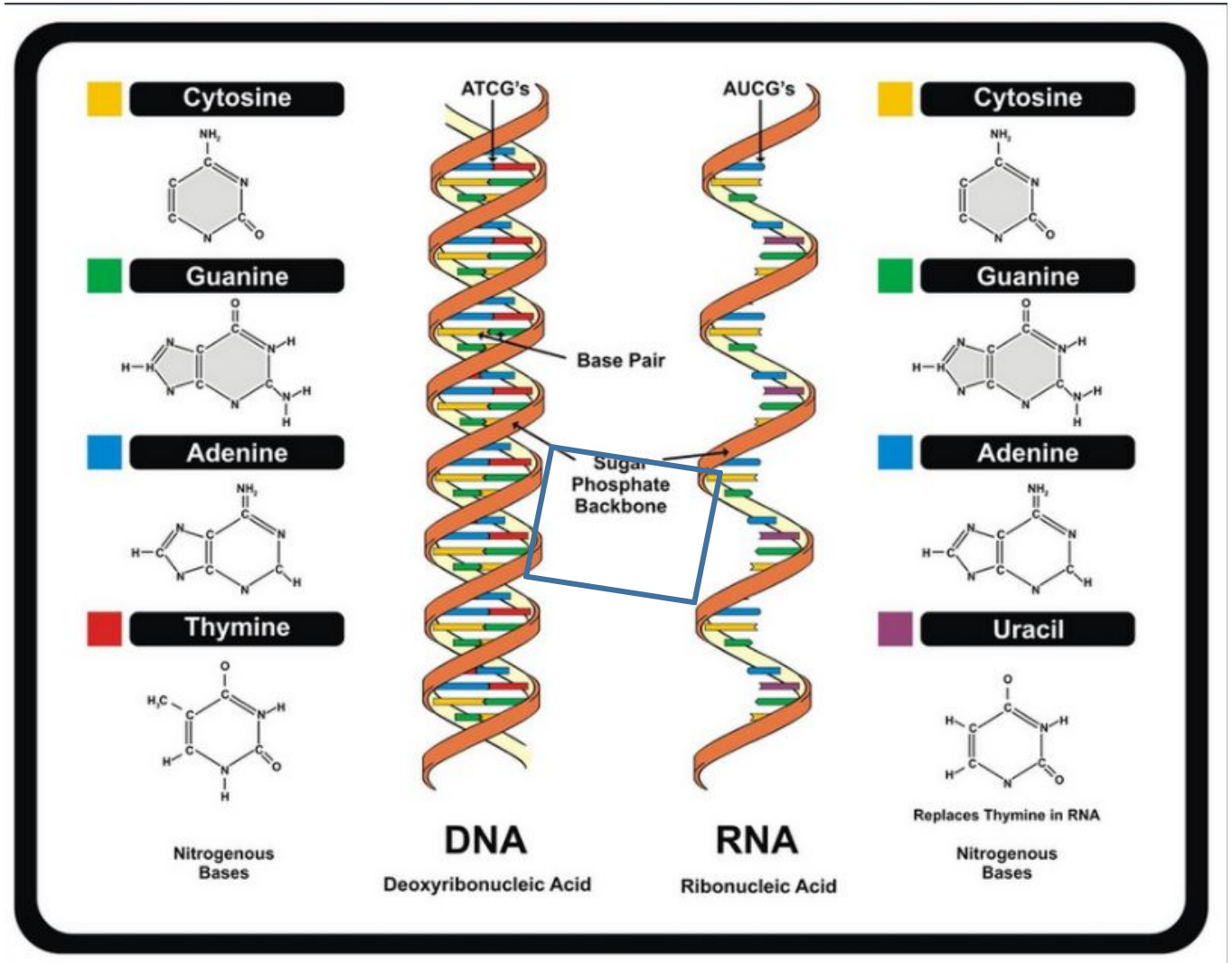
Structure of DNA/ RNA

1. Double helix
2. Consists of 4 base pairs

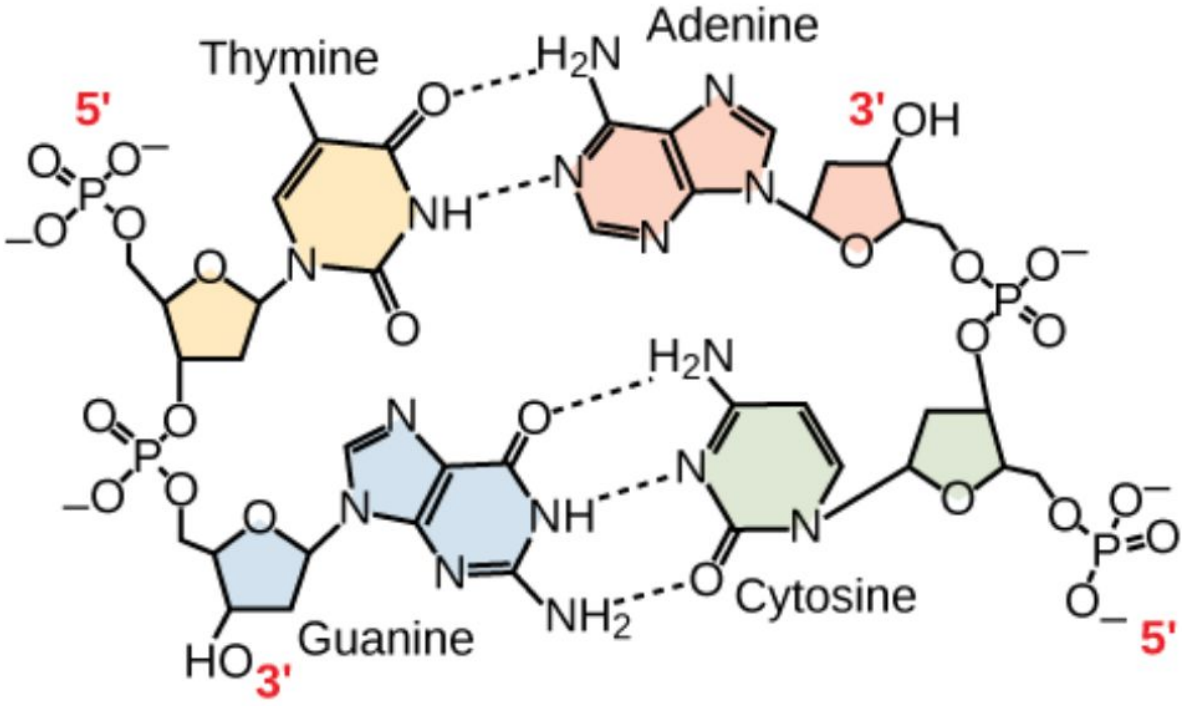
Sugar- Phosphate backbone

Colored blocks are the bases.
There are 2 strands of the backbone that runs in opposite direction
The bases on the 2 strands base pair



The rules pertaining to the basic DNA structure

- There are 4 bases- Adenine [A], Guanine[G], Thymine [T], Cytosine [C].
- A pairs with T [2 H-bonds]
- G pairs with C [3 H-bonds]



