Protein Synthesis

Amino acids are chemicals that can be strung together to form different proteins. There are 20 different amino acids and the proteins they produce depend on the way they combine. Proteins make up the composition of cells. Genes found on chromosomes control the making of proteins. Enzymes control speed at which reactions take place. A different enzyme controls each step in a reaction. In a series of steps and initial reactant is changed into a final product. The products between start and finish are called intermediary metabolites.

What are translocation mutations? <http://wiki.answers.com/Q/What_are_translocation_mutations>
When a gene breaks off from it's sequence and goes to another one or "relocates"

May 23-8:35 AM

The role of DNA in protein Synthesis

ATC CCC TAC

Codons are 3 base codes for amino acids. Since there are four different nitrogen bases, there are 64 different combinations of codons. UGG is the codon that codes for the amino acids tryptophan. Messenger ribonucleic acid (mRNA) reads the code from the DNA in the nucleus and transfers the message to the ribosome where construction of the protein will take place. There are two main differences between DNA and RNA. In DNA, the sugar is deoxyribose, whereas in RNA, the sugar is ribose. RNA uses the nitrogen base uracil, not thymine. Some of the codes found in the RNA are thought to be initiator and terminator codons that start and stop protein synthesis.

Insertion (illustration <http://ghr.nlm.nih.gov/handbook/illustrations/mutationtypes?show=insertion>)
An insertion changes the number of DNA bases in a gene by adding a piece of DNA. As a result, the protein made by the gene may not function properly.
Deletion (illustration <http://ghr.nlm.nih.gov/handbook/illustrations/mutationtypes?show=deletion>)
A deletion changes the number of DNA bases by removing a piece of DNA. Small deletions may remove one or a few base pairs within a gene, while larger deletions can remove an entire gene or several neighboring genes. The deleted DNA may alter the function of the resulting protein(s).
Duplication (illustration <http://ghr.nlm.nih.gov/handbook/illustrations/mutationtypes?show=duplication>)
A duplication consists of a piece of DNA that is abnormally copied one or more times. This type of mutation may alter the function of the resulting protein.

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Jan 9-3:15 PM

The role of DNA in protein Synthesis

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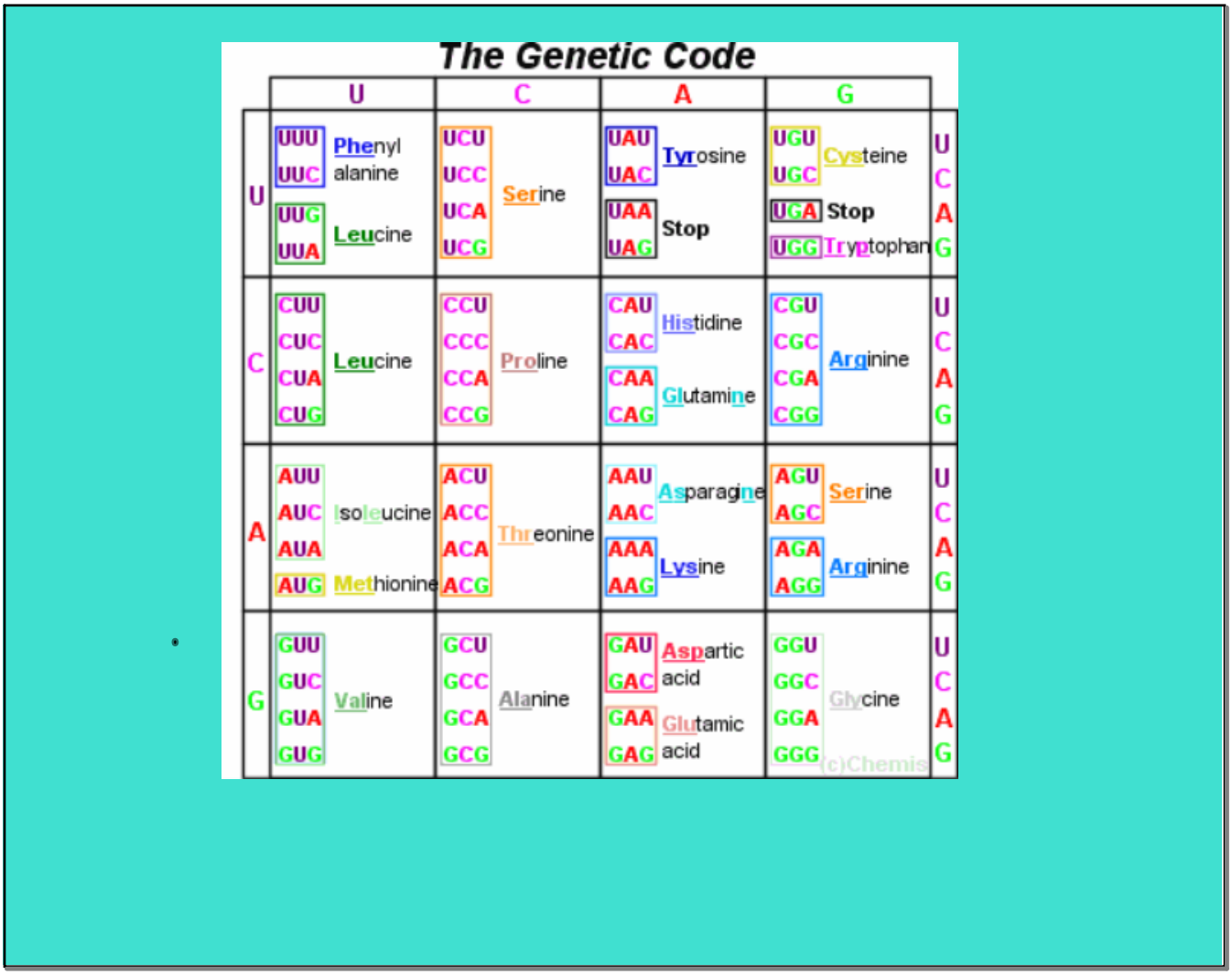
Jan 12-1:01 PM

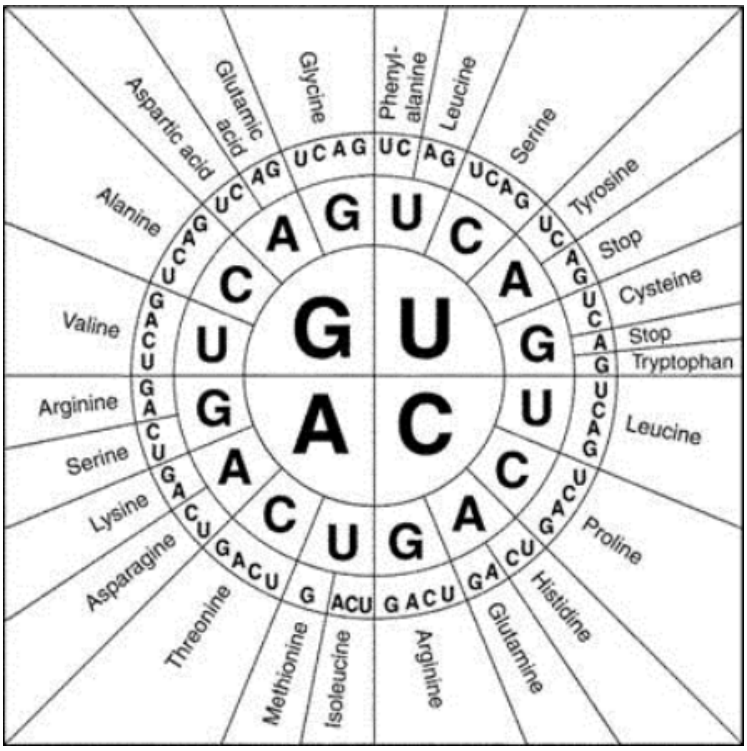
Pg 299-305

Protein Synthesis: Transcription

Transcription is the transfer of the genetic code from the DNA in the nucleus to the mRNA. The DNA molecule unzips and the mRNA finds complementary base pairs. DNA adenine pairs with mRNA uracil and DNA cytosine pairs with the mRNA guanine. These nucleotides are fused together and form a long chain and then move out of the nucleus to the ribosome. The original strands of DNA rejoin.

Another Look


The Genetic Code
U
C
A
G
UUU Phenyl alanine
UUC
UUG Leucine
UUA
UCU Serine
UCC
UCA
UCG
UAU Tyrosine
UAC
UAA Stop
UAG
UGU Cysteine
UGC
UGA Stop
UGG Tryptophan
CUU Leucine
CUC
CUA
CUG
CCU Proline
CCC
CCA
CCG
CAU Histidine
CAC
CAA Glutamine
CAG
CGU Arginine
CGC
CGA
CGG
AUU Isoleucine
AUC
AUA
AUG Methionine
ACU Threonine
ACC
ACA
ACG
AAU Asparagine
AAC
AAA Lysine
AAG
AGU Serine
AGC
AGA Arginine
AGG
GUU Valine
GUC
GUA
GUG
GCU Alanine
GCC
GCA
GCG
GAU Aspartic acid
GAC
GAA Glutamic acid
GAG
GGU Glycine
GGC
GGA
GGG
(c)Chemis


Glycine
Glutamic acid
Aspartic acid
Phenyl-alanine
Leucine
Serine
Tyrosine
Stop
Cysteine
Stop
Tryptophan
Leucine
Proline
Histidine
Glutamine
Arginine
Isoleucine
Methionine
Threonine
Asparagine
Lysine
Serine
Arginine
Valine
Alanine
U C A G
G U C A
A C U G
C A G U

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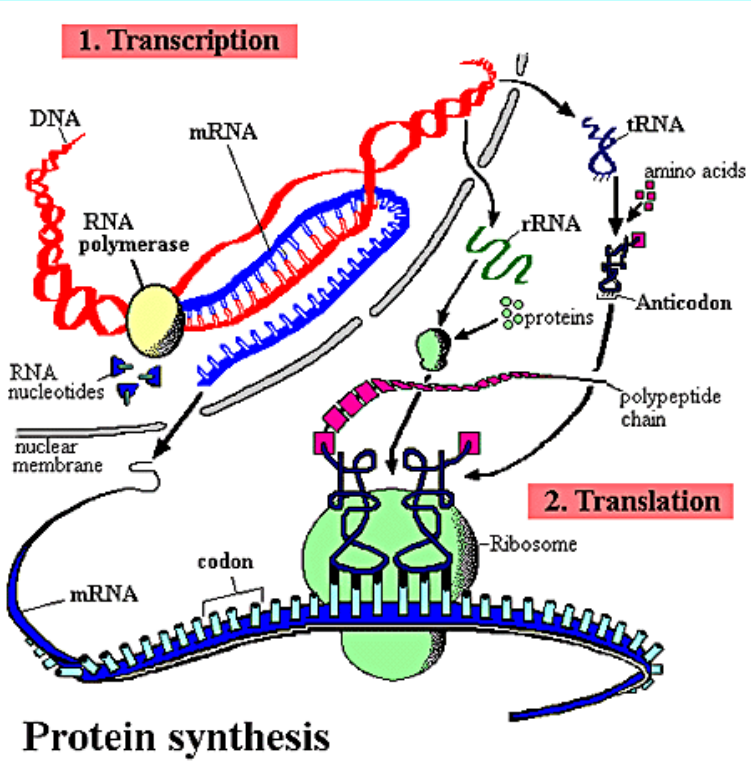
Translation

The mRNA has delivered the blueprint from the DNA to the ribosome and it waits here for the transfer RNA (tRNA). The tRNA molecules carry amino acids to the ribosomes for protein synthesis. The tRNA molecule places the appropriate amino acids along the mRNA. Remember that the nitrogen bases will govern which amino acids will fit the mRNA. In other words, the mRNA determines the sequencing of the amino acids. The mRNA codons are read by the anticodons of the tRNA.

