why does the DNA move to the positive side of the gel?	
6. The DNA separates based on size. • How does it separate by size? Explain	
7. The gel is taken out of the chamber and stained. • Why do we stain the gels if we are using DNA?	

3 Types of Stem Cells:

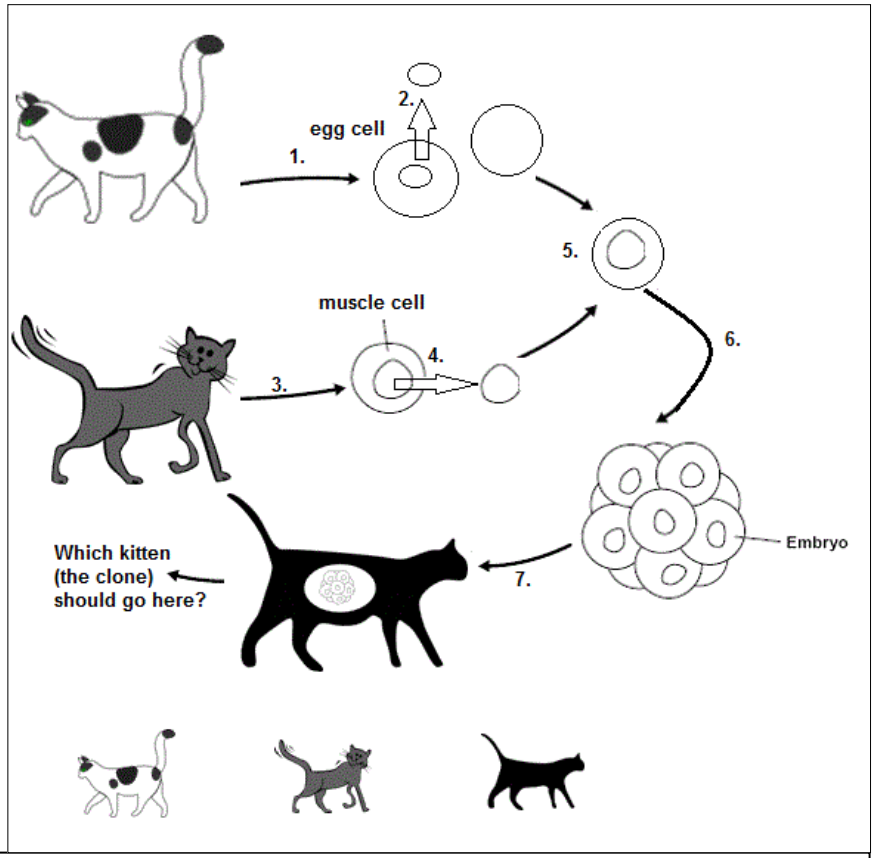
- _____ – Cells in early embryos, can become any type of cell
- _____ - treat diseases of the blood or to restore the blood system after treatment for specific cancers.
- _____ - these are tissue-specific, and only form that type of tissue

How are scientists trying to use stem cells?

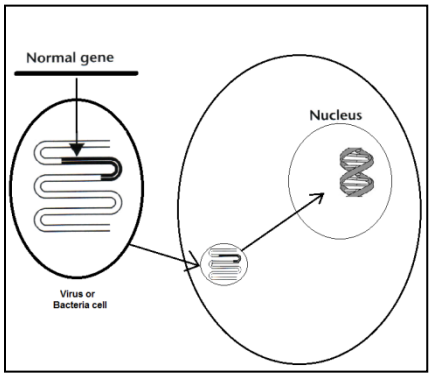
- Scientists are trying to develop stem cell _____. Since stem cells can become _____ types of cells, if a person needs a certain cell type due to injury or disease, then stem cells can be implanted to produce the cells the patient needs.

So what's the controversy….

- Using embryo's – are we destroying life?
- Therapies are still being studied. Some implants have not been successful. Instead of the stem cells developing into the cell the doctors wanted, the stem cells form something else.
  - Cancer cells
  - Bone in the brain



Gene therapy uses something called a vector to deliver a _____ gene taken from a person without the disease and delivering the gene into the cells of the person with the disease.



_____ – A device used to deliver the gene ("normal" DNA) to the cells of a patient with a non-working copy of the gene. Ex: _____ and _____ because they naturally infect cells.

2 diseases treated this way are:

- Severe combined immunodeficiency (_____ or "bubble boy" disease)
- _____

Steps to Cloning:

_____ Let the egg cell divide to form an embryo.

_____ Place the diploid nucleus into the egg cell. This has the full set of chromosomes.

_____ The cloned animal is born.

_____ Take an egg cell from a female.

_____ Remove the nucleus from the diploid cell.

_____ Place the embryo into a surrogate female.

_____ Remove the haploid nucleus. The nucleus must be removed or there will be too many chromosomes.

_____ Take a diploid cell from an animal.