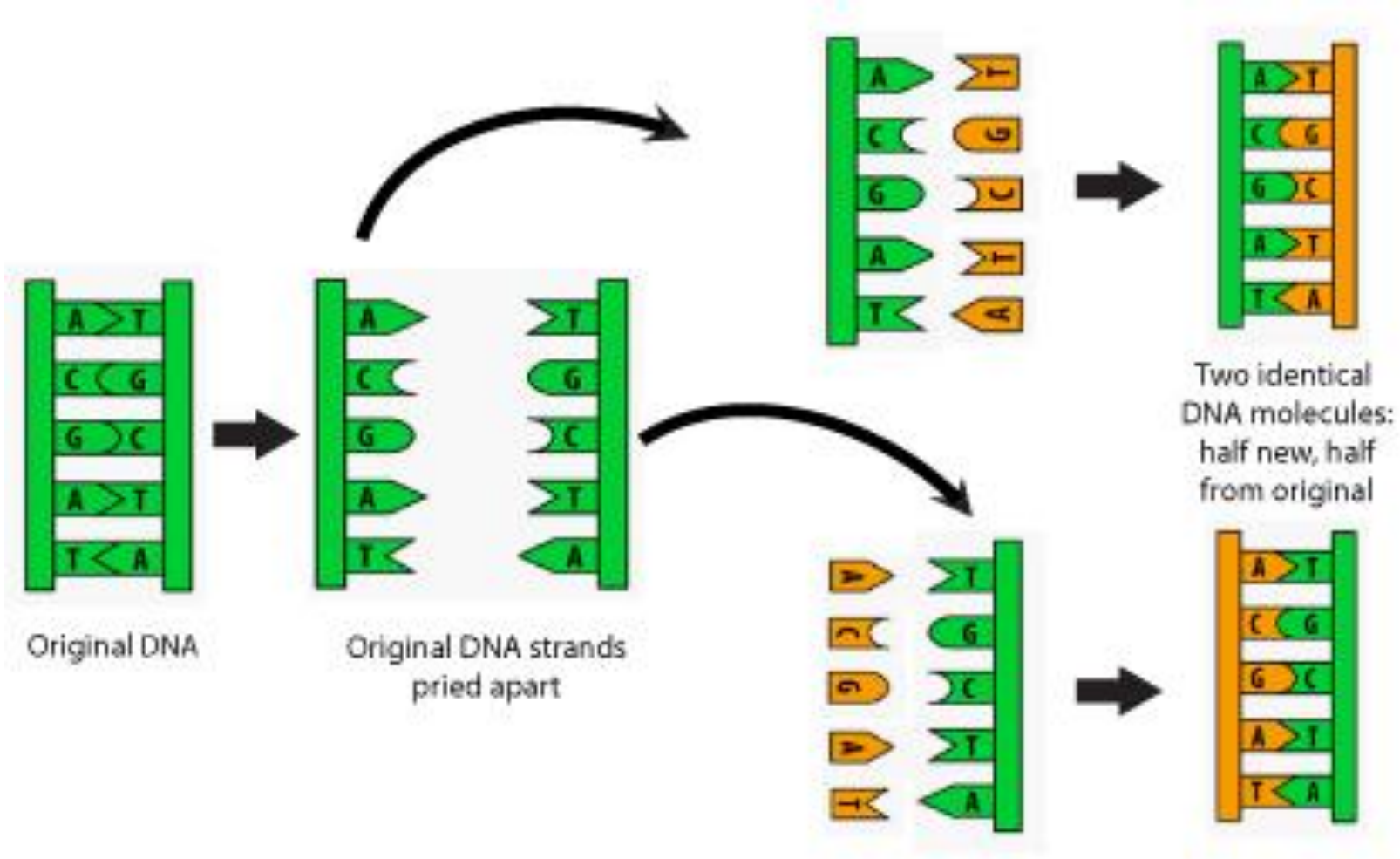
Note!!!
The 2 strands are anti-parallel to each other.
Observe the sugar-Phosphate backbone to understand