Protein Synthesis Link



Feb 15-1:14 PM

DNA and Mutations

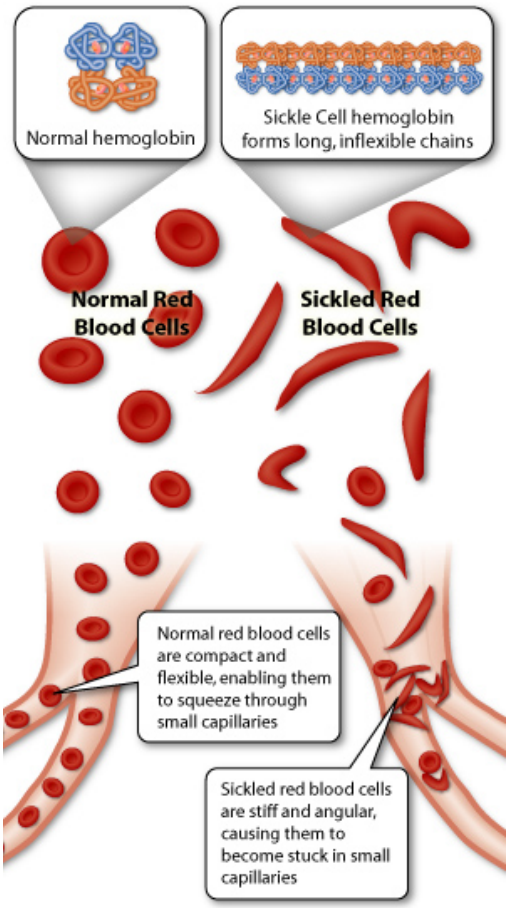
Mutations arise when mistakes in DNA replication occur. Anything that causes an alteration of DNA is referred to as mutagenic agent. X-rays, radiation and hazardous chemicals are mutagenic agents. These may cause a change in the sequencing of the nucleotides, which result in the formation of new proteins. These new proteins have different chemical structures and cannot carry out the normal function.

May 30 - 10:29 AM

Errors sometimes arise when there is a shortage of nitrogen bases. An incorrect base is used and changes the genetic code. Hydroxalmine is a chemical that alters the shape of the Cytosine molecule causing it to bind with thymine.

May 30 - 10:35 AM

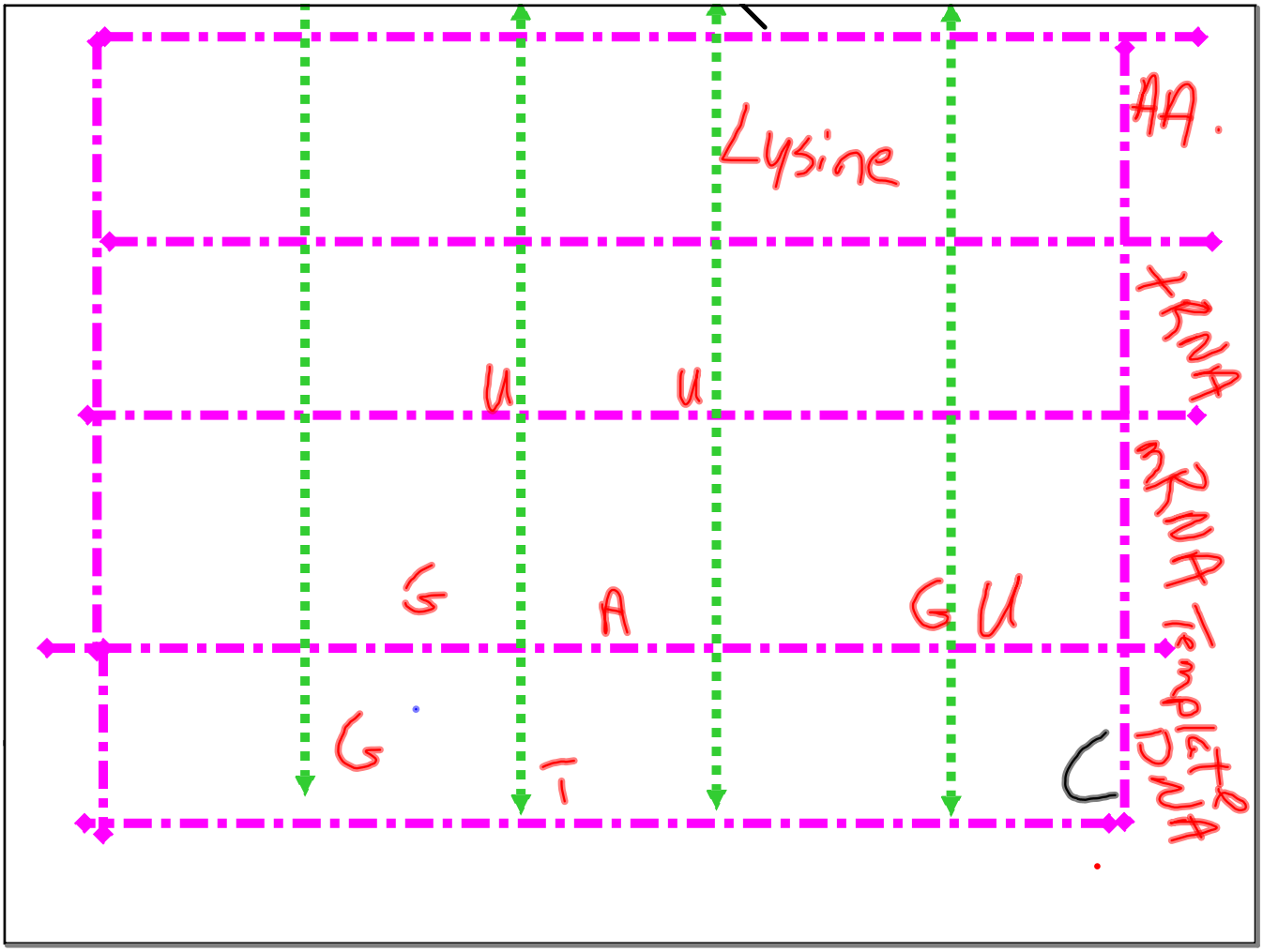
Mutagenic agents may also cause the DNA molecule to break apart and it may not reassemble correctly. Once there is a mutation in a cell, each time the cell reproduces the mutation is passed on. Sickle-cell anemia is a genetic disorder caused by an error in the DNA. The alteration of one nitrogen base changes the protein and the red blood cells cannot carry adequate amounts of oxygen. The cells develop a sickle shape, and clog arteries, damaging tissues.



Oncogenes: Gene Regulations and Cancer

Cancer is uncontrolled cell growth. Evidence suggests that cancer results from 1) changes in the genetic code caused by nitrogen base substitution or movement of genetic material from one part of a chromosome to another, 2) mutagens such as X-rays induce cancer. Oncogenes are cancer causing genes. They can be found in normal DNA and it is thought that if they move to another part of the chromosome they may become active and cause cancer

The most common oncogene, ras, is found in 50% of colon patients and 30% of lung cancer patients. It makes a protein that acts as an on switch for cell division. When sufficient numbers of cells have been produced, the gene should be turned off. The oncogene produces a protein that blocks the off switch and cells continue to divide. The theory states: regulatory and structural genes become separated after mutation.


Lysine
AA.
tRNA
mRNA
template DNA
U
U
G
A
G U
G
T
C

Structural genes direct protein building in specific cells. Genes in immature red blood cells cause proteins to form hemoglobin while genes in skin cells cause the protein keratin to be produced. How are the required proteins turned off and on? It is thought that regulator genes act like a switch turning off segments of the DNA molecule. It is thought that cancer genes leave the switch regulating cell division turned on.

Old paper

Nov 28-11:26 AM

--The DNA sequence of a gene can be altered in a number of ways. Gene mutations have varying effects on health, depending on where they occur and whether they alter the function of essential proteins. The types of mutations include:

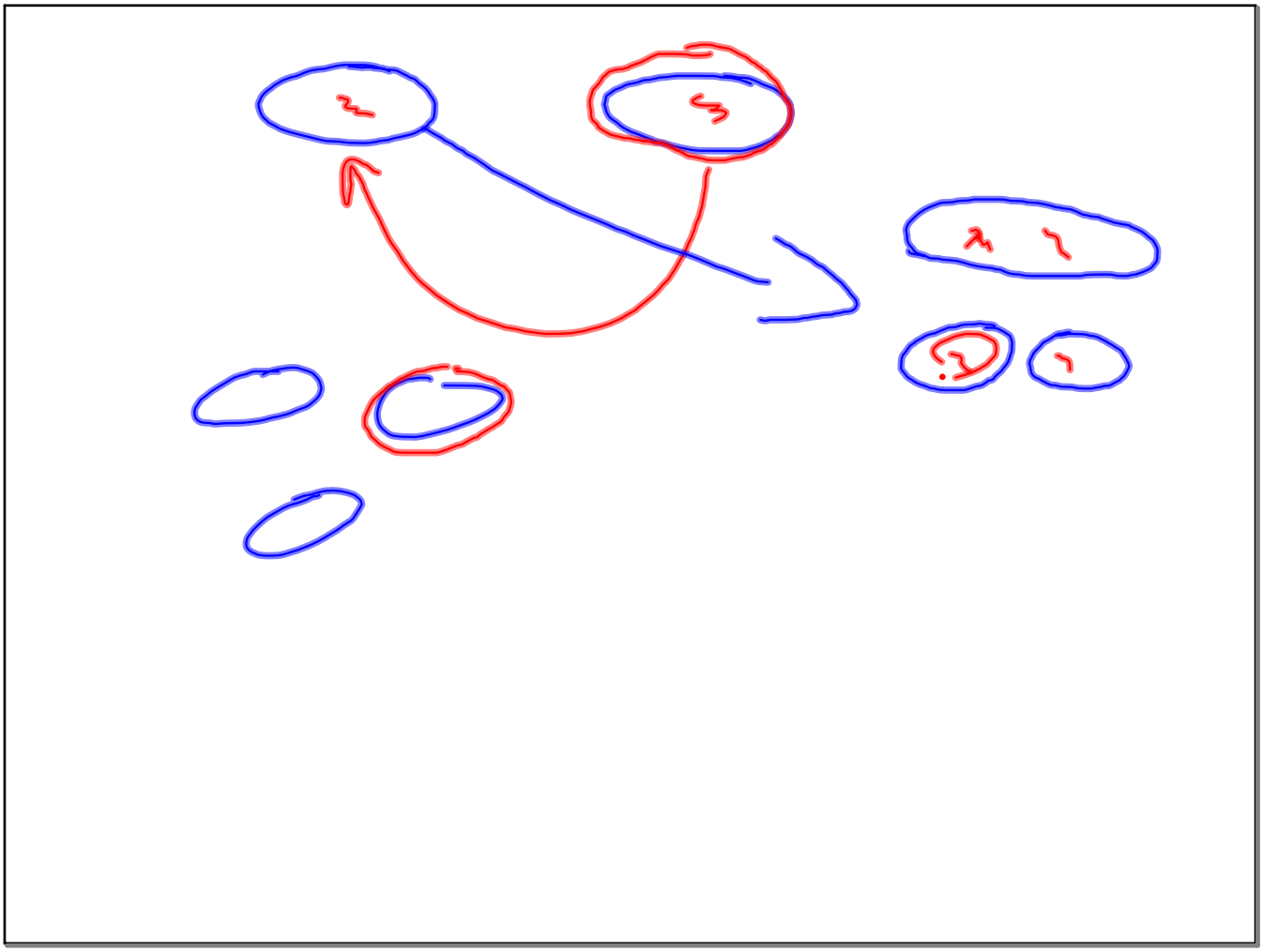
Point mutation-This type of mutation is a change in one DNA base pair that results in the substitution of one amino acid for another in the protein made by a gene.

