

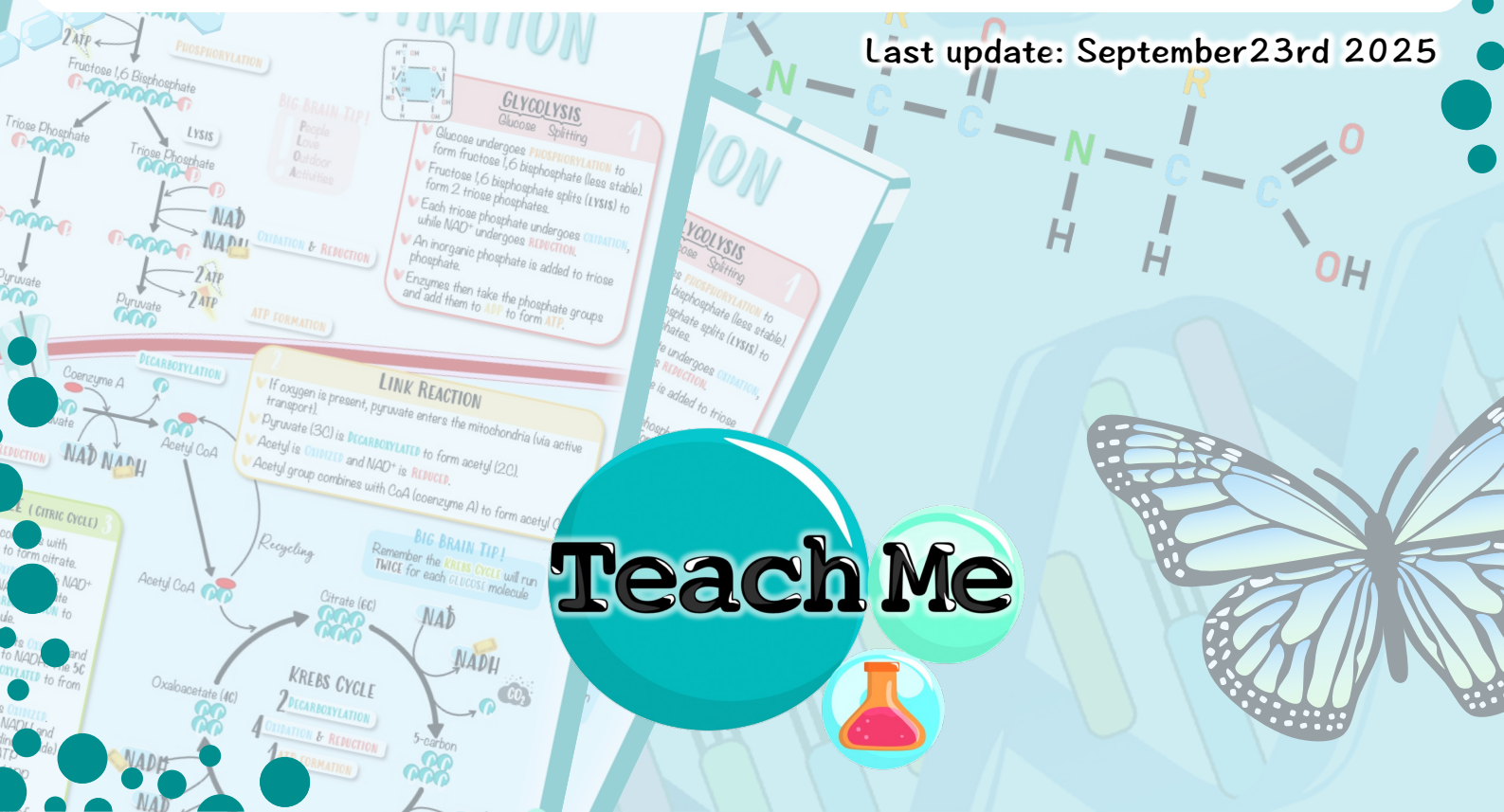
TeachMe

STUDY NOTES

CHAPTER 1 - CELL STRUCTURE PROKARYOTIC CELLS

Last update: September 23rd 2025

Teach Me



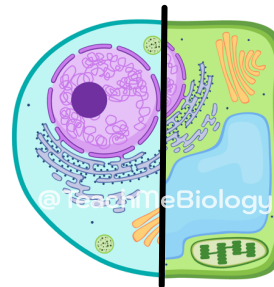
PROKARYOTIC CELLS

All living organisms can be categorized as **EUKARYOTIC** or **PROKARYOTIC**. As humans, we are made up of eukaryotic cells, and so are plants and other animals. Bacteria on the other hand are prokaryotes.

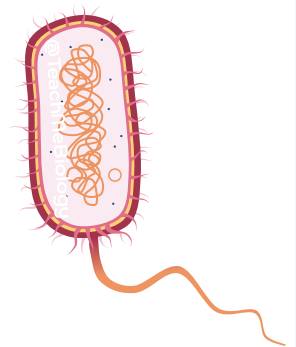
ALL LIVING ORGANISMS

EUKARYOTES

☀️ PROKARYOTES



(previous note)



PROKARYOTIC CELLS

"Before" "Nucleus"

Prokaryotic cells are found in: **Bacteria** + **Archea**

Prokaryotic cells are **NOT COMPARTMENTALIZED** they have no membrane-bound organelles. They comprise unicellular (one cell only) organisms exclusively, making them both smaller and simpler than eukaryotic cells.

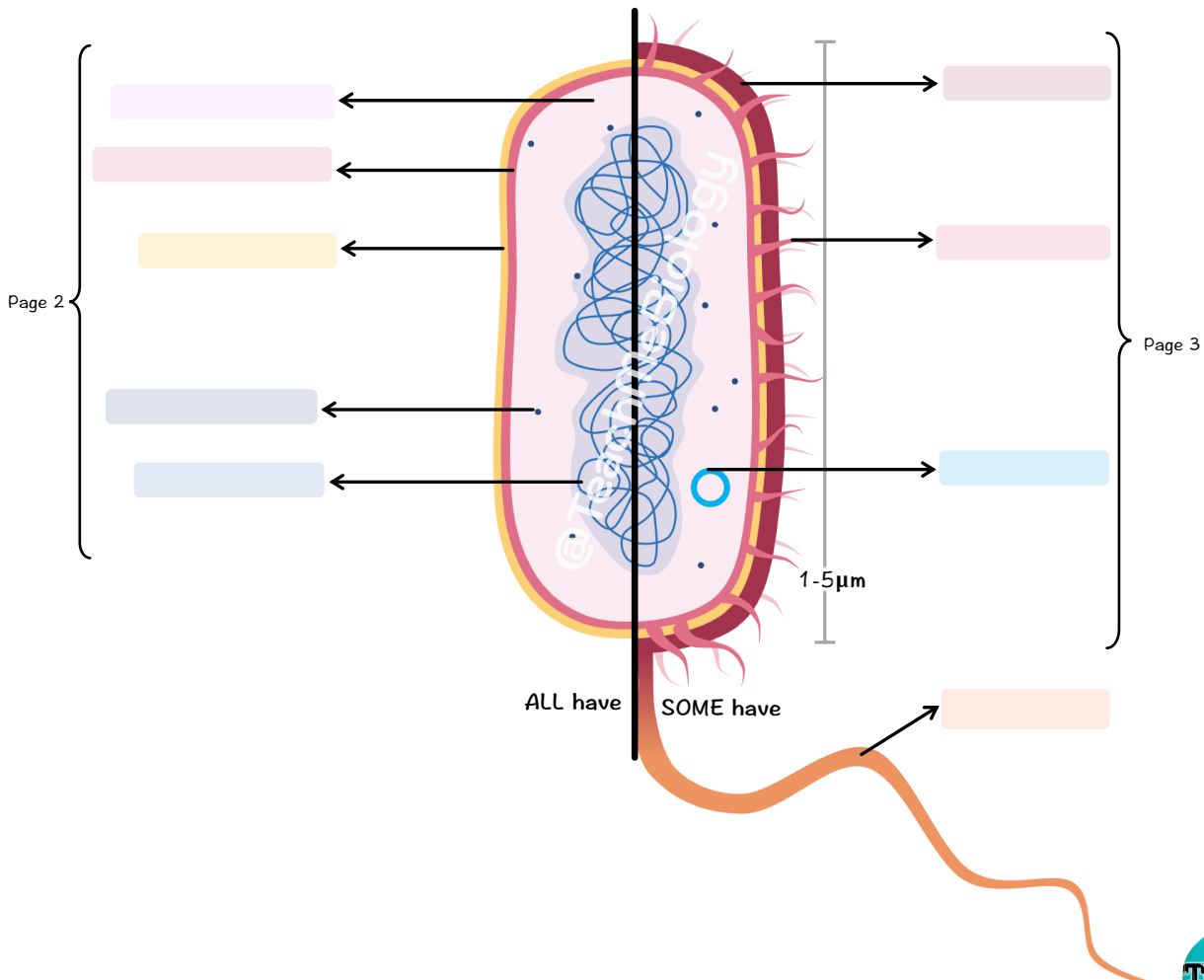
DID YOU KNOW?

A common misconception is that all bacteria are bad—but many are actually good for you! In fact, your body is home to about **39 trillion bacterial cells** and **30 trillion eukaryotic cells**, meaning they slightly outnumber your own cells. Altogether, they weigh around 200 grams—about the size of an apple!



Learning more about prokaryotic cells helps us save ourselves by killing bacteria!

All the structures you need to know about for prokaryotic cells are shown below on the diagram. It can feel overwhelming in the beginning, but on the next page, we will go through each of the structures one-by-one — you can then come back to this page and test yourself by filling-in the name of each structure! (find the answer key on page 2 and 3)



STRUCTURES ALL PROKARYOTES HAVE

