CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

Subject Code- 20SZT148

DNA FINGERPRINTING

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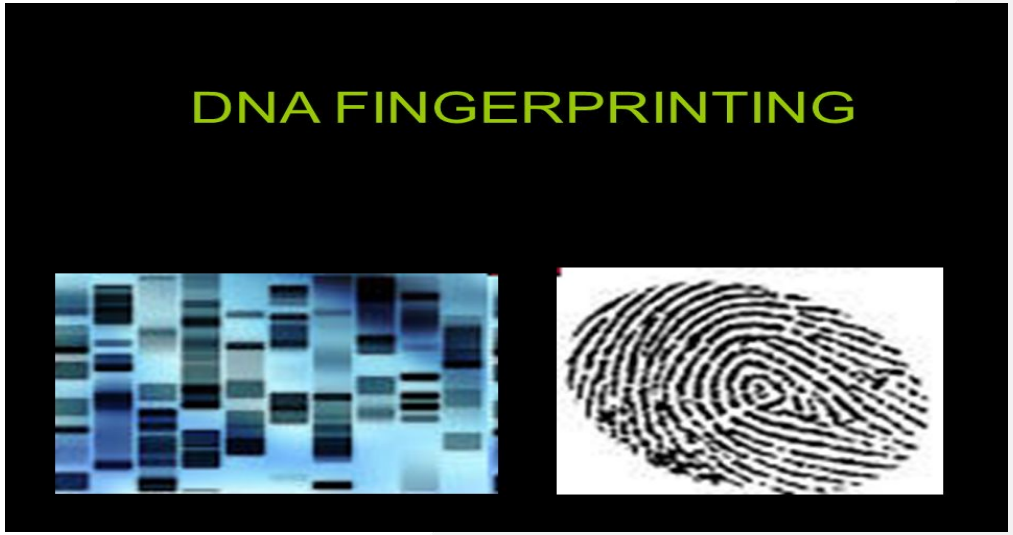
DNA FINGERPRINTING

Course Outcome

CO Number	Title	Level
CO1	It gives an idea about the about the basic cell biology.	**Understanding**
CO2	It deals with the idea of uses of biology in engineering.	**Understanding**
CO3	It provide knowledge about the uses of softwares in biology field.	**Remembering**



