

Biology Unit 5

Carbon and the Biological Molecules

Monomers of Biomolecules

Nucleic Acid

Carbohydrate

Lipid

Protein

TEAM LIFE

Carbon



Nitrogen



Phosphorus



Hydrogen



Oxygen



Sulfur



Carbon, Hydrogen, Nitrogen, Oxygen, Phosphorus, and Sulfur
make up the 6 molecules of life

Carbon is the most common
biological molecule in all life

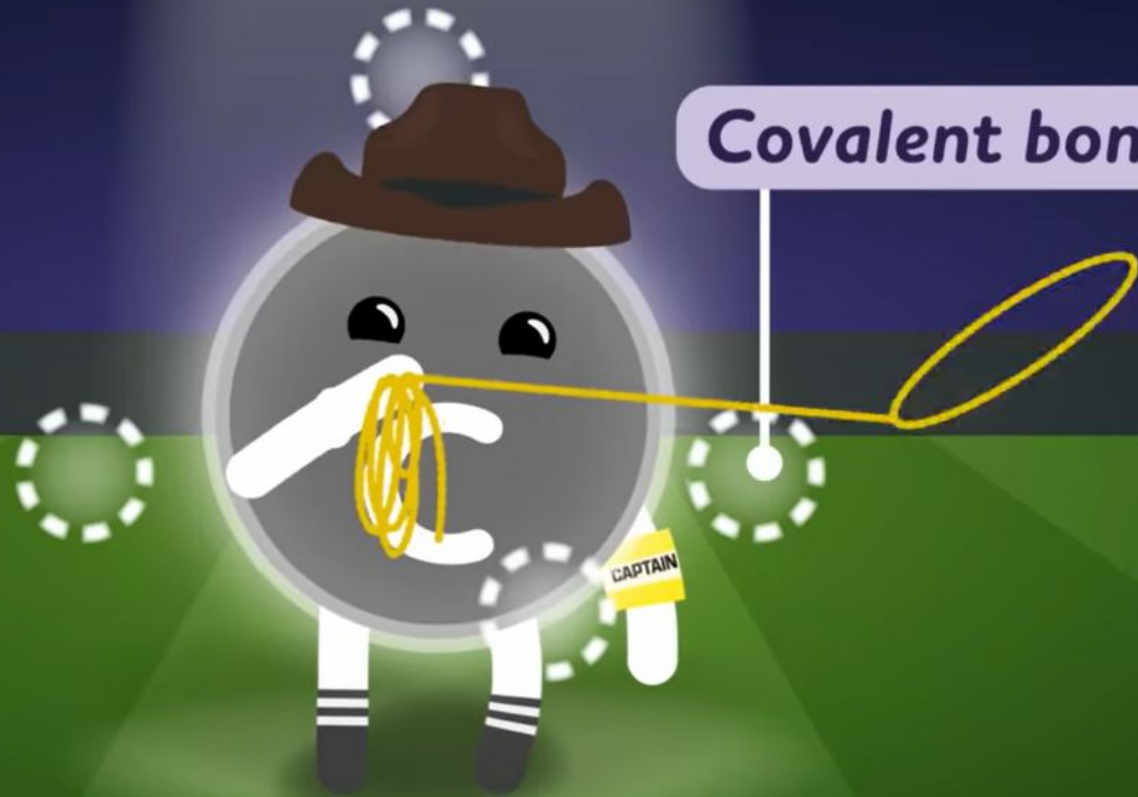
Carbon



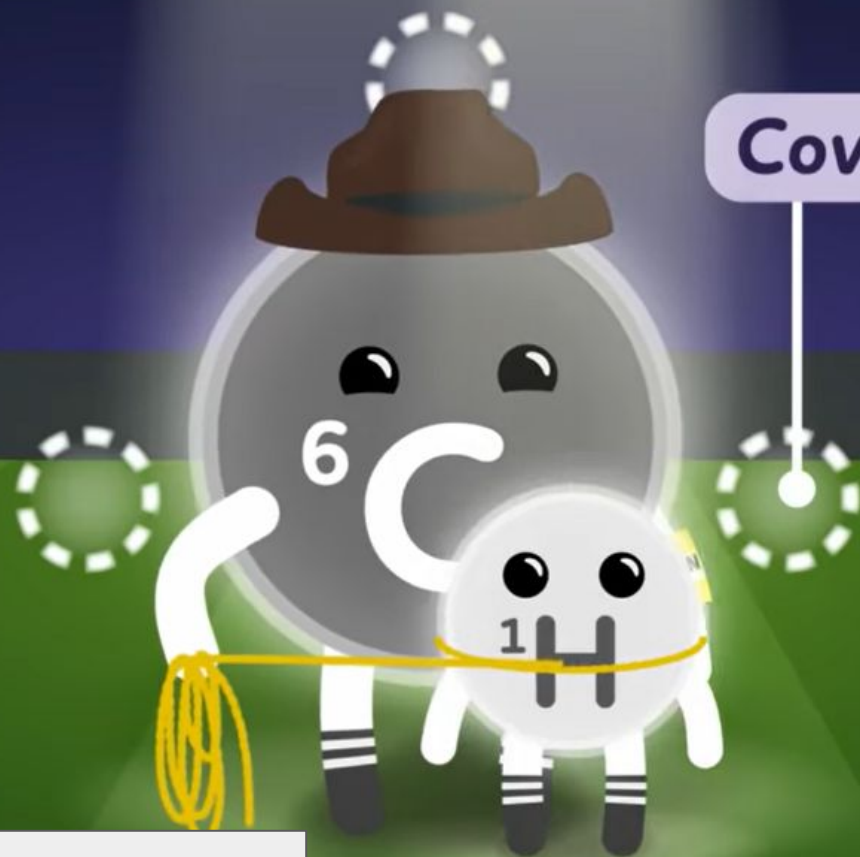


A **covalent bond** is a chemical bond in which two atoms share one or more pairs of electrons

Covalent bonds



Think of covalent bonds as the molecular version of a rodeo



Covalent bonds

The Carbon Cowboy is lassoing a hydrogen atom.



Covalent bonds

Carbon can form **4** covalent bonds
with other atoms.

Hydrogen



Hydrogen has only 1
covalent bond



Oxygen



Oxygen can create 2 covalent bonds

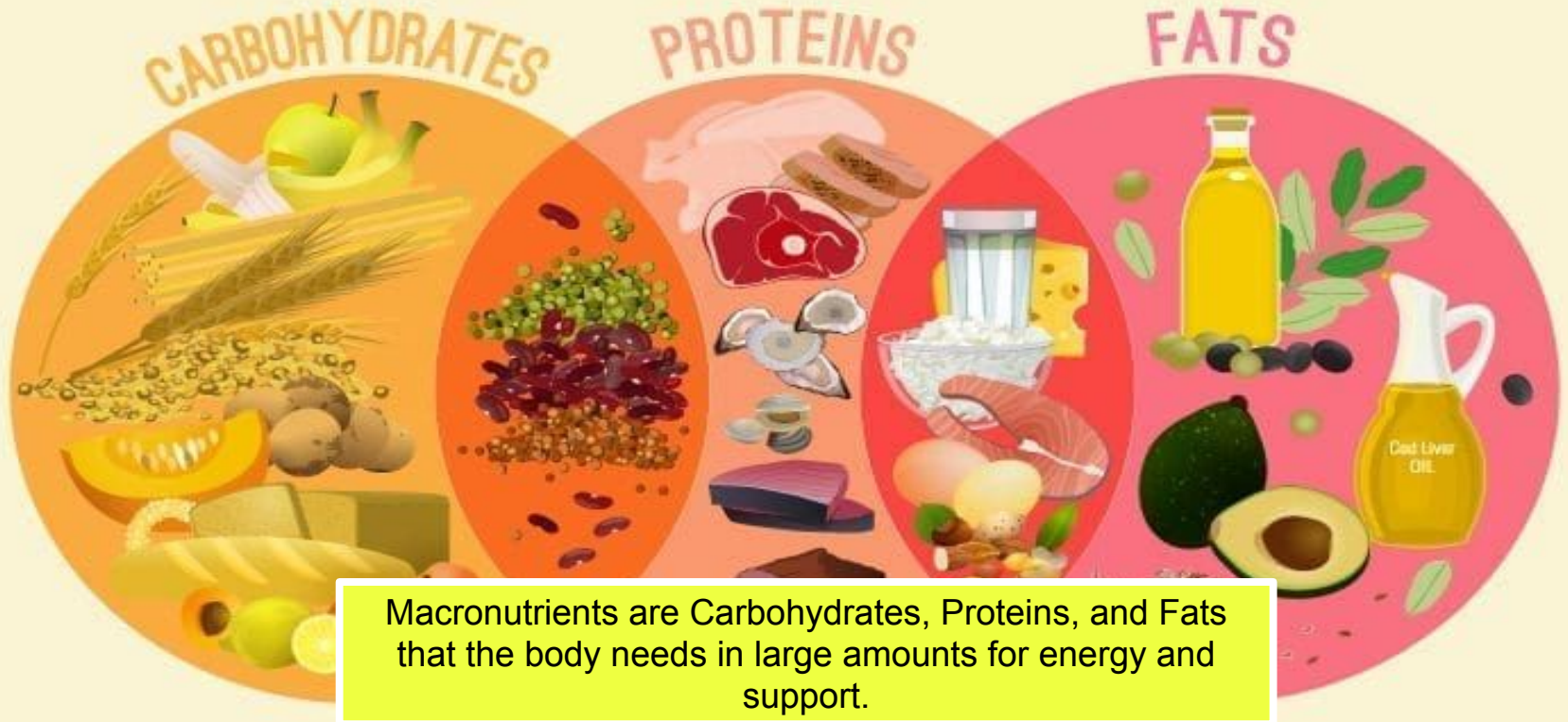
Nitrogen



Nitrogen has 3 covalent bonds

MACRONUTRIENTS

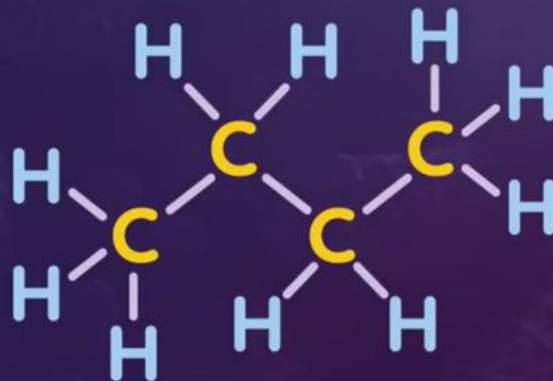
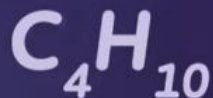
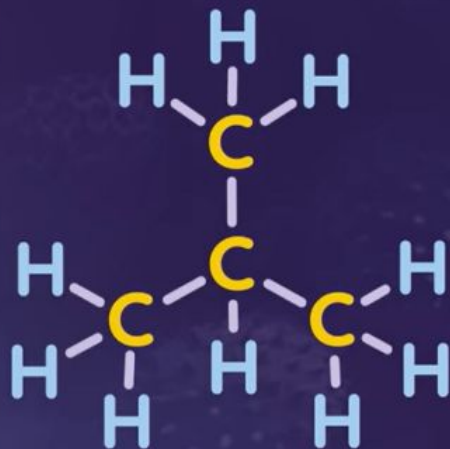
A SIMPLE GUIDE TO MACROS



Macronutrients are Carbohydrates, Proteins, and Fats that the body needs in large amounts for energy and support.

ISOMERS

Compounds with the same chemical formula, but with a different arrangement of atoms.



This makes them Isomers

MAJOR BIOLOGICAL MOLECULES



Lipids



Carbohydrates



Proteins



Nucleic Acids

LIPIDS

*Organic molecules that
cannot dissolve in water.*

They're usually made of stuff
like cooking oil or bees wax.





Carbohydrates are sugars the body uses for energy

CARBOHYDRATES

NUCLEIC ACIDS

Our 3rd type of
biological
molecule is
Nucleic Acid.

*Store and transmit **genetic information**, which is basically **instructions that we inherit** from our parents that tell our bodies how to work.*

PROTEINS

Some proteins have structural roles like the collagen that makes up most of our skin.

Antibodies



Collagen



Insulin



PROTEINS

Proteins can make up skin, nails, hair, messengers, muscle, and your immune system.

Antibodies



Collagen

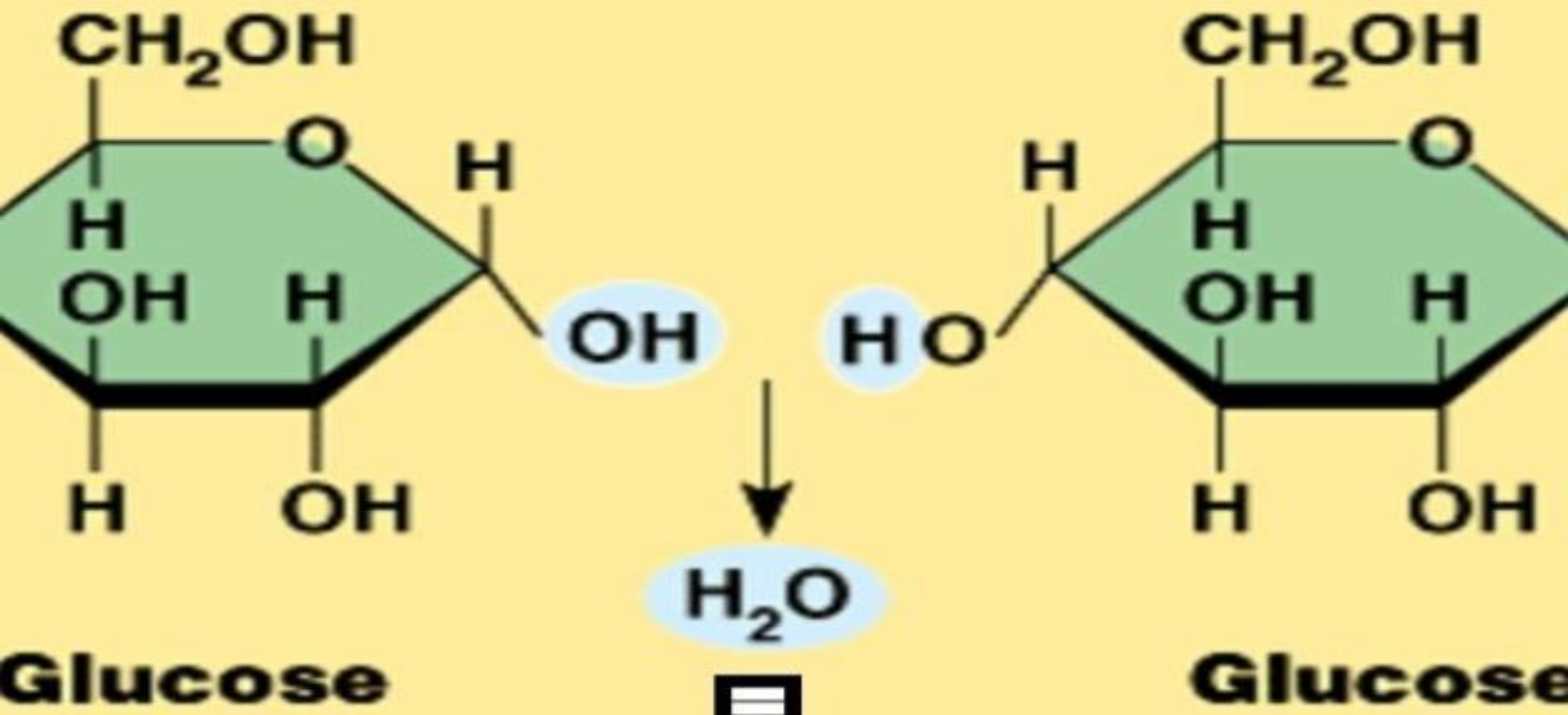


Insulin



The background is a dark blue illustration of a pond. In the upper left, a green frog is perched on a lily pad. To its right, a dragonfly is shown in flight. The lower half of the image features several stylized, light blue water lilies with long stems and pointed leaves. The overall scene is serene and naturalistic.