Inversion-a piece of the DNA is inverted and no longer functions properly

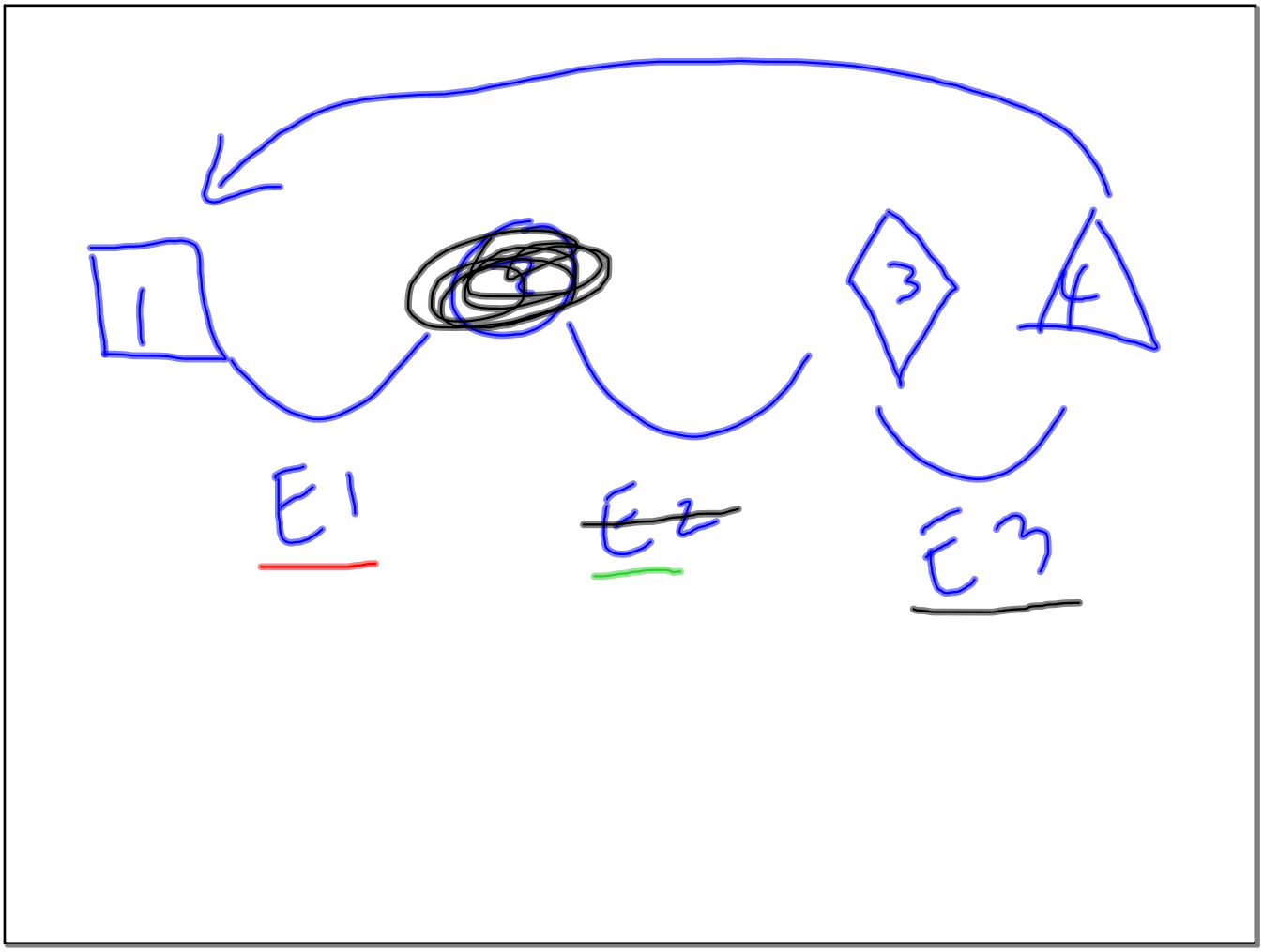
Insertion-a piece of DNA is add to the DNA and alters its abilities to perform function

Deletion- piece of DNA is lost

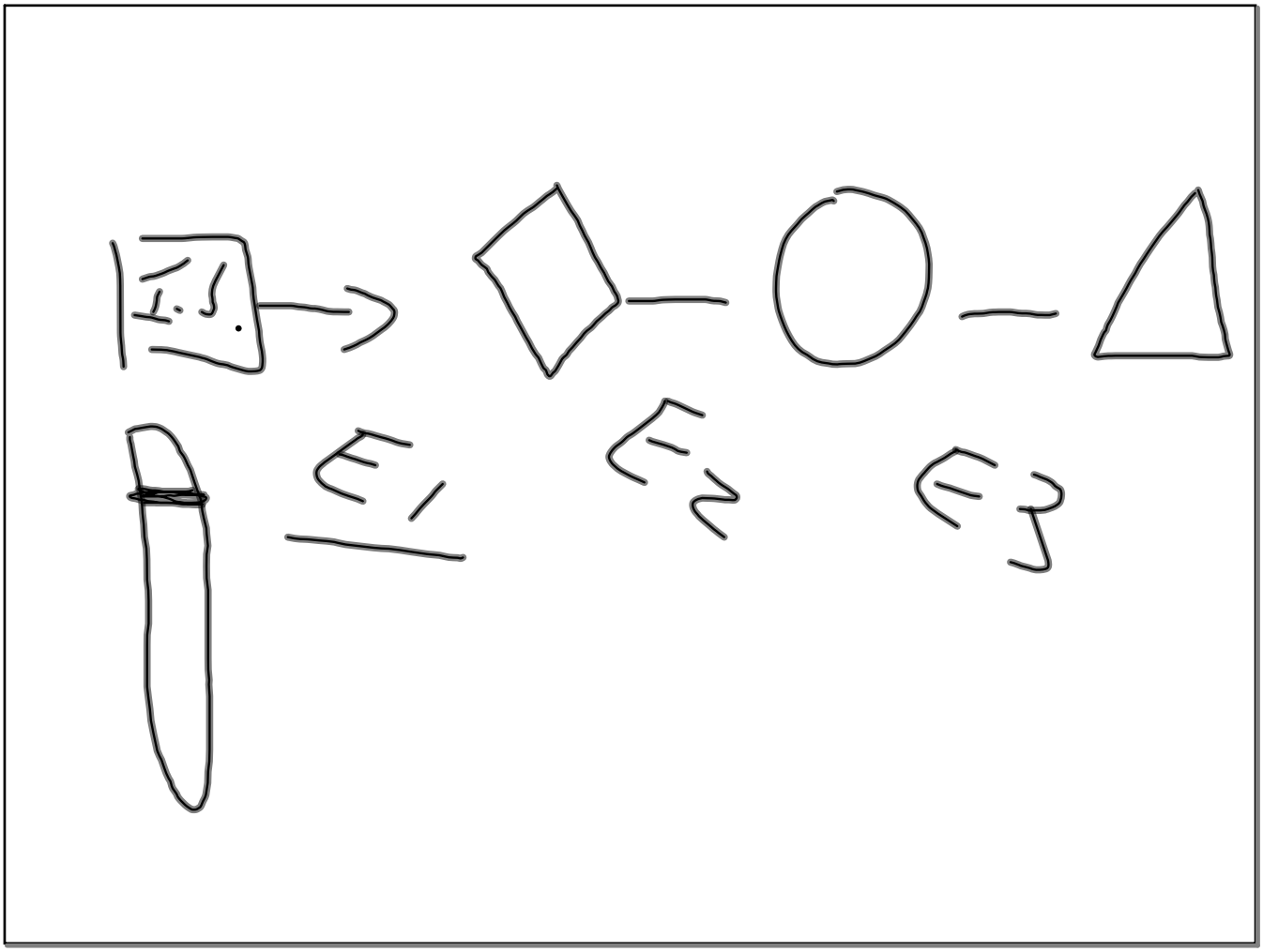
Do not confuse genetic mutations with chromosomal mutations. Chromosomal mutations involve the acquisition of parts or the whole of another chromosome.



