

Notes pg # 8:

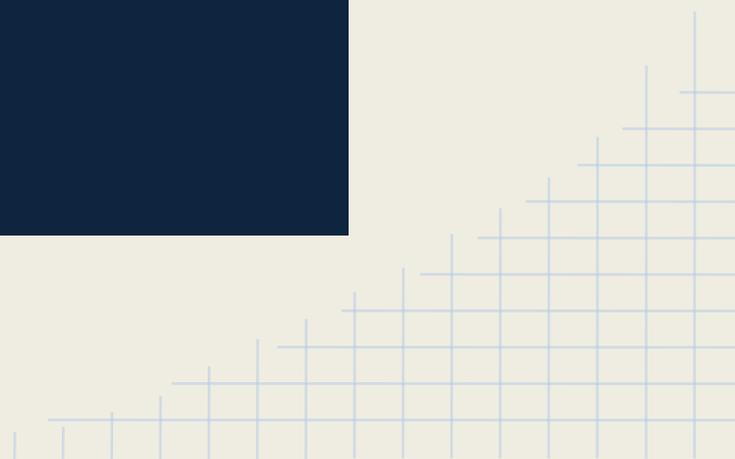
DNA Mutations & Proteins

Essential Question (EQ):

How do mutations affect DNA and proteins?

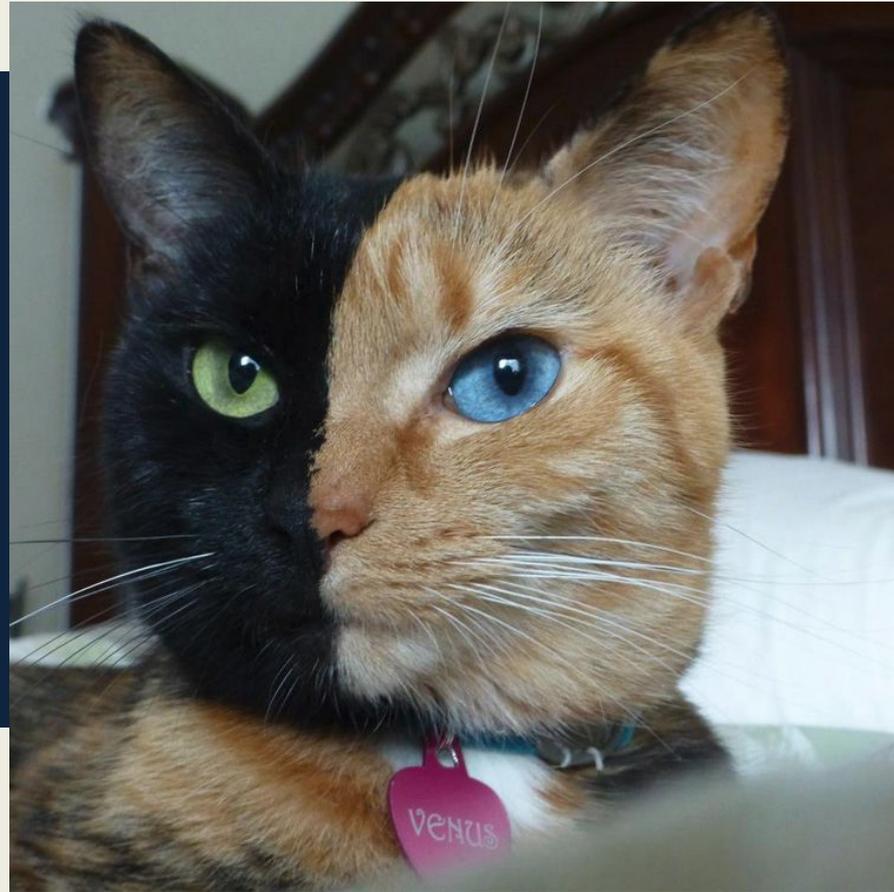


Review: What are the 4
types of chromosome
mutations?



Vocabulary:

Mutation: A permanent change in the sequence of bases within the DNA code that can cause harm, cause benefits, or cause no change to protein function & organism survival.



Normal DNA

In order to make the proteins needed for the organism, DNA has a specific sequence (order) of bases to create the proteins that an organism needs to survive.