Other terminologies- Complementary strands

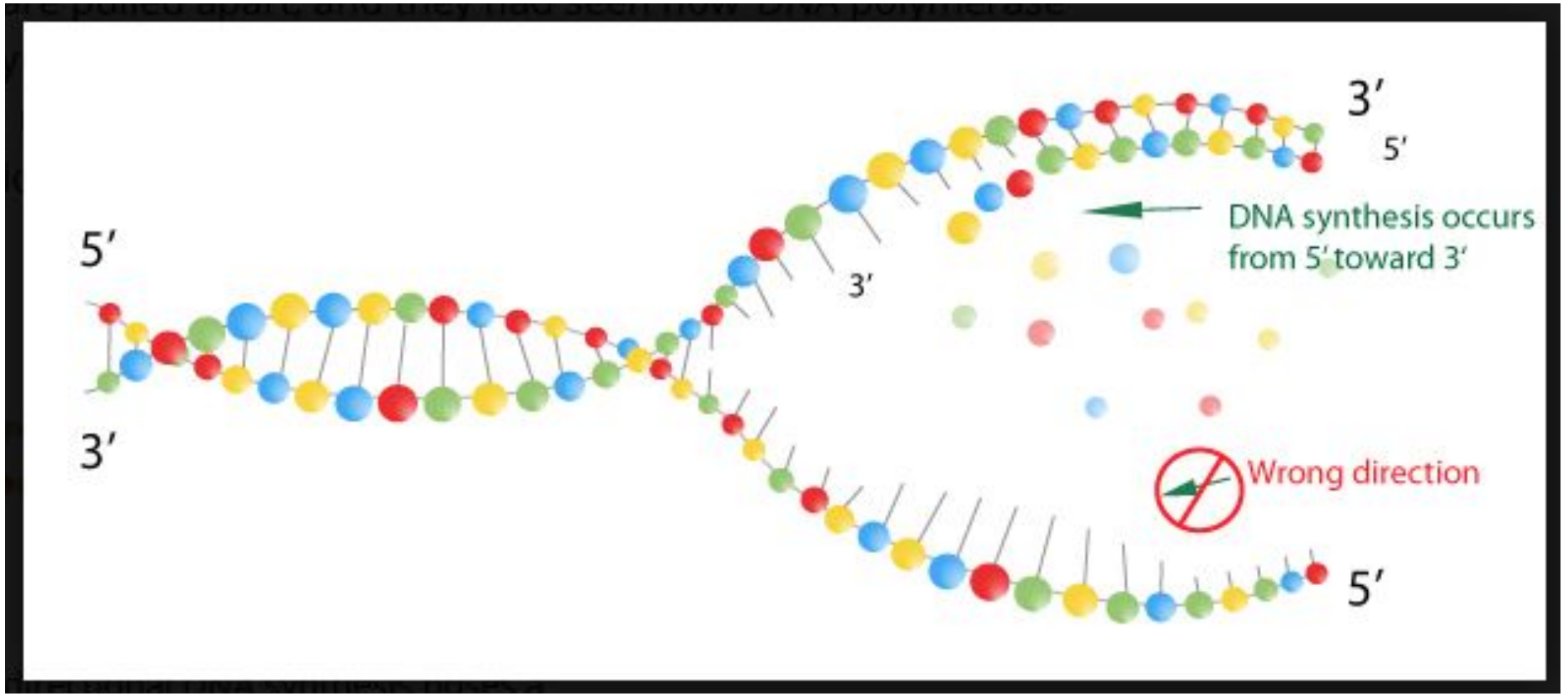
Replication- Making copies of DNA

Simple steps

1. Helicases- Unwinds DNA
2. Polymerases- Creates Complementary strand