Will be covered in this lecture

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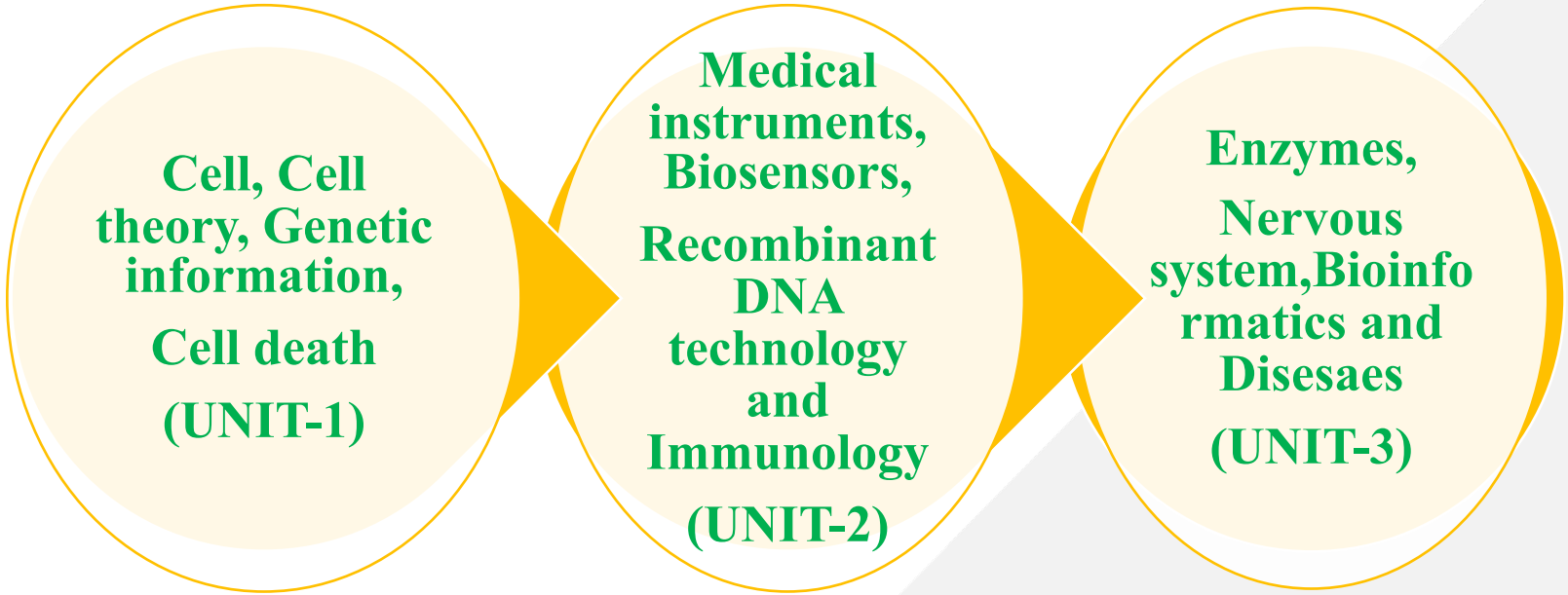
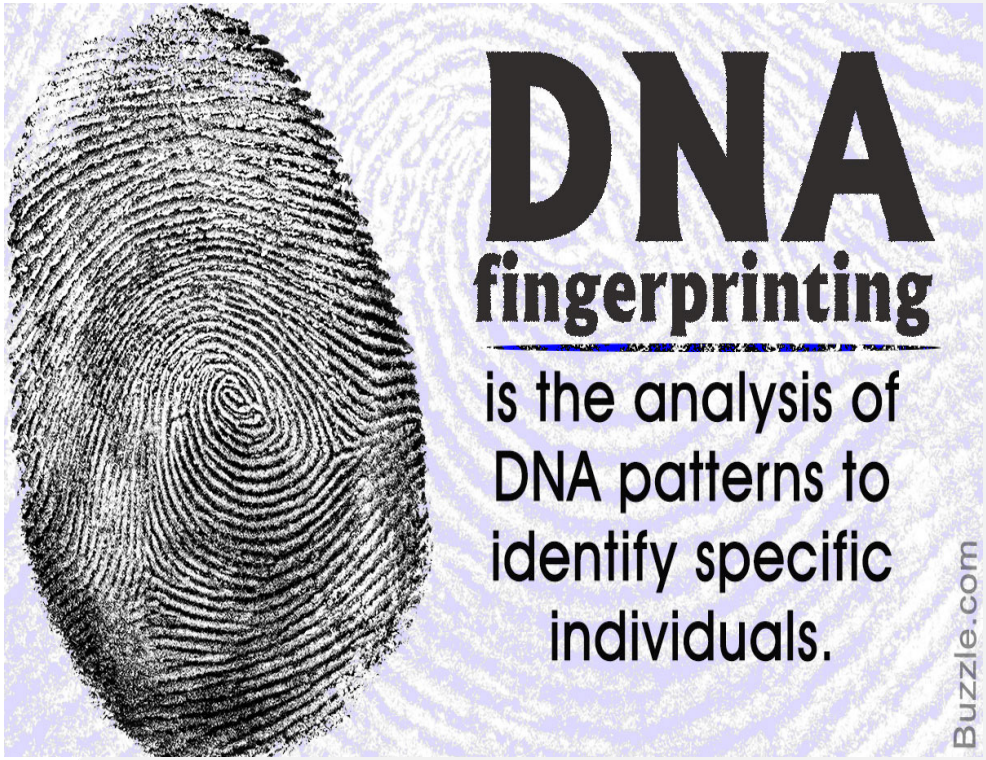
BIOLOGY FOR ENGINEERS



DNA FINGERPRINTING

•DNA fingerprinting is a laboratory technique used to establish a link between biological evidence and a suspect in a criminal investigation.

