

Topic 7 - Gel Electrophoresis and Gene Therapy

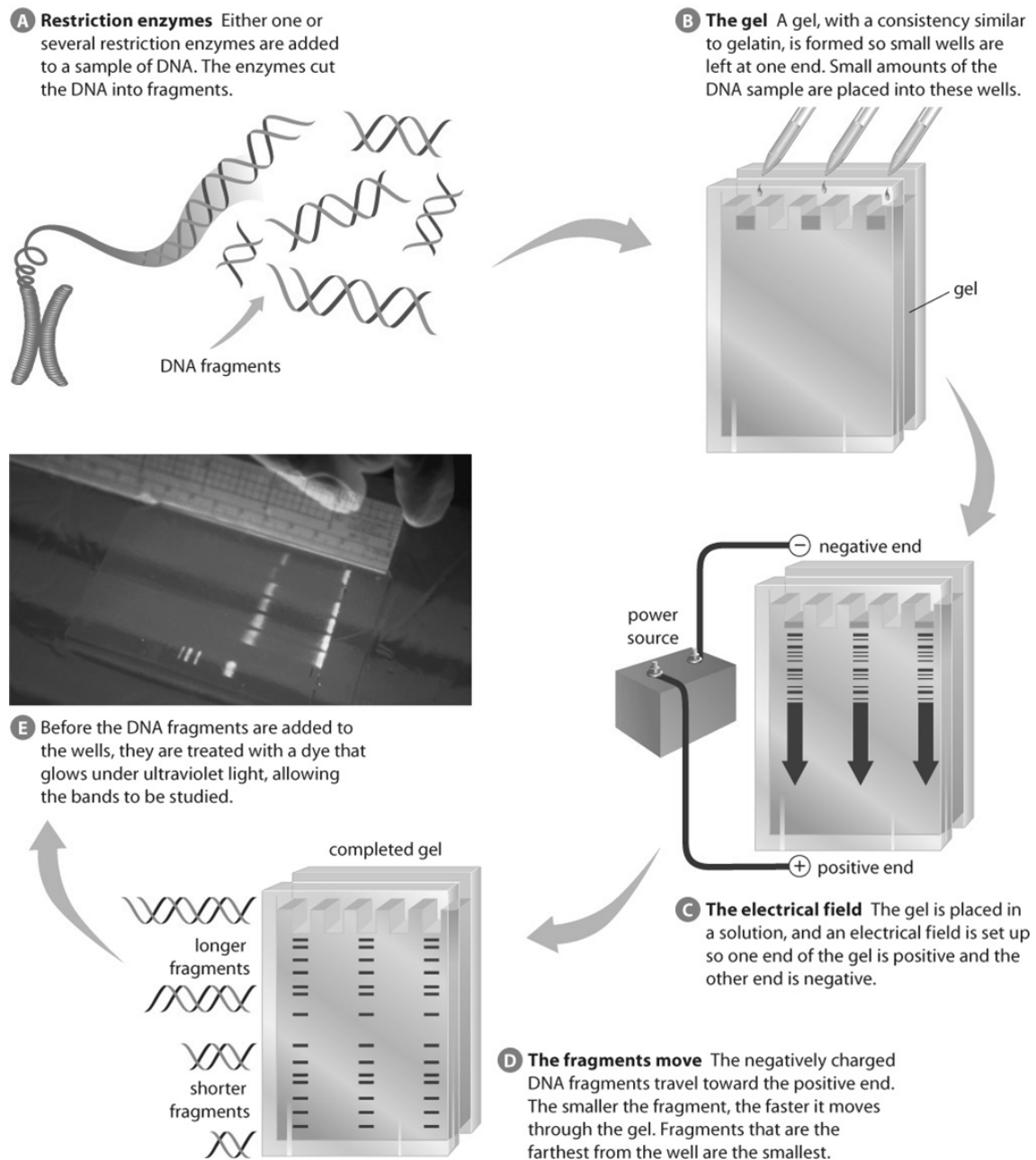
Using Gel Electrophoresis in Forensics

- Gel Electrophoresis is a technique that allows the separation of DNA of different lengths

- Perform the animation at the link below to get a better understanding of how Gel Electrophoresis works

http://www.teachersdomain.org/asset/tdc02_int_creatednafp2/

- Do the exercise on the next page



DNA Fingerprinting

<http://highered.mcgraw-hill.com/sites/dl/free/0072835125/126997/animation40.html>