Replication – More details pertaining to directionality



DNA to mRNA

5’ TAC GCT GCT AGC TAG TCA 3’

3’ 5’ ??

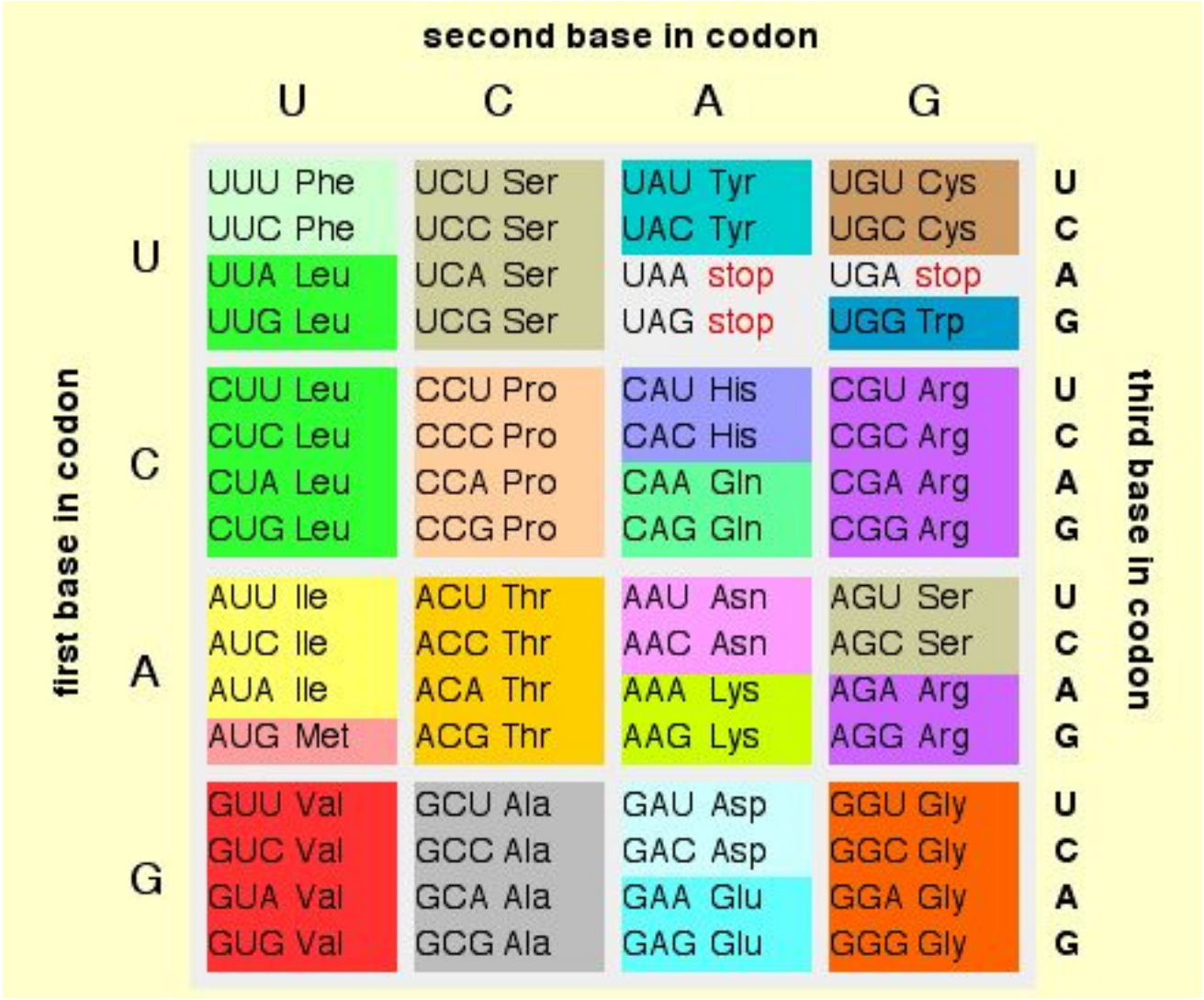
3’ ATG CGA CGA TCG ATC AGT 5’

