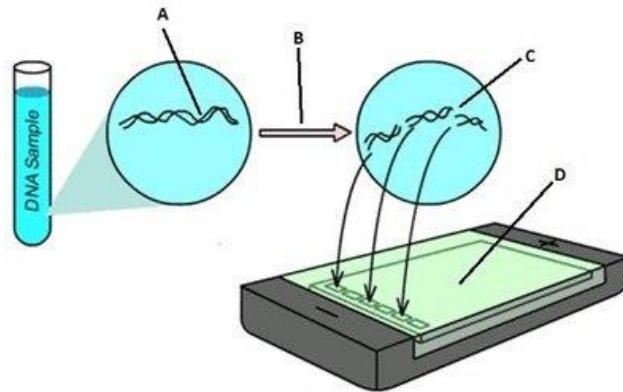


DNA Typing, Recombinant DNA and Ames Test Review

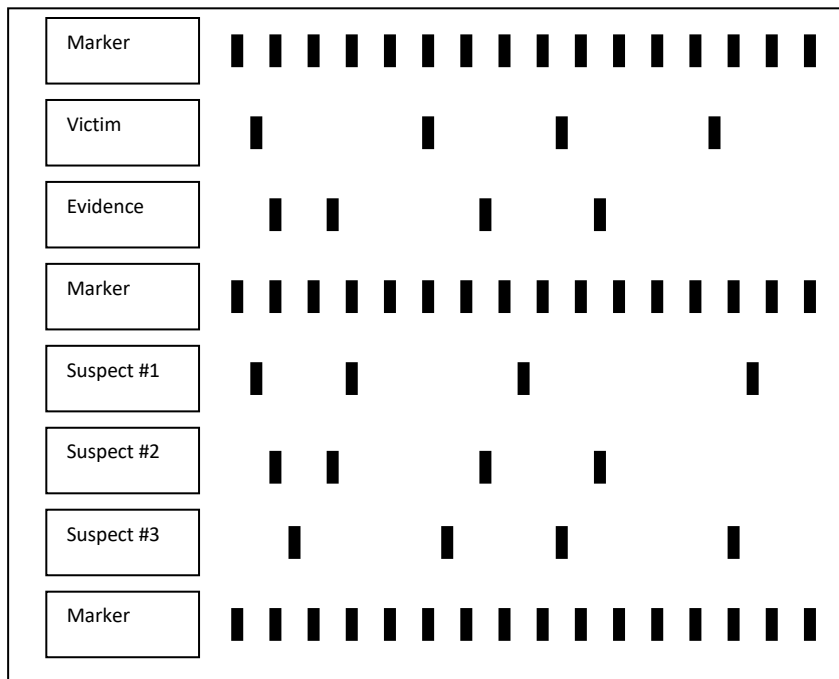
1. What is recombinant DNA. Describe how it is formed, mentioning the role of the restriction enzyme and ligase.
2. List 5 uses of recombinant DNA for human therapy.
3. Describe what is pictured below.



4. Define DNA Typing.
5. Explain how DNA Typing works (include enzyme involved).
6. What fact about our DNA allows it be used effectively for DNA Typing.
7. Provide three examples where DNA Typing is commonly used.
8. Examine the DNA typing (gel electrophoreses) results below. What can you really say for sure?



9. Examine the DNA typing (gel electrophoreses) results below. What can you really say for sure?

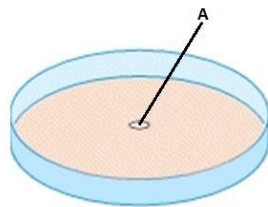


10. Why is the victim's DNA included on the chart?

11. Assume that each of the 4 genes (bands) analysed occur in the general population at a frequency of $1/100$, $1/60$, $1/75$, and $1/125$. What statistical analysis or statement can you make regarding the degree of certainty of "exclusion"?

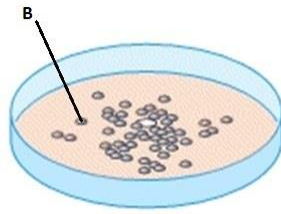
12. What is an Ames test used to determine?