HYDROLYSIS LETS US **REUSE THE
BUILDING BLOCKS FROM THE
PRODUCERS AND CONSUMERS
THAT WE EAT TO BUILD UP OUR
OWN MACROMOLECULES.**



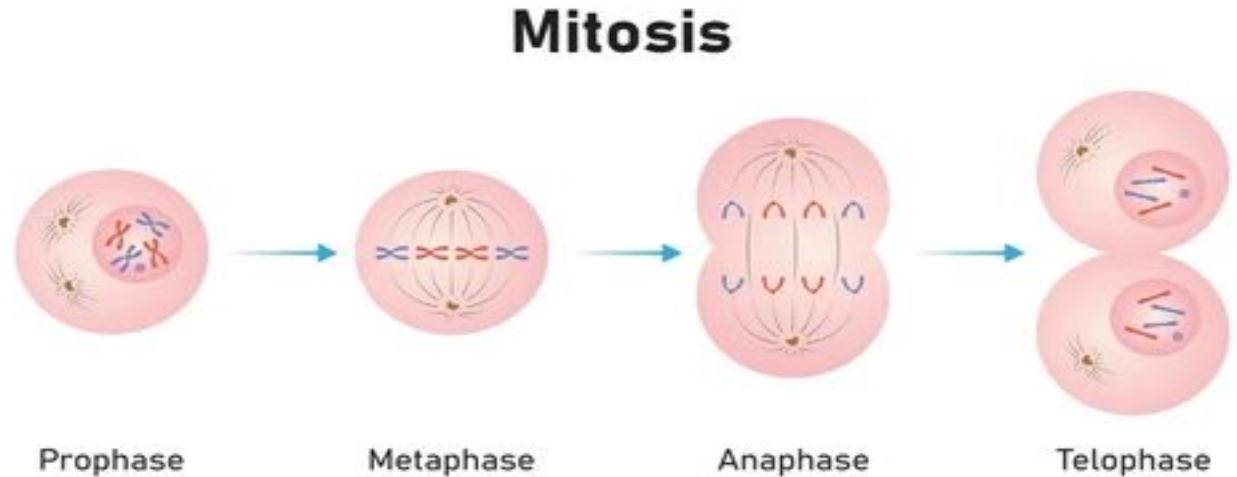
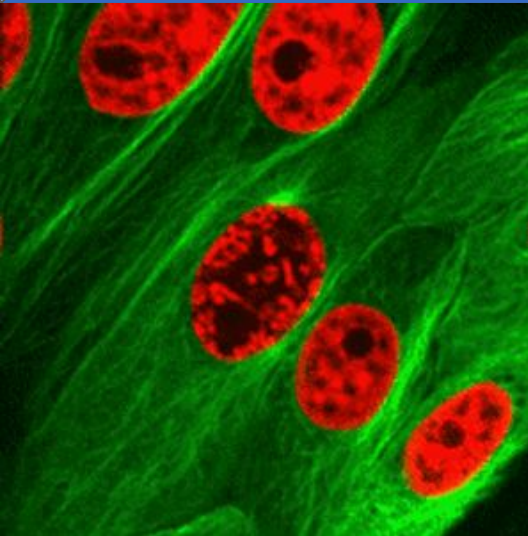
Hydrolysis uses **water** to break down molecules into their basic units.

DEHYDRATION REACTIONS



Dehydration reactions
eliminate water to reconnect
molecules for the body to use.

Biology 6: Mitosis



CELLULAR DIVISION

A cell duplicates itself in order to reproduce.



Do not divide (in adults)



Neuron



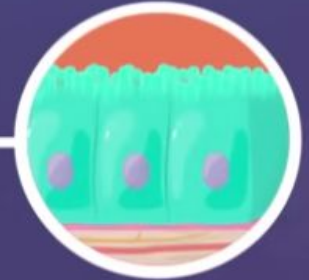
Muscle

Cells that DO NOT Divide:
Neuron cells
Muscle cells

Divide often



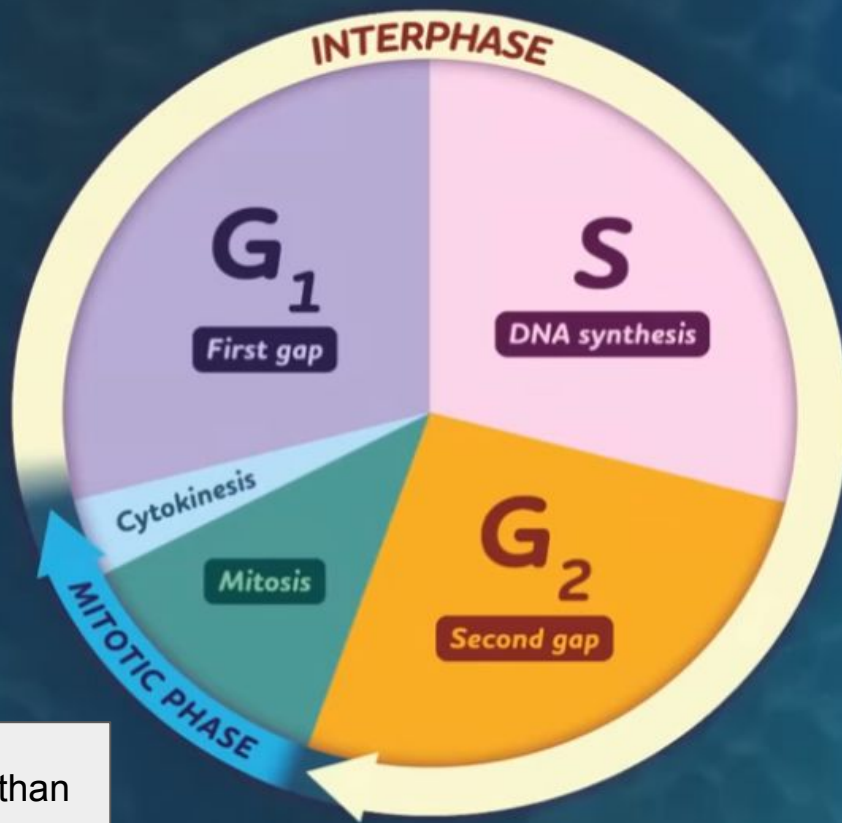
Skin



Digestive tract

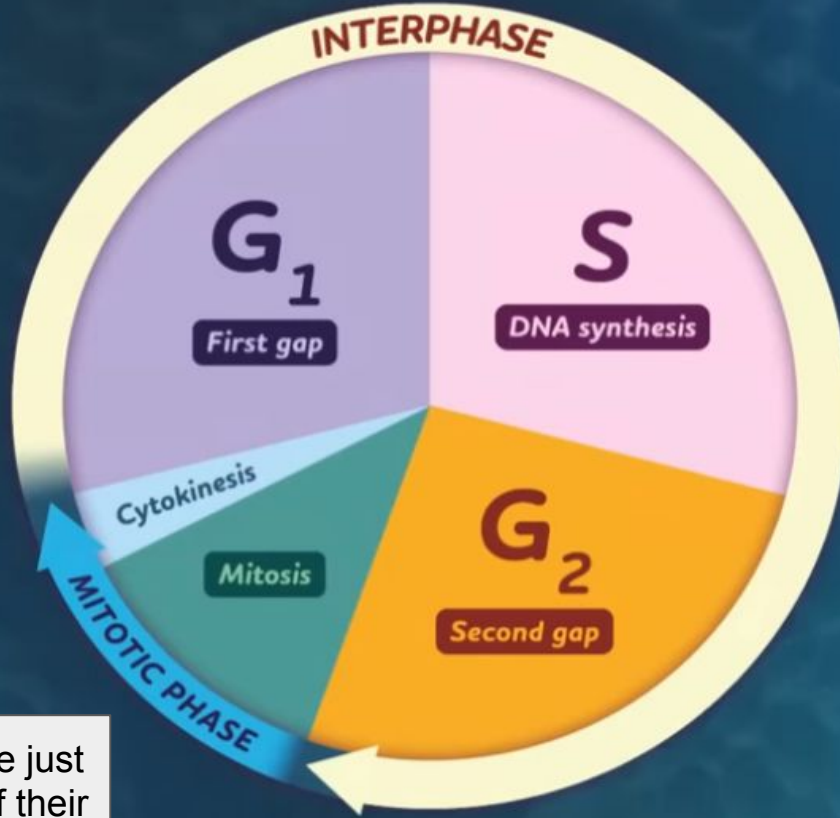
Cells that Divide:
Skin cells
Digestive cells

CELL CYCLE



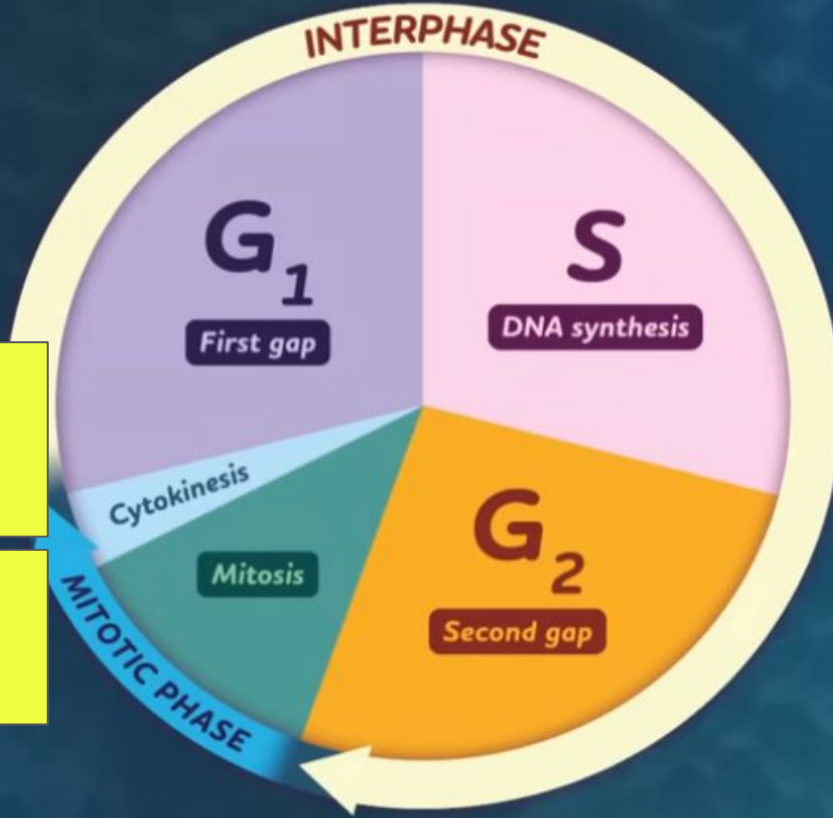
There's more to a cell's life than reproduction.

CELL CYCLE



Cells spend 90% of their time just doing their jobs in a period of their life cycle called Interphase.