It can read like a sentence:

Write this down:

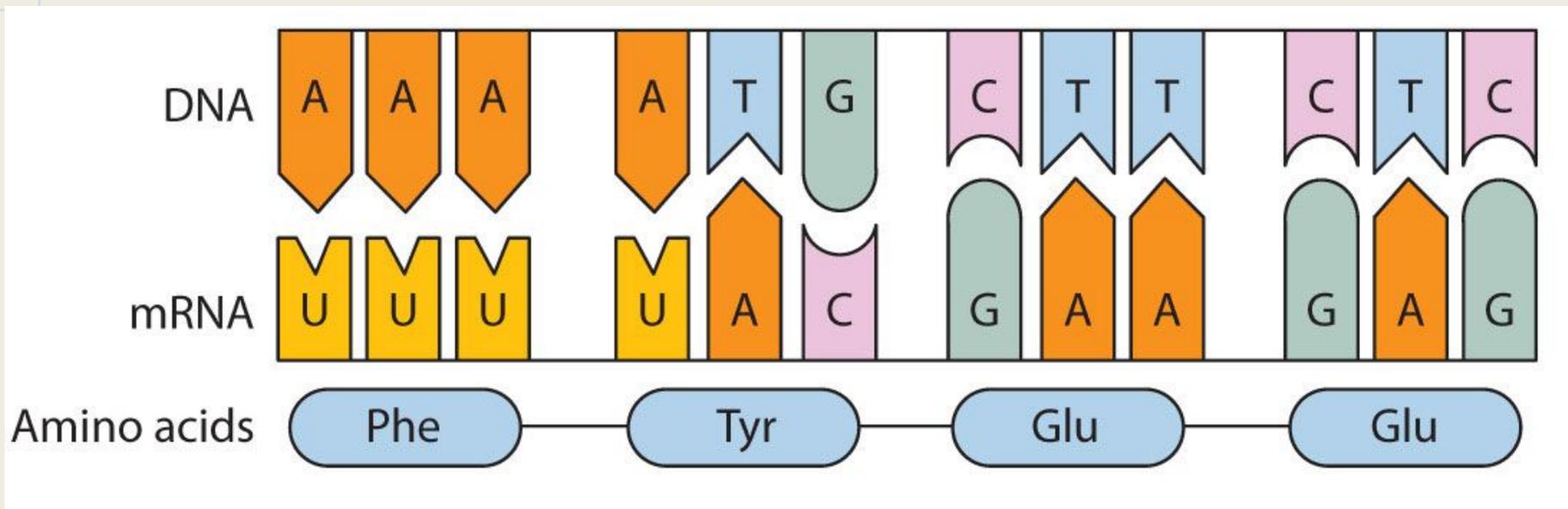
THE BIG BAD CAT ATE THE BIG FAT RAT

Think-Pair-Share

0:30

As: Why is copying the correct sequence of bases in DNA so important?

Bs: What could happen to your proteins if the DNA is mutated (has typos)? What could happen to *you*?



Gene Mutation Type #1

Write this down (leave the big blank empty):

THE BAG BAD CAT ATE THE BIG FAT RAT

What happened?