13. What is A?



14. If the results plate for the Ames test looked like the test plate above what would you conclude?

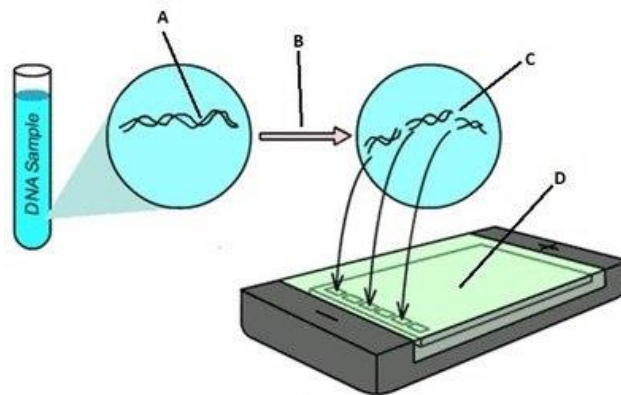
15. What is B?



16. If the results plate for the Ames test looked like the test plate above what would you conclude?

Key

1. What is recombinant DNA. Describe how it is formed, mentioning the role of the restriction enzyme and ligase.
AKA GMO (genetically modified organisms) Recombinant DNA that is made artificially by splicing 1 or more segments of DNA from 2 organisms. The restriction enzyme (**DNA restrictase**) cuts the DNA and the **DNA ligase** stitches the two new segments together.
2. List 5 uses of recombinant DNA for human therapy.
insulin for diabetics , clotting factors for hemophiliacs, human growth hormone, erythropoietin for treating anemia, three types of interferons, several interleukins, granulocyte-macrophage colony-stimulating factor for stimulating the bone marrow after a bone marrow transplant, tissue plasminogen activator for dissolving blood clots, adenosine deaminase for treating some forms of severe combined immunodeficiency, angiostatin and endostatin for anti-cancer drugs, parathyroid hormone
3. Describe what is pictured below. Below is gel electrophoresis which is used to separate DNA for DNA Typing.



4. Define DNA Typing. DNA typing is the analysis of ones DNA.
5. Explain how DNA Typing works (include enzyme involved). DNA in question is collected and isolated. Special restriction enzymes are used to cut the DNA into fragments of varying lengths. These DNA fragments are placed into a Gel Electrophoresis plate which separates the DNA into visually noticeable bands. The separation of bands is achieved by passing an electrical current through the gel which "drags" the negatively charged fragments across the gel. The shortest fragments move the furthest and so on. Later photos of the plates are analyzed for band similarities.
6. What fact about our DNA allows it be used effectively for DNA Typing. No two people have the exact same DNA.
7. Provide three examples where DNA Typing is commonly used.
Evidence in criminal cases such as rapes and murders
Paternity cases

To determine whether a hopeful immigrant is really a close relative of already established residents.

8. Examine the DNA typing (gel electrophoreses) results below. What can you really say for sure?

The alleged father on the left can most likely be excluded as he does not share either of the 2 genes with the child. The alleged father on the right can not be excluded at this point as he does share one of the 2 genes with the child. Although we can not state as a fact that he is the father, more positive test results would suggest that it is unlikely that he is not the father. (i.e. 1 in 25,000 chance that he is not the father)

9. Examine the DNA typing (gel electrophoreses) results below. What can you really say for sure?

We can exclude suspects #1 and #3. Suspect #2 is not excluded and a statistical analysis would be required to strengthen the case against him.

10. Why is the victim's DNA included on the chart?

To be sure the evidence did not come from them, i.e. The victims blood.

11. Assume that each of the 4 genes (bands) analysed occur in the general population at a frequency of 1/100, 1/60, 1/75, and 1/125. What statistical analysis or statement can you make regarding the degree of certainty of "exclusion"?

$1/100 \times 1/60 \times 1/75 \times 1/125 = 1/56,250,000$

Only 1 in 56,250,000 people have that DNA sequence. (There is a 1 in 56 million chance that the DNA used as evidence did not come from the suspect and actually came from a different person)

12. What is an Ames test used to determine?

Whether a chemical is a mutagen (carcinogen) or not.

13. What is A? The test chemical (chemical being tested).

14. If the results plate for the Ames test looked like the test plate above what would you conclude? The chemical PASSES the Ames test and is NOT a carcinogen.

15. What is B? A bacterial colony.

16. If the results plate for the Ames test looked like the test plate above what would you conclude?

The chemical FAILS the Ames test and IS a carcinogen.