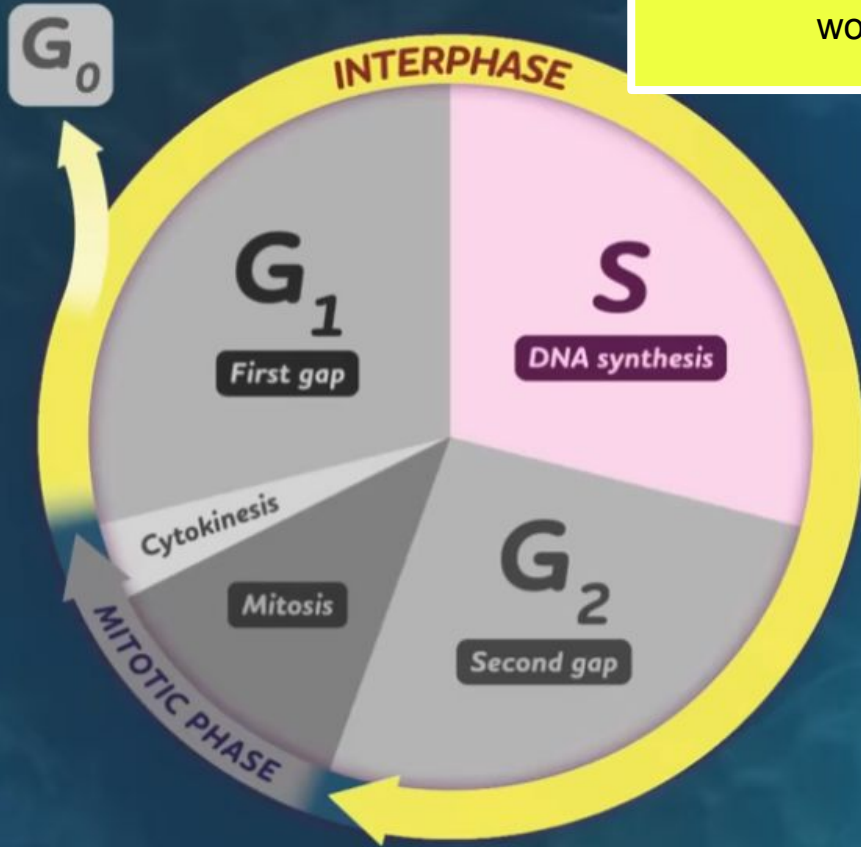
CELL CYCLE



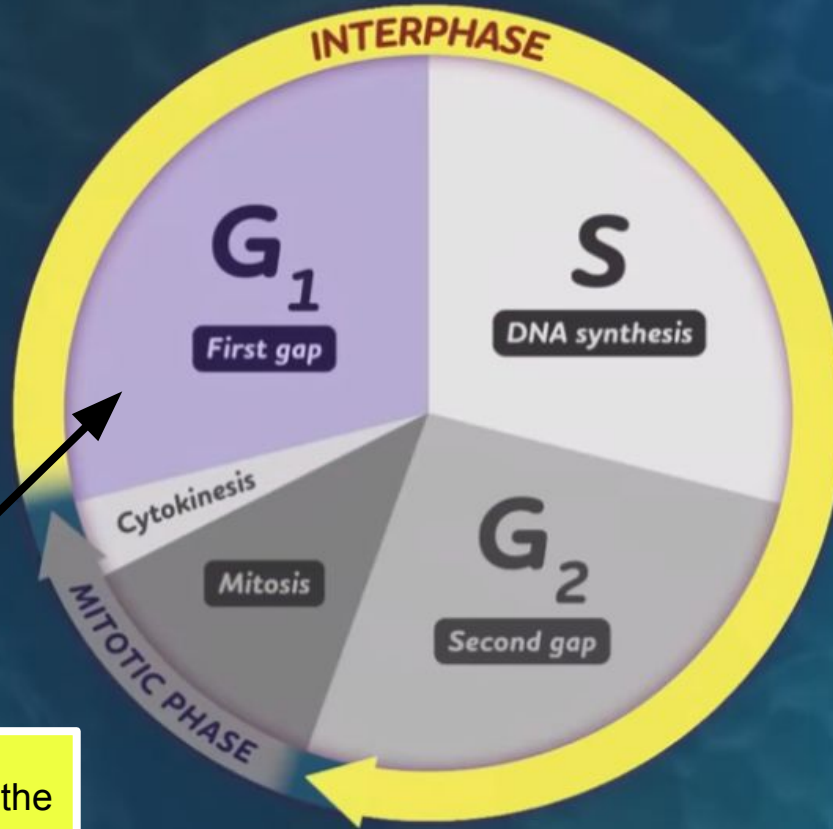
CELL INTERPHASE

Cell Interphase is when a cell grows, replicates DNA, and prepares for division.

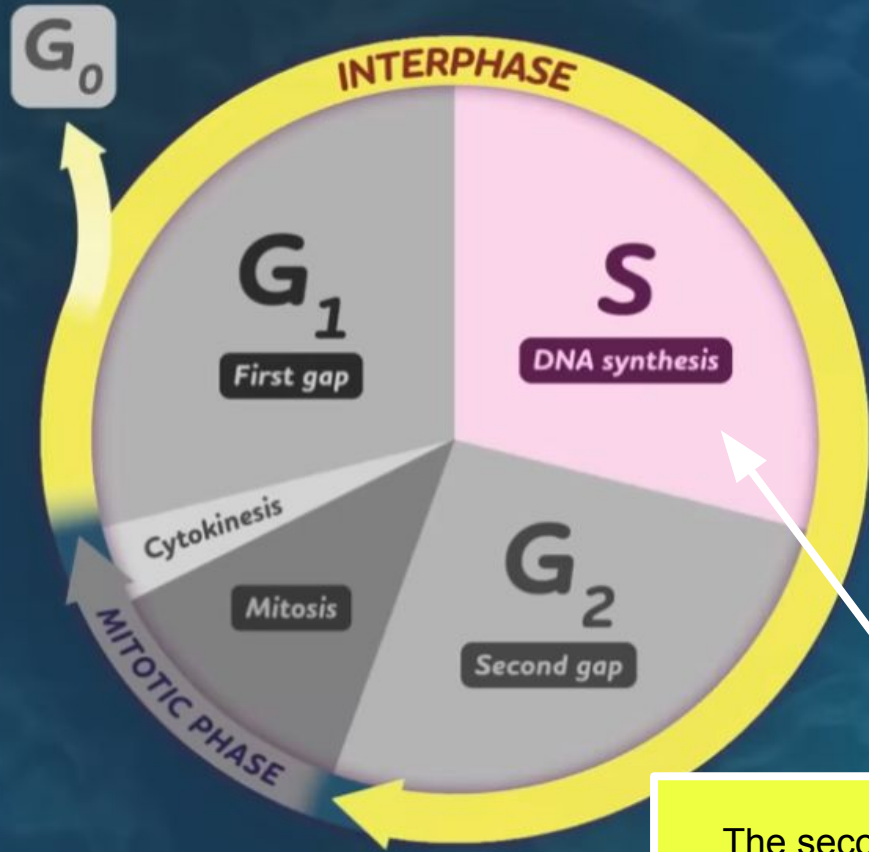
Mitosis comes from the Greek word "Thread"



CELL CYCLE

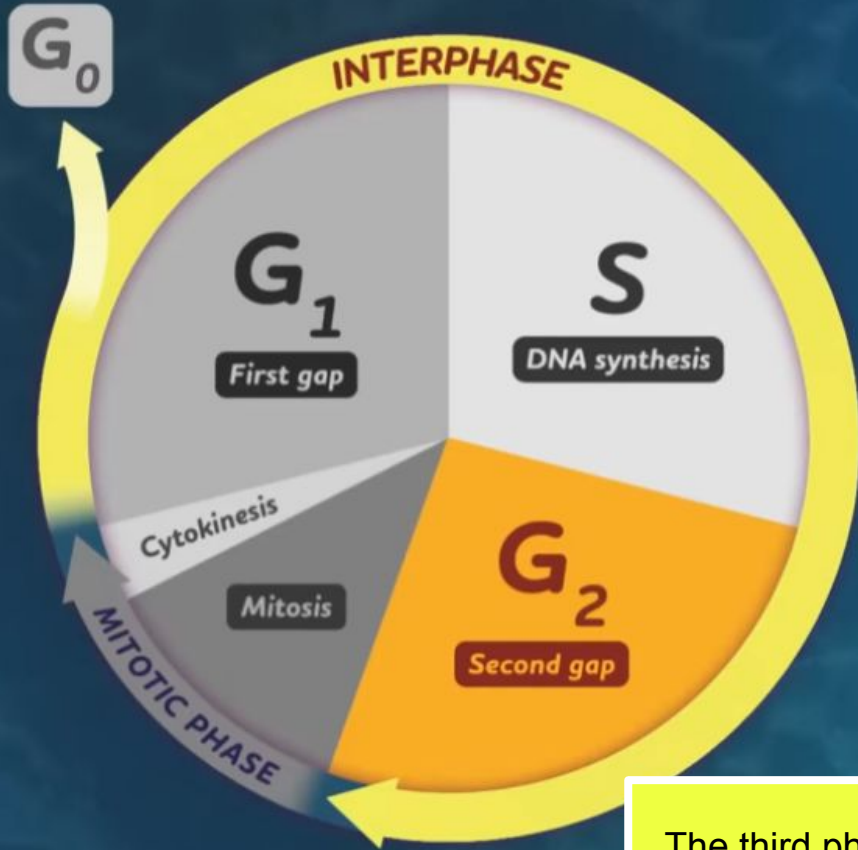


The first phase is called G1 or the First Gap



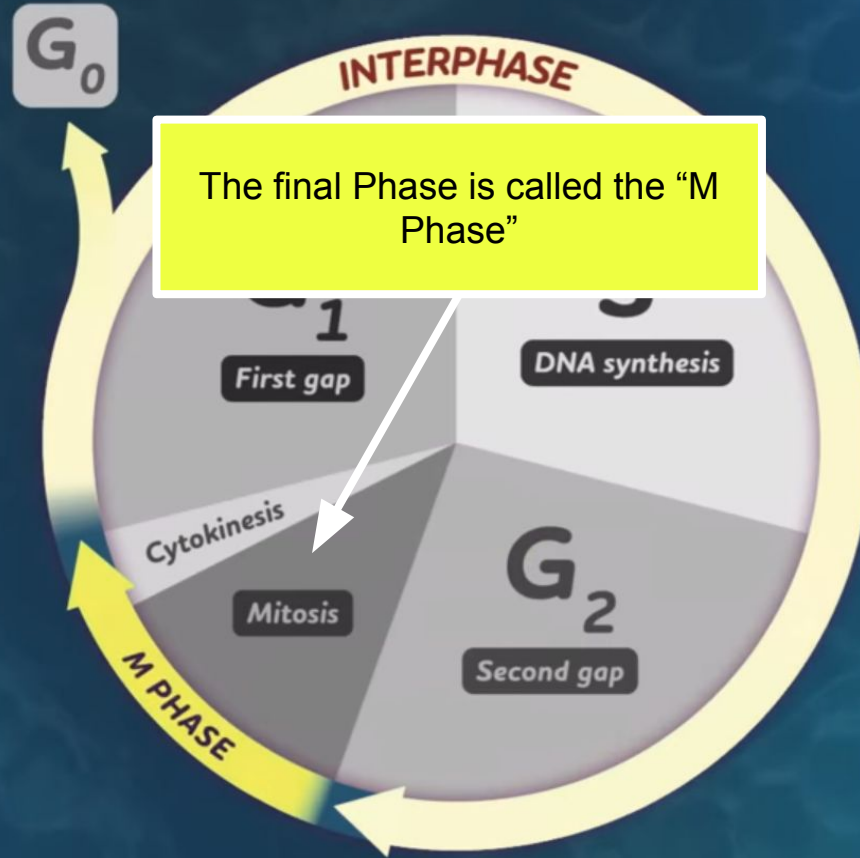
The second phase is called the
“S-Phase”





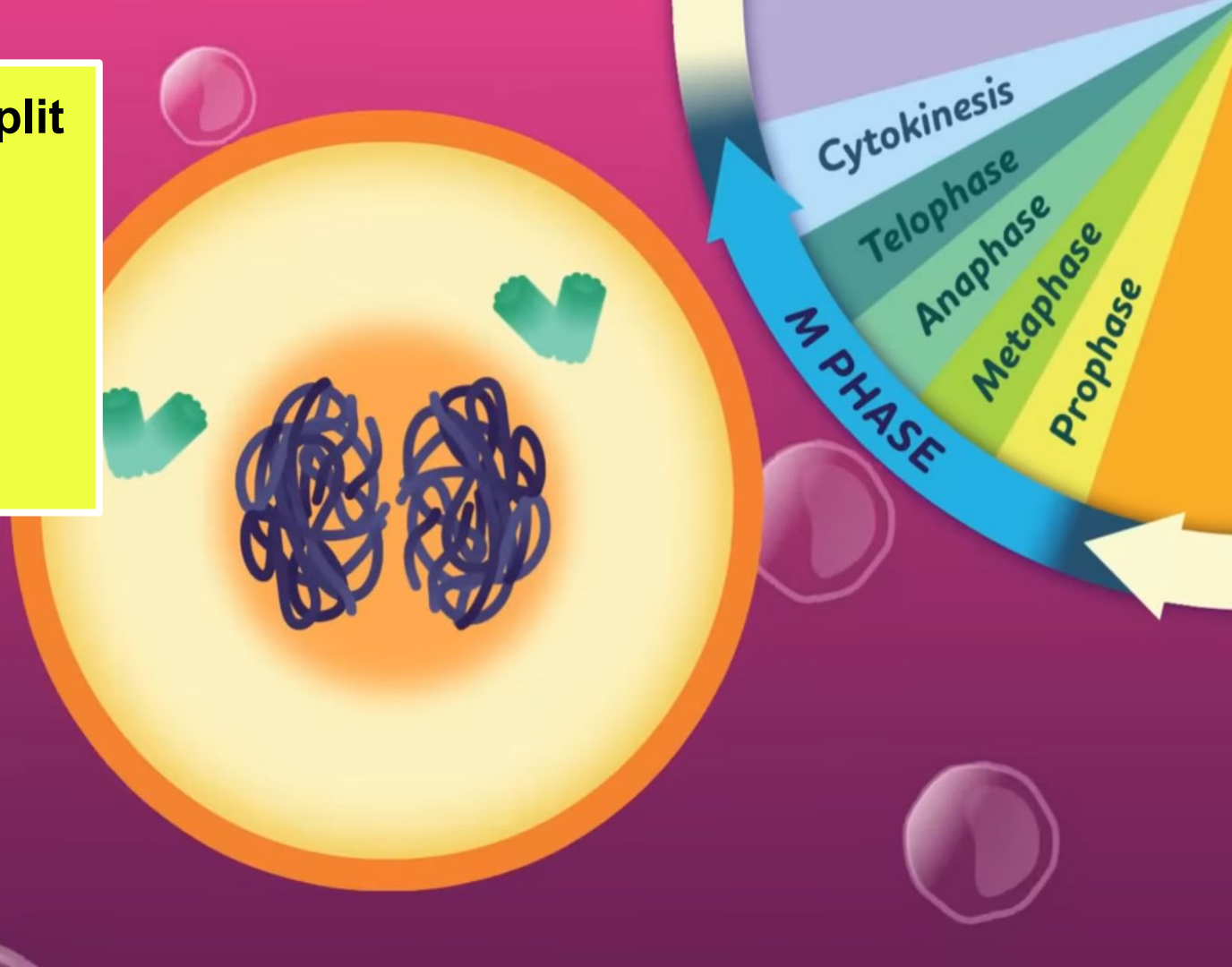
The third phase is called “G2” or the “Second Gap”.