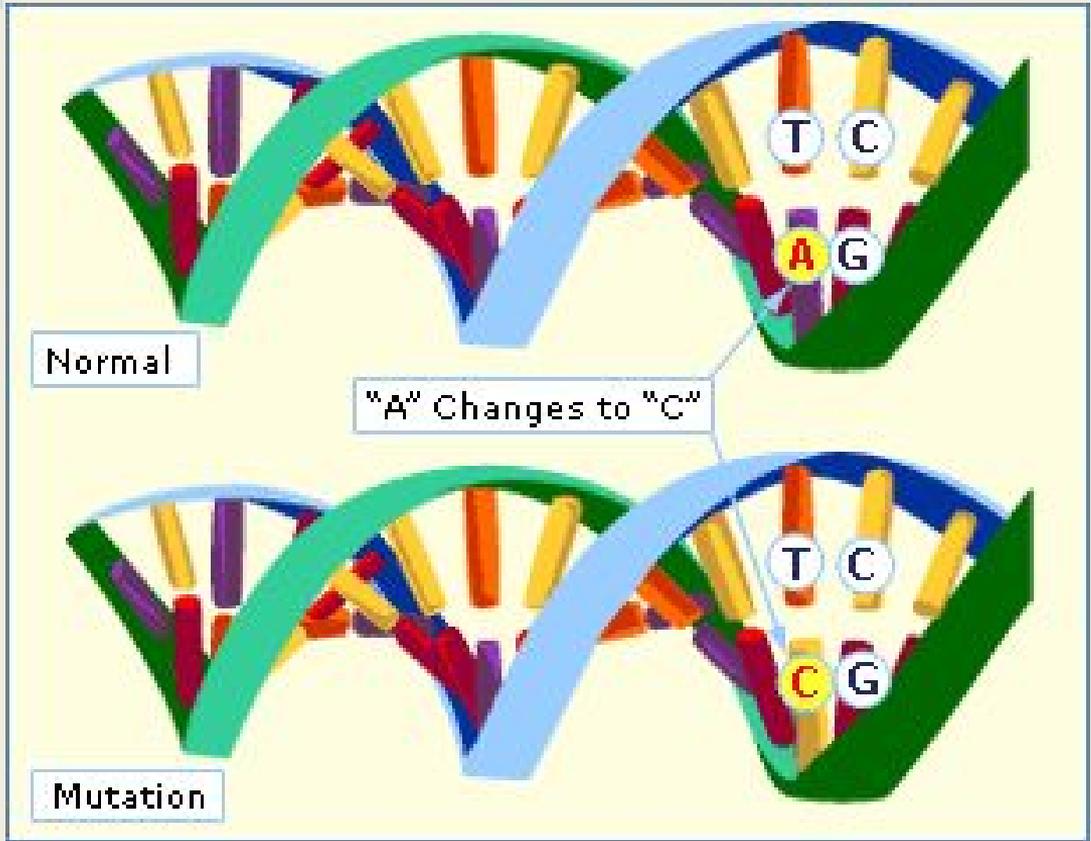
Substitution

Write this down:

THE BAG BAD CAT ATE THE BIG FAT RAT



In a substitution mutation, one of the bases gets switched out for another.

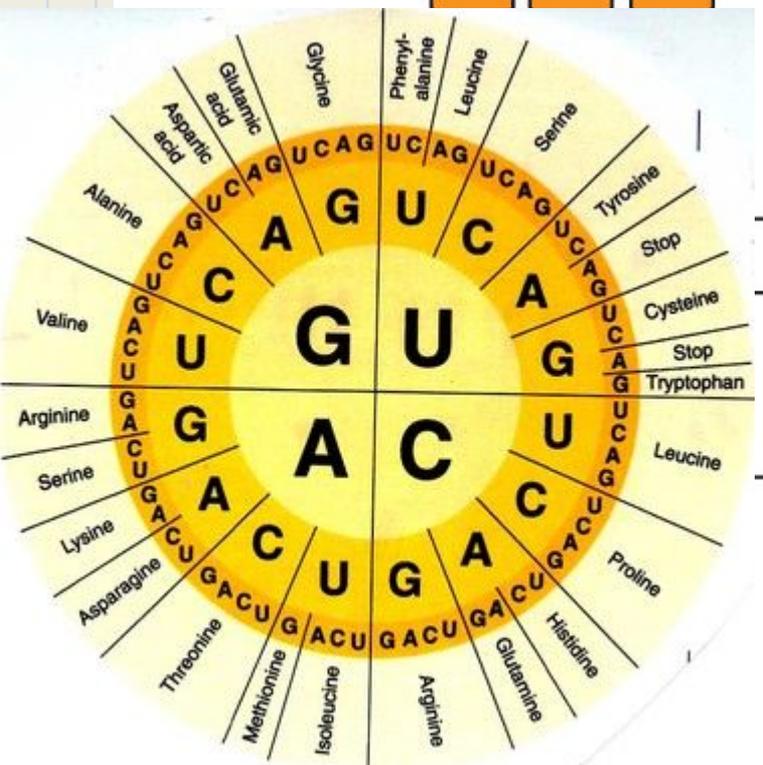
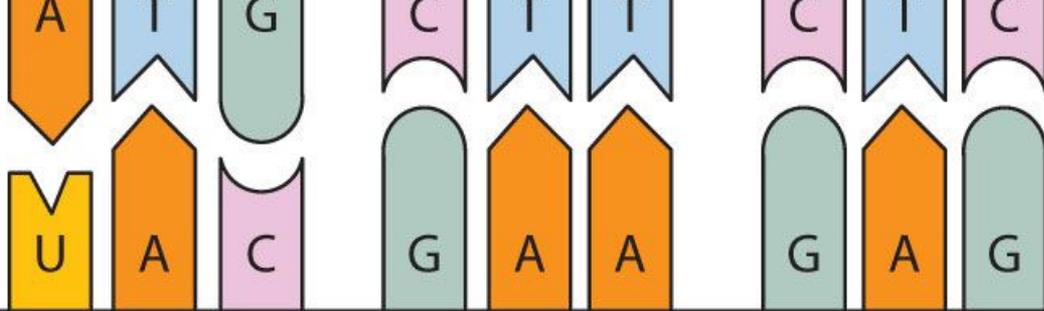