•A DNA sample taken from a crime scene is compared with a DNA sample from a suspect.



https://biologywise.com/pros-cons-of-dna-fingerprinting-technique

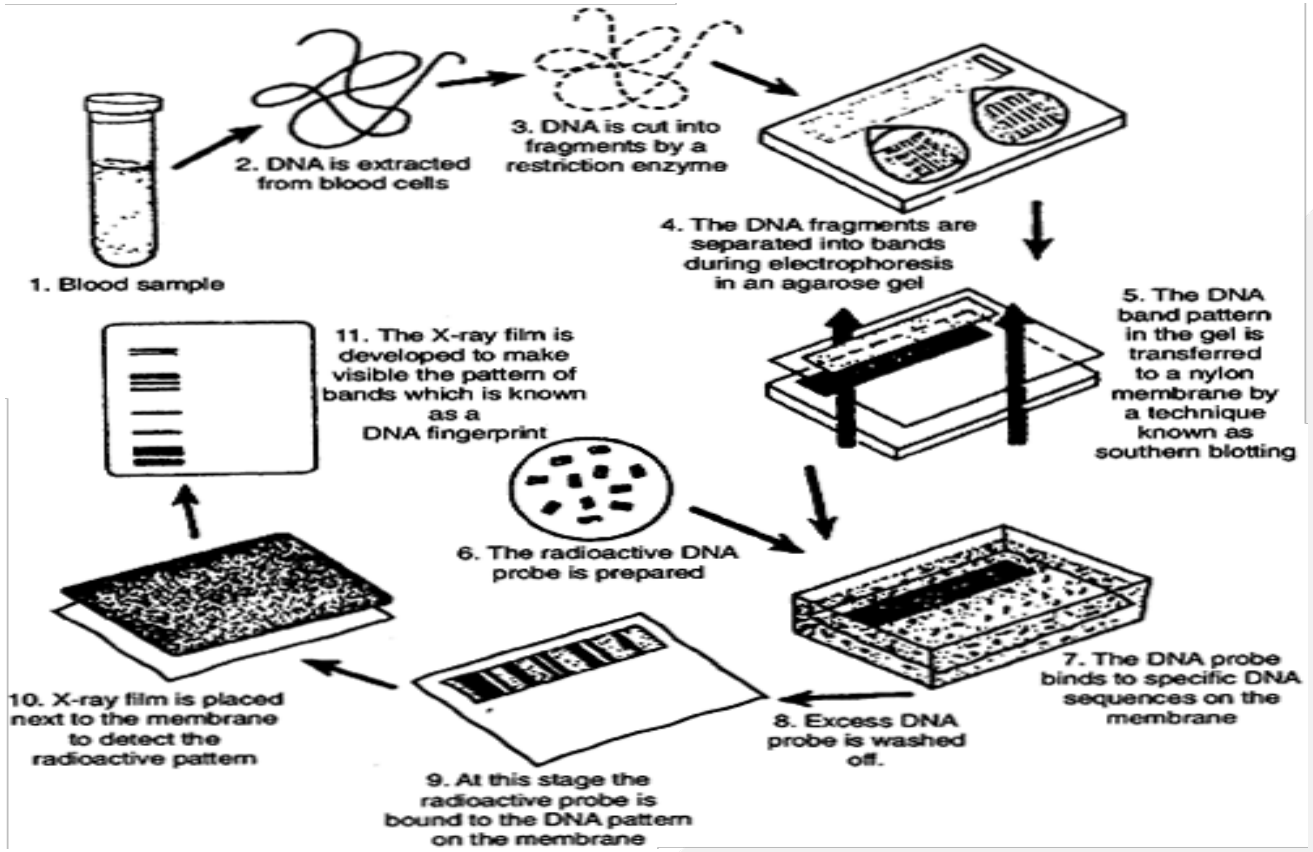
DNA FINGERPRINTING

- This is also known as ‘DNA PROFILING’ o ‘DNA TYPING’. DNA fingerprinting is a technique to identify a person on the basis of his/her DNA specificity.

Meaning:

- DNA of an individual carries some specific sequence of bases, which do not carry any information for protein synthesis. Such nucleotide base sequences are repeated many times and are found in many places throughout the length of DNA. The number of repeats is very specific in each individual.
- The tandem repeats of short sequences are called ‘mini satellites’ or ‘variable number tandem repeats’ (VNTRs). Such repeats are used as genetic markers in personal identity.

DNA FINGERPRINTING



http://learningbiology.weebly.com/dna-figerprinting.html

TECHNIQUE OF DNA FINGERPRINTING

Extracting DNA from Cells

- To perform DNA fingerprinting, you must first have a DNA sample! In order to procure this, a sample containing genetic material must be treated with different chemicals.

- Common sample types used today include blood and cheek swabs.

- These samples must be treated with a series of chemicals to break open cell membranes, expose the DNA sample, and remove unwanted components – such as lipids and proteins – until relatively pure DNA emerges.