CELL CYCLE



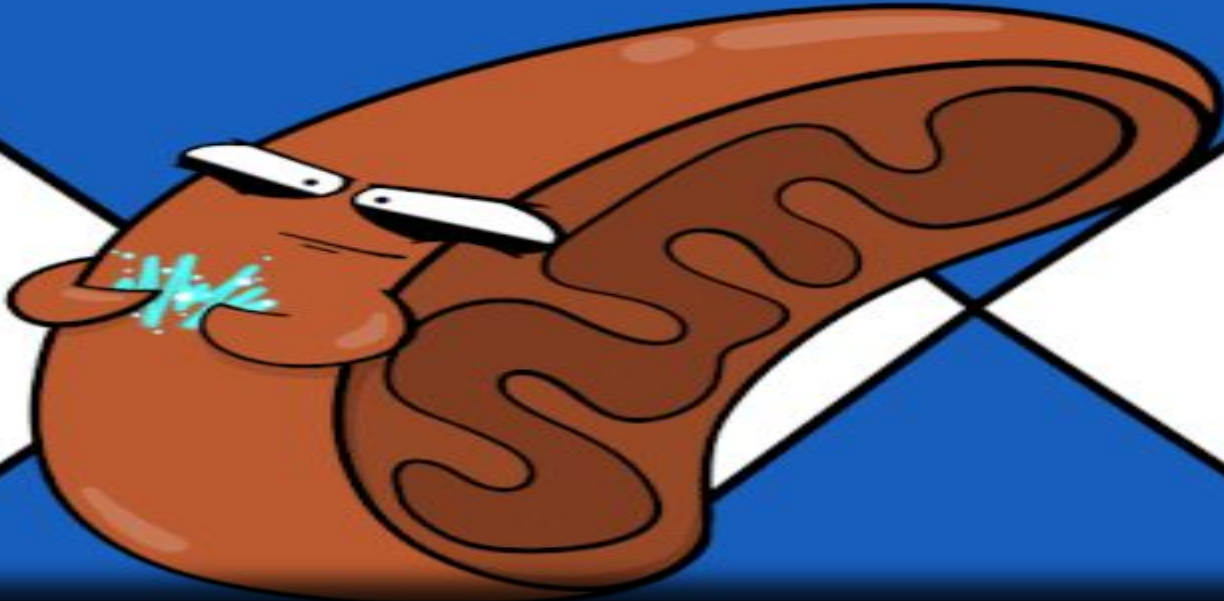
**The Final Phase is split
in sections.**

- A. Prophase**
- B. Metaphase**
- C. Anaphase**
- D. Telophase**
- E. Cytokinesis**



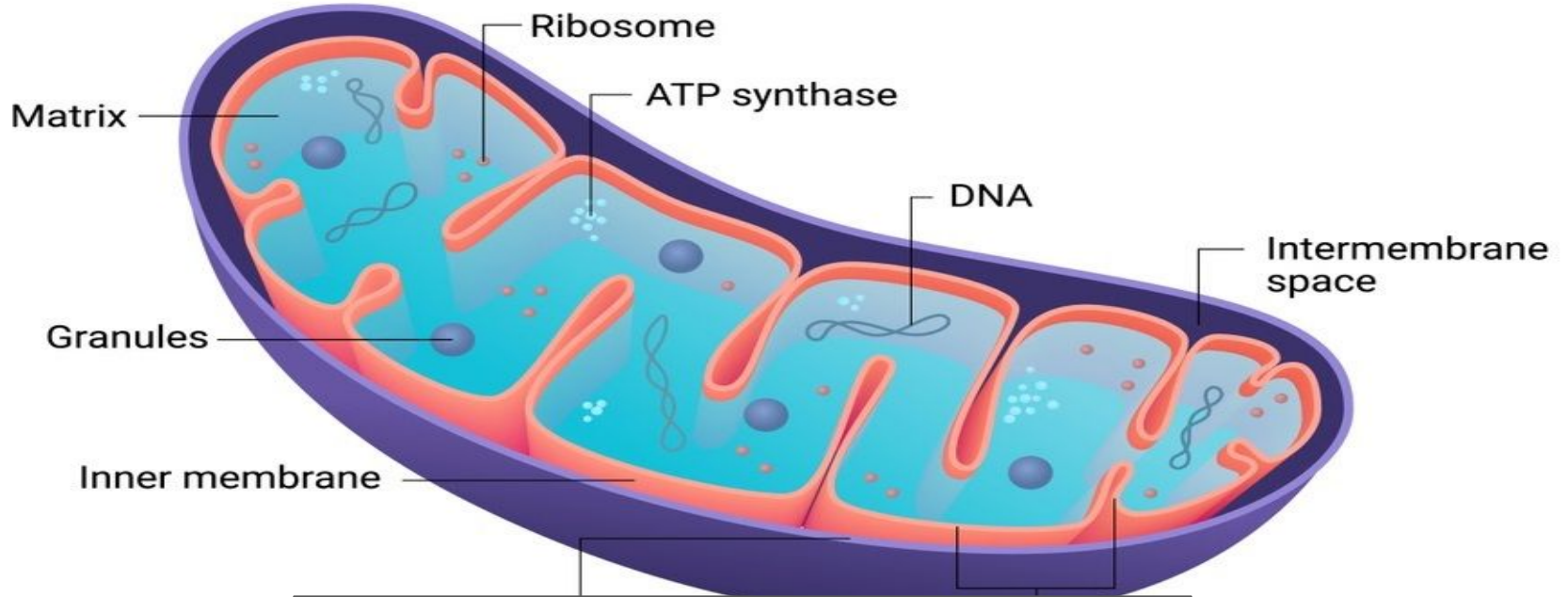
MITOCHONDRION

Go, go mitochondria!



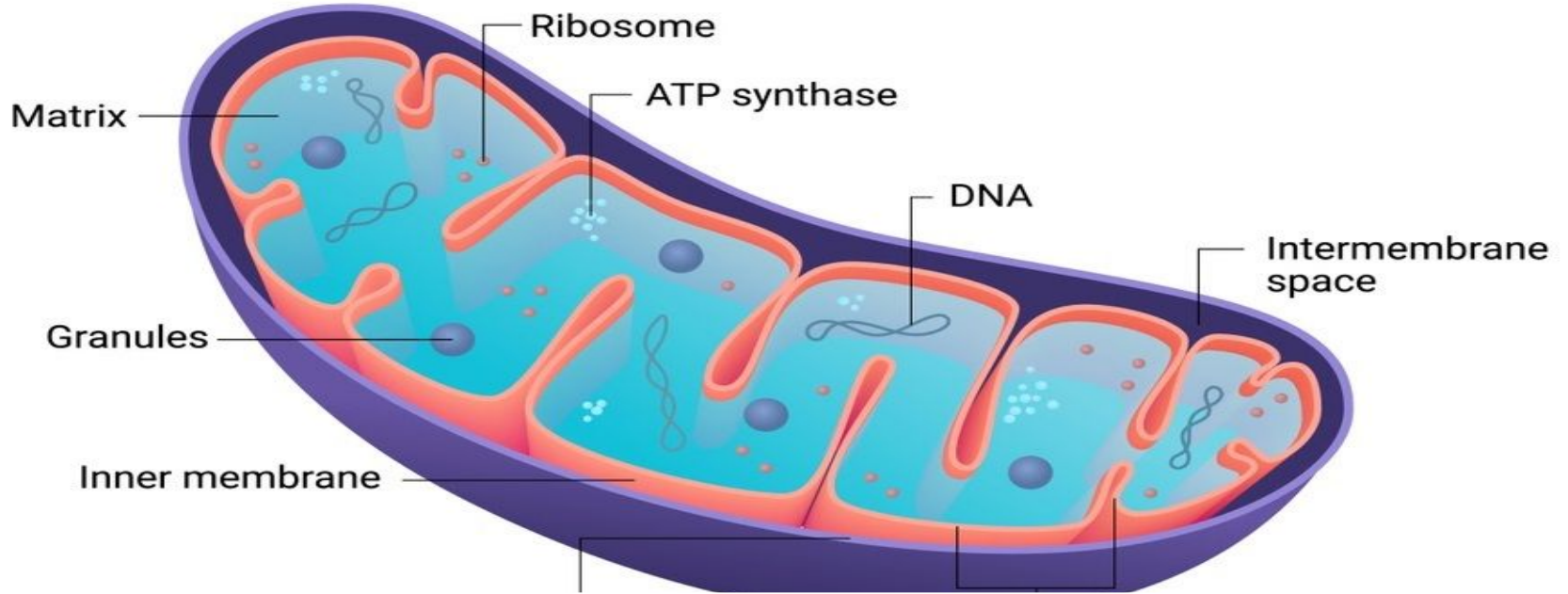
BIOLOGY Unit 7 CELLULAR RESPIRATION

MITOCHONDRIA



Mitochondria is _____

MITOCHONDRIA



Mitochondria is THE POWERHOUSE OF THE CELL

A person wearing blue jeans and brown hiking boots is walking on a mossy forest floor. A green trekking pole is visible on the left. The background shows a dense forest with sunlight filtering through the trees. A dark blue rounded rectangle with white text is in the top right, and a yellow-outlined box containing a blue rounded rectangle with white text is in the middle right.

CELLULAR RESPIRATION

The process that breaks down food and oxygen so we can energize our cells.

Energy in our bodies is stored in the molecule ATP, or
Adenosine-Triphosphate

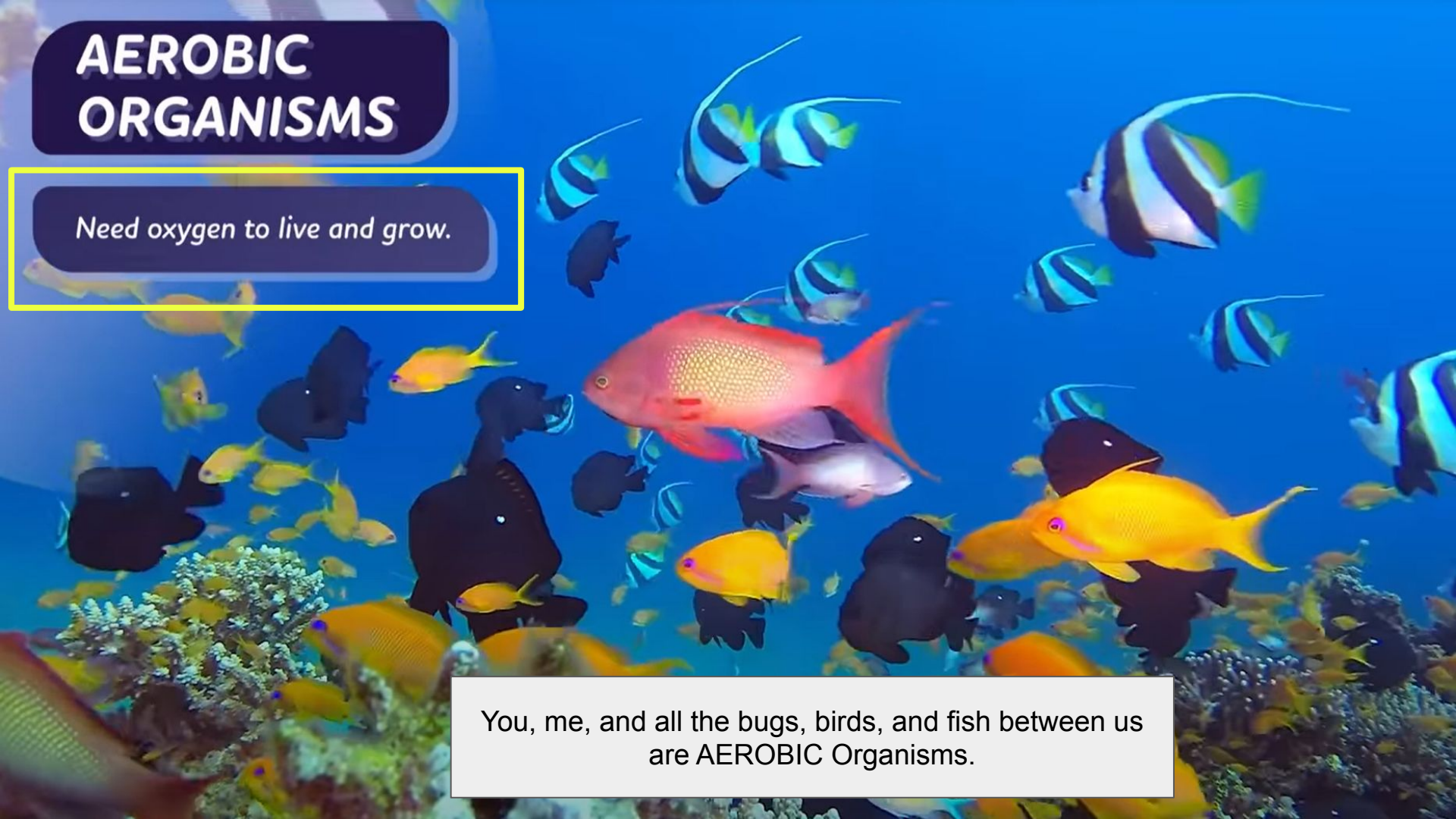
ADENOSINE TRIPHOSPHATE

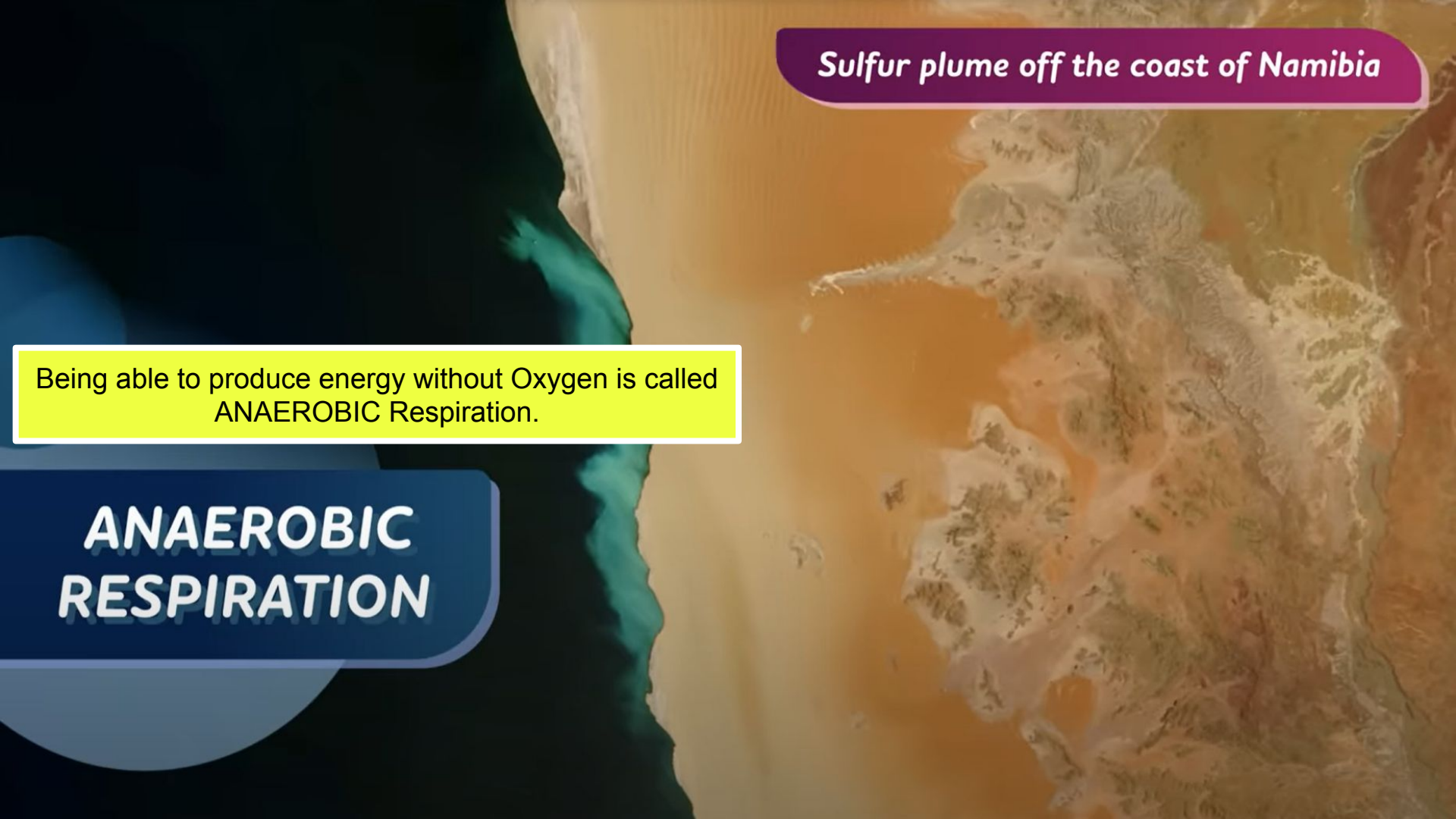


AEROBIC ORGANISMS

Need oxygen to live and grow.