Normal

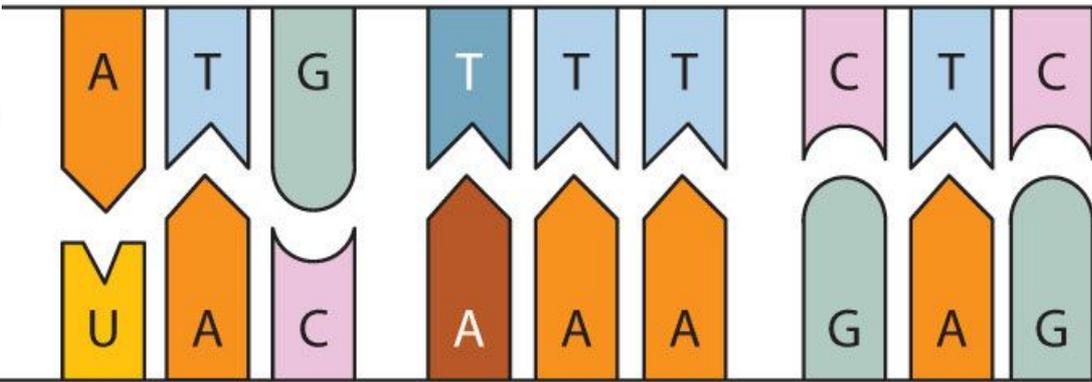
"A" Changes to "C"