TECHNIQUE OF DNA FINGERPRINTING

PCR Amplification

- If the amount of DNA in a sample is small, scientists may wish to perform PCR – Polymerase Chain Reaction – amplification of the sample.
- PCR is an ingenious technology which essentially mimics the process of DNA replication carried out by cells.
- Nucleotides and DNA polymerase enzymes are added, along with "primer" pieces of DNA which will bind to the sample DNA and give the polymerases a starting point.
- PCR "cycles" can be repeated until the sample DNA has been copied many times in the lab if necessary.

TECHNIQUE OF DNA FINGERPRINTING

Treatment with Restriction Enzymes

- The best markers for use in quick and easy DNA profiling are those which can be reliably identified using common restriction enzymes, but which vary greatly between individuals.
- For this purpose, scientists use repeat sequences – portions of DNA that have the same sequence so they can be identified by the same restriction enzymes, but which repeat a different number of times in different people.
- Types of repeats used in DNA profiling include Variable Number Tandem Repeats (VNTRs), especially short tandem repeats (STRs), which are also referred to by scientists as “microsatellites” or “minisatellites.”

TECHNIQUE OF DNA FINGERPRINTING

•Once sufficient DNA has been isolated and amplified, if necessary, it must be cut with restriction enzymes to isolate the VNTRs. Restriction enzymes are enzymes that attach to specific DNA sequences and create breaks in the DNA strands.

•In genetic engineering, DNA is cut up with restriction enzymes and then "sewn" back together by ligases to create new, recombinant DNAsequences. In DNA profiling, however, only the cutting part is needed. Once the DNA has been cut to isolate the VNTRs, it's time to run the resulting DNA fragments on a gel to see how long they are!

TECHNIQUE OF DNA FINGERPRINTING

Gel Electrophoresis

- Gel electrophoresis is a brilliant technology that separates molecules by size. The "gel" in question is a material that molecules can pass through, but only at a slow speed.
- In this case, measuring the size of the DNA fragments from the sample that has been treated with a restriction enzyme will tell scientists how many copies of each VTNR repeat the sample DNA contains.It's called "electrophoresis" because, to make the molecules move through the gel, an electrical current is applied. Because the sugar-phosphate backbone of the DNA has a negative electrical charge, the electrical current tugs the DNA along with it through the gel.
- By looking at how many DNA fragments the restriction enzymes produced and the sizes of these fragments, the scientists can "fingerprint" the DNA donor.

TECHNIQUE OF DNA FINGERPRINTING

Transfer onto Southern Blot

- Now that the DNA fragments have been separated by size, they must be transferred to a medium where scientists can “read” and record the results of the electrophoresis.
- To do this, scientists treat the gel with a weak acid, which breaks up the DNA fragments into individual nucleic acids that will more easily rub off onto paper.
- They then “blot” the DNA fragments onto nitrocellulose paper, which fixes them in place.