You, me, and all the bugs, birds, and fish between us
are AEROBIC Organisms.





Sulfur plume off the coast of Namibia

Being able to produce energy without Oxygen is called ANAEROBIC Respiration.

ANAEROBIC RESPIRATION

CELLULAR RESPIRATION

Energy released

Glucose



the process by which cells convert nutrients, primarily glucose, into usable energy in the form of ATP.

CELLULAR RESPIRATION

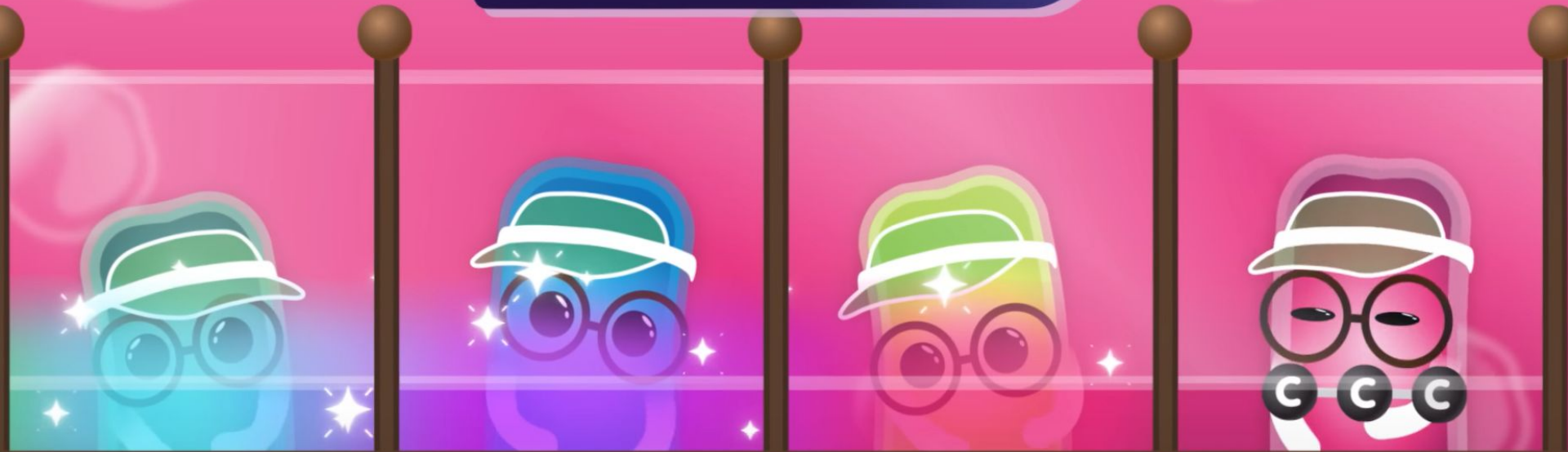
It all starts with Glycolysis

Glycolysis

*Breaks down
the simple sugar
glucose we get
from eating carbs.*



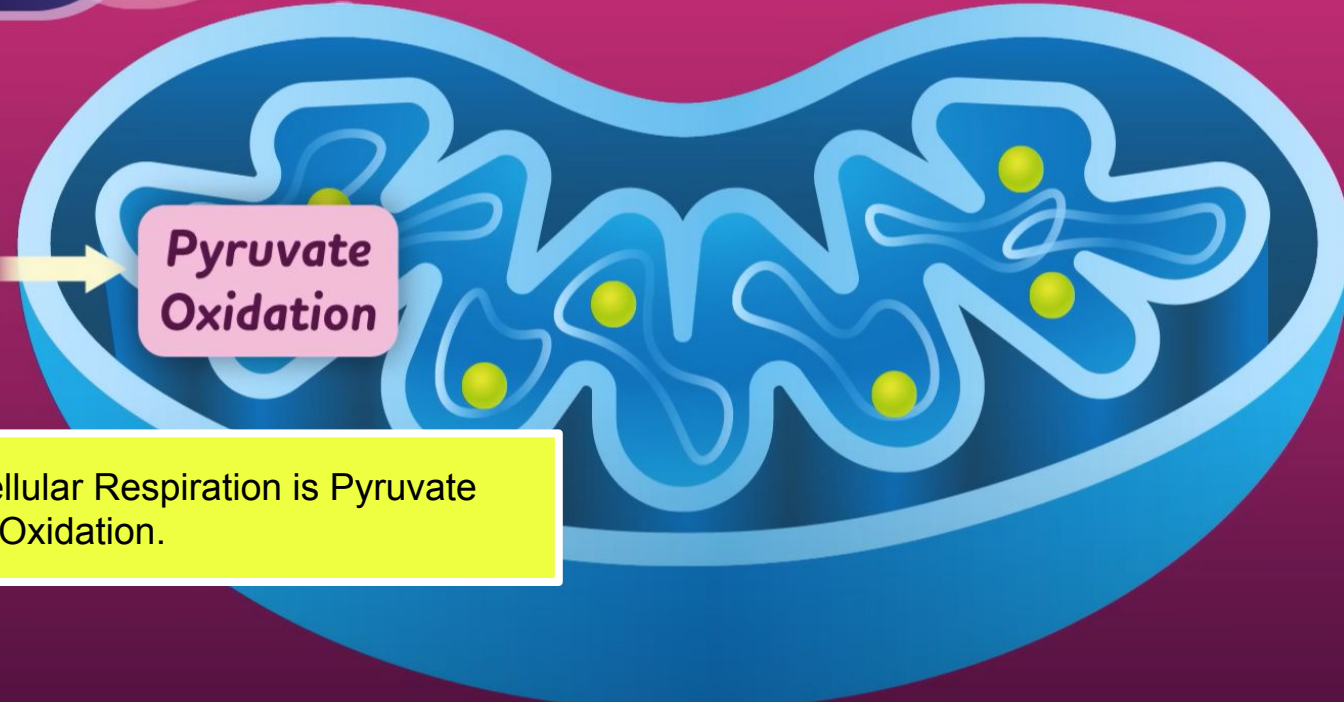
GLYCOLYSIS



Pyruvate

Glycolysis breaks the sugar glucose down into a 3-carbon molecule called a Pyruvate

CELLULAR RESPIRATION

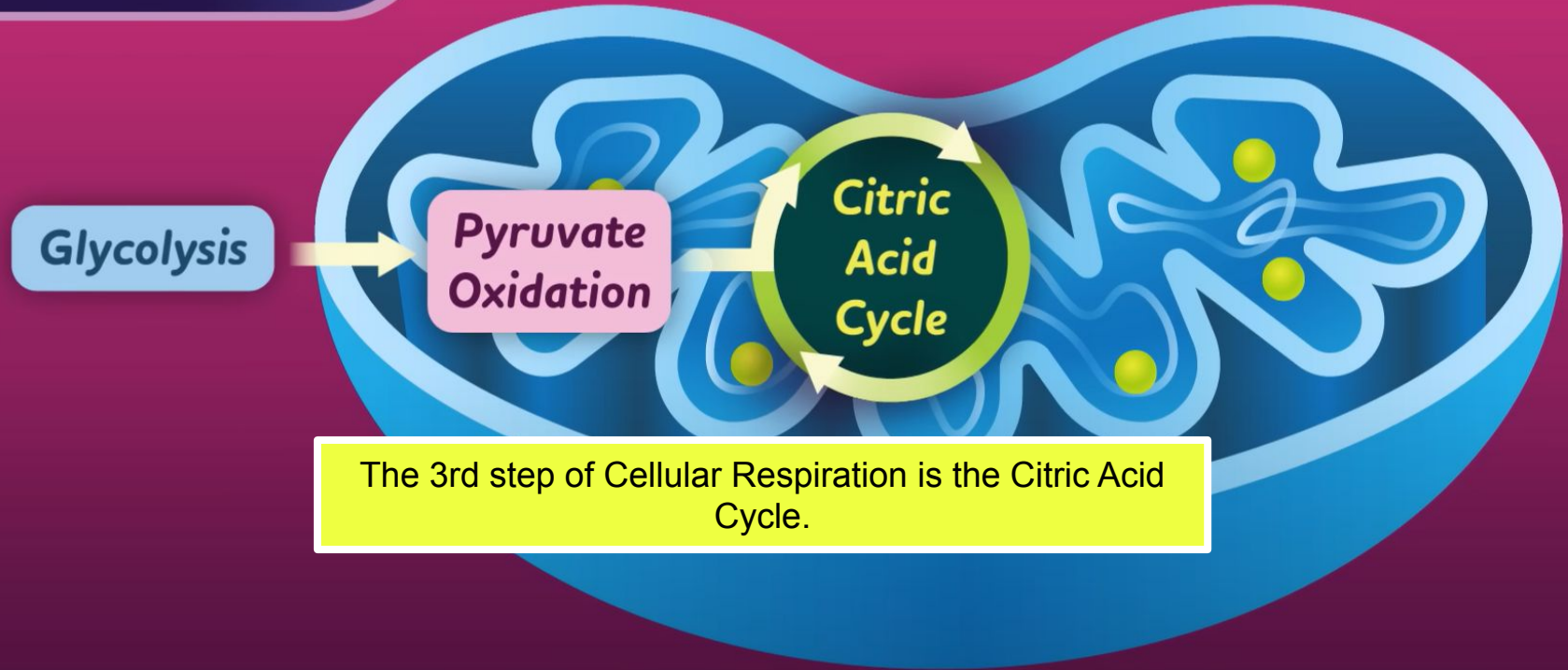
A diagram of a mitochondrion, which is bean-shaped with a blue outer membrane and a highly folded inner membrane. Inside the mitochondrion, there are several yellow circular structures representing mitochondria. An arrow points from the word 'Glycolysis' to the first yellow structure, and another arrow points from the first yellow structure to a pink box labeled 'Pyruvate Oxidation'.

Glycolysis

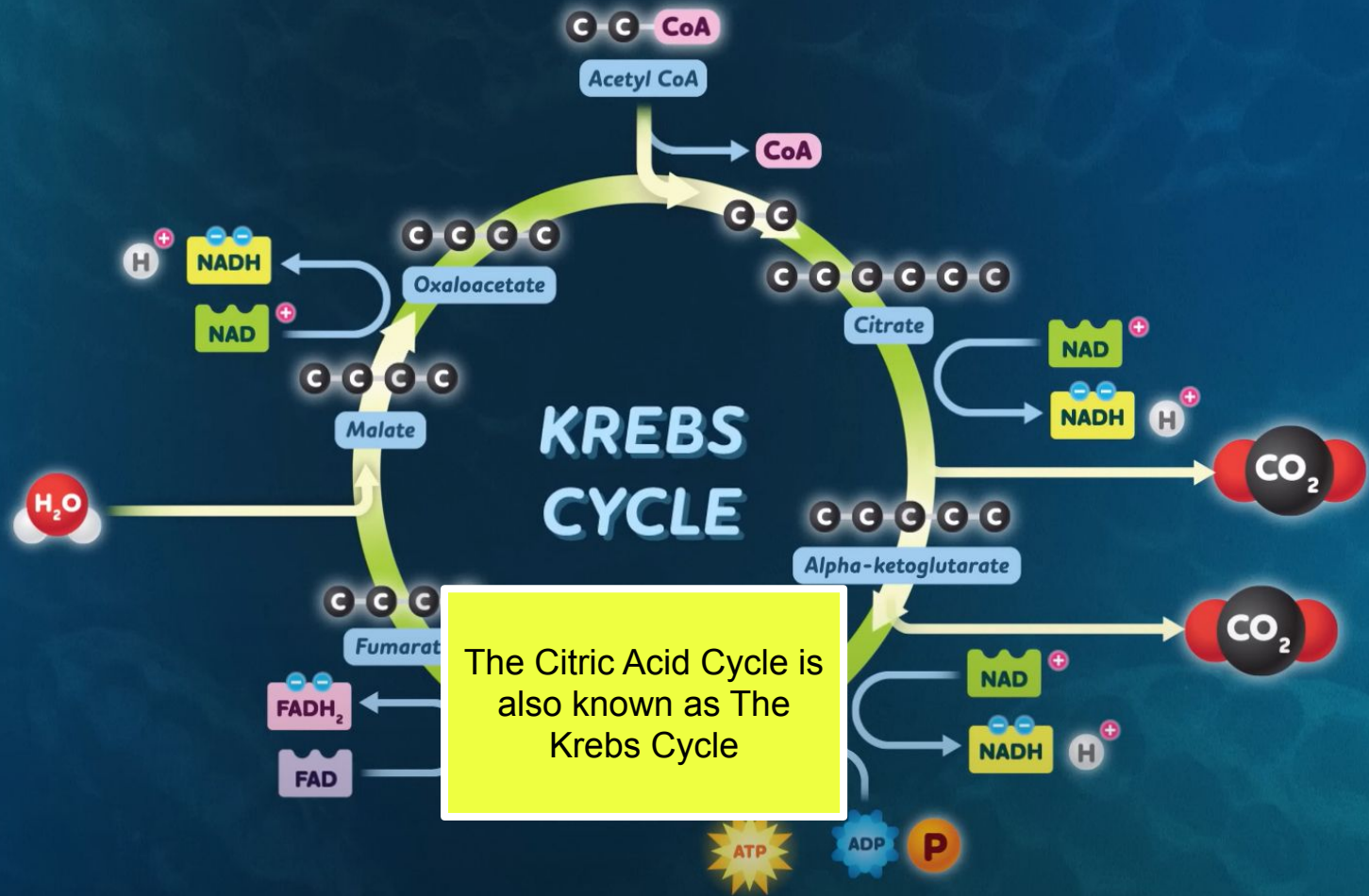
Pyruvate
Oxidation

The 2nd step of Cellular Respiration is Pyruvate Oxidation.