5’ UAC GCU GCU AGC UAG UCA 3’

5’ TAC GCT GCT AGC TAG TCA 3’

3’ ATG CGA CGA TCG ATC AGT 5’

Triplet code/ mRNA to Protein code



Speed and Precision of DNA replication

- Polymerase 700 bp per sec
- Errors 1 in 10^7 nucleotides
- With proof-reading 1 in 10^9 nucleotides

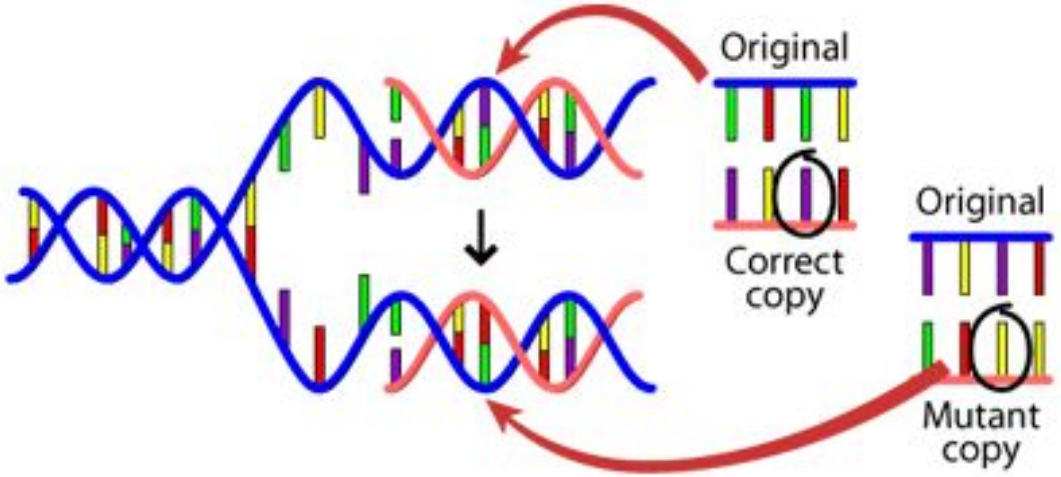
Types of mutations

- Substitution- Exchanges one base for another
- Insertion- Insertion of extra base pairs
- Deletion- Deletion of a base pair or sections of DNA
- Frame shift- Insertions or deletions resulting in altered proteins due to a shift in the frames.

- There are other types but the above ones are the basic.