TECHNIQUE OF DNA FINGERPRINTING

Treatment with Radioactive Probe

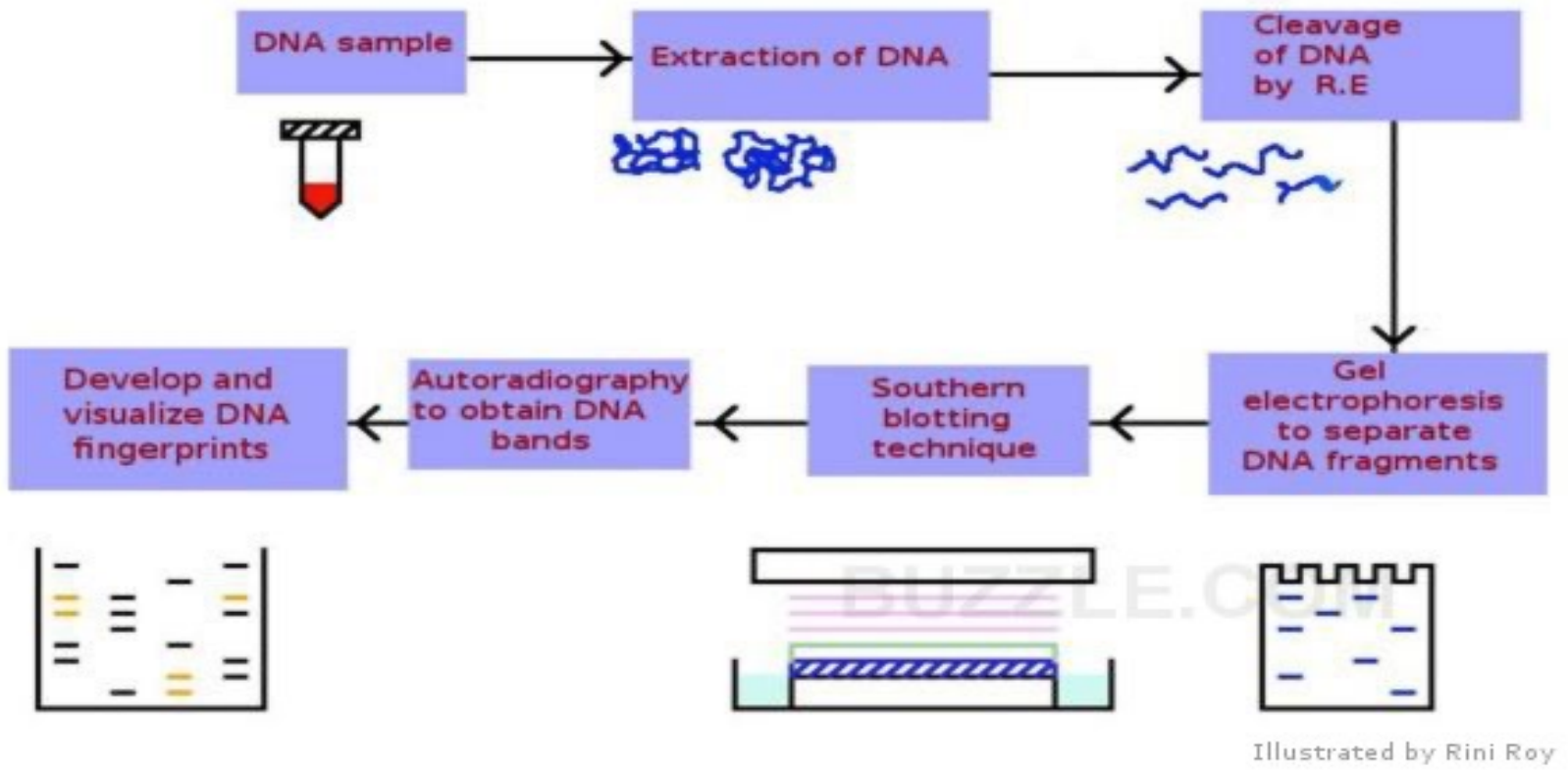
- Now that the DNA is fixed onto the blotting paper, it is treated with a special probe chemical that sticks to the desired DNA fragments. This chemical is radioactive, which means that it will create a visible record when exposed to X-ray paper.
- This method of blotting DNA fragments onto nitrocellulose paper and then treating it with a radioactive probe was discovered by a scientist name Ed Southern – hence the name "Southern blot."
- Amusingly, the fact that the Southern blot is named after a scientist and not the direction "south" did not stop scientists from naming similar methods "northern" and "western" blots in honor of the Southern blot.

TECHNIQUE OF DNA FINGERPRINTING

X-Ray Film Exposure

- The last step of the process is to turn the information from the DNA fragments into a visible record. This is done by exposing the blotting paper, with its radioactive DNA bands, to X-ray film.
- X-ray film is “developed” by radiation, just like camera film is developed by visible light, resulting in a visual record of the pattern produced by the person’s DNA “fingerprint.” To ensure a clear imprint, scientists often leave the X-ray film exposed to the weakly radioactive Southern blot paper for a day or more.
- Once the image has been developed and fixed to prevent further light exposure from changing the image, this “fingerprint” can be used to determine if two DNA samples are the same or similar!

TECHNIQUE OF DNA FINGERPRINTING



https://biologywise.com/dna-fingerprinting-process

CONCLUSION

- DNA fingerprinting is a technique that simultaneously detects lots of minisatellites in the genome to produce a pattern unique to an individual. This is a DNA fingerprint.
- The probability of having two people with the same DNA fingerprint that are not identical twins is very small.
- DNA fingerprinting is a chemical test that shows the genetic makeup of a person or other living things.
- It's used as evidence in courts, to identify bodies, track down blood relatives, and to look for cures for disease.

ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1st Hourly Test	36
2nd Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

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THANK YOU

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