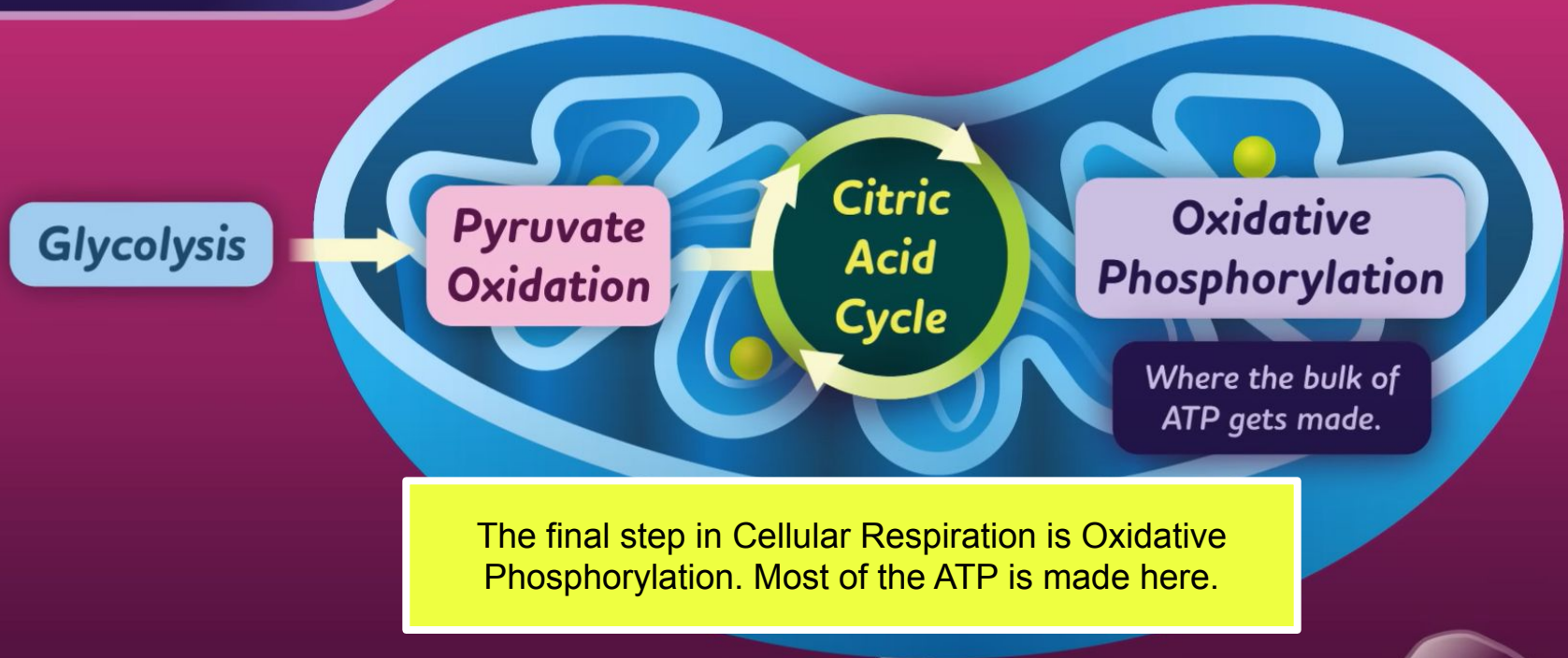
CELLULAR RESPIRATION



The 3rd step of Cellular Respiration is the Citric Acid Cycle.



CELLULAR RESPIRATION



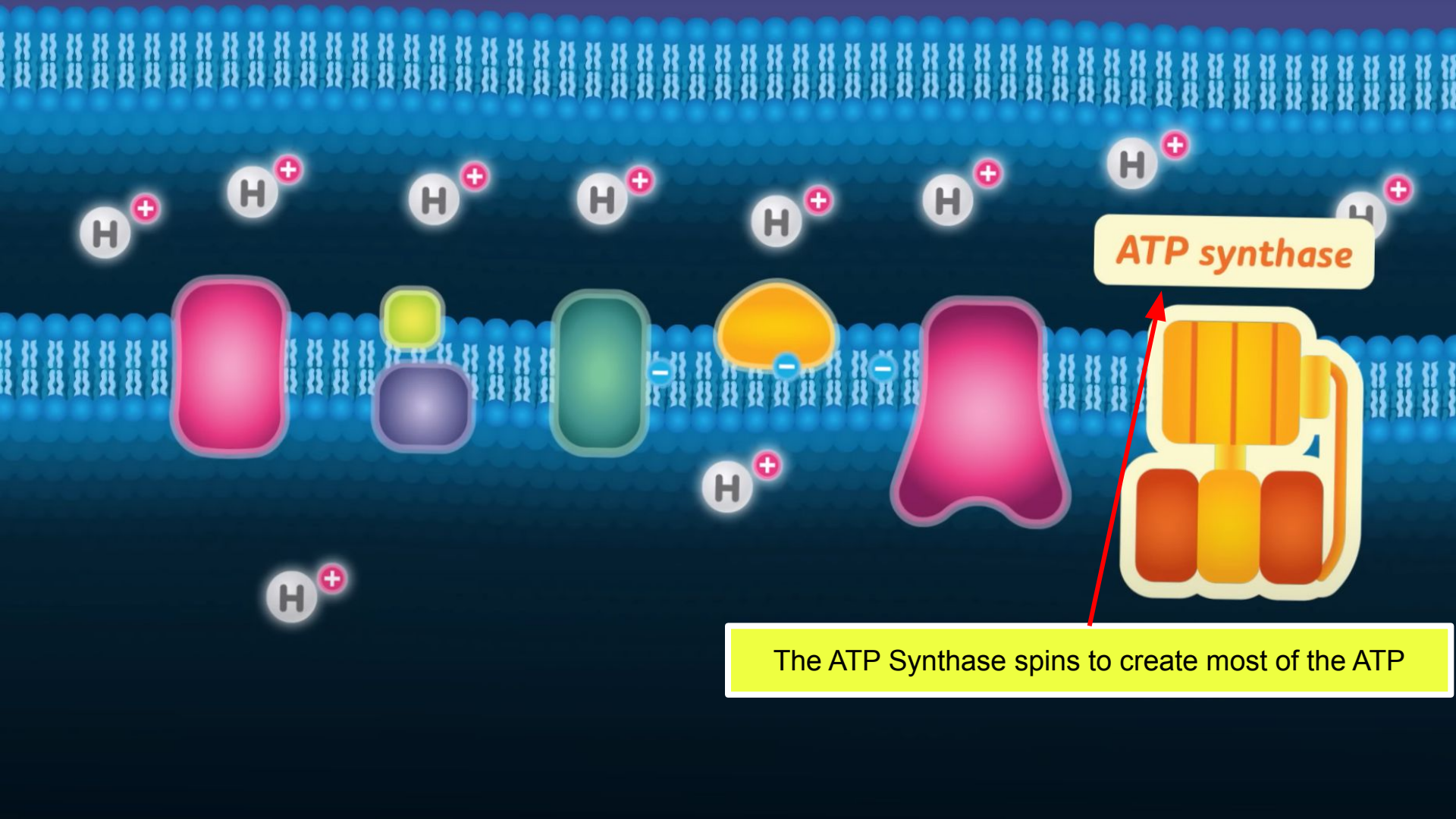
Outer membrane

ELECTRON TRANSPORT CHAIN

Inner membrane

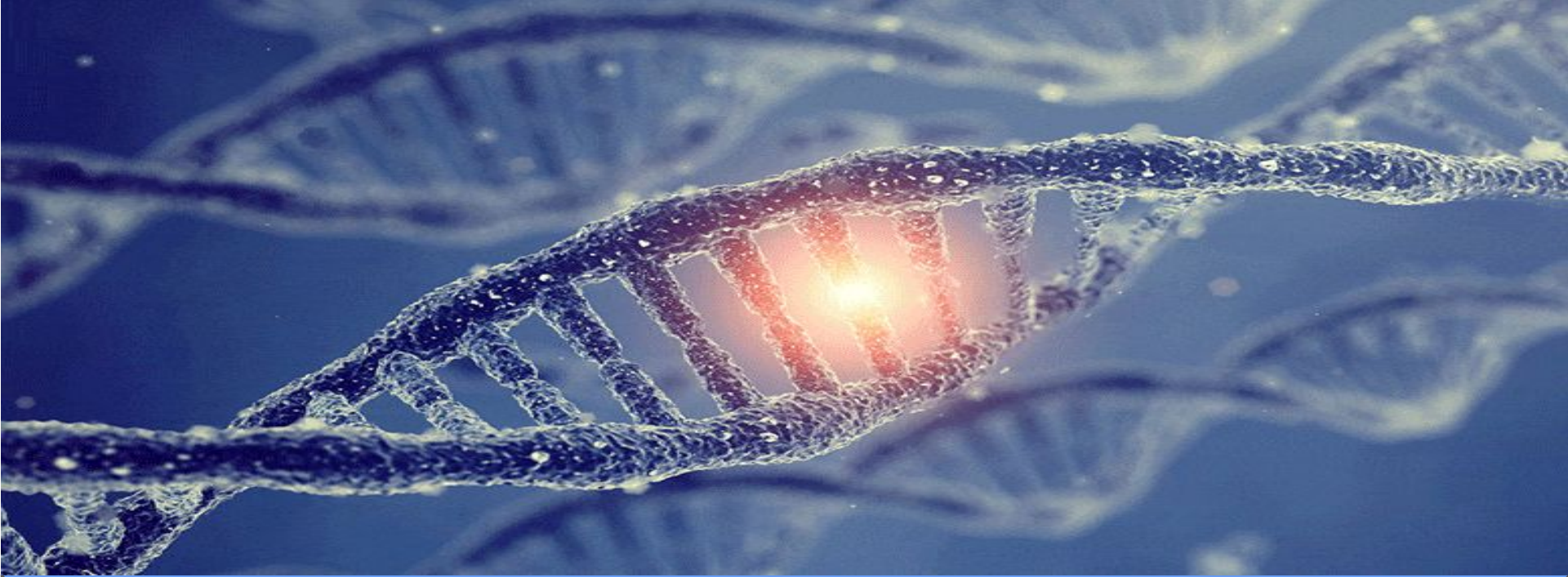
The Electron Transport Chain moves electrons to create ATP in the Mitochondria



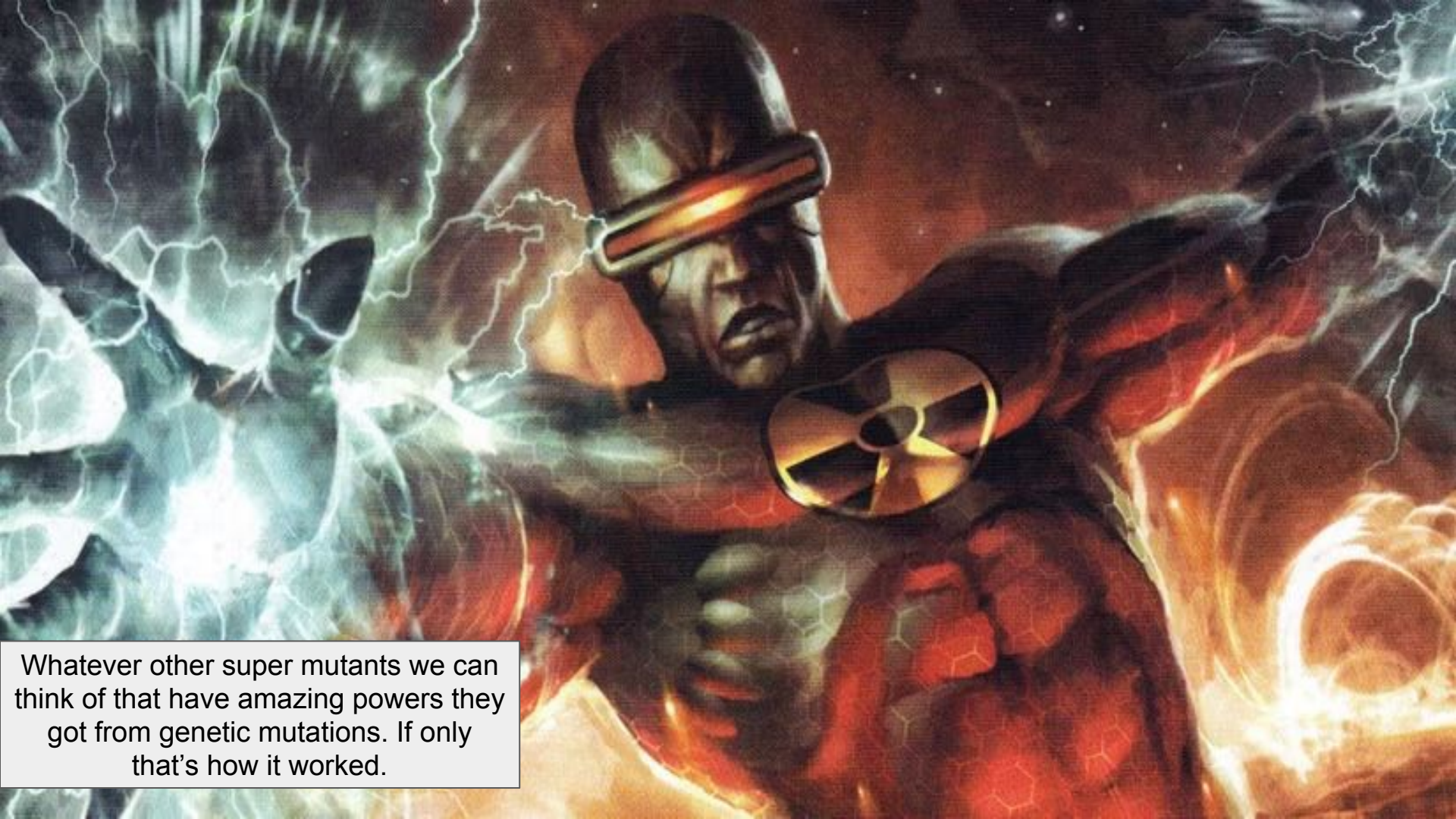


ATP synthase

The ATP Synthase spins to create most of the ATP



BIOLOGY 8: Genetic Mutations

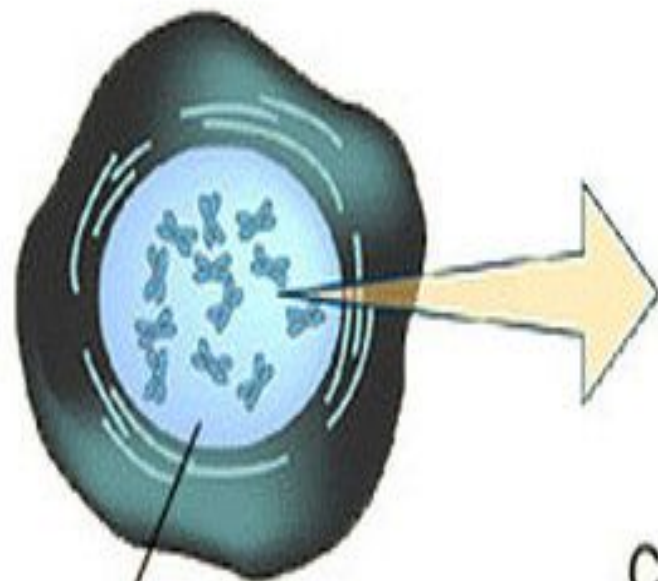


Whatever other super mutants we can think of that have amazing powers they got from genetic mutations. If only that's how it worked.