Mutation

DNA A A A



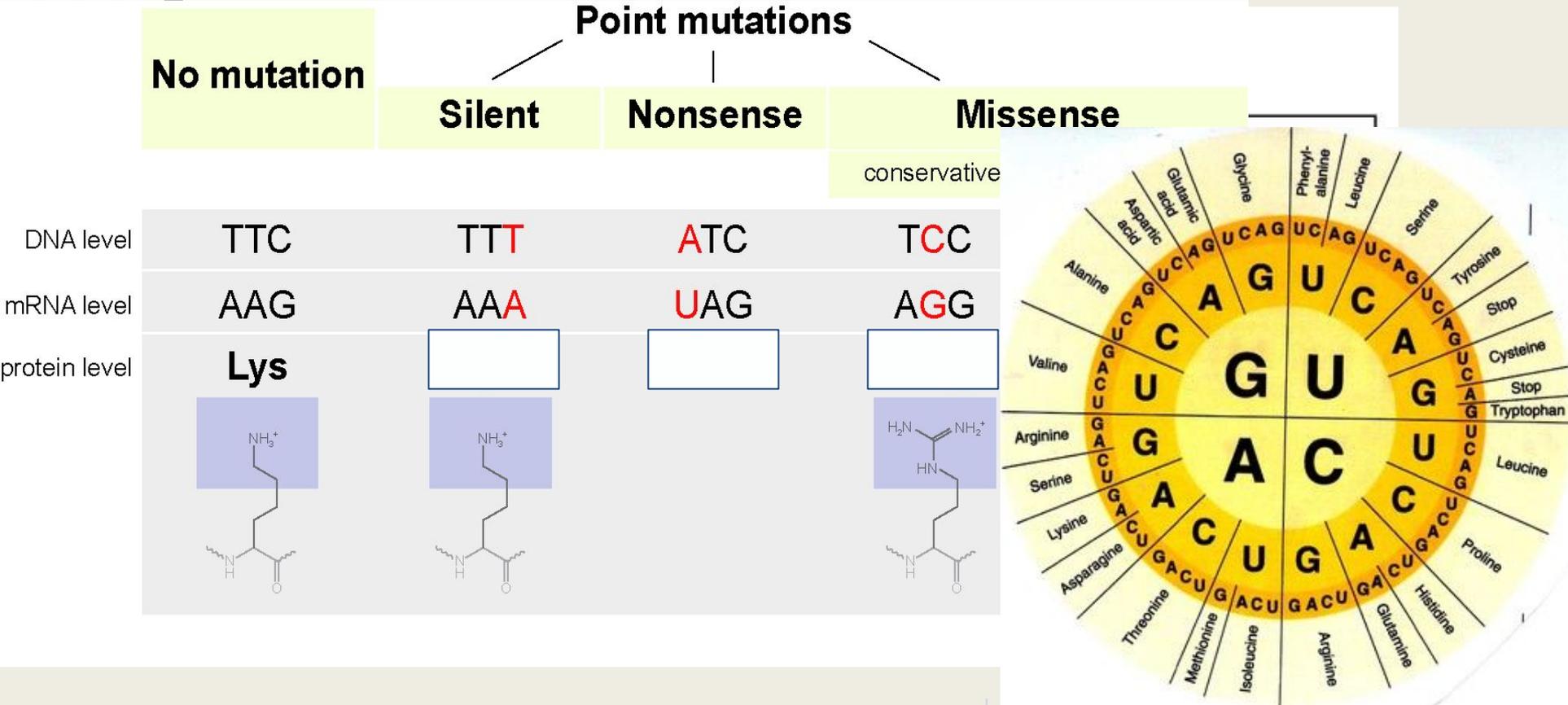
Tyr — Glu — Glu



mRNA U U U

Amino acids Phe — Tyr — — Glu

Mutations can be bad, really bad, or cause no change!



Gene Mutation Type #2

Write this down:

TEB IGB ADC ATA TET HEB IGF ATR AT_

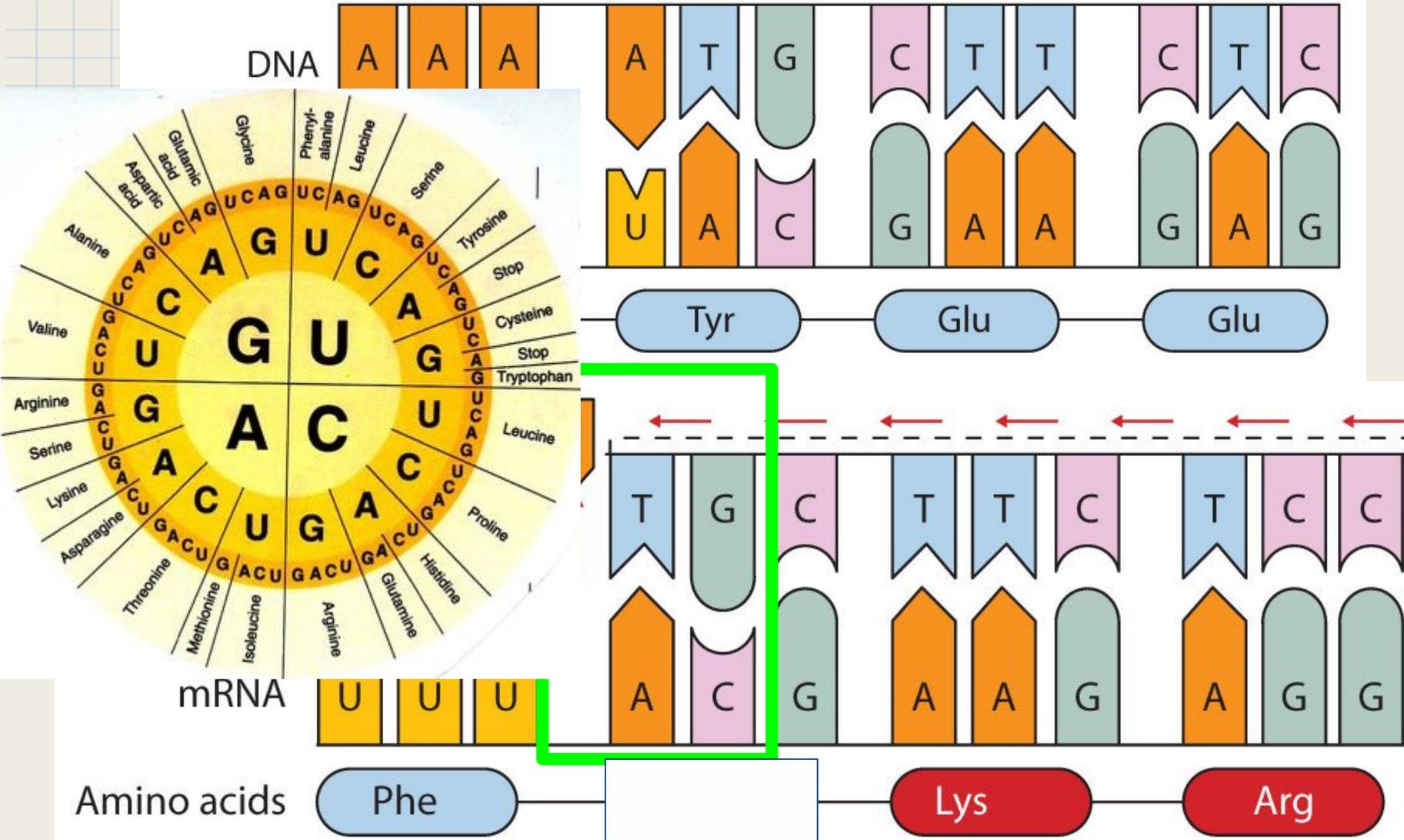
What happened?