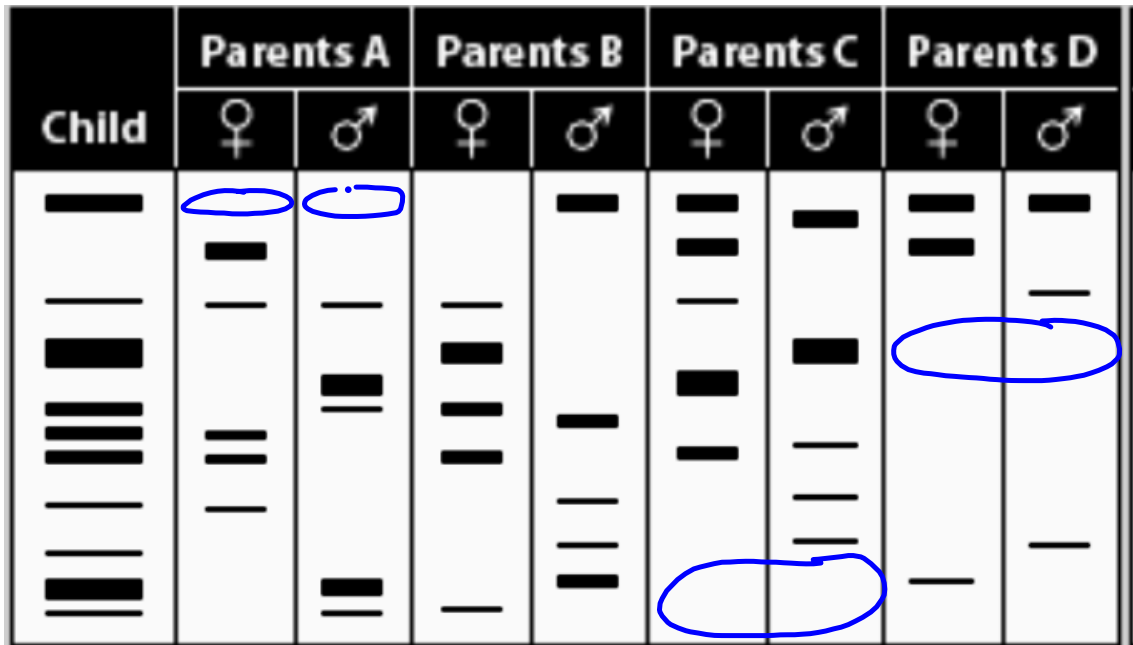


<https://www.youtube.com/watch?v=ZxWXCT9wVoi>



DNA fingerprinting Exercise

The following diagram shows the results of a gel electrophoresis analysis of one child and four different sets of parents. Use these DNA fingerprints to answer the Analysis questions and identify the child's biological parents.



Analysis

- Which parental DNA matches the child's DNA? How do you know?
- Try to determine the percentage of the father's DNA that matches the child's DNA. Can you do the same for the mother's DNA? Explain why or why not.
- Describe other situations in which DNA fingerprinting might be useful.

When you are done, flip the page over and check your answers.

Answers to Analysis Questions

1. The parents of the child are Parents B. They are the only parents that have all of the same DNA segments as the child.
2. Five of the child's DNA segments (50 percent) match the mother, and the other five (50 percent) match the father.
3. Other situations where DNA fingerprinting may be useful are in paternity cases, identifying the remains of murder or accident victims, tracing the movement of wildlife, or in plant and animal breeding programs.

Gene Therapy

- Gene therapy is when a normal gene is inserted into an individual's cell to take the place of a defective gene

- Go through the animation at the link below to get a better understanding of how gene therapy works

<http://www.sumanasinc.com/scienceinfocus/genetherapy/genetherapy fla.html>

- Read the article at the link below

<http://www.pbs.org/saf/1202/features/genetherapy.htm>

Mitochondrial DNA

- DNA is also found in the mitochondria of a cell

- An egg cell can pass on mitochondrial DNA to offspring

- A sperm cell does not pass on mitochondrial DNA (mtDNA)

- mtDNA can be used to trace inheritance through the maternal side of an individual

- Read pg 690

- Go through the tutorial below

<http://www.dnab.org/30/animation.html>

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Review Sheet

Use the following information to answer the next 4 questions

A deletion mutation in mitochondrial DNA causes Kearns–Sayre syndrome (KSS). A large sample of different types of somatic cells was removed from a male with KSS, tested, and found to contain the deletion. The only type of mitochondrial DNA that was found in somatic cells from the man’s mother was mitochondrial DNA that did not have the KSS deletion.

A reasonable hypothesis to explain these results is that the mutation in the mitochondrial DNA that caused KSS in the man first occurred in the

- A. mother’s oocytes
- B. man’s somatic cells
- C. man’s spermatocytes
- D. mother’s somatic cells

Both males and females can be affected by mitochondrial mutations, but only females can transmit genetic mutations to their offspring. For this inheritance pattern, which of the following rows gives the contributions to the zygote made by the sperm and by the egg?

Row	Sperm Contribution	Egg Contribution
A.	nuclear contents only	both nuclear and cytoplasmic contents
B.	both nuclear and cytoplasmic contents	nuclear contents only
C.	neither nuclear nor cytoplasmic contents	both nuclear and cytoplasmic contents
D.	both nuclear and cytoplasmic contents	neither nuclear nor cytoplasmic contents

Mitochondrial DNA and nuclear DNA both code for the formation of proteins. Which of the following statements about protein synthesis is **true**?

- A. An mRNA anticodon binds with an amino acid codon, which results in the placement of a specific tRNA molecule in the polypeptide chain.
- B. An mRNA anticodon binds with a tRNA codon, which results in the placement of a specific polypeptide molecule in the amino acid chain.
- C. A tRNA anticodon binds with an mRNA codon, which results in the placement of a specific amino acid molecule in the polypeptide chain.
- D. A tRNA anticodon binds with a polypeptide codon, which results in the placement of a specific mRNA molecule in the amino acid chain.

Use the following additional information to answer the next question.

In an individual with KSS, part of the coding strand of mitochondrial DNA that has been deleted has the following base sequence.

ACC TCC CTC ACC AAA

The third amino acid coded for by this segment of mitochondrial DNA is

- A. lysine
- B. threonine
- C. glutamate
- D. phenylalanine

Biologists have been able to map the large territory inhabited by the bear population by locating their feces. In order to use DNA found in feces to track bears, it is necessary to identify individual bears by the DNA found in their feces. One technique that is used to do this is DNA fingerprinting.

In DNA fingerprinting, gel electrophoresis is used to

- A. cut DNA into fragments
- B. separate fragments of DNA
- C. match a gene with its function
- D. pair homologous chromosomes