MUTATION

A change in an organism's genetic code, alternatively called a variation.

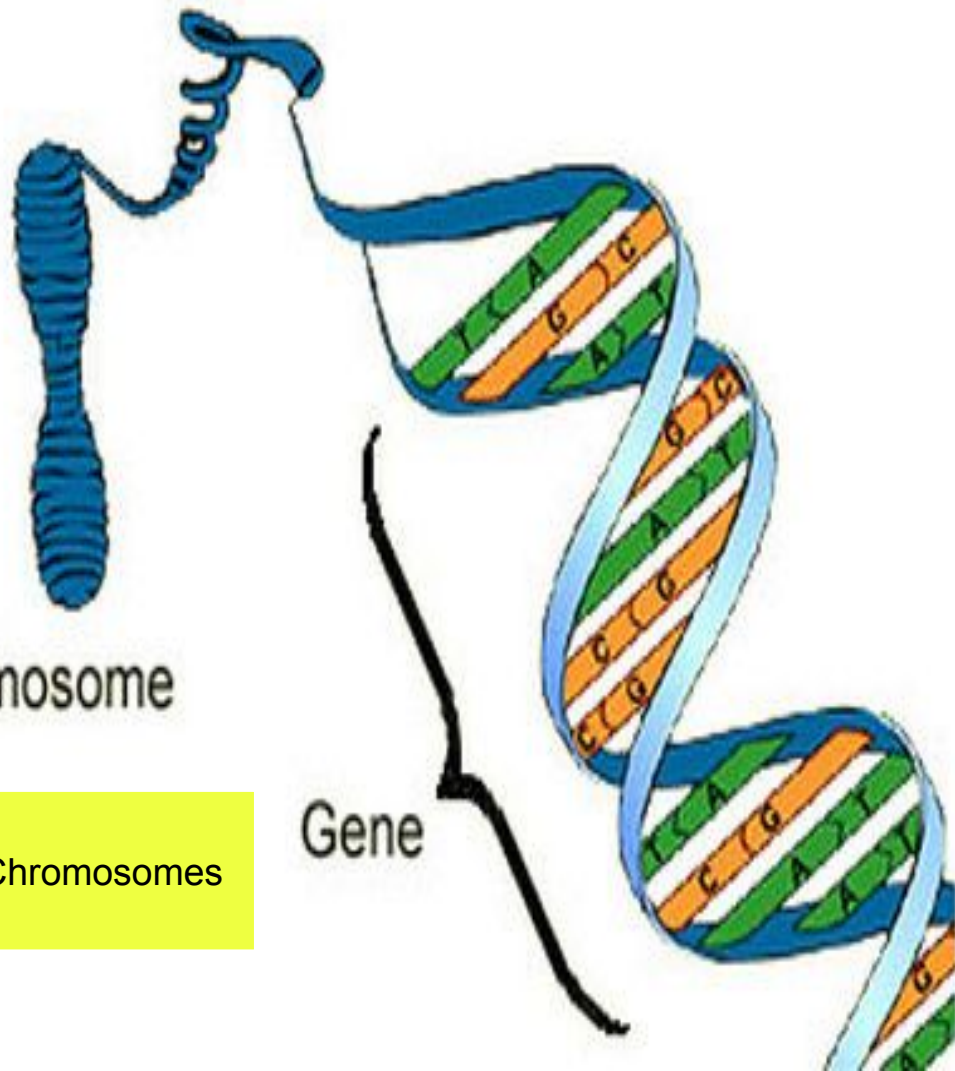
The word "Mutation" comes with a lot of baggage from popular culture.



Nucleus

Chromosome

A Gene is a section of Chromosomes



Gene



Sections of DNA are made up of letters called Nucleotides

DNA REPLICATION ERROR

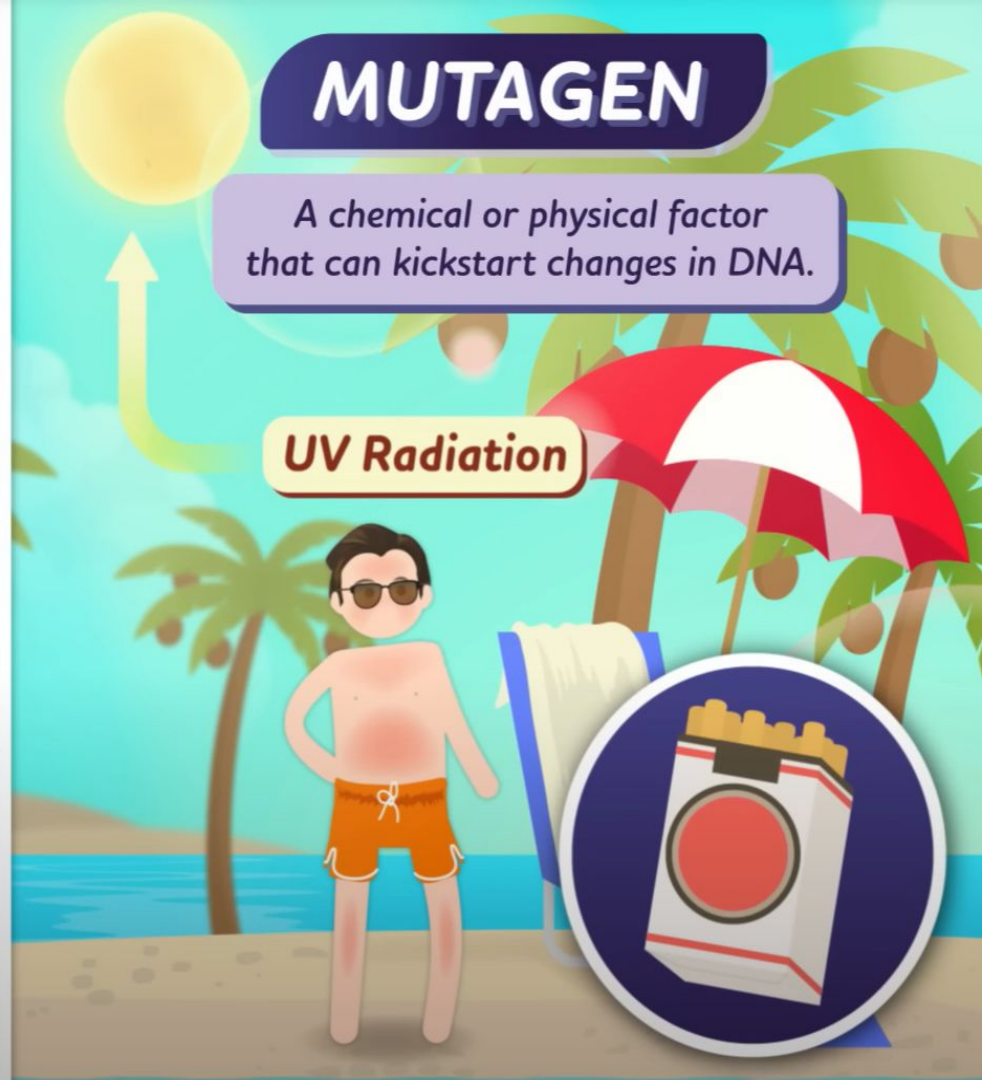
Occurs when DNA reproduces incorrectly.



MUTAGEN

A chemical or physical factor that can kickstart changes in DNA.

UV Radiation



A close-up photograph of a baby lying down, looking up. Two hands are gently holding the baby's face. The background is a soft, out-of-focus grey.

INHERITED MUTATIONS

A mutation in your DNA that is inherited from your parents.

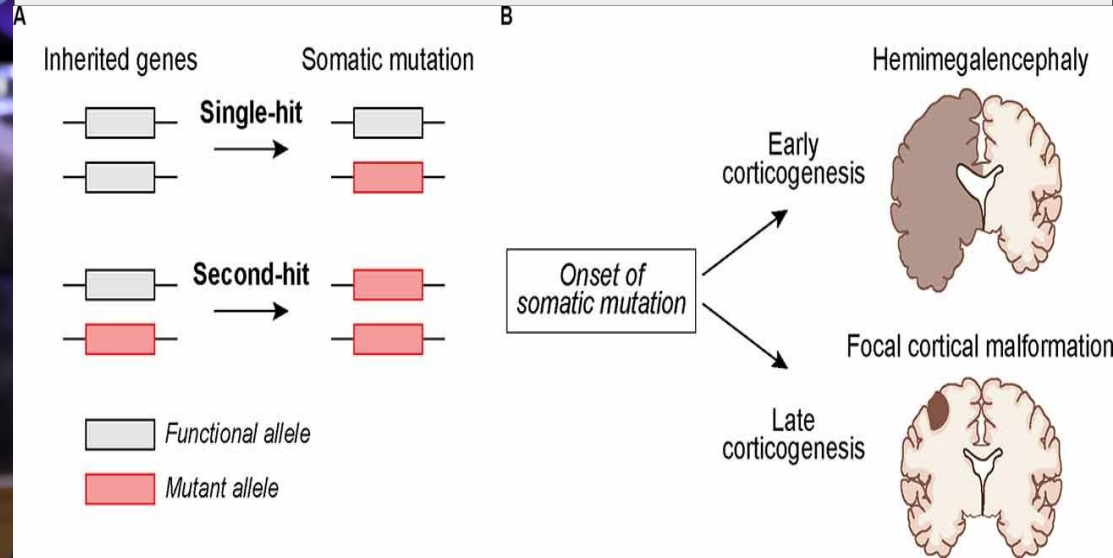
SOMATIC MUTATION

A mutation that occurs after conception. Somatic mutations don't get passed on genetically.

From the Greek "**soma**" meaning "body"

6A

A mutation that occurs after conception (birth) is called a somatic mutation, and it can occur anywhere in the body except the egg or sperm cells.



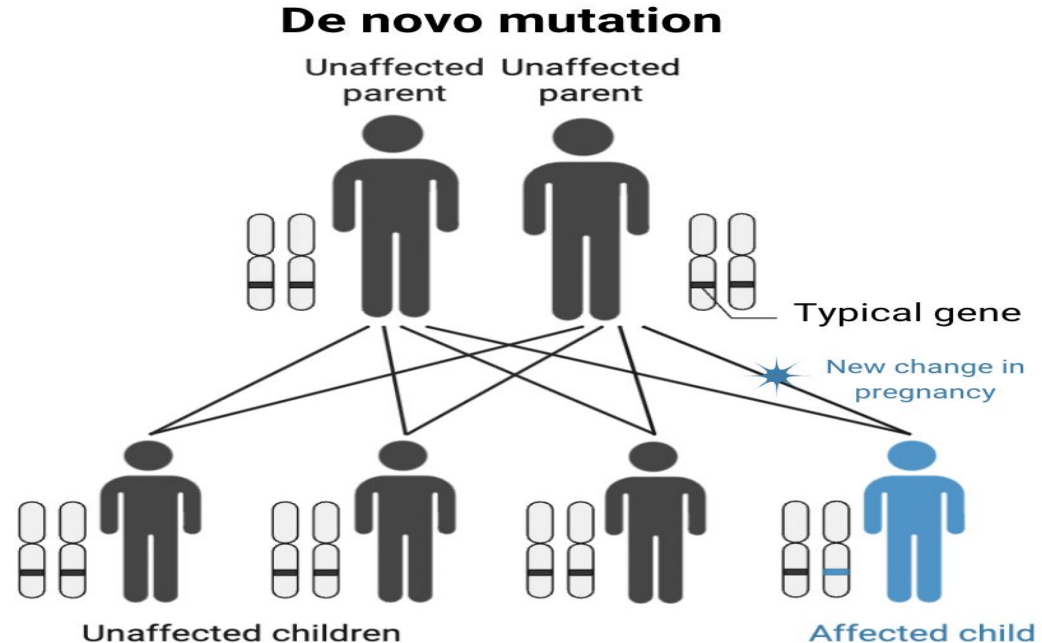
DE NOVO MUTATION

A mutation that occurs in an organism's sperm or egg cells, and can be passed on to all of its offspring's cells.

From
the Latin
"**de novo**"
meaning
"from new"

7A

But, if an organism develops a mutation in one of its egg or sperm cells, well, that altered DNA could be passed to all of its offspring's cells. This is called a De Novo Mutation.



SUBSTITUTION

8A

Where one nucleotide is substituted for a different one.