Deletion

Write this down:

TEB IGB ADC ATA TET HEB IGF ATR AT_
↑
H

In a deletion mutation, one of the bases gets deleted from the gene and shifts the sequence.



Gene Mutation Type #3

Write this down:

THE BIG BAD CAR TAT ETH EBI GFA TRA

What happened?

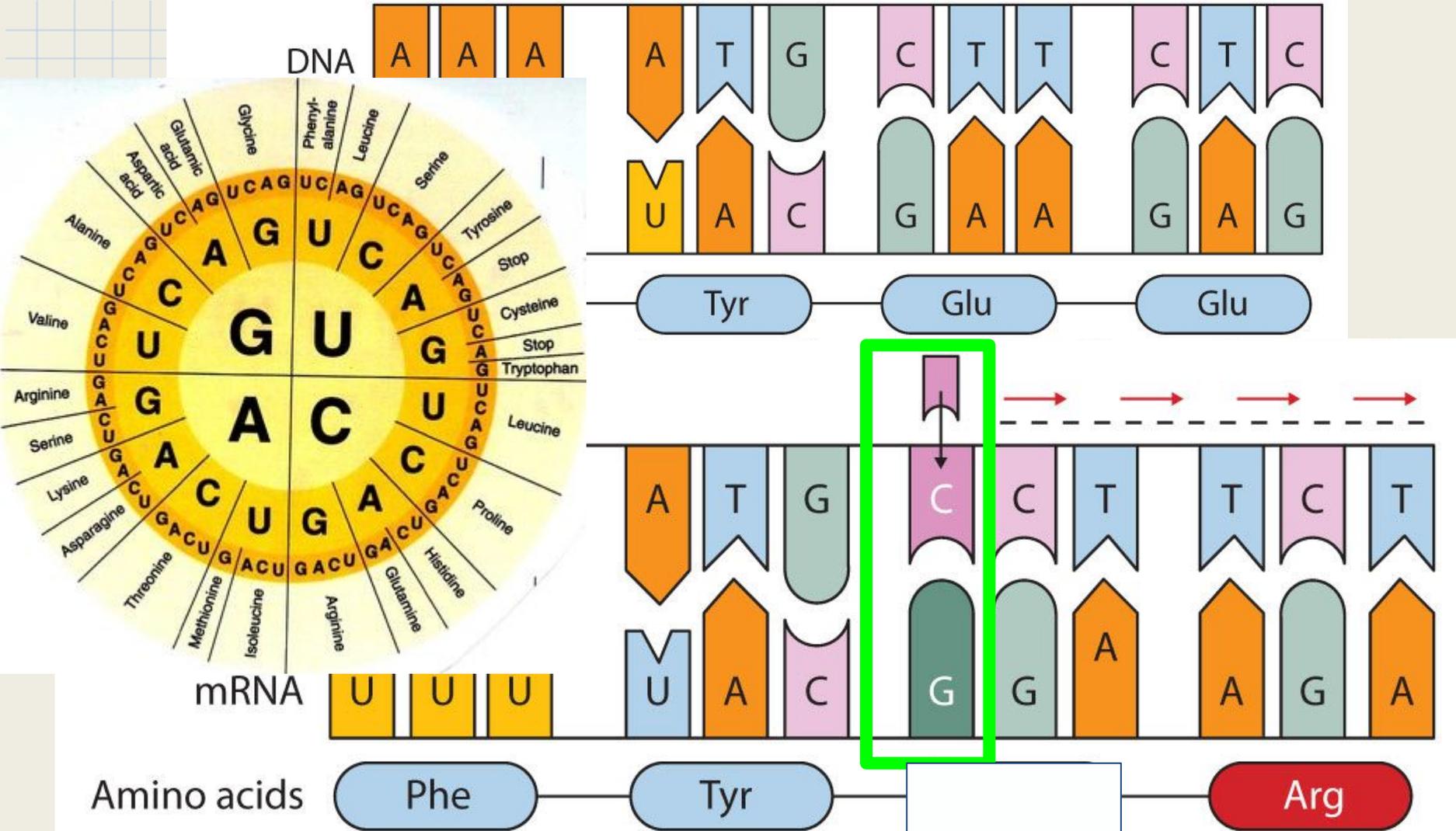
Insertion

Write this down:

THE BIG BAD CAR TAT ETH EBI GFA TRA



In a insertion mutation, an extra letter gets added to the sequence and shifts the letters over.



