

**Pre-PhD Course work
(Zoology)
Maa Shakumbhari University
Saharanpur, Uttar Pradesh**



**Topic :Molecular Biology
Lecture 9: 1.05.2026**

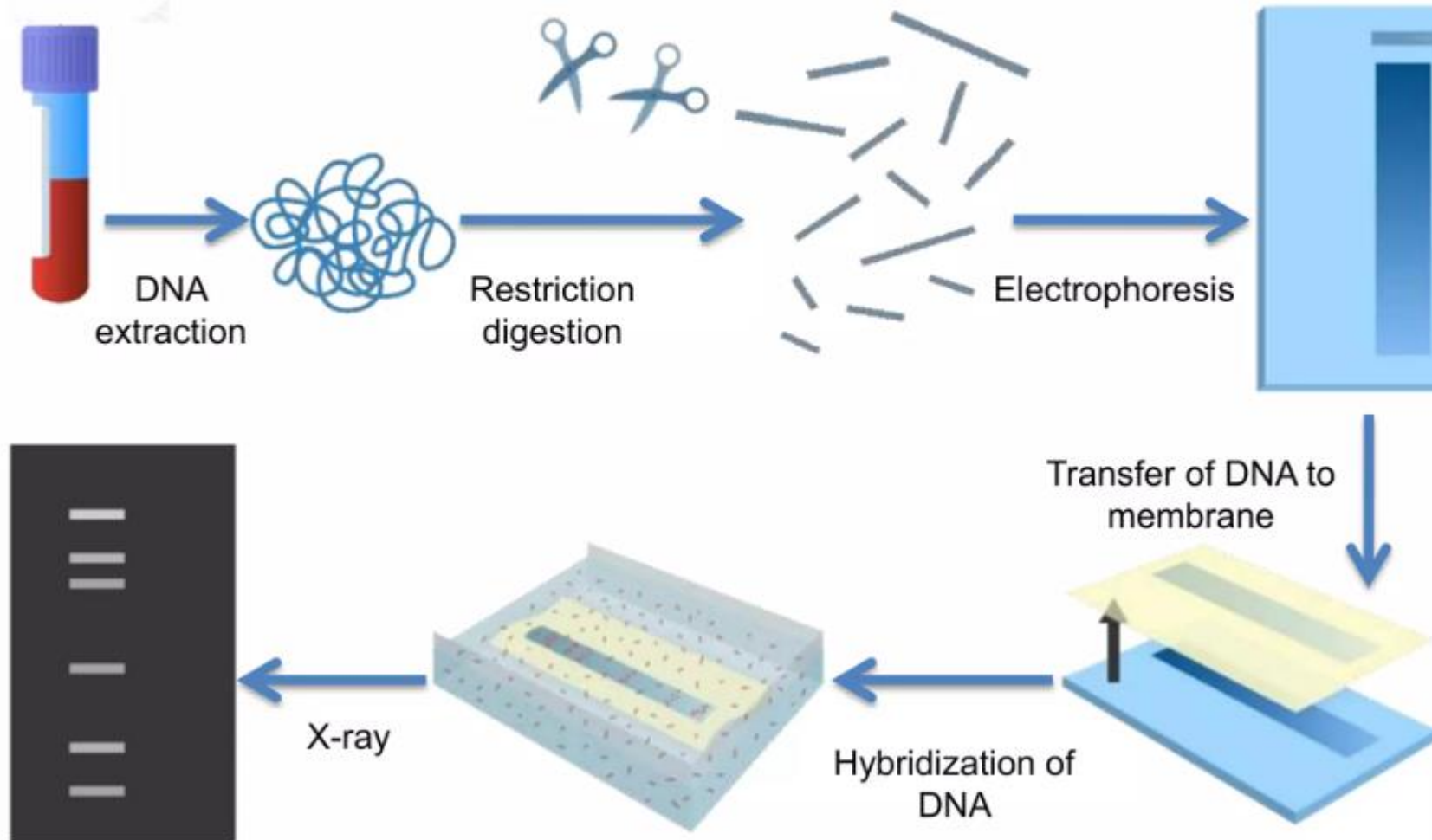
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Assistant Professor

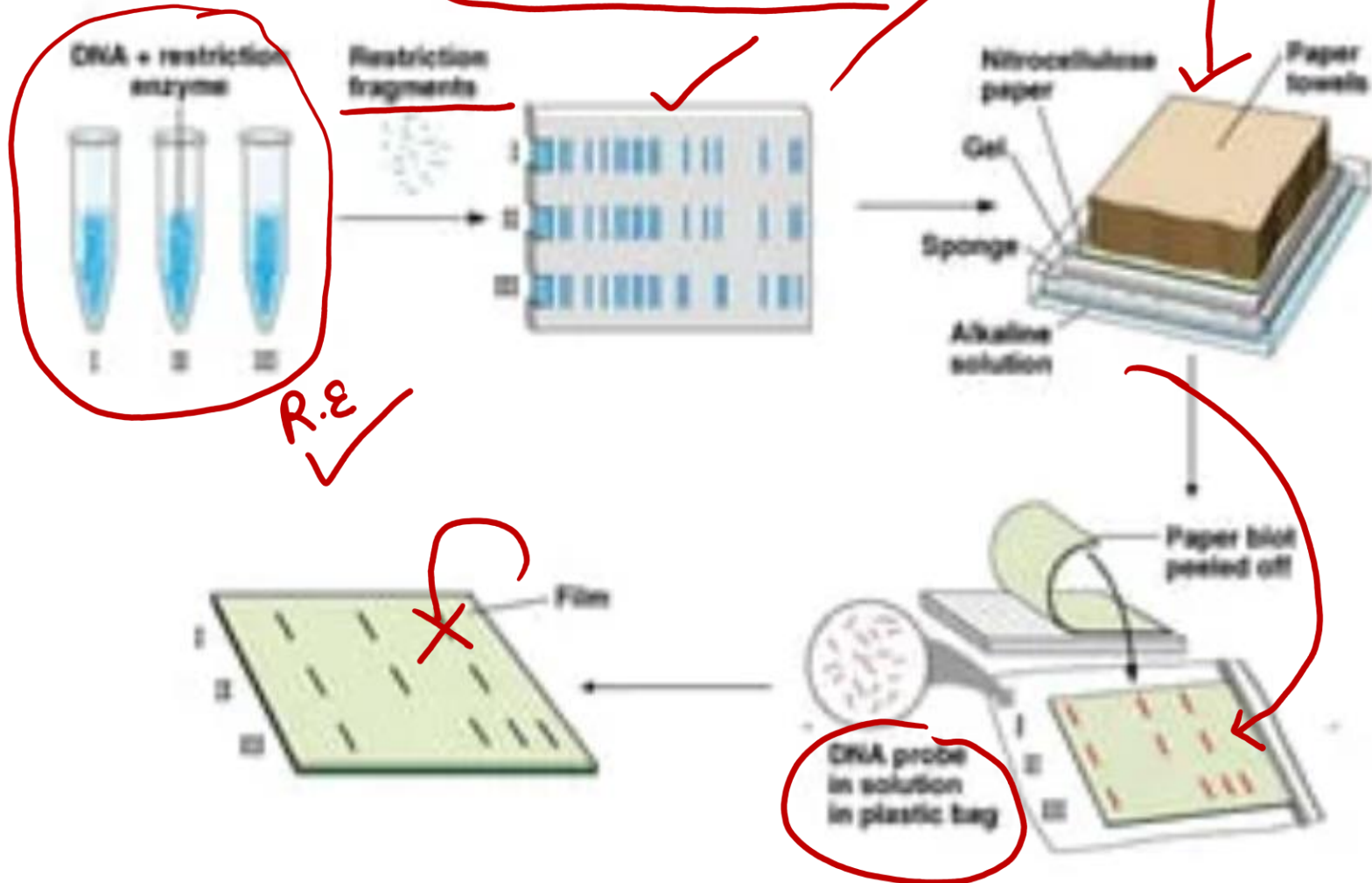
Department of Zoology

Sanatan Dharm College, Muzaffarnagar

RFLP

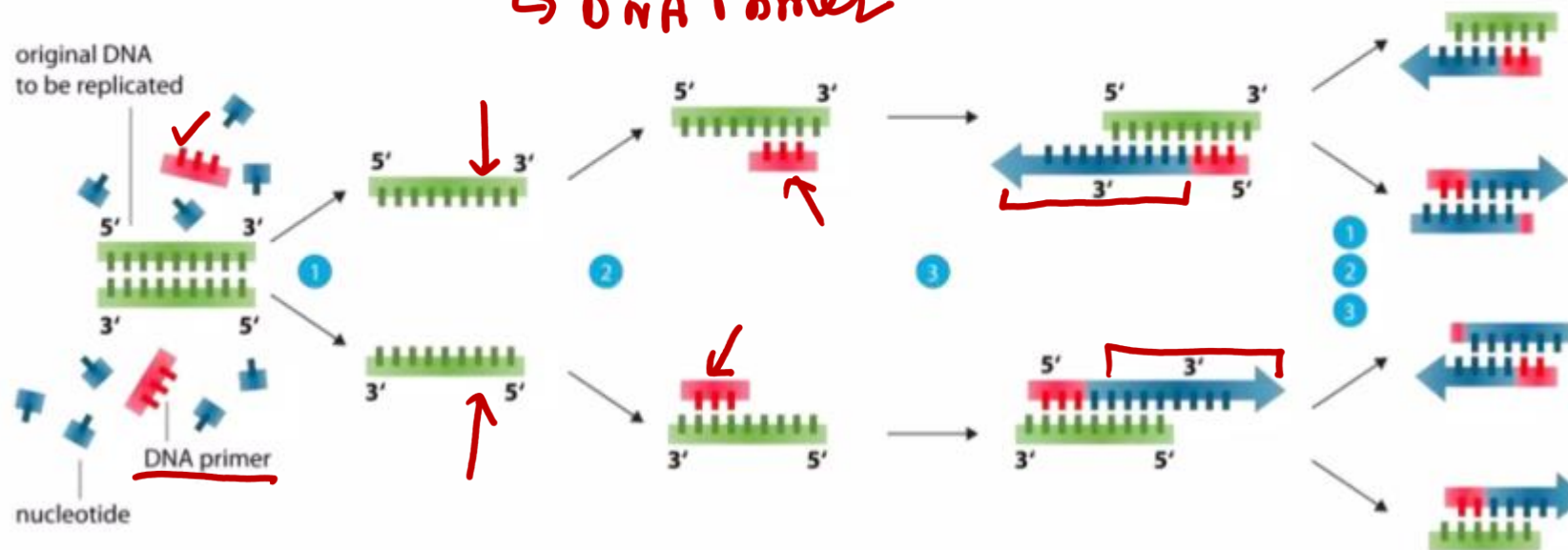


Southern blotting



PCR/SRT

STR
5' ATG T 3'
3' TAC T-5'
↳ DNA primer



<u>Restriction fragment length polymorphism (RFLP)</u>	<u>Polymerase chain reaction amplification of short tandem repeats (PCR/SRT)</u>
<u>More sample needed</u> ✓	<u>Less sample needed</u> ✓
<u>Fresh DNA sample needed</u>	<u>Fresh DNA sample not always mandatory</u>
<u>No chance of amplification of contamination</u>	<u>Chance amplification of contamination</u>
<u>Require more time</u>	<u>Require less time</u>
<u>Analysis is costly.</u>	<u>Analysis is cheap than RFLP</u>

DNA database



1995

National DNA Database
(NDNAD)

6
millions



Combined DNA Index
System (CODIS)

10
millions



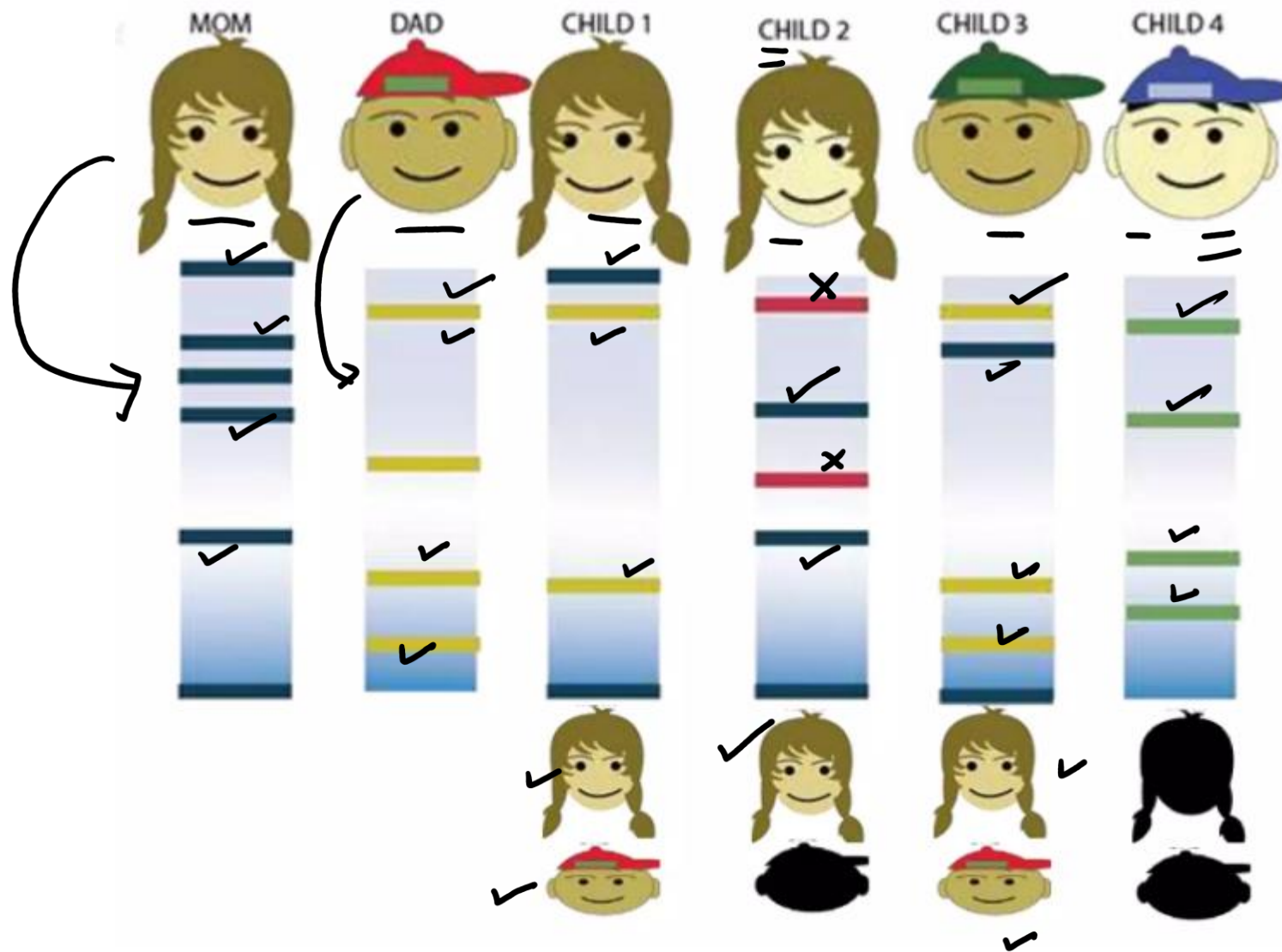
National DNA Database

16
millions

Future of DNA fingerprinting

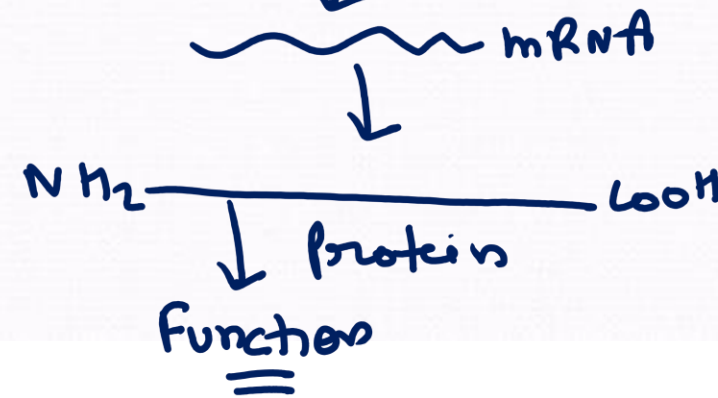
Automated





GENE IDENTIFICATION

- Identification of important components in genomic DNA
- Identification of Genes in a Genomic DNA Sequence
- Prediction of protein-coding genes
 - Prokaryotes
 - Unicellular eukaryotes
 - Multicellular eukaryotes



Human's $\Rightarrow$ Total genes
 $\downarrow$
approx. 35000

↓
Bioinformatics
&
Computational
biology

↘ Molecular
Biology

What is a Gene?

- Fundamental unit of heredity
- DNA involved in producing a polypeptide; it includes regions preceding and following the coding region (leader and trailer) as well as intervening sequences (introns) ✓
- Entire DNA sequence including exons, introns, and noncoding transcription-control regions.

↓
Regulatory units

coding
⇓
↑

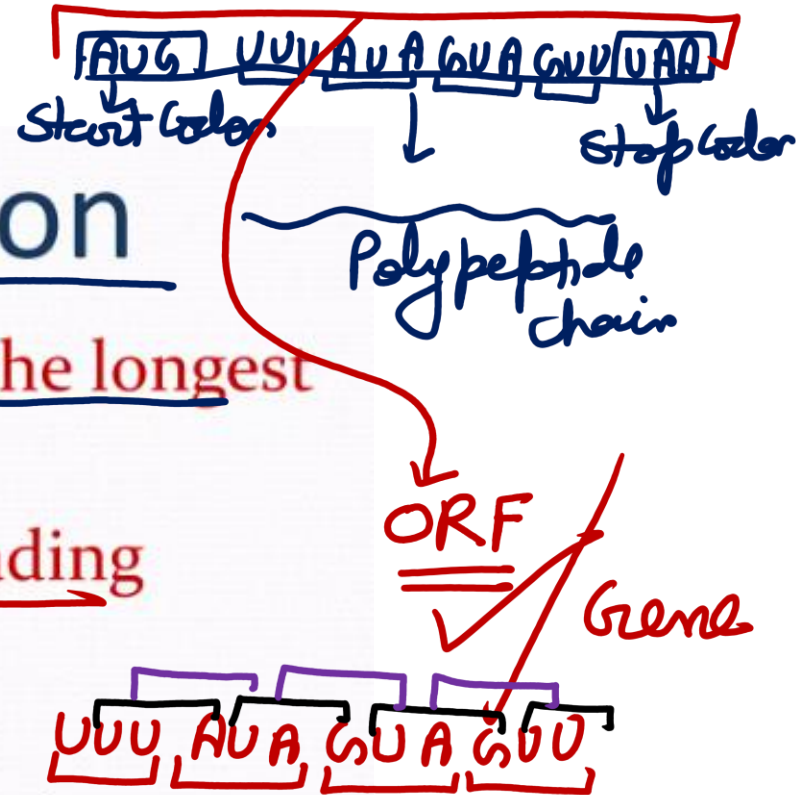
Non-coding
↑

What Components are Important in Protein Coding Genes?

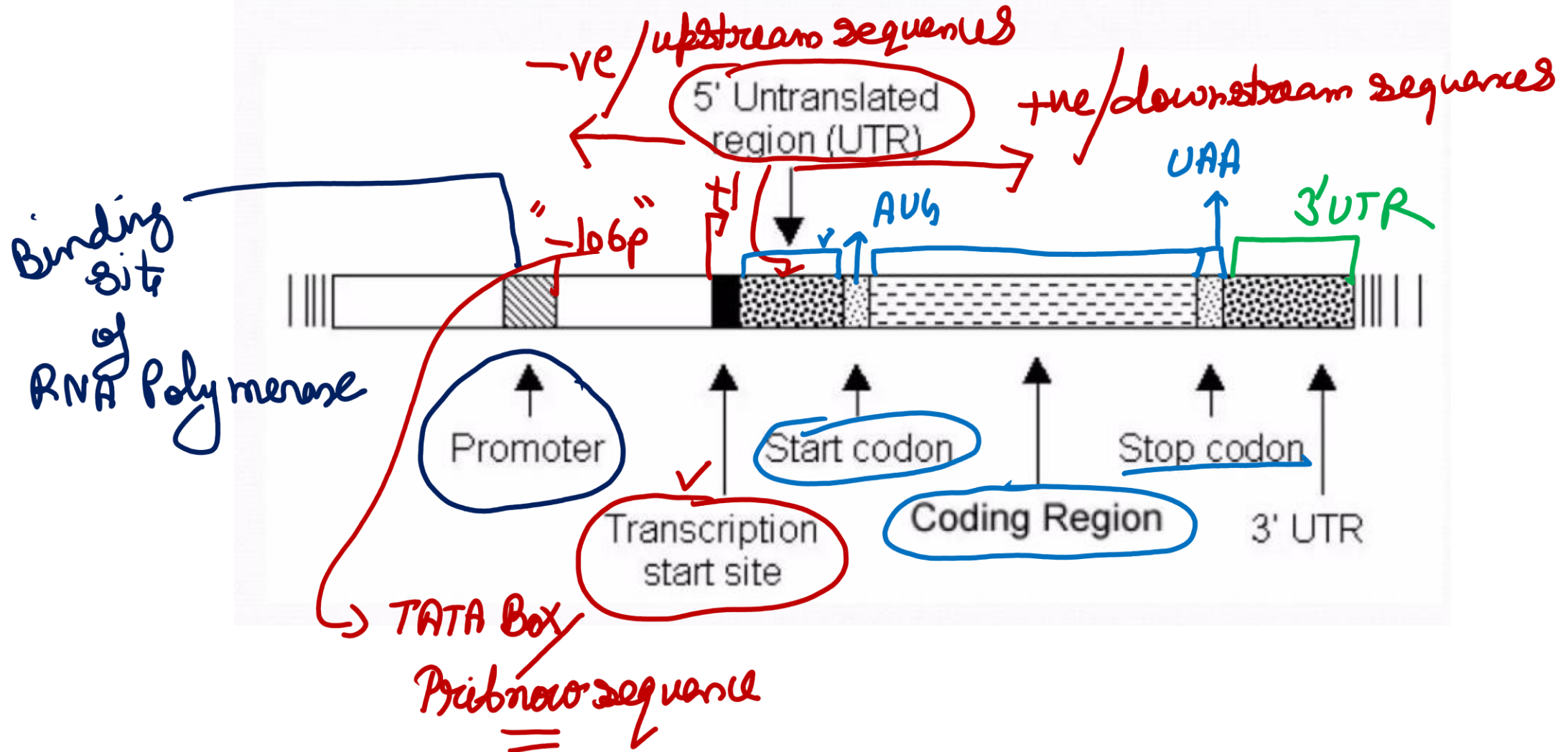
- Sequences that **initiate** transcription ✓
- Sequences that **process hnRNA** to mRNA
- **Signals** important in translation

Prokaryotic gene prediction

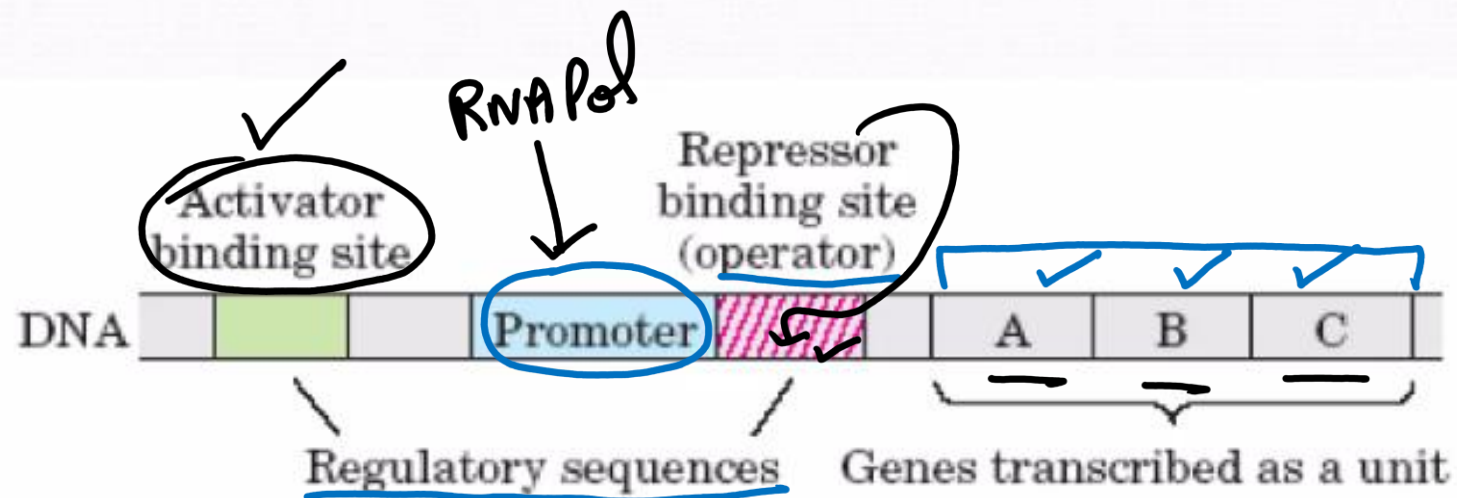
- Prokaryotic gene can be defined simply as the longest ORF for a given region of DNA.
- Translation of a DNA sequence in all six reading frames is a straightforward task
- Translate tool on the ExPASy server (<http://www.expasy.org/tools/dna.html>) or the
- ORF Finder at NCBI (<http://www.ncbi.nlm.nih.gov/gorf/gorf.html>.)



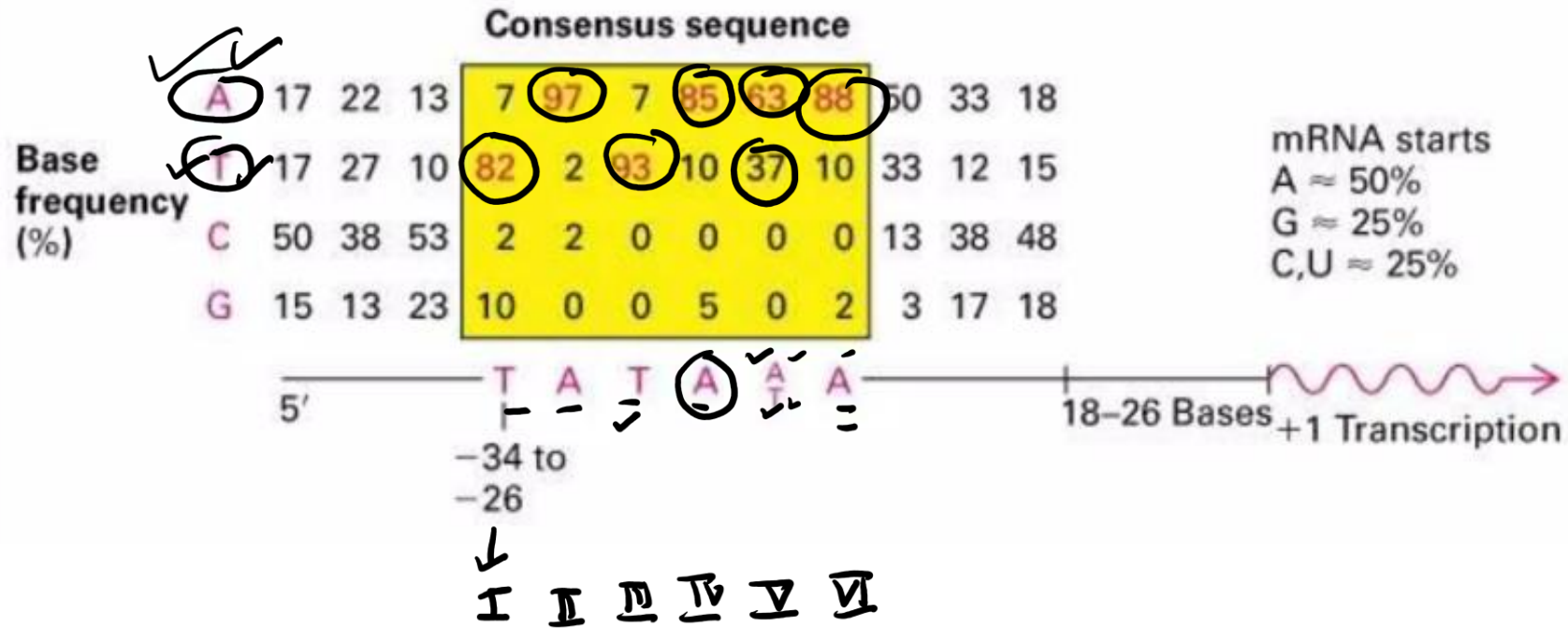
PROKARYOTES GENE STRUCTURE



PROKARYOTES OPERON



TATA Box



Evidence that a particular ORF actually encodes a protein

- The ORF in question encodes a protein that is similar to previously described ones (search the protein database for homologs of the given sequence).
- The ORF has a typical GC content, codon frequency, or oligonucleotide composition.
- The ORF is preceded by a typical ribosome-binding site (search for a Shine-Dalgarno sequence in front of the predicted coding sequence).
- The ORF is preceded by a typical promoter