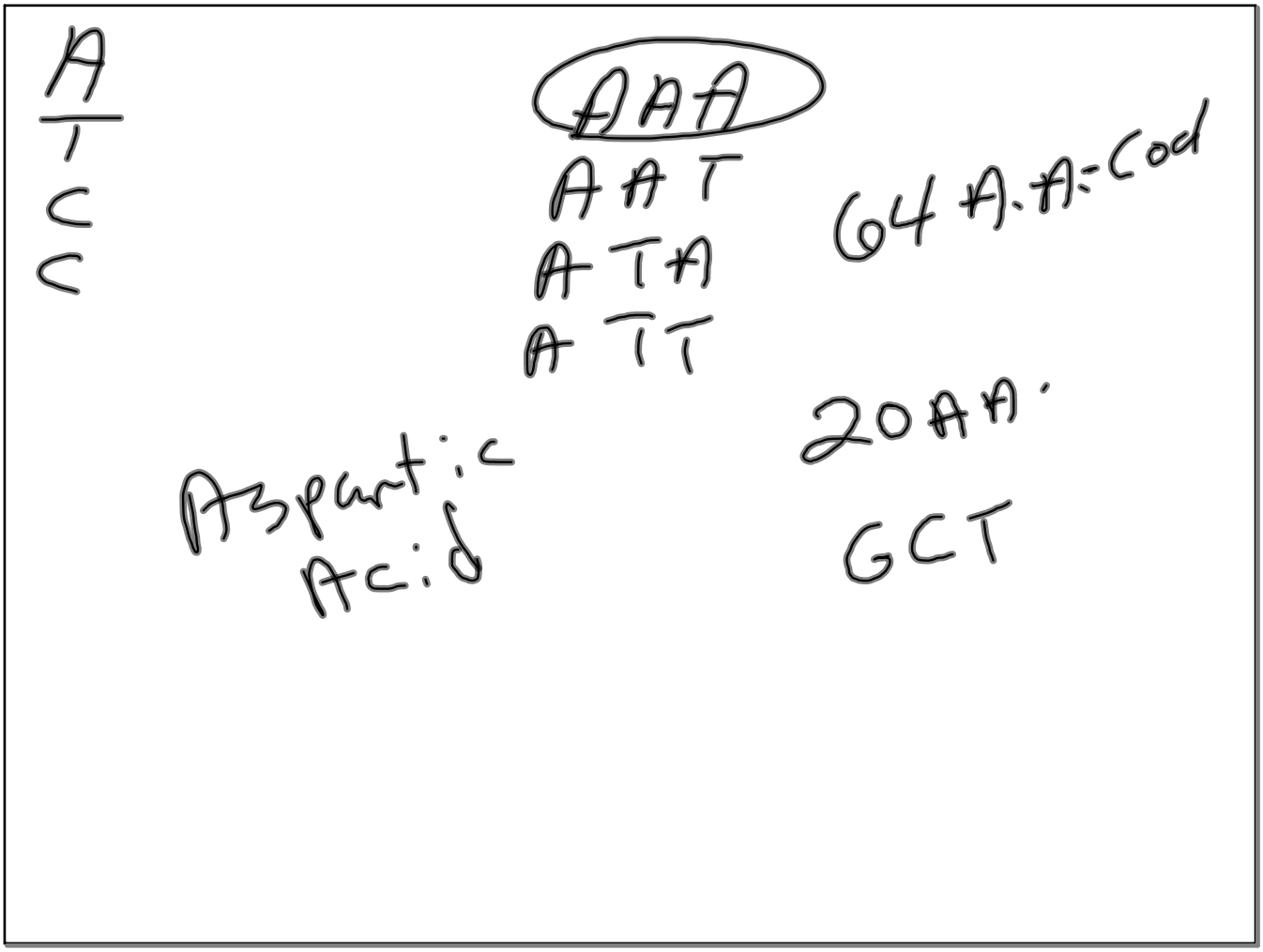
Jan 14-12:41 PM



Jan 14-10:11 AM



Jan 12-12:58 PM


A
T
C
C
AAA
AAT
ATA
ATT
64 A.A: Cod
20 AA.
GCT
Aspartic Acid

Codons

AAA

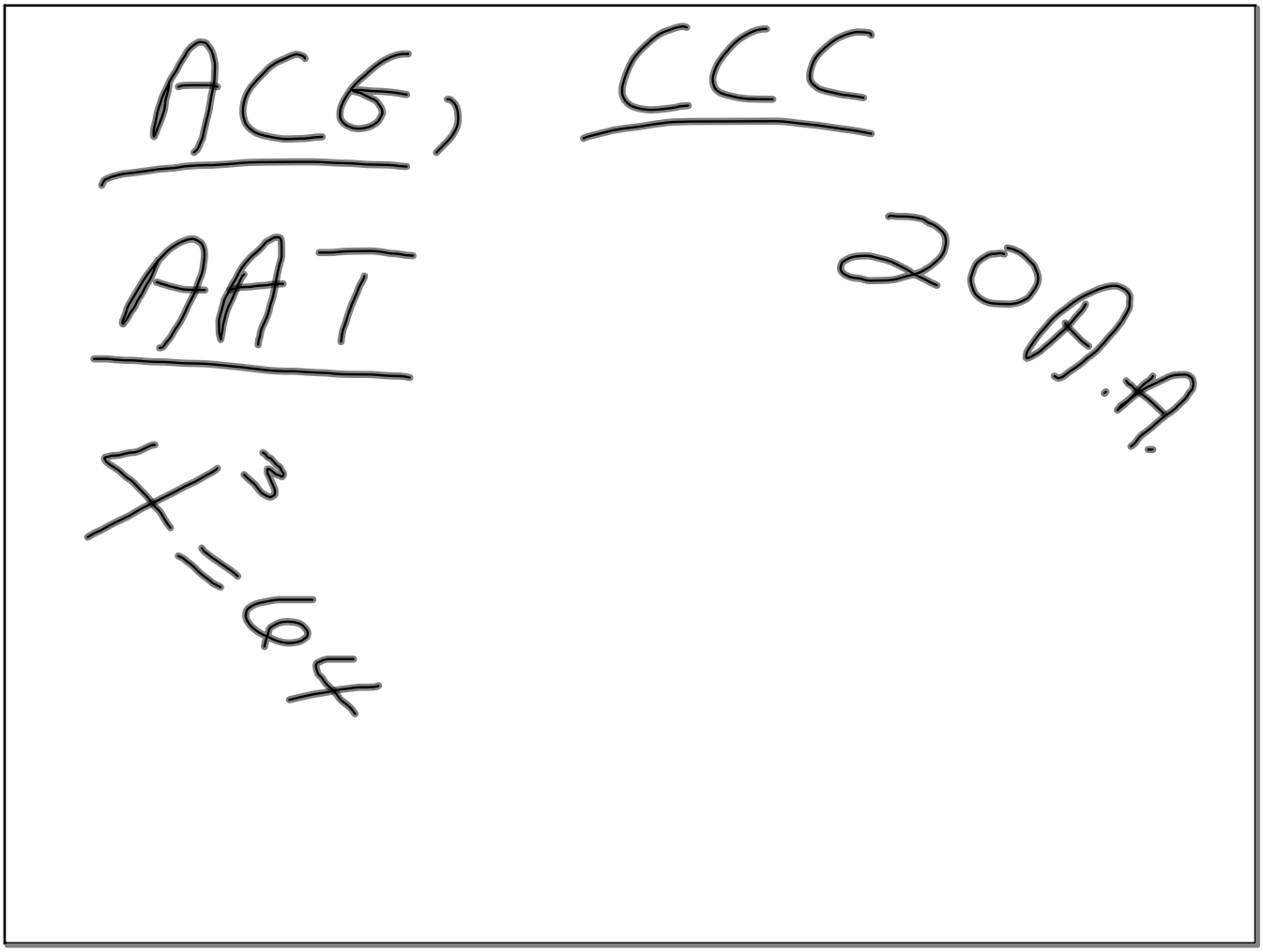
ACG

Thymine

↓

uracil

Jan 14-1:33 PM

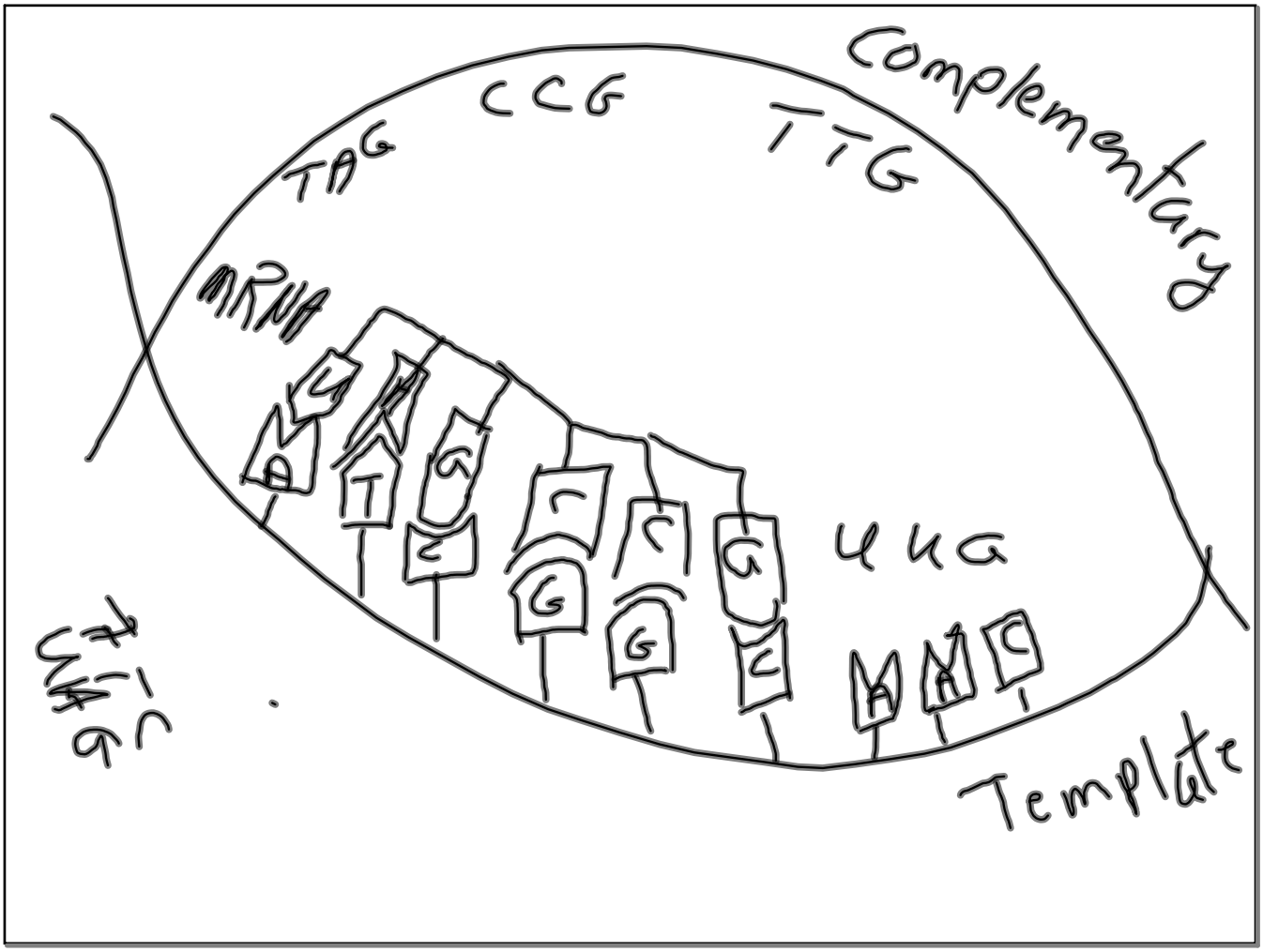


Jan 14-10:19 AM

AAA AUCG
AAC

64 combinations - codons

Lysine 20 A.A.