3 Main Types of Gene Mutations

Substitution

Insertion

Deletion

Original sequence

T G G **C** A G

T G G C A G

T G G ~~C~~ A G

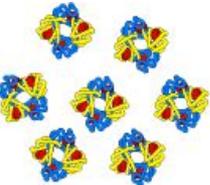
Mutated sequence

T G G **T** A G

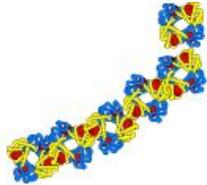
T G G **TAT** C A G

T G G G

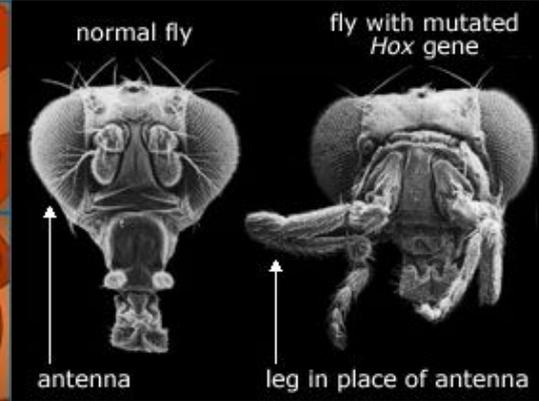
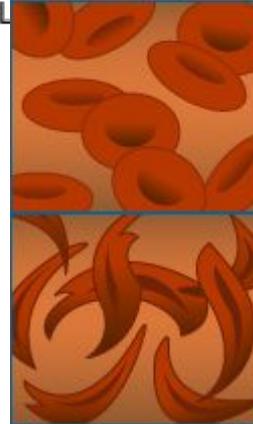
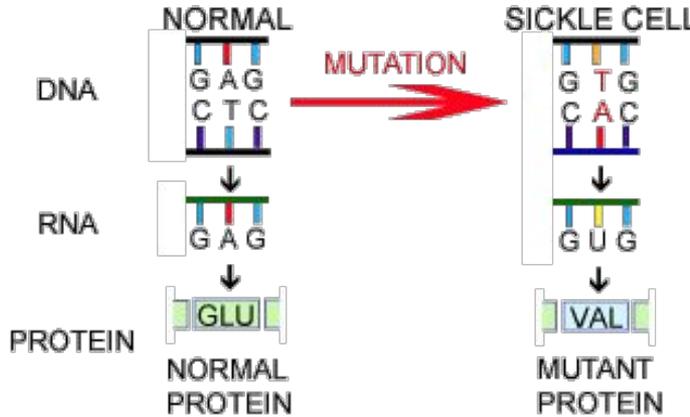
What type of mutation causes sickle cell anemia?



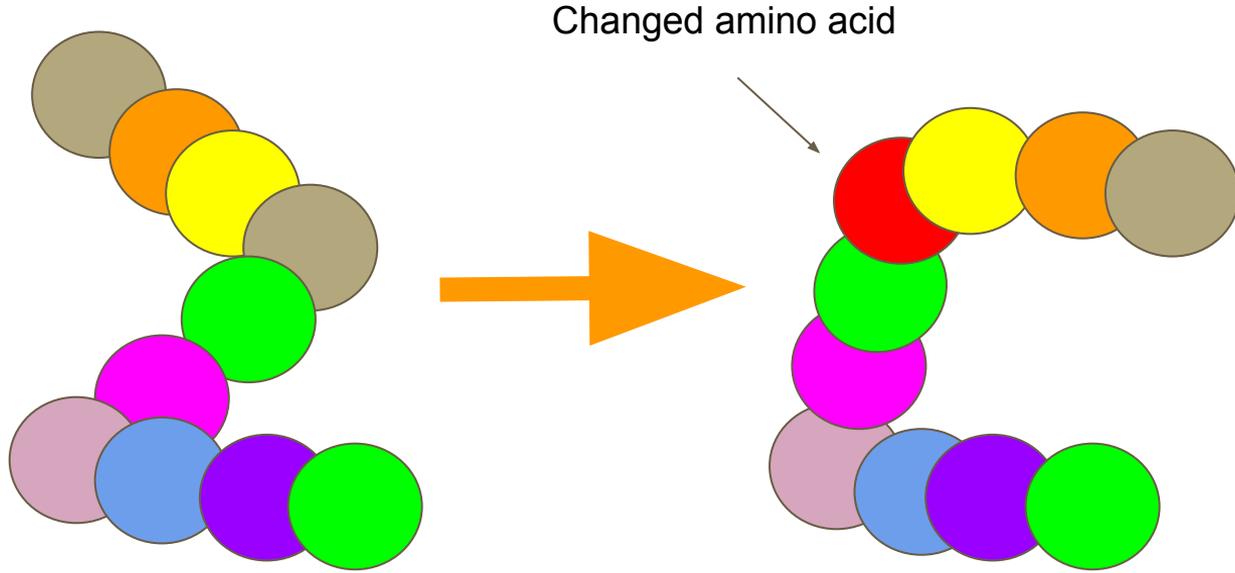
NORMAL HEMOGLOBIN



CLUMPED HEMOGLOBIN



How does that affect the protein?