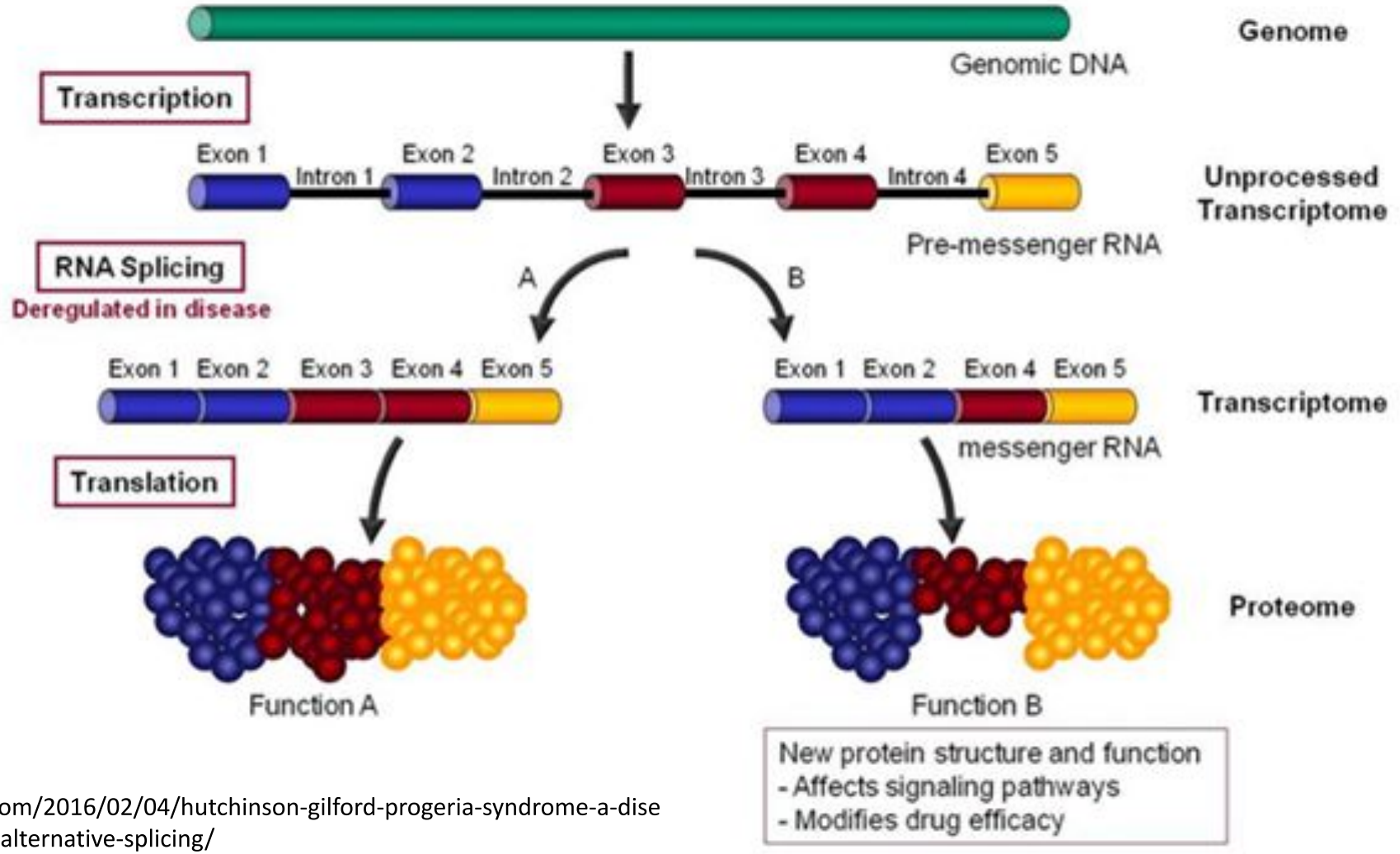
Causes of mutation

- DNA fails to copy accurately
- External influences can create mutations- harmful chemicals and radiation



- Cell can repair- But is not perfect

Hutchinson-Gilford Progeria Syndrome – a disease of accelerated aging due to Alternative Splicing



http://www.anti-agingfirewalls.com/2016/02/04/hutchinson-gilford-progeria-syndrome-a-disease-of-accelerated-aging-due-to-alternative-splicing/

“HGPS is a major clue to solving the “puzzle of aging” and the molecular mechanisms here are relevant to normal aging. ”

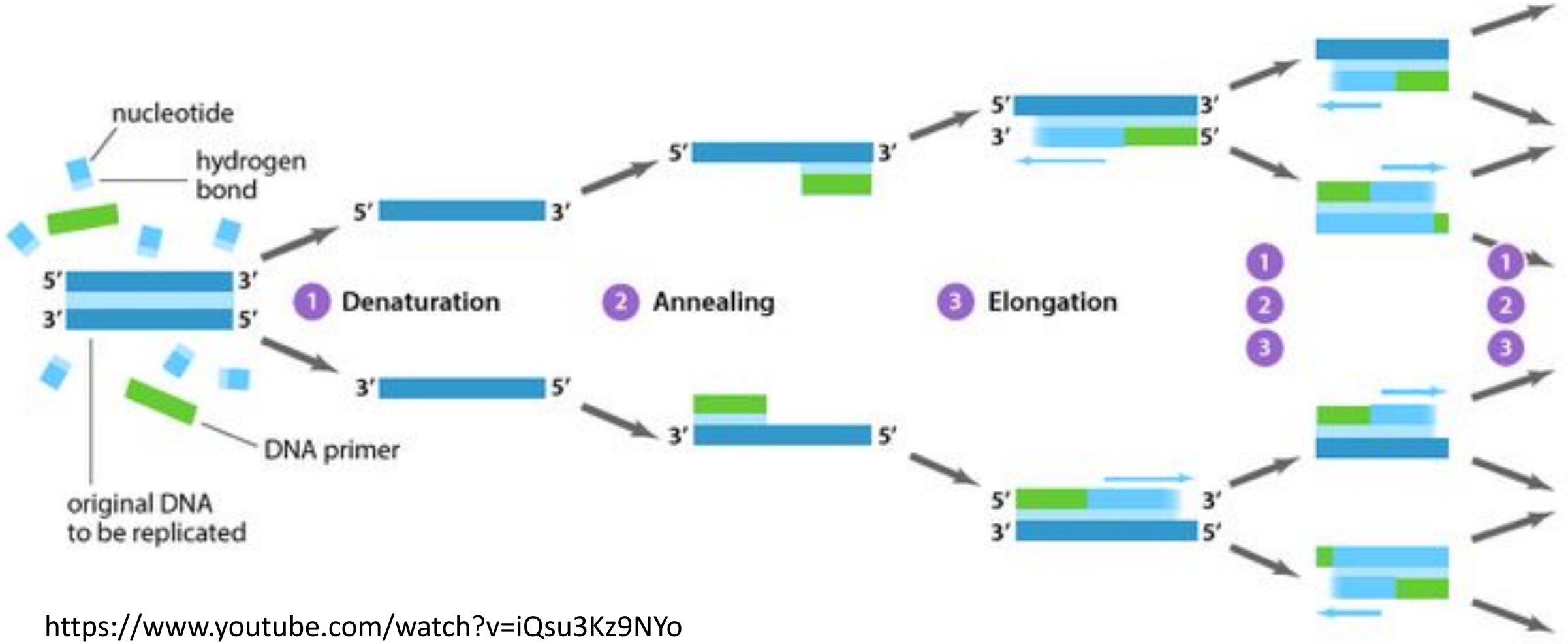
https://en.wikipedia.org/wiki/Progeria

Genetic code/ Triplet code

- There are 4 bases A,U,G, C
- For a triplet code, how many combinations are possible?

- Protein is made of 20 different amino acids

PCR-Polymerase Chain Reaction



https://www.youtube.com/watch?v=iQsu3Kz9NYo

NEW YORK, Nov. 2, 2017 /PRNewswire/ --

Report Synopsis

Polymerase chain reaction (PCR) is a technology that has opened up new vistas for advances in life sciences research and molecular diagnostics due to its attributes, such as detection and quantification of DNA and RNA genetic materials. North America leads the global market for PCR, estimated at US$3.5 billion (40.3% share) in 2017, which is expected to maintain a 2017-2022 CAGR of 7.5% in reaching a projected US$5 billion by 2022.

Read the full report: https://www.reportlinker.com/p05171154

Asia-Pacific is expected to witness the fastest similar period robust CAGR of 9.2% and reach US$2.5 billion by 2022. Global demand for PCR in Clinical Diagnostics Labs & Hospitals, among end use sectors, is slated to record the fastest CAGR of 8.6% during the aforementioned analysis period.

https://www.bizjournals.com/albany/prnewswire/press_releases/New_York/2017/11/02/SP34015