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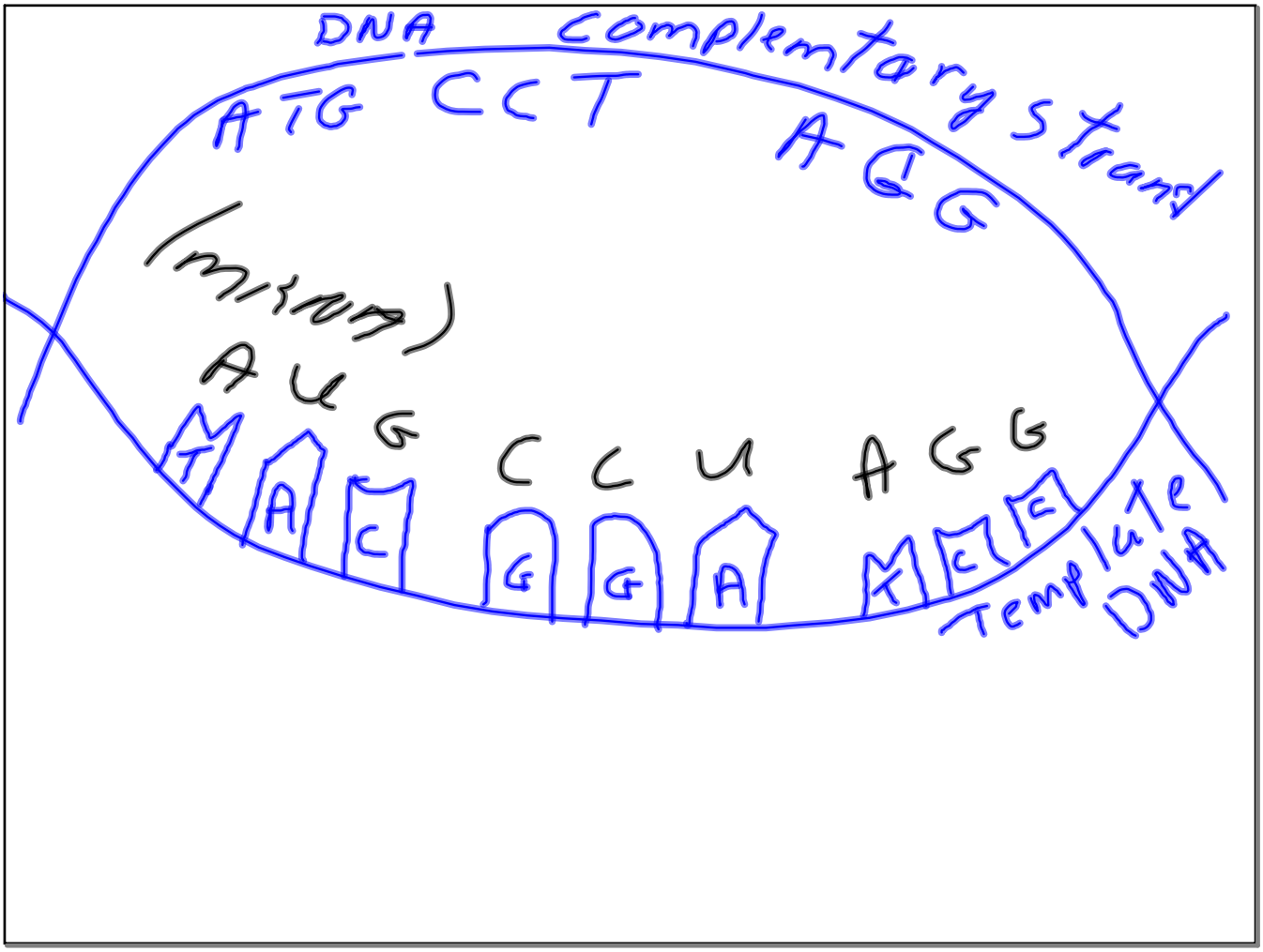
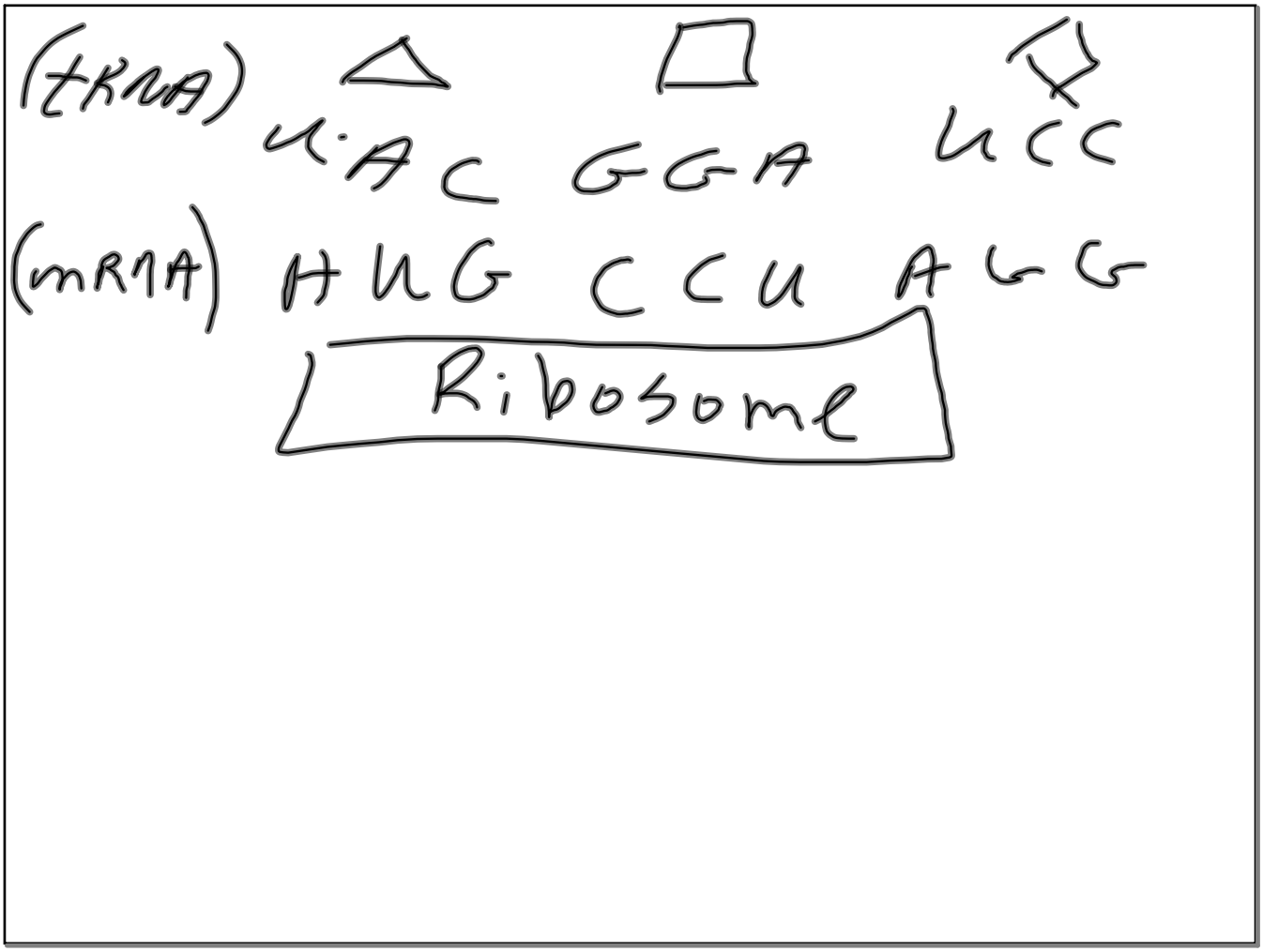
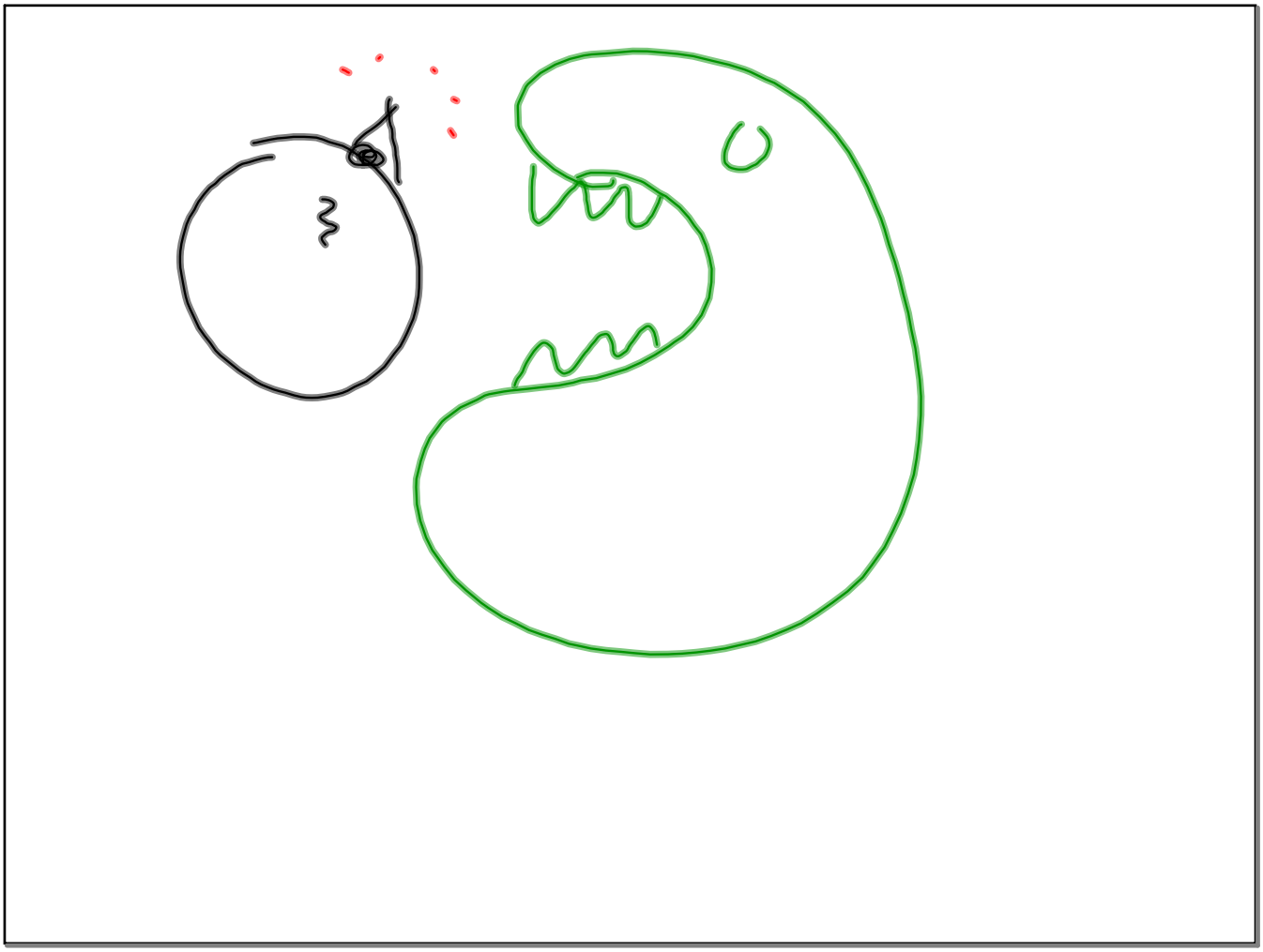