Normal Protein

Mutated Protein

Changing the order of amino acids can change the shape of the protein. If the protein is the wrong shape, then it won't work correctly.

Are all mutations bad?

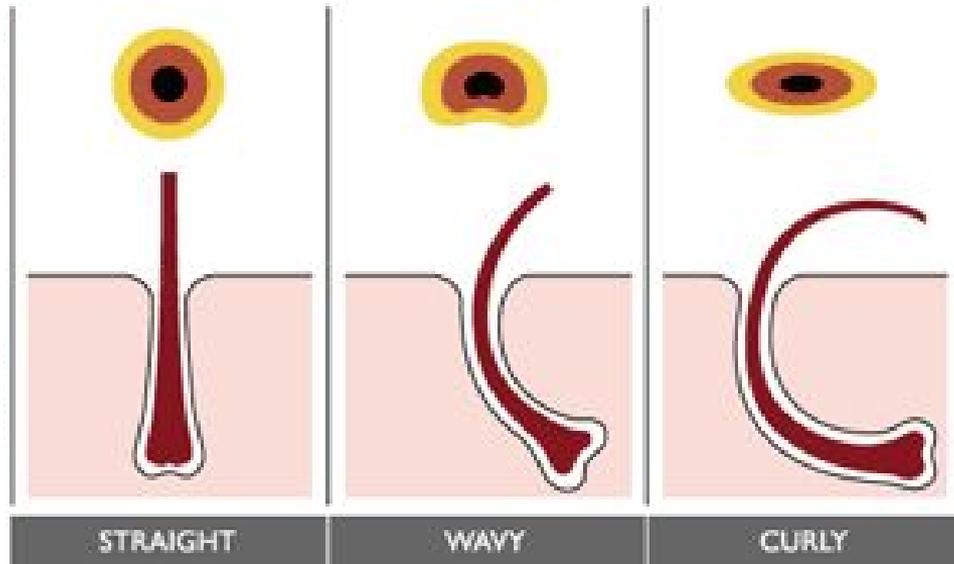
When a mutation occurs in a strand of DNA, one of the following 3 things could happen to the protein:

1. Nothing at all because the shape didn't change
2. The protein could work differently (even better!) because of the new shape
3. The protein could stop working at all cell probably dies :(

It all depends on *which* of the three types of mutations occurred, where, and *how many*.

Ex: Curly hair! (Don't write, just read)

Genetic diversity amongst organisms is because of mutations that occur but still allow the protein to work:



Mutations that occurred in the hair follicle gene changed the shape of the protein but didn't prevent it from working

Mutations lead to genetic diversity: Time to think

Without mutations everyone in a species would look the same and have the same weaknesses. Without mutations, everyone is at risk to the same things. Mutations can give some individuals a better chance to survive when others cannot.

EX: If everyone has the same immune system, then if a virus can kill one person it can kill everyone.

Ex: A mutation that allows only *you* to drink milk when everyone else can't makes *you* more likely to survive a famine.

Ex: A mutation that allows you to be left-handed when everyone else is right-handed gives you an advantage when hunting/fighting- you'll confuse your opponent and have better chances to win.

You write: How can *mutations* be important to the survival of the human race?

Closer question

(1-2 Sentences):

What are the three different types of mutations?

*Check yourself (before you wreck yourself):
Can you answer the EQ?*



Mutations

With the Amoeba Sisters

2 facts,
Then
tape
notes on
pg#8

WHERE DO GENES COME FROM?



:)

MiniLab -Top of page 5: Creating a DNA to a protein

<http://learn.genetics.utah.edu/content/molecules/transcribe/>

1. Write down the DNA sequence. Label it "DNA Sequence"
2. Write down the matching mRNA sequence. Label it "mRNA Sequence"
3. To begin attaching amino acids, click on the mRNA strand where it starts with **AUG**
4. Write down the matching amino acids. Label them "Amino Acid Sequence"