Substitution

original

C T G G **A** G

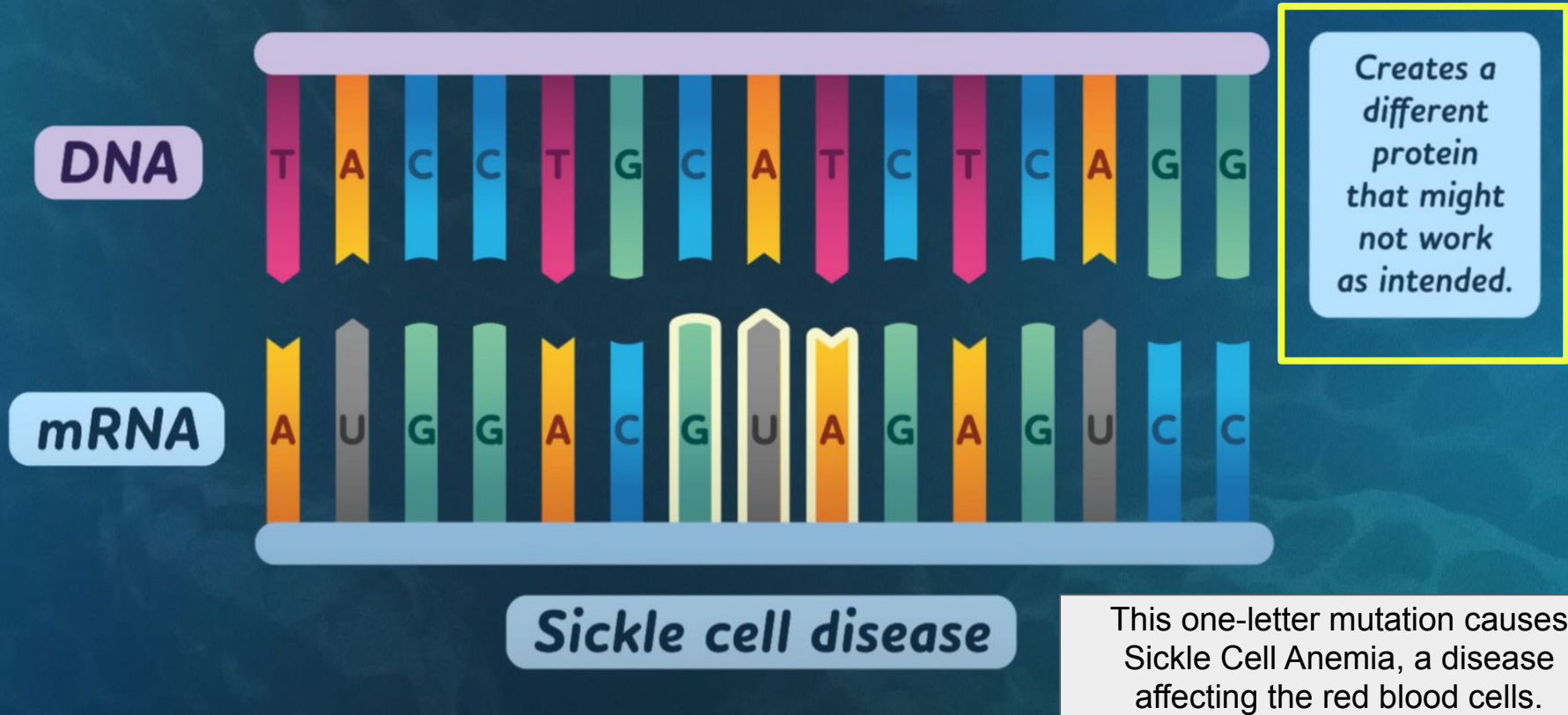


mutated

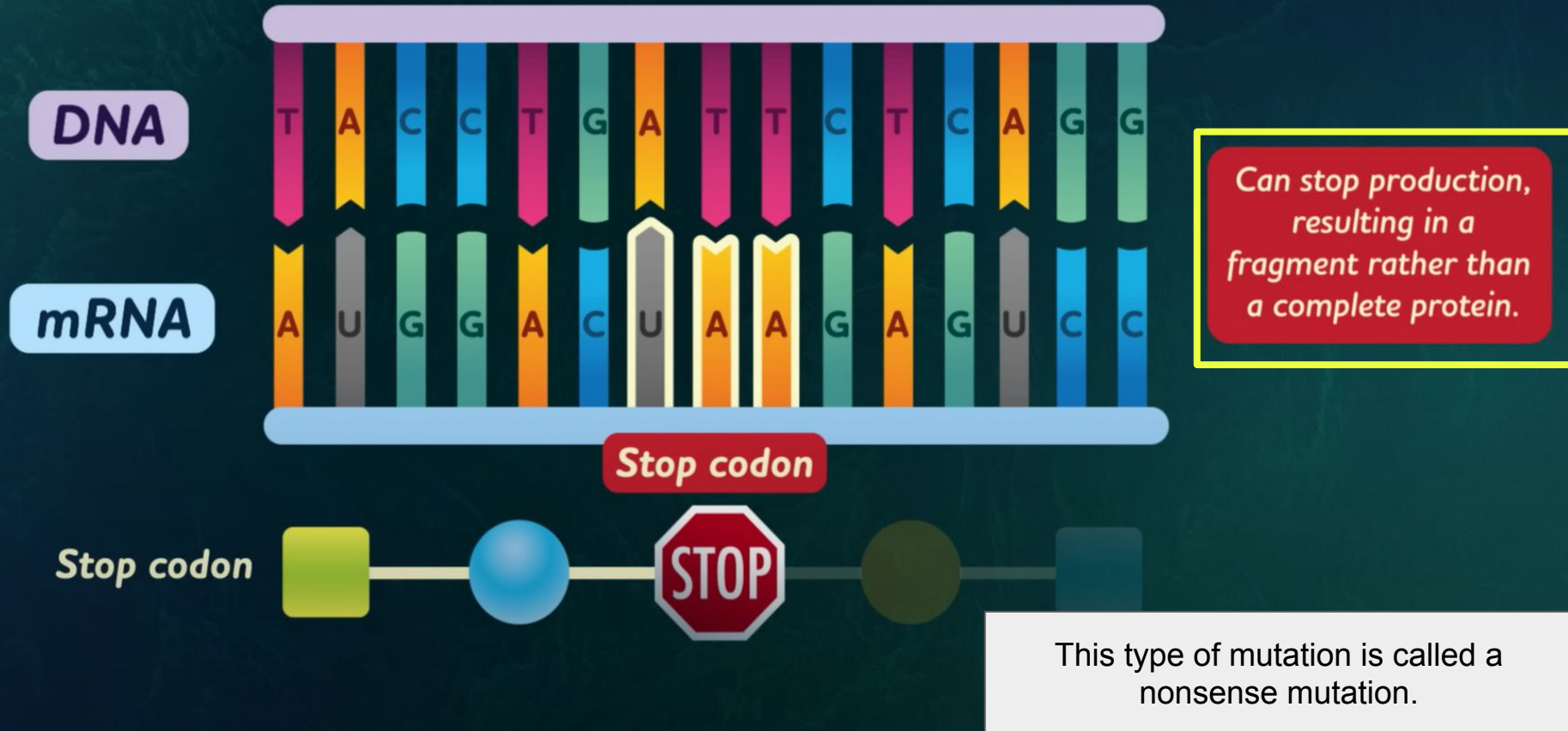
C T G G **G** G

One common how is substitution, where one nucleotide is substituted for a different one. Depending on which letter is swapped, this could mean nothing noticeable happens, or it could potentially affect the entire organism.

MISSENSE MUTATION



NONSENSE MUTATION



SILENT MUTATION

A silent mutation is a change in the nucleotides that does not change the amino acid.

DNA

T

A

C

A

G

G

mRNA

A

U

G

G

A

C

G

A

G

G

A

G

U

C

C

Glutamic acid

So, if this last letter mutated from an A to a G, nothing would happen, or at least, that's what we thought.

FRAMESHIFT MUTATIONS

When nucleotides get deleted or extra nucleotides get added.

DNA

T A C C T G C T C T C T C A G G

mRNA

A U G G A C G A G A G A G U C C

Met

Asp

Glu

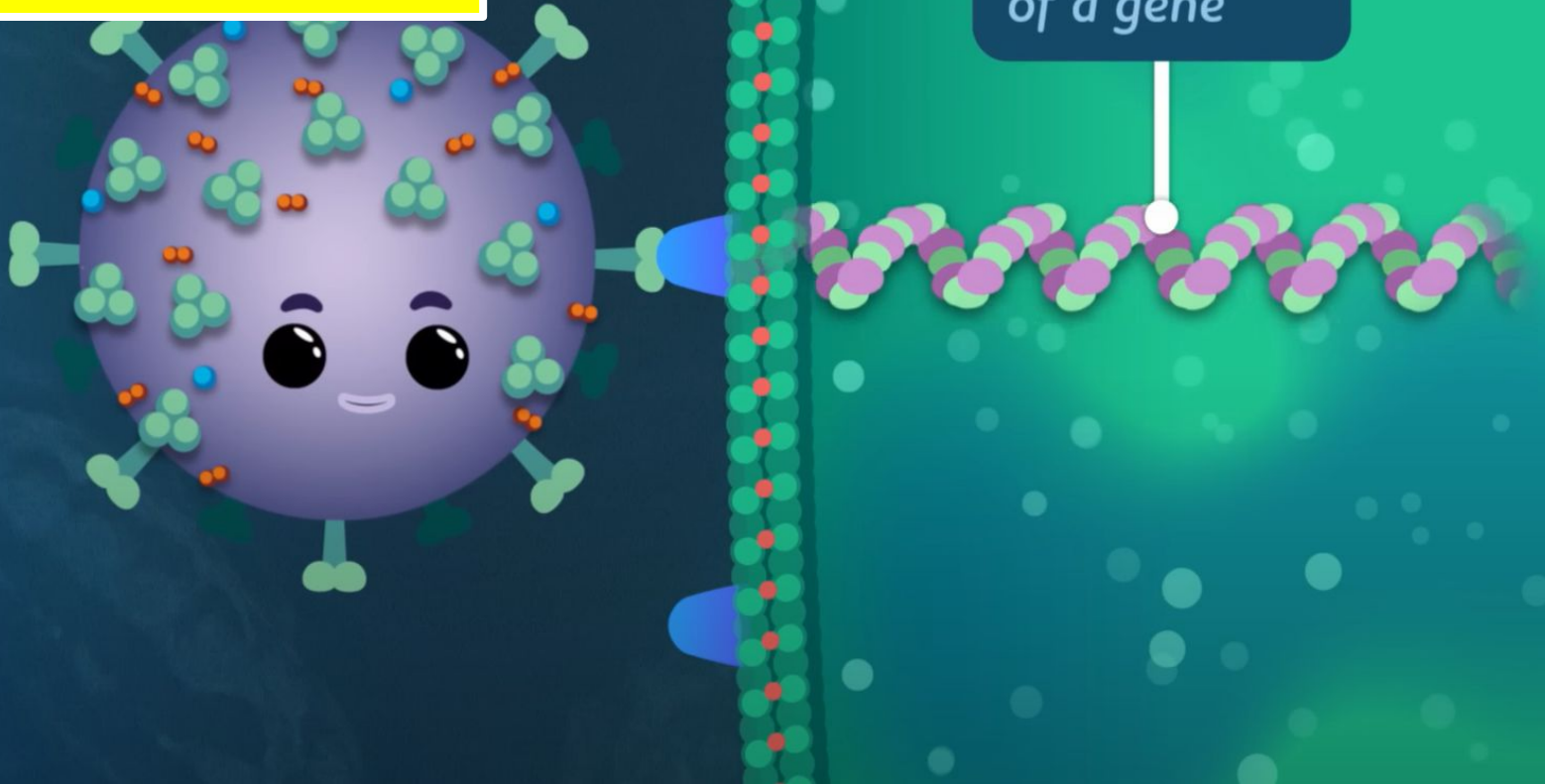
~~Glu~~

~~Ser~~

These are called Frameshift mutations.

GENE THERAPY

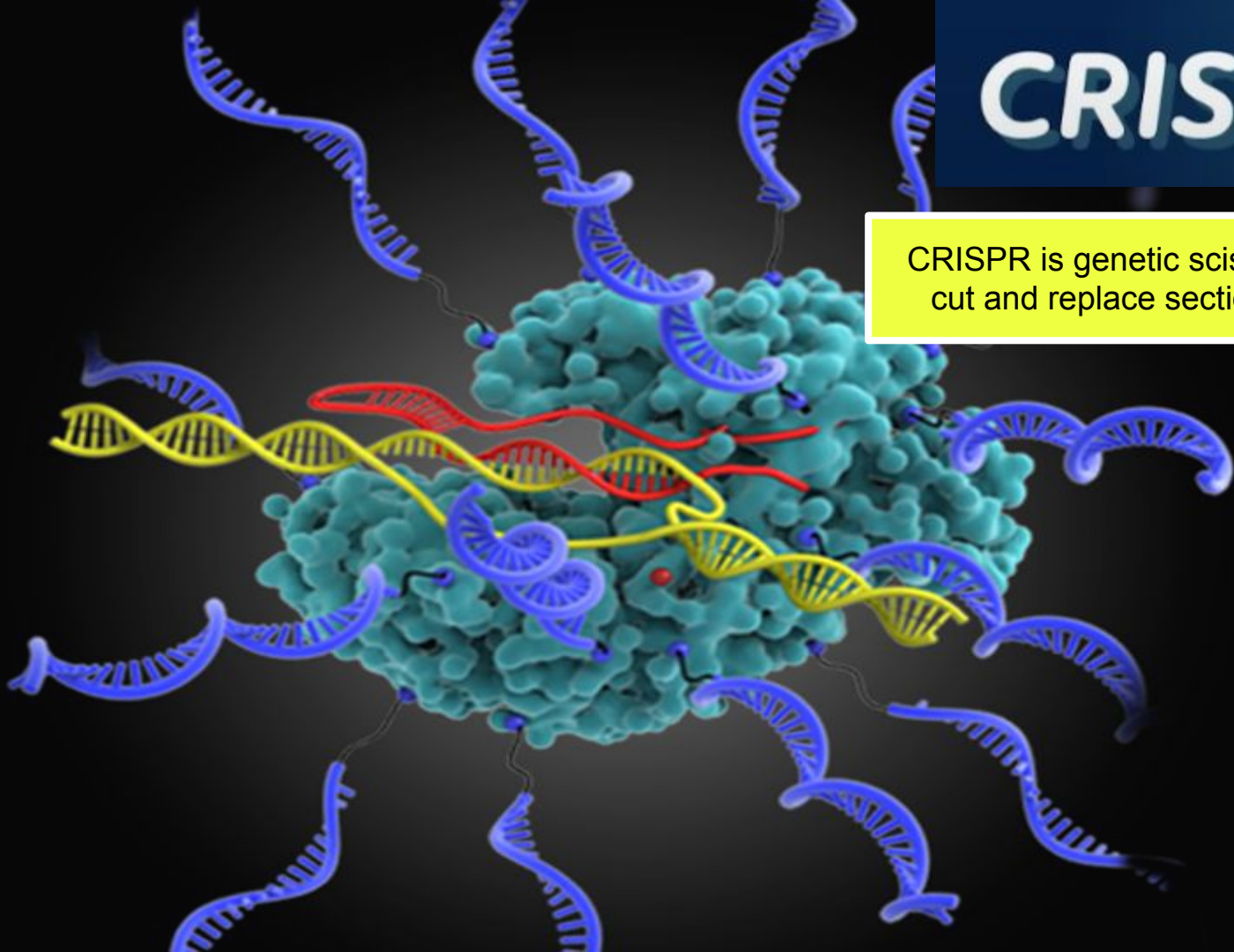
Using a virus to deliver a healthy copy of a gene into a cell.



*Healthy copy
of a gene*

CRISPR

CRISPR is genetic scissors that can cut and replace sections of DNA.



PHARMACOGENOMICS

The study of how genes affect the way medicine works — or the way your DNA influences how your body responds to certain drugs.



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I hope this Study Guide brings you the help you need for your Section Test. Gooooood Luck!