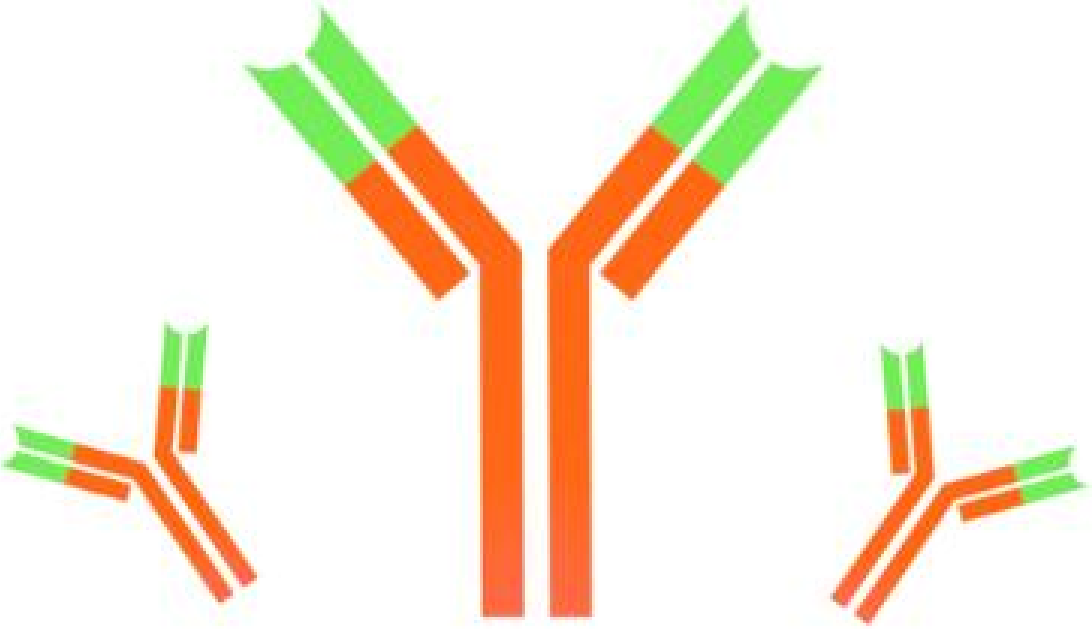
ABCs of Synthetic Biology

For babies

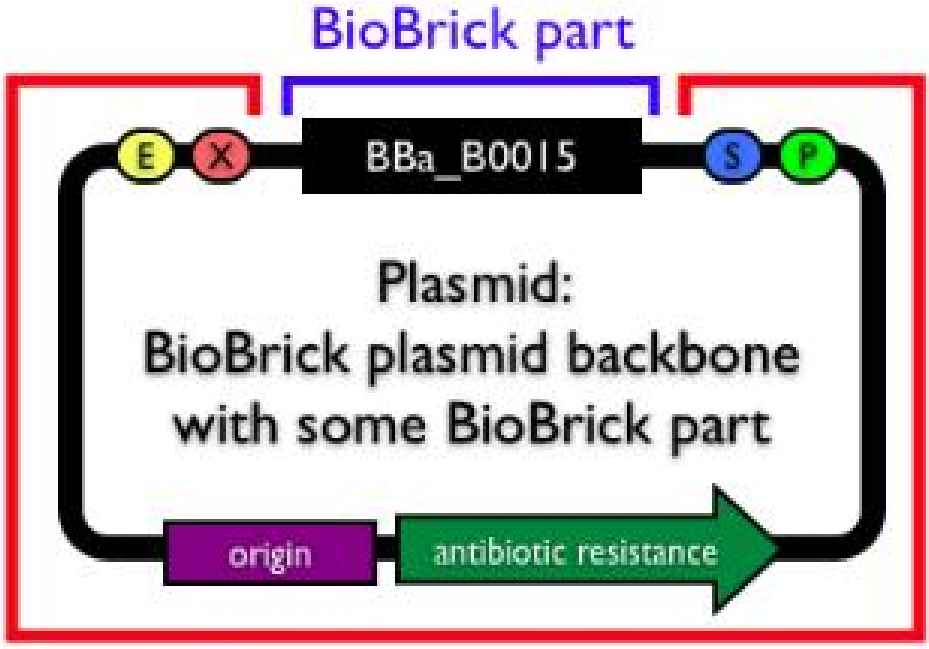
By: Amogh Chaturvedi

A is for Antibody



It is a protein molecule that functions in attacking bacteria, viruses and foreign objects. It is found in the blood of our bodies

B is for Biobrick



They are DNA sequences which serve as building blocks to make complex DNA sequences, much like how lego bricks can make a mansion

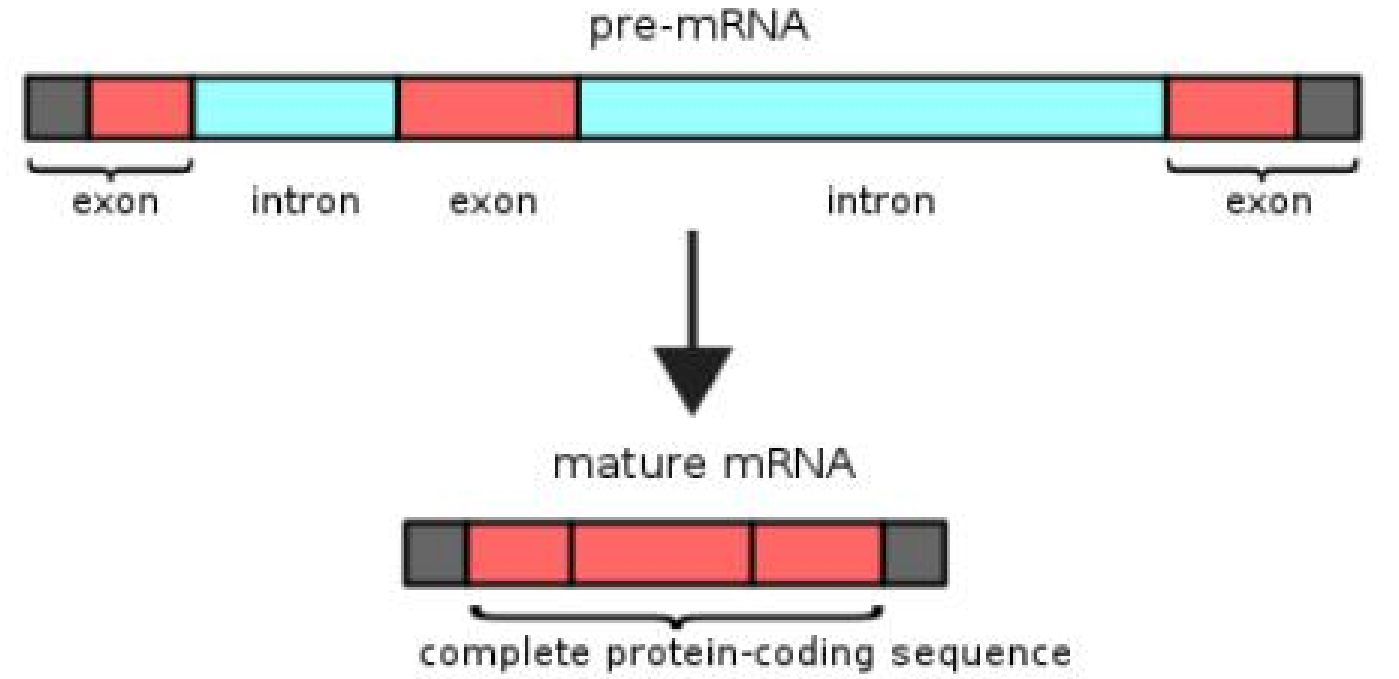
C is for CRISPR

It is a gene editing technology - uses bacterial enzymes to modify DNA sequences

D is for DNA

It is the blueprint for life. It has the instructions for amino acid synthesis and controls all functions of a cell

E is for Exon

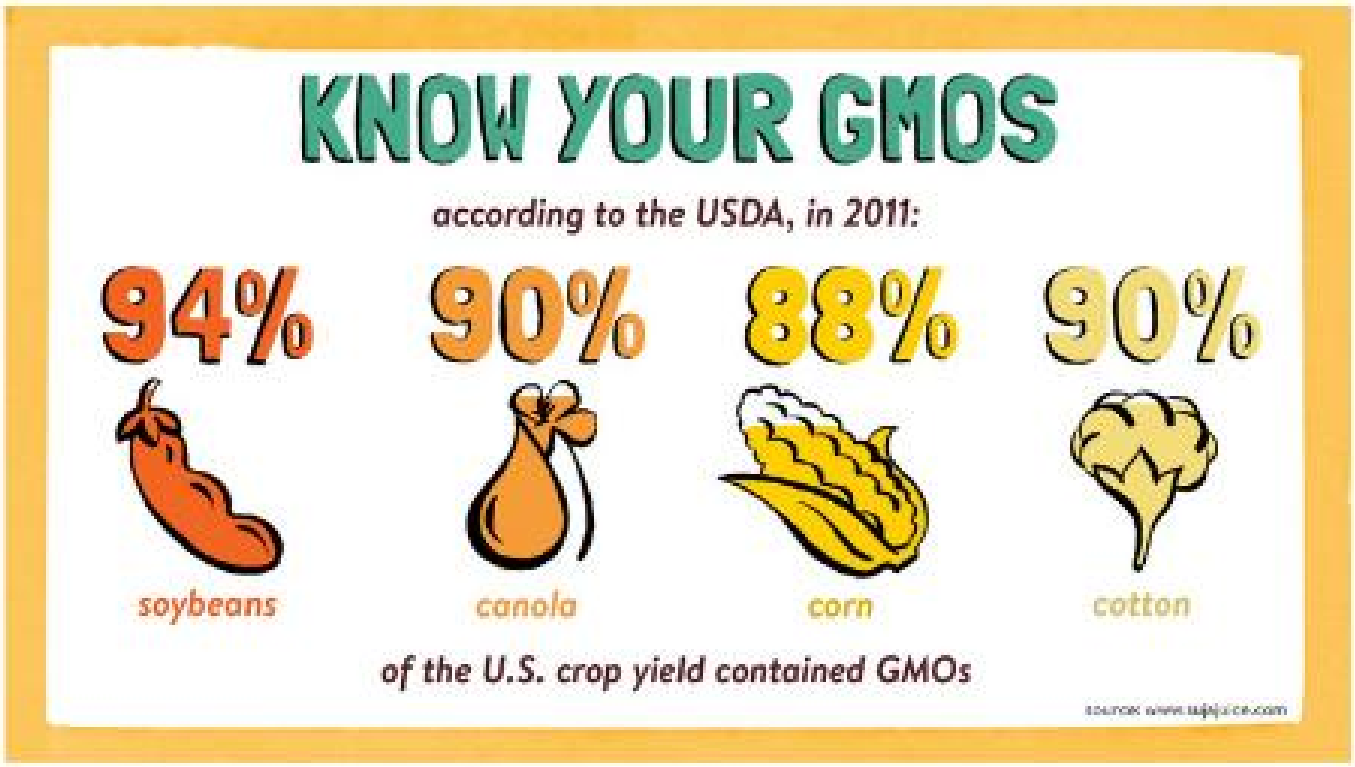


Exons are the DNA/RNA sequences that have the information to code a protein/amino acid sequence

F is for Fun

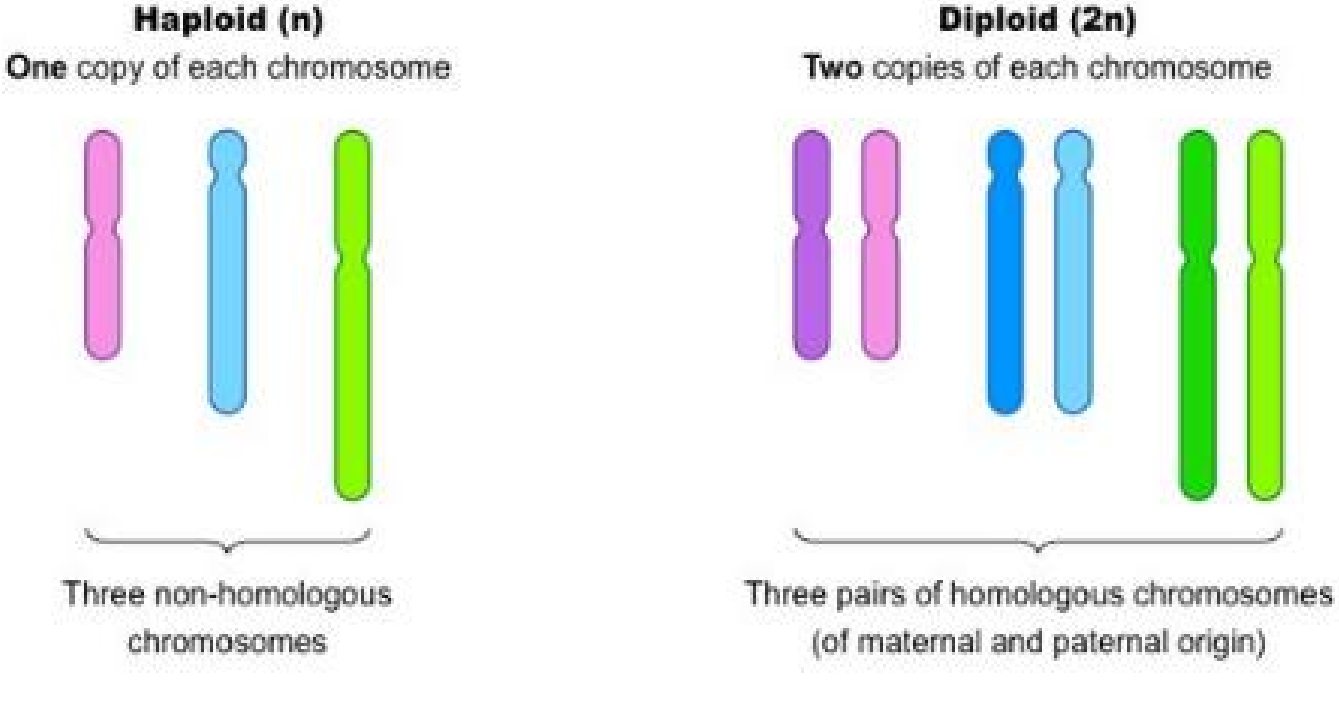
We decided to put a non-science one in here, Synthetic Biology is loads of fun! From making your own DNA to seeing it expressed live in bacteria and yeast is very interesting.

G is for GMO



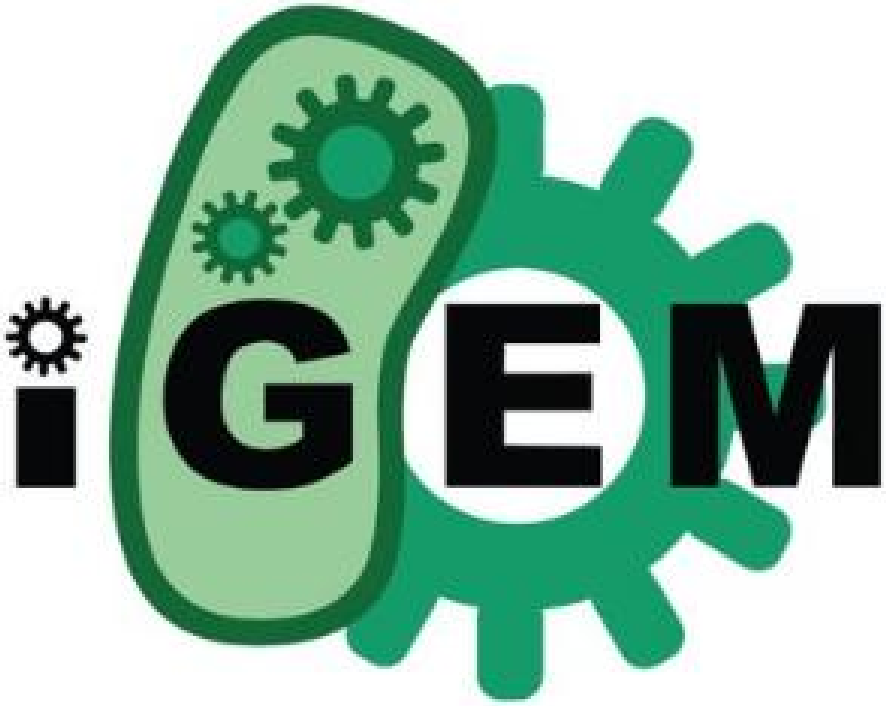
GMO stands for Genetically modified organism; in which a gene from one organism has been transferred to another organism

H is for Haploid



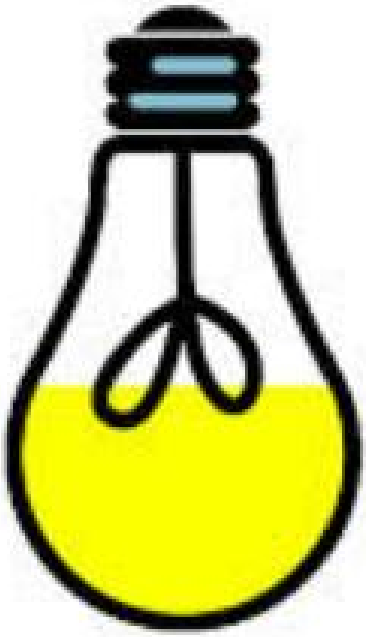
Containing only one copy of each chromosome. Represented by (n) while diploid, which is containing 2 copies in (2n)

I is for iGEM



iGEM = International Genetically Engineered Machine. It is a synthetic biology competition where teams tackle real world problems with synthetic Biology

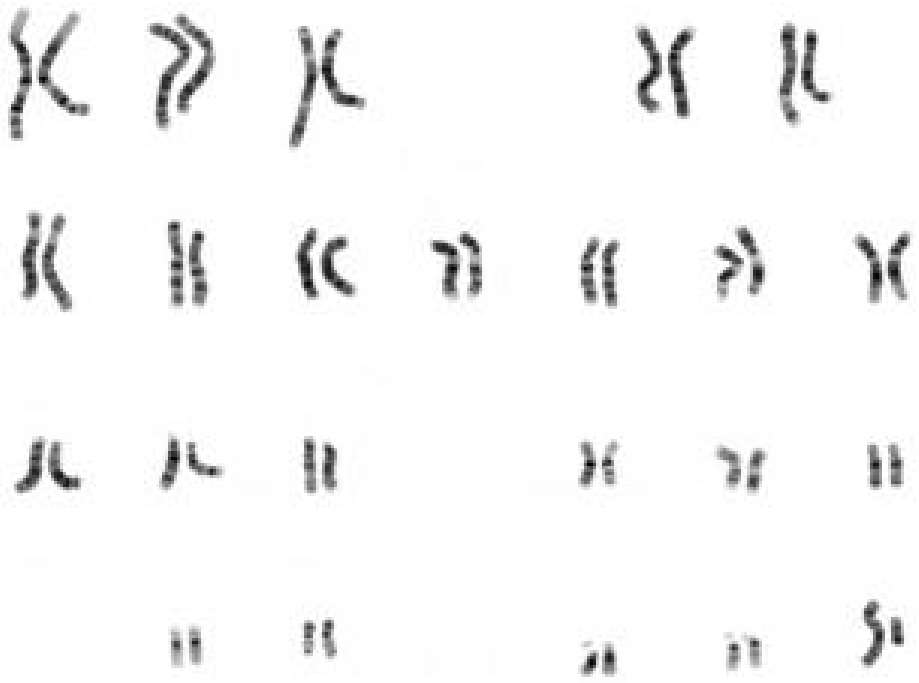
J is for Joule



Total
ENERGY
=
Joules (J)

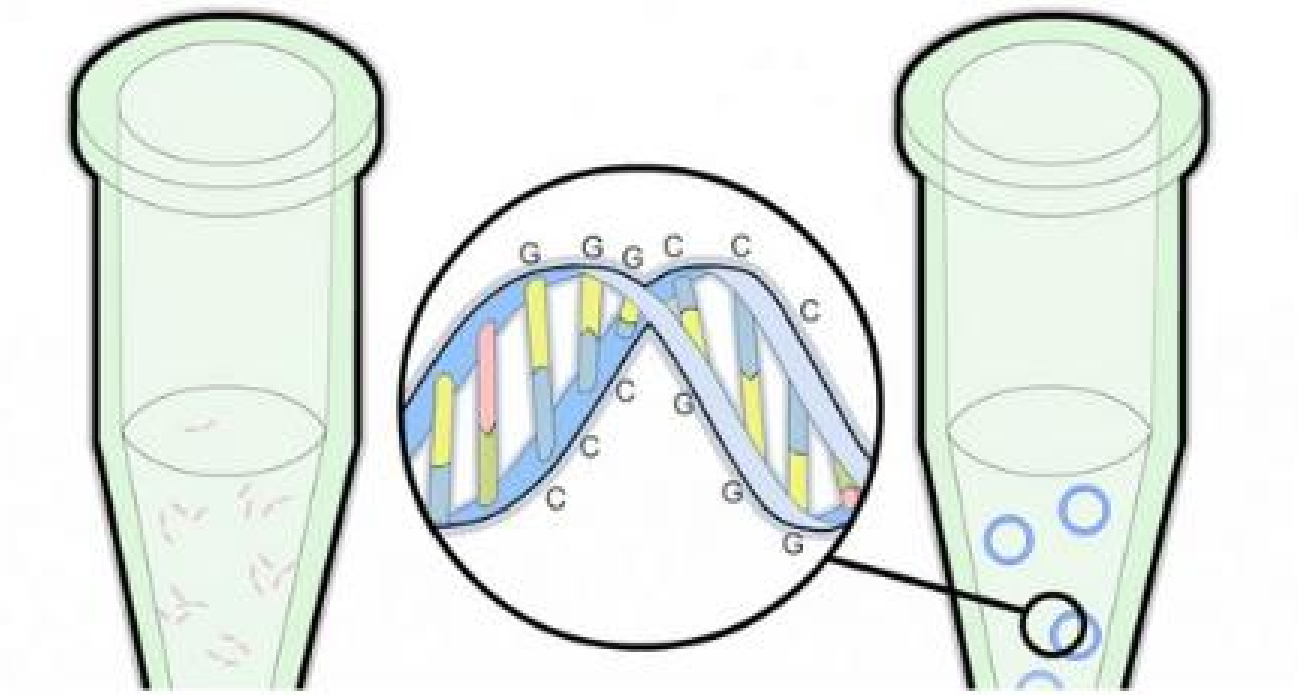
Joule is a unit of energy. It is the energy needed for a 1kg mass moving at 1 meter per second

K is for karyotype



A picture of the number and appearance of chromosomes. Chromosomes are stained before they are pictured.

L is for Library

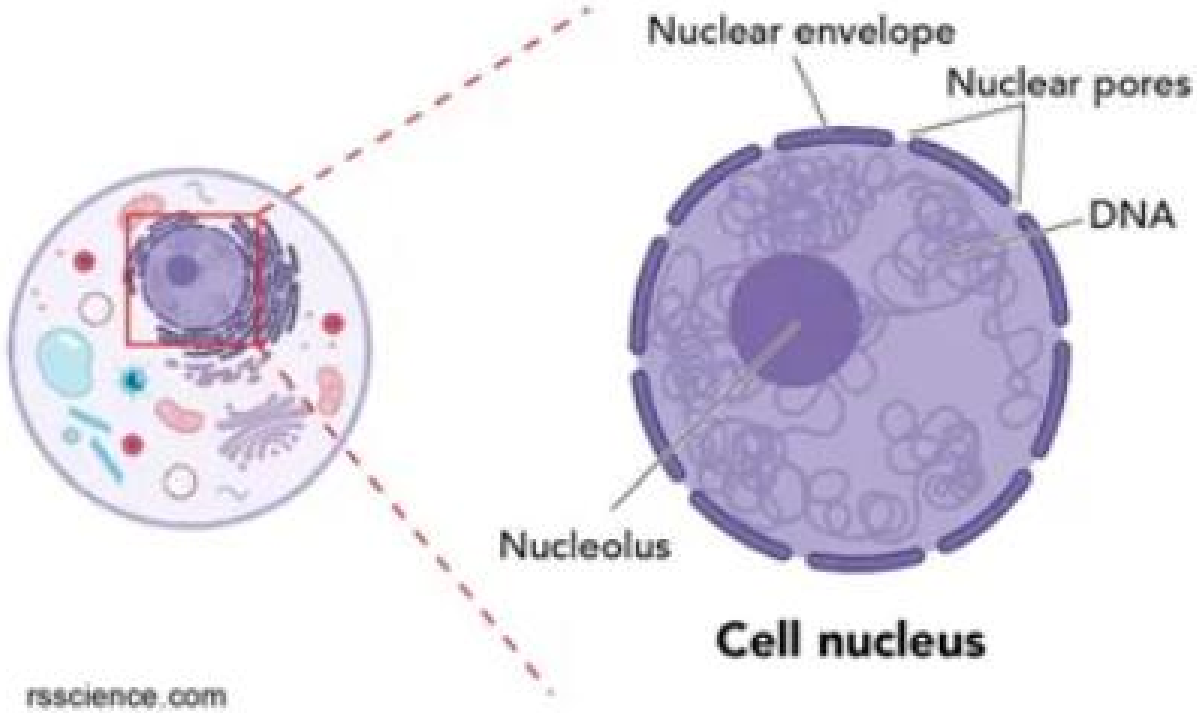


We are talking about a DNA library here, which is a collection of DNA sequences.

M is for Mutant

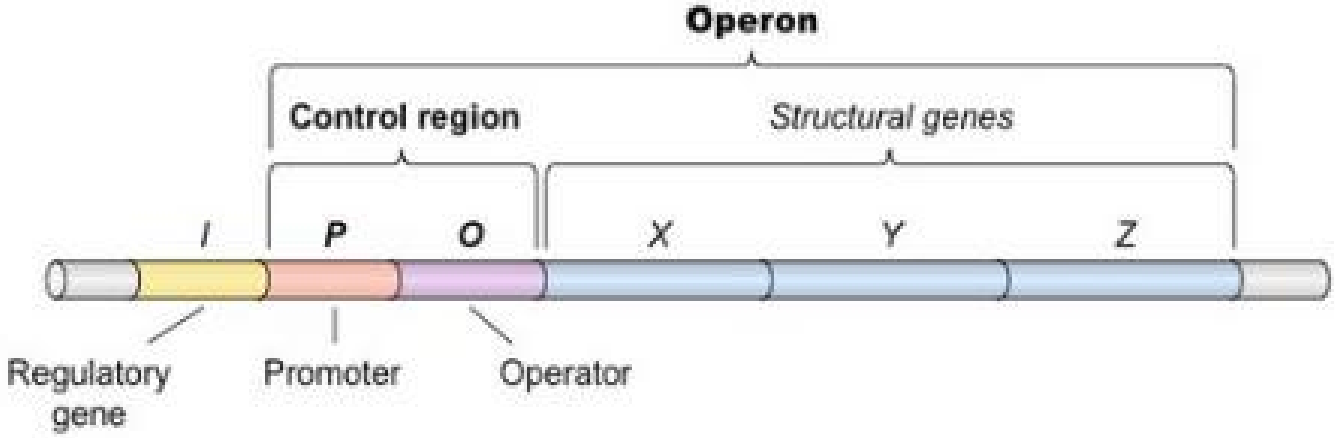
This is a cell or organism that has a phenotype or genotype different from the normal. It is due to a change in the DNA

N is for nucleus



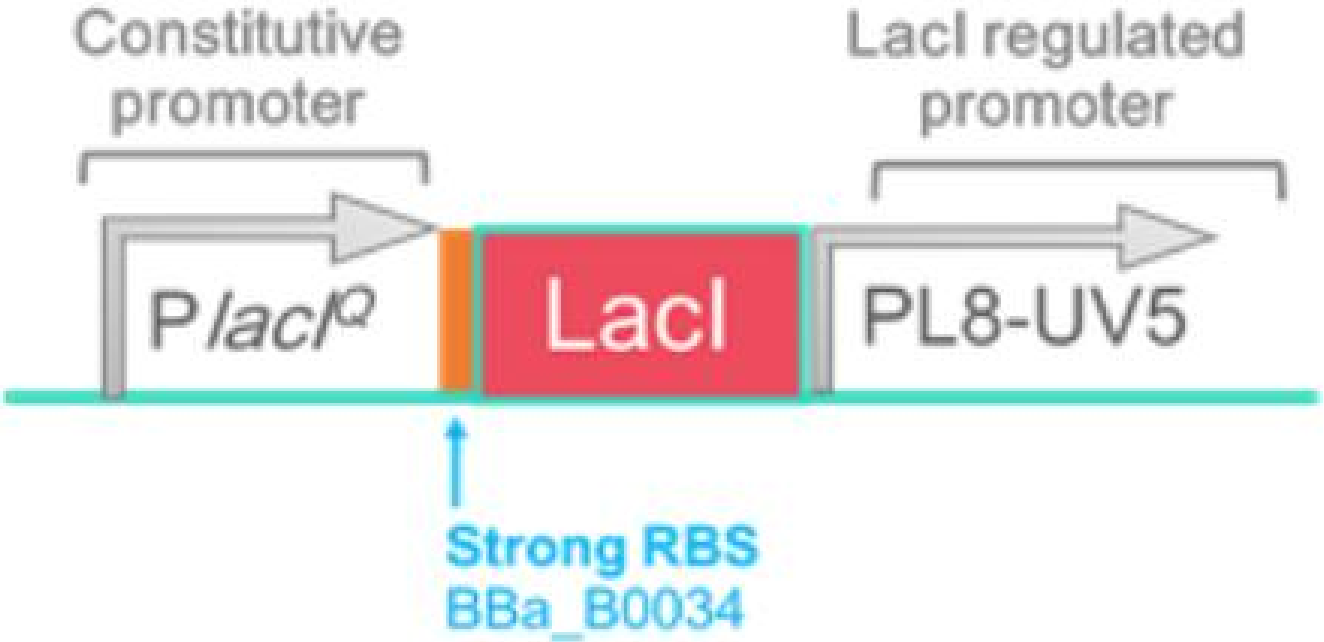
It is an organeele in cells which house the genetic material like DNA and RNA

O is for Operon



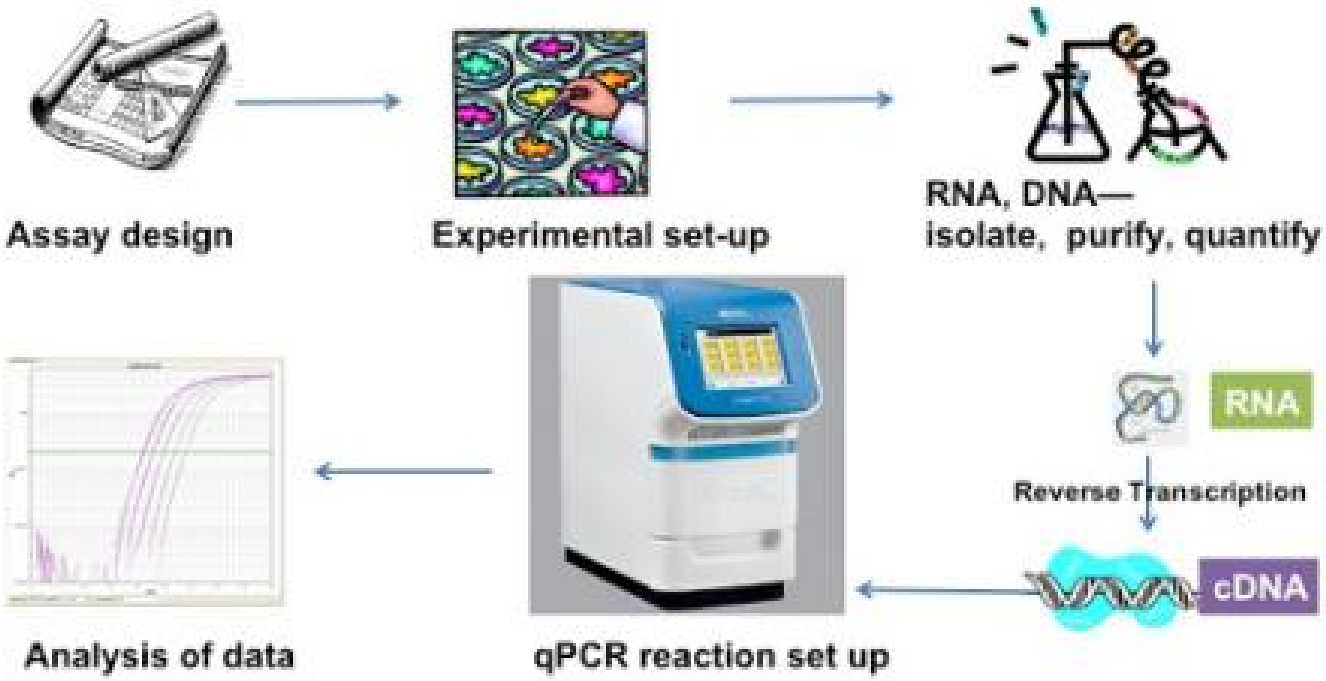
It is a string of genes which are all under the influence of one promoter. Thus these are made into an RNA as a group

P is for Promoter



The site of DNA transcription into RNA. Allows for enzymes to attach to start the DNA to RNA translation

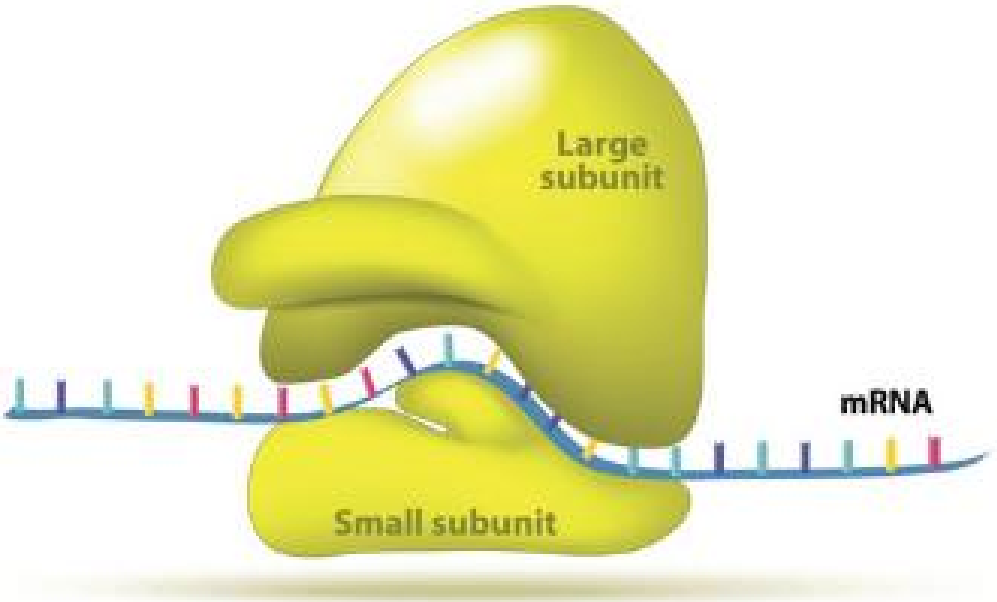
Q is for qPCR



It is also known as real-time polymerase chain reaction and can measure DNA via PCR which makes it quantitative

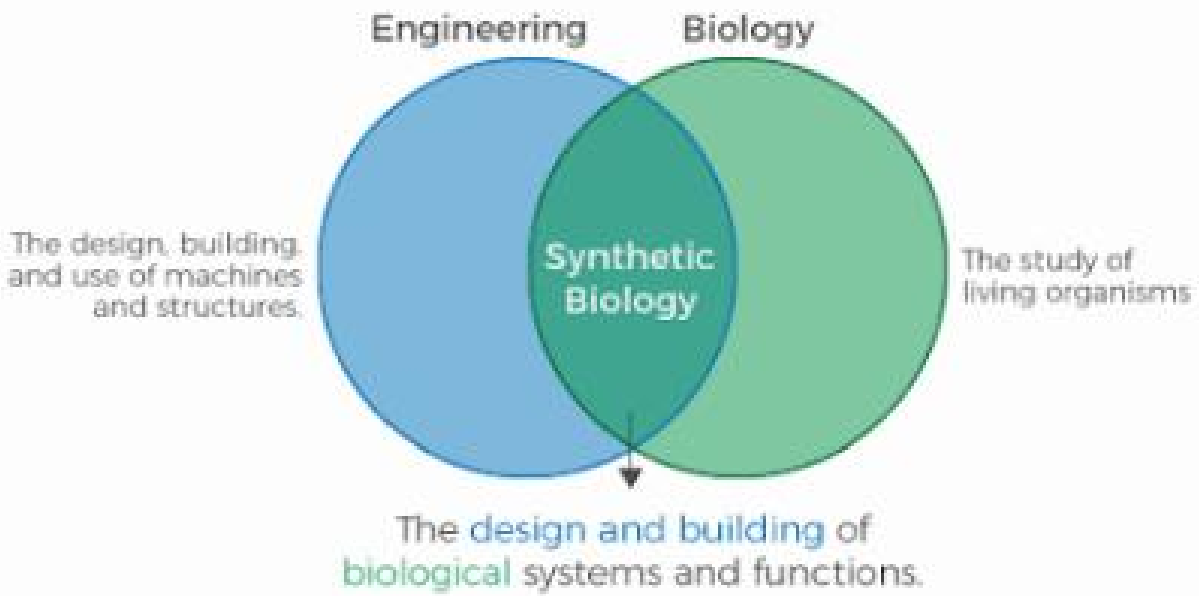
R is for ribosome

RIBOSOME



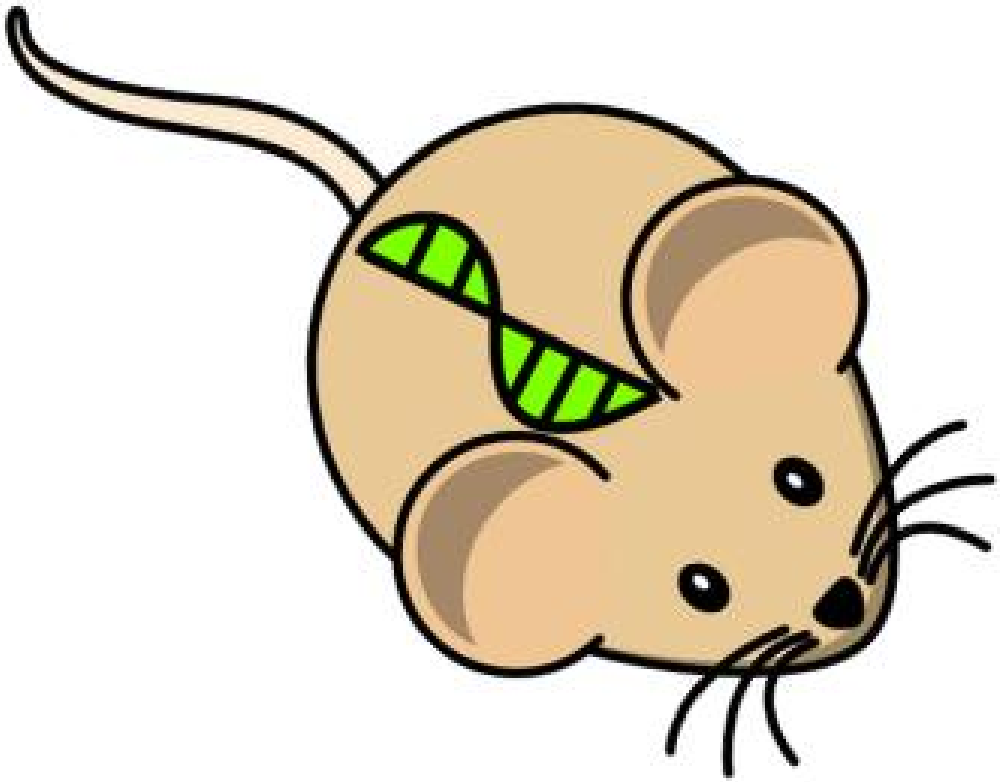
This is the organelle that can either be found in the cytoplasm of ER and functions to make amino acids from mRNA sequence

S is for SynBio



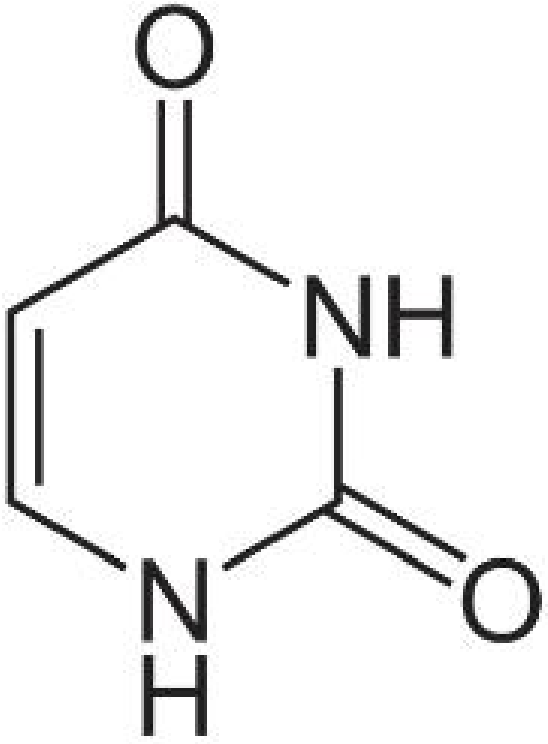
SynBio = Synthetic biology and it seeks to make new biological parts and also use DNA libraries to assemble new genomes

T is for Transgenic



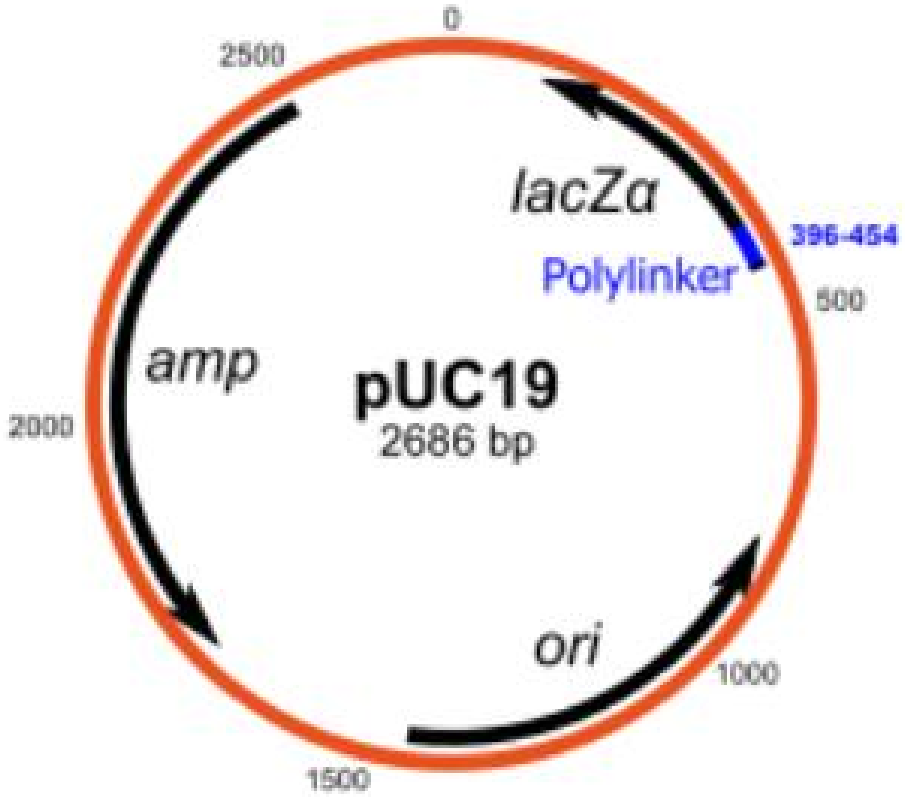
It is an organism that has genes
from another organism.

U is for Uracil



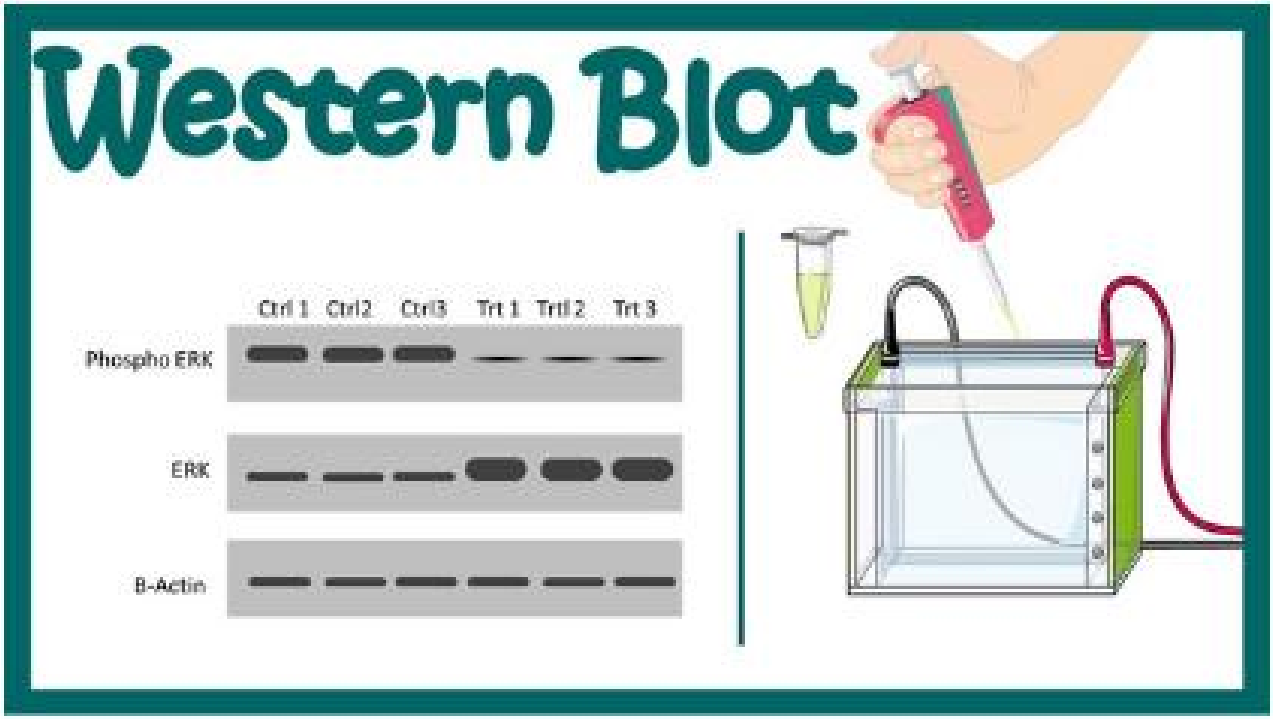
It is a nitrogen base in RNA and forms a base pair with Adenine. It is not present in DNA and serves to replace thymine.

V is for Vector



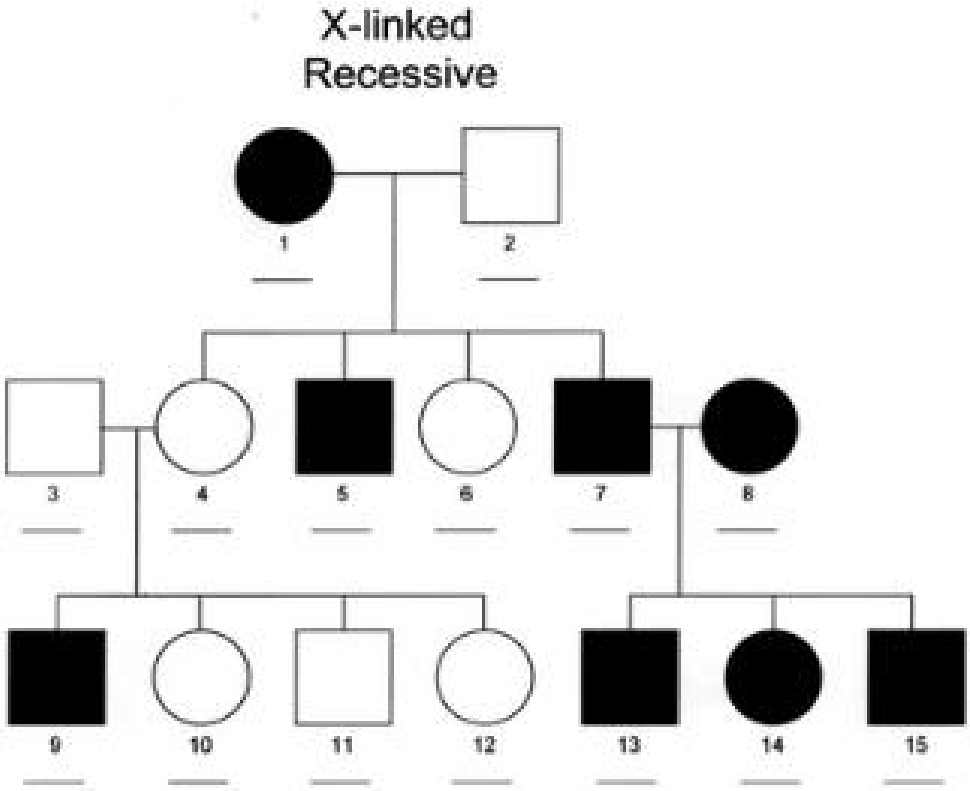
We are referring to a cloning vector which is a DNA molecule to hold genetic material that needs to be transferred.

W is for Western Blotting



A western Blot is a technique to detect and seperate proteins in a mixture

X is for X-linked

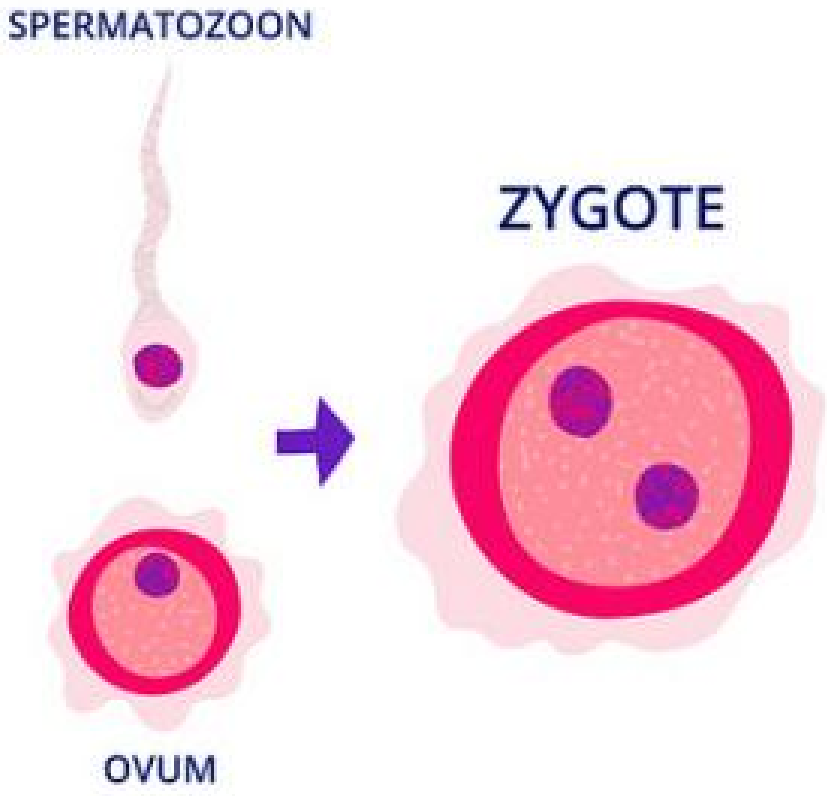


A X-linked trait is one where the X chromosome carries the gene and it follows a unique mode of inheritance

Y is for Yeast

Yeast are eukaryotic, single-celled fungi which are used a model organisms in synthetic biology research

Z is for zygote



A zygote is a resultant of fertalization between two sex cells.

BLURB

IN THIS BOOK, WE GO THROUGH THE ABCS COVERING A NEW TERM RELAVANT TO SYNTHETIC BIOLOGY. WE HOPE TO ENGAGE THE YOUNG AND BRIGHT MINDS OF CHILDREN AND GET THEM INTRESTED IN BIOLOGICAL RESEARCH AS EARLY AS POSSIBLE.

PURPOSE

"THE IGEM FOUNDATION IS AN INDEPENDENT, NON-PROFIT ORGANIZATION DEDICATED TO THE ADVANCEMENT OF SYNTHETIC BIOLOGY, EDUCATION AND COMPETITION, AND THE DEVELOPMENT OF AN OPEN COMMUNITY AND COLLABORATION. THIS IS DONE BY FOSTERING AN OPEN, COOPERATIVE COMMUNITY AND FRIENDLY COMPETITION. THE IGEM COMPETITION IS AN ANNUAL, WORLD WIDE SYNTHETIC BIOLOGY EVENT THAT GIVES STUDENTS THE OPPORTUNITY TO PUSH THE BOUNDARIES OF SYNTHETIC BIOLOGY BY TACKLING EVERYDAY ISSUES FACING THE WORLD." (HTTPS://IGEM.ORG/MAIN_PAGE)

THIS BOOK SERVES AS A WAY FOR THE CCA IGEM TEAM TO CONTRIBUTE THEIR SCIENTIFIC KNOWLEDGE TO THE REST OF THE COMMUNITY. AS A PART OF IGEM, WE WANT TO INFORM AND TEACH OUT COMMUNITY ABOUT THE FAST GROWING FIELD OF SYNTHETIC BIOLOGY.

MEET THE AUTHORS

AMOGH CHATURVEDI, A SOPHOMORE AT CANYON CREST ACADEMY PLAYS AN IMPORTANT ROLE IN THE IGEM CLUB AT CCA AS A STUDENT LEADER. AMOGH IS ALSO INVOLVED IN THE HUMAN PRACTICES AND SCIENCE COMMUNICATIONS DIVISION OF THE CLUB WHICH FOCUS ON OUTREACH AND COLLABORATION WITH THE PUBLIC. AMOGH IS INTERESTED IN TABLE TENNIS, BASS CLARINET, JIGSAW PUZZLES, YOUTUBE, AND VIDEO GAMES.