

## EOC Review Part 6

### Patterns of Inheritance (Biotechnology and Evolution)

#### Biotechnology

To the right is an electrophoresis gel showing evidence from a rape case. Could the defendant be the rapist? Explain your answer.

No. His DNA (#2) does not match the DNA from the perpetrator of the crime (#5).

If the longest fragments are at the top of the gel, where is the positive charge?

Bottom

Because DNA has a \_\_\_\_\_ (+ or - ?) charge, which way will it go in a gel?

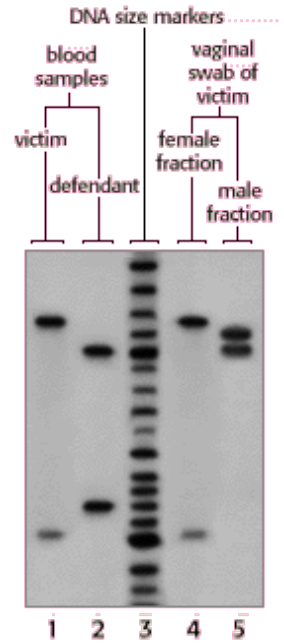
Negative. Towards the positive.

Which size fragments move the fastest? Explain why this leads to bands in the gel.

Smaller fragments move fastest through the porous gel; the bands are the different size pieces of gel getting stuck along the way at different points.

What other ways can DNA fingerprinting be useful?

Forensics, understanding evolution, paternity.

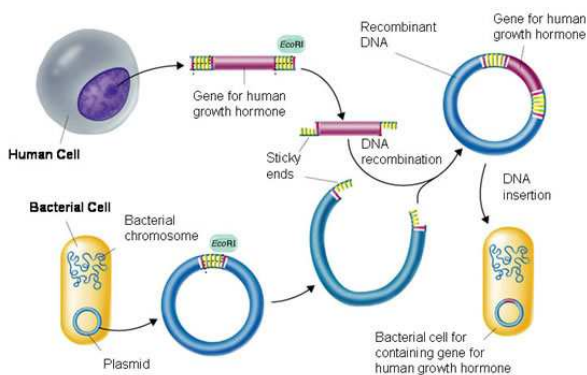


What are the goals of the Human Genome Project, and what can it be used for?

Goal was to sequence the entire human genome; store info in data bases; discover genes that code for traits. Useful to understand/treat genetic diseases; gene therapies.

What is a restriction enzyme?

An enzyme that cuts DNA at a specific sequence of bases.



Look at the picture to the left, which describes the process of altering bacteria to produce human insulin. What is the value of this recombinant DNA technology?

Produces abundant "pure" insulin (previously used pig insulin, which is expensive)

What is a transgenic organism?

Transgenic organism is one that has been genetically altered, such as putting a human insulin gene into a bacteria so it will produce insulin.

#### Evolution

Discuss the steps in Darwin's theory of Natural Selection:

(1) Individuals differ, and some of these differences can be inherited. Where do the differences come from?

Mutations and sexual reproduction

(2) Organisms produce more offspring than can survive. Why don't all survive?

Competition for resources -- only the most fit survive and reproduce

(3) The most fit organisms pass on their heritable traits to their offspring. What does "fit" mean?

The organisms with adaptations that are better suited to their environment will survive, reproduce, and pass on their adaptive genes to the next generation.

In the table below, describe the role of each of the following in developing the current theory of evolution:

	Importance to evolutionary theory
Understanding of geology (changes in the earth)	Understanding earth changes explains why organisms might change to fit the new environments
Malthus' ideas about population growth	Organisms reproduce exponentially but the world is not overcrowded by organisms -- because they compete to survive
Anatomical comparisons	Similar anatomy suggests similar ancestry
Patterns in fossil evidence	Following the patterns and aging the fossils suggests evolutionary trees
Lamarck's ideas about inheritance of acquired characteristics	Acquired characteristics are not inherited because the genes have not been affected
Biochemical comparisons (DNA and proteins)	Similar DNA and/or proteins suggests similar ancestry
The role of variations	Variations provide the fuel for natural selection. Those variations that are advantageous are selected for; survive and are passed on
The role of sexual reproduction	Sexual reproduction is a source of variation
The role of geographic isolation	Geographic isolation can lead to speciation -- when organisms are evolving in two different environments
The importance of the environment	Environments select for adaptations that best suit the organisms for survival in the environment

Genetic variations lead to different adaptations. What are adaptations?

Inherited traits that increase an organism's chance of survival.

What are homologous structures? Name two body parts in two different animals that are homologous. Similar structures arising from common ancestor, now evolved to do different things. Example, whale flipper and human arm.

What is a vestigial structure? Name a few in humans.

A structure without a present day function. Erector pili, coccyx (tailbone), appendix

What is geographic isolation?

When two populations separated by some physical obstacle (mountains, river, etc) become two different species.

What is reproductive isolation?

When two populations become two different species due to their inability to interbreed.

Populations of organisms have many genetic variations. Where do these come from?

Random mutations.

What is speciation?

The formation of two or more species from one ancestral species.

Describe how a population of insects can become resistant to a pesticide. Insects are exposed to pesticide; most die, but a few have a variation that makes them resistant; these insects survive and reproduce; the next generation consists only of those insects that can survive the pesticide (because all others are killed)