DNA complementary strand
ATG CCT AGG
(mRNA)
A U G C C U A G G
T A C G G A T C C
Template DNA

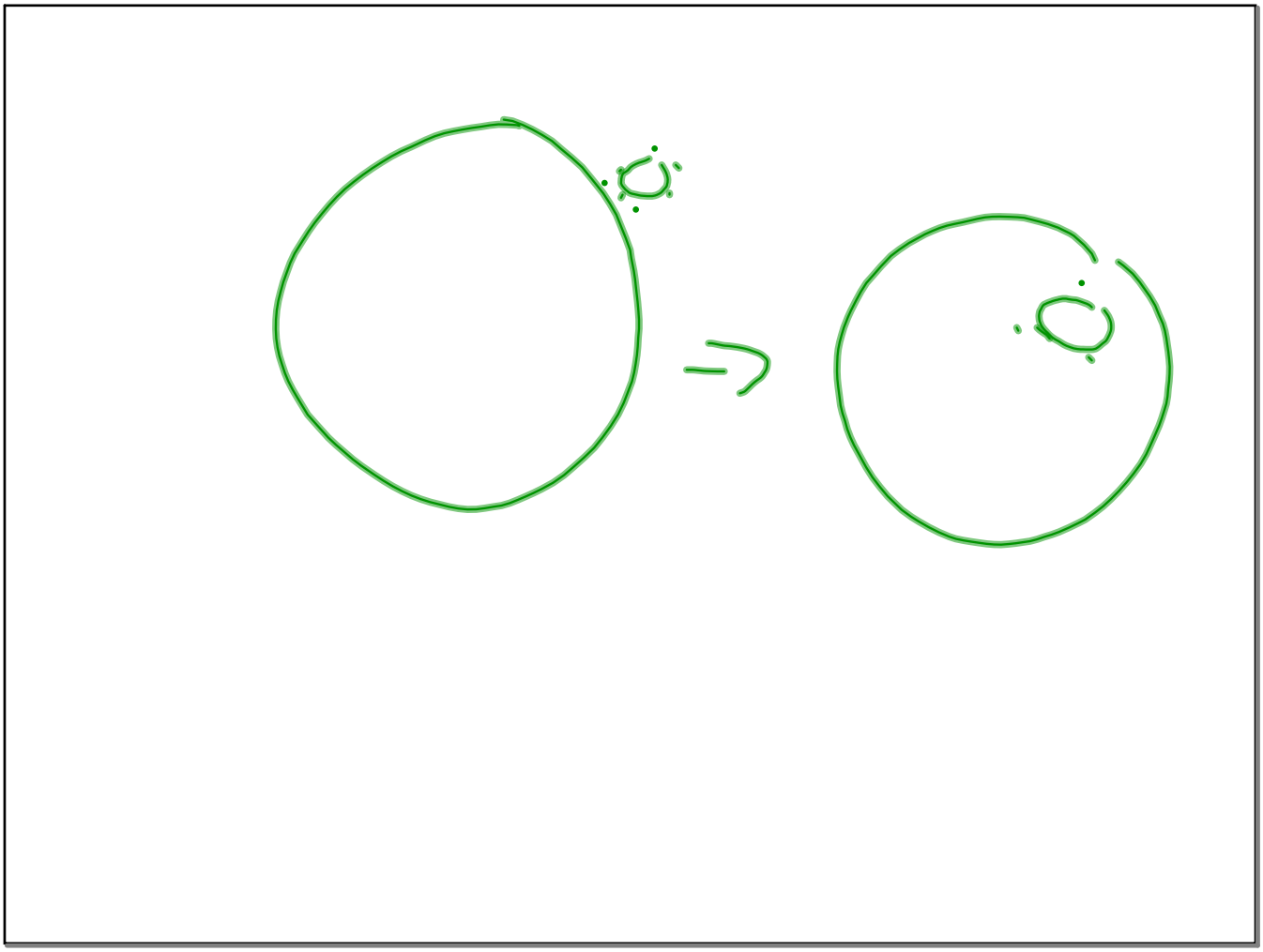
May 17-8:42 AM



May 17-8:58 AM



Jan 18-9:03 AM



Jan 18-9:03 AM

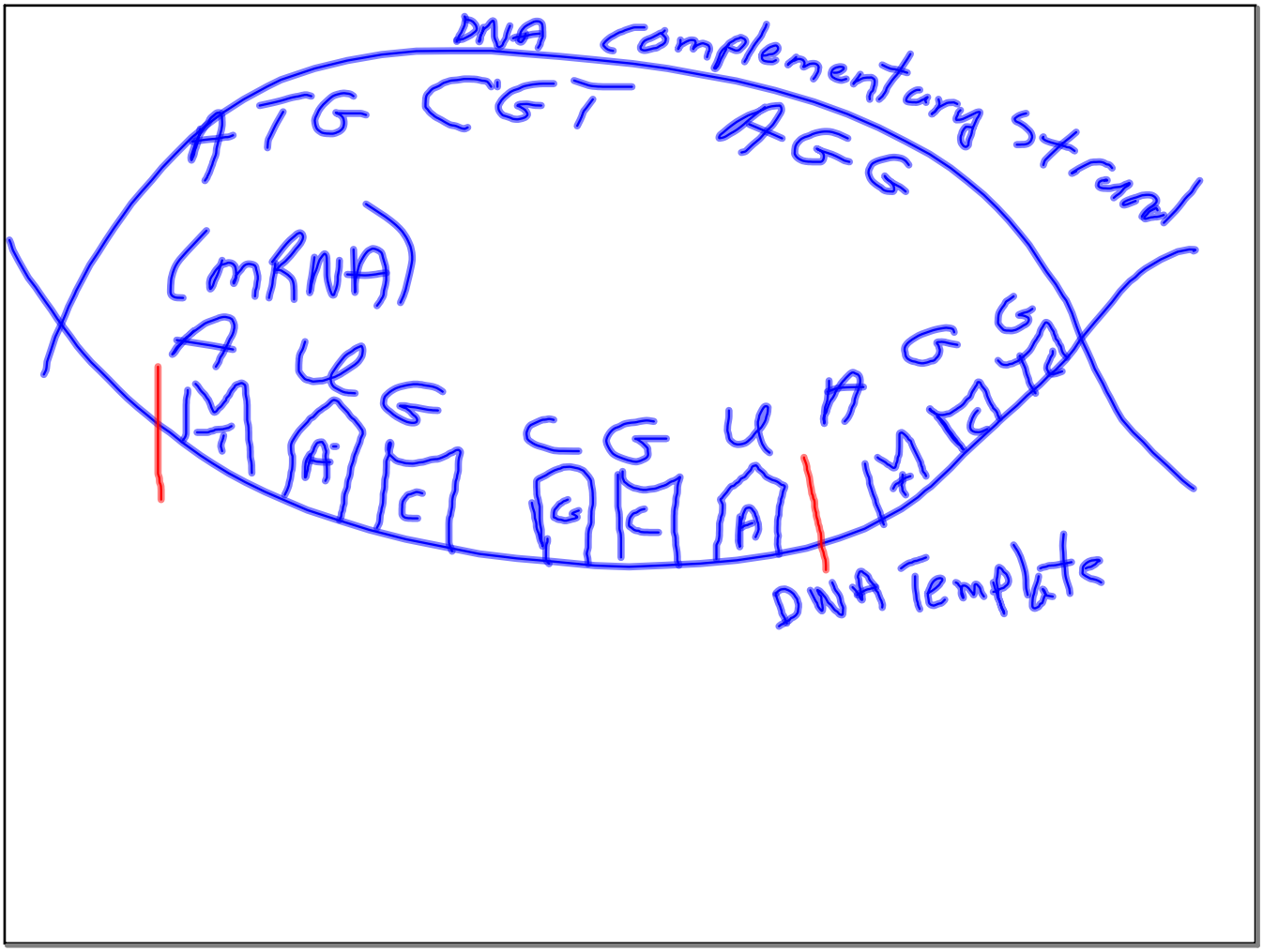
Malaria

$Hb^A\ Hb^A$

$Hb^A\ Hb^S$

$Hb^S\ Hb^S$

Jan 18-9:11 AM



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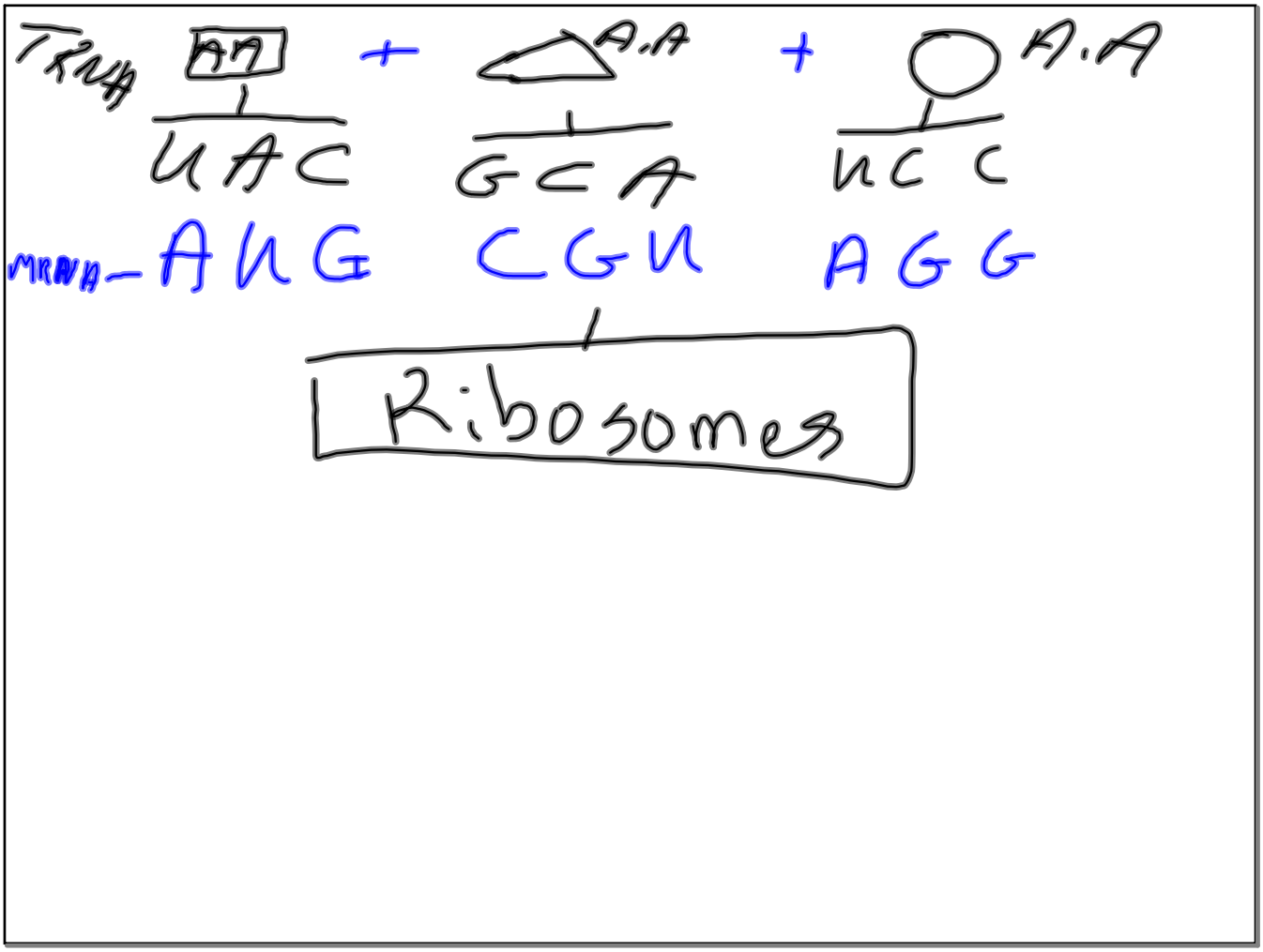
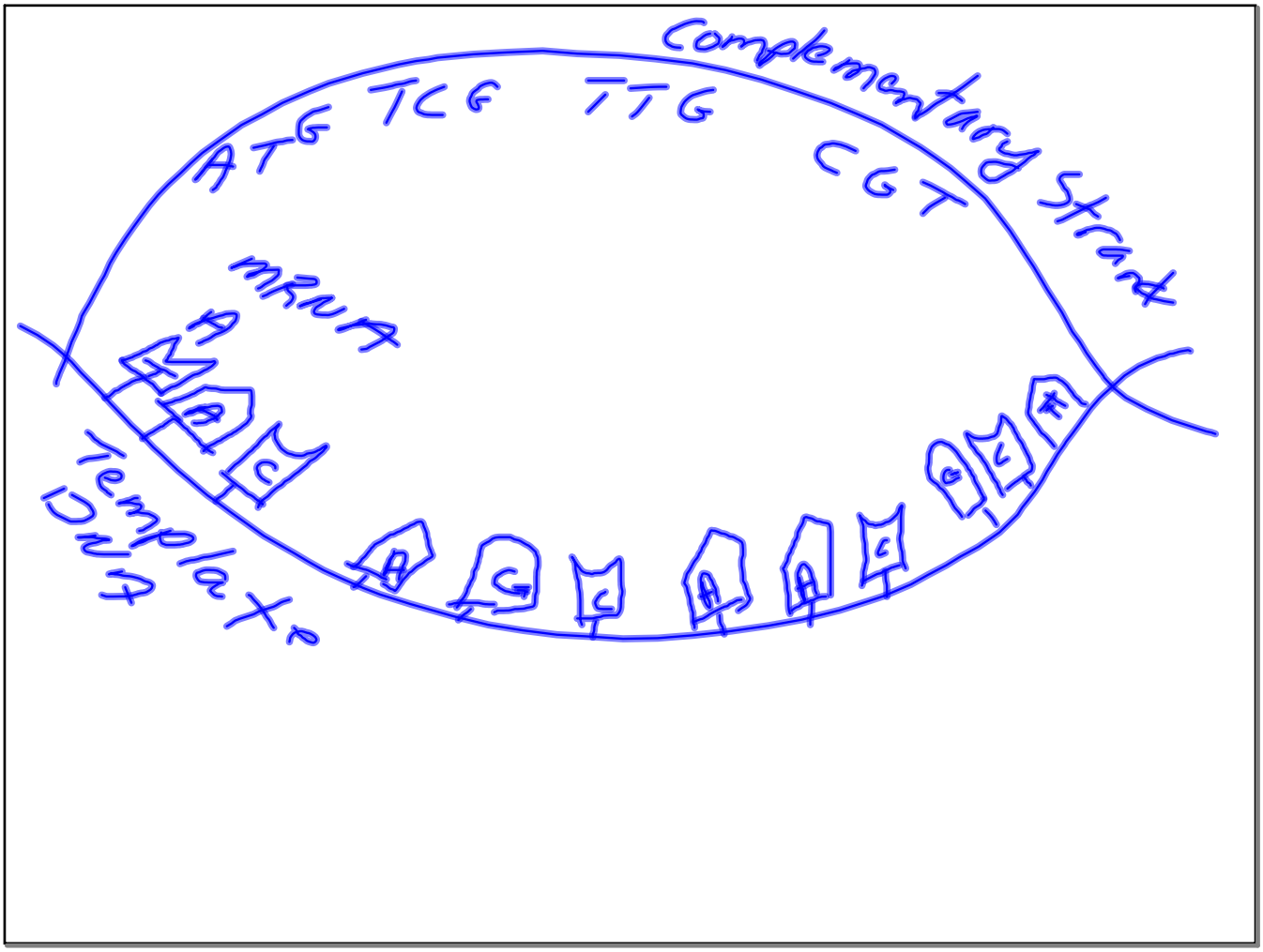
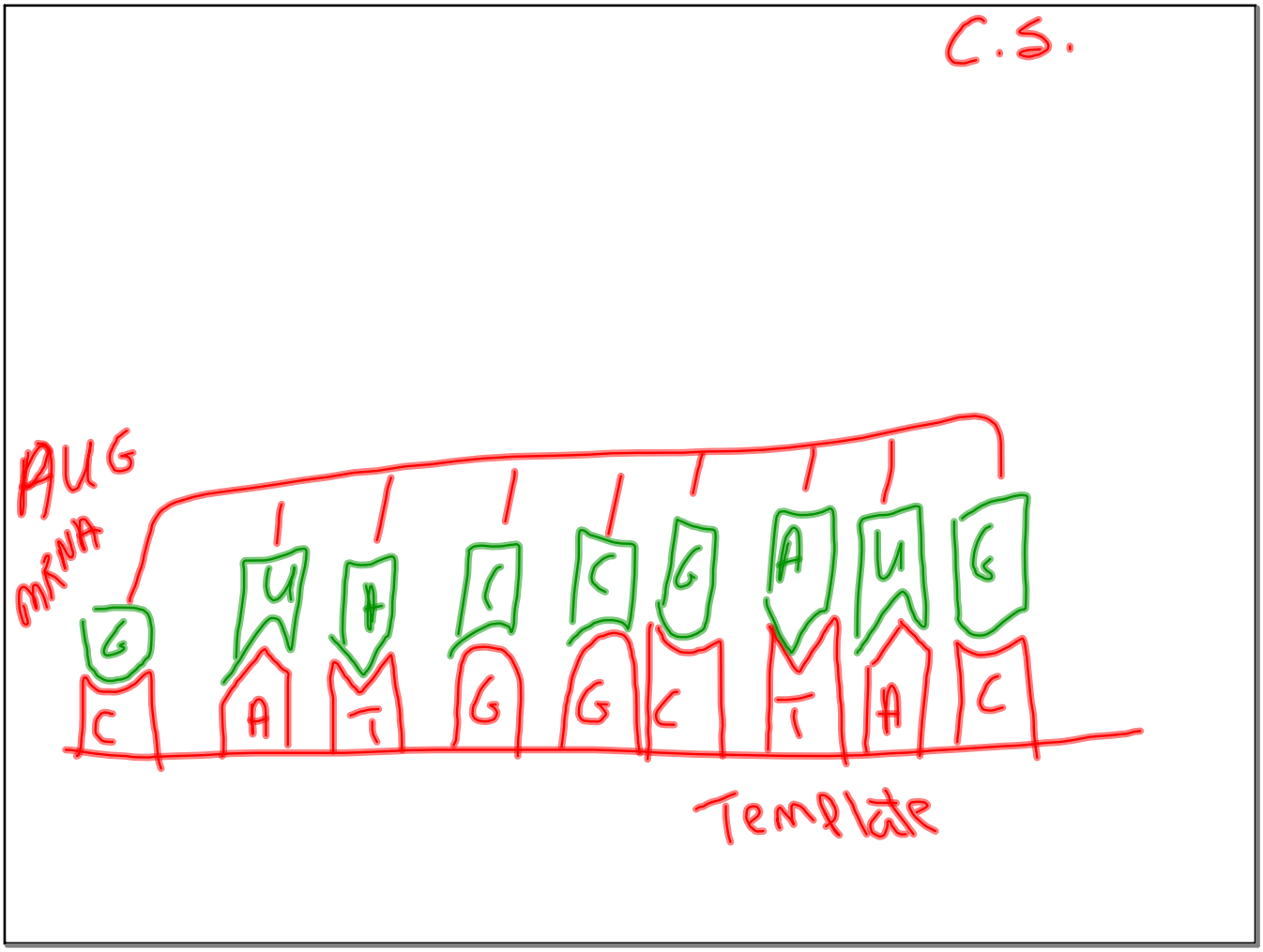

tRNA
AA
A.A
A.A
UAC
GCA
UCC
mRNA – AUG CGU AGG
Ribosomes

A - T
C - G } DNA

C - G
A - U } uracil → RNA



May 18-9:17 AM

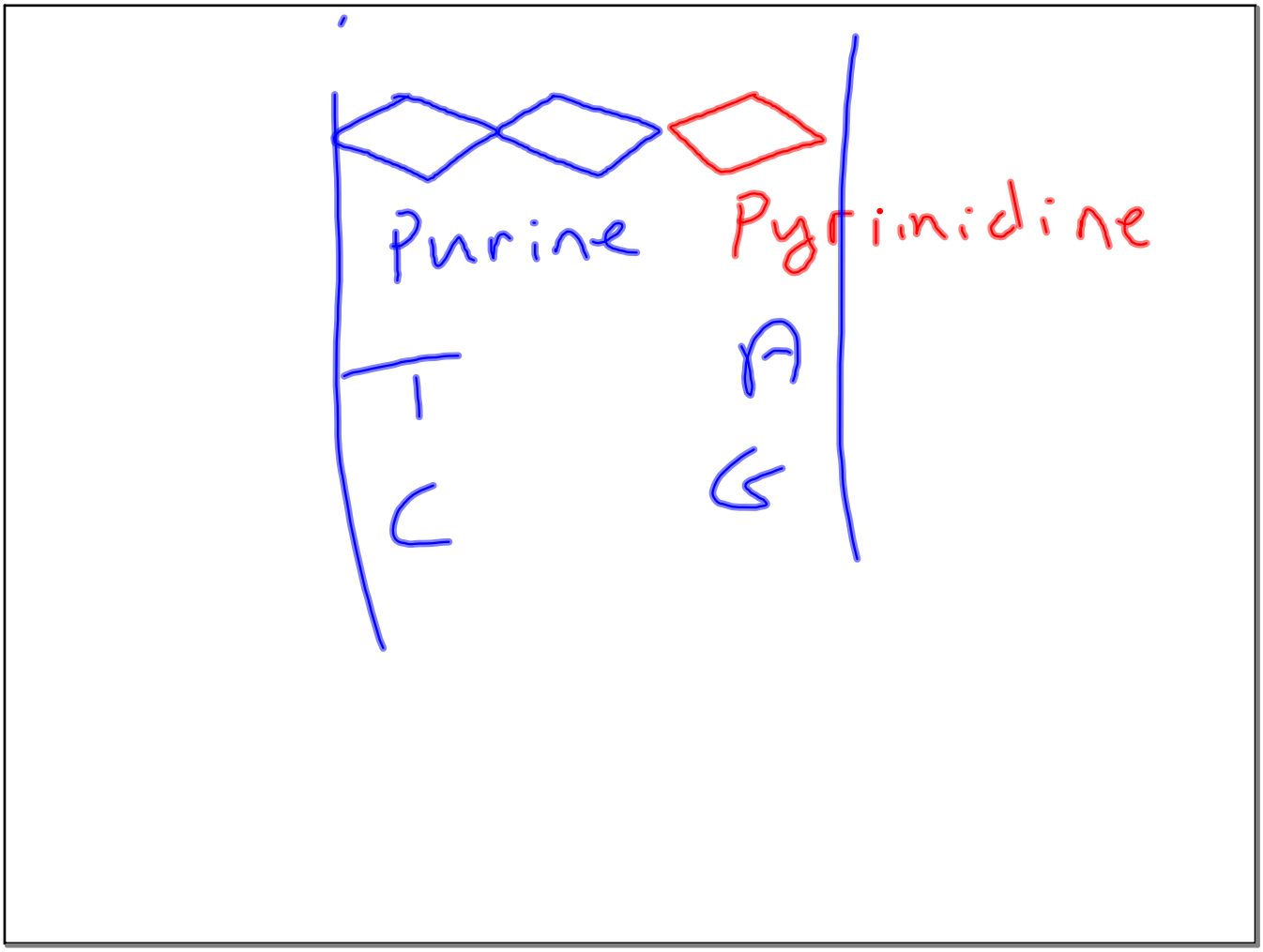


Nov 28-2:37 PM

AUG
TAC

Nov 28-2:44 PM


AA
G G C
A A
U A C
C A A
A U G G U A C E G U U G
mRNA



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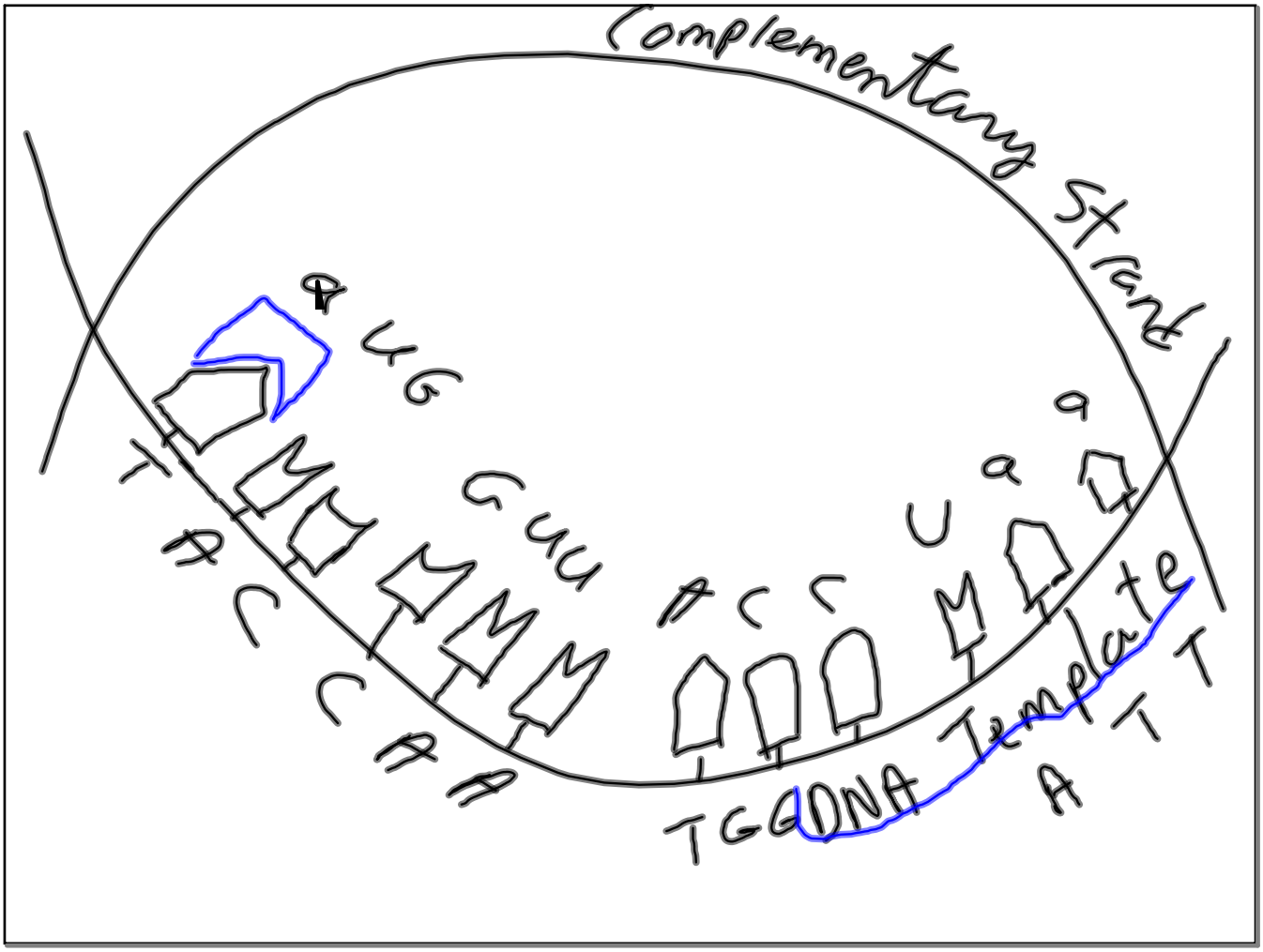
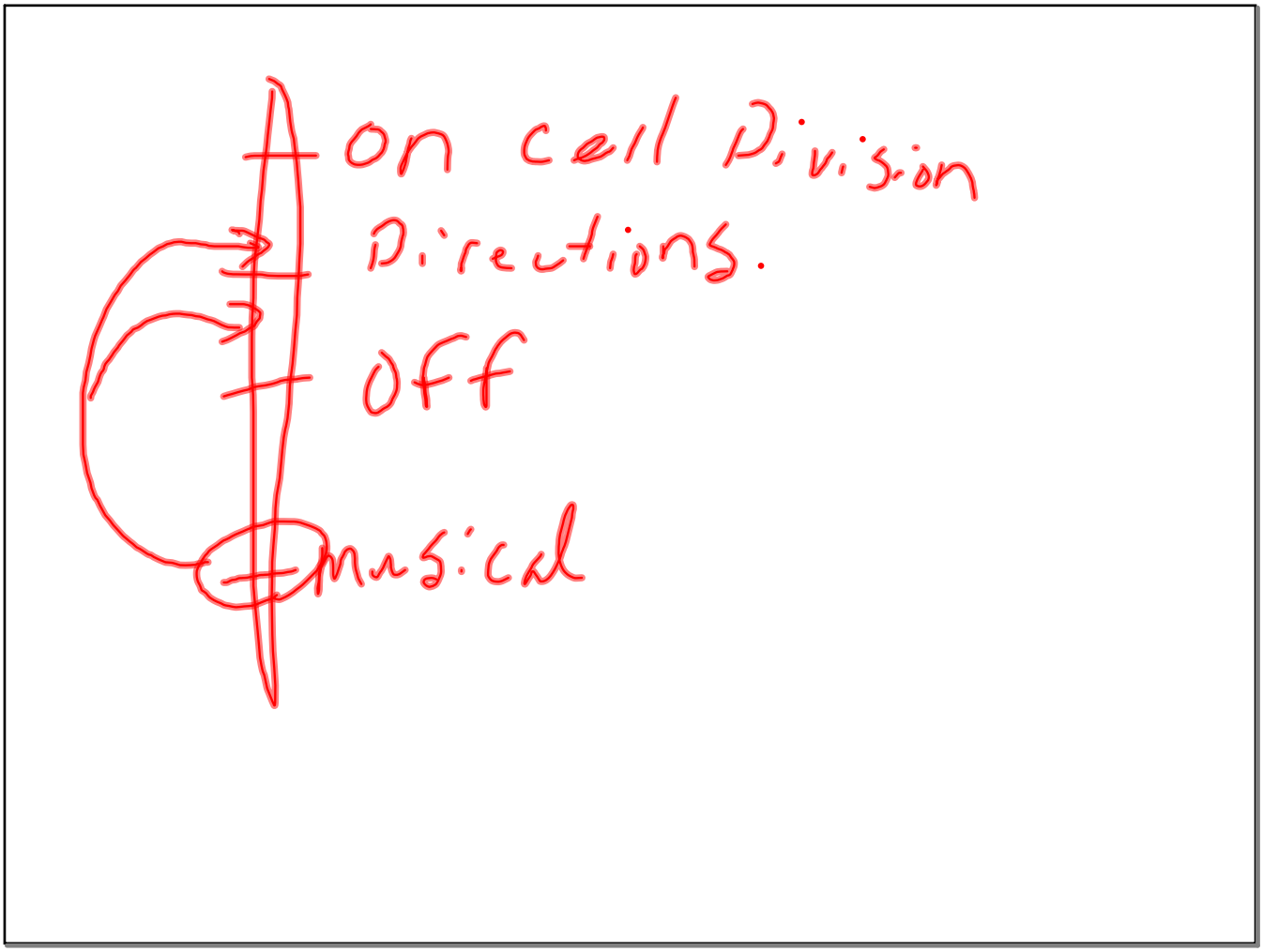


Jan 14-1:06 PM



May 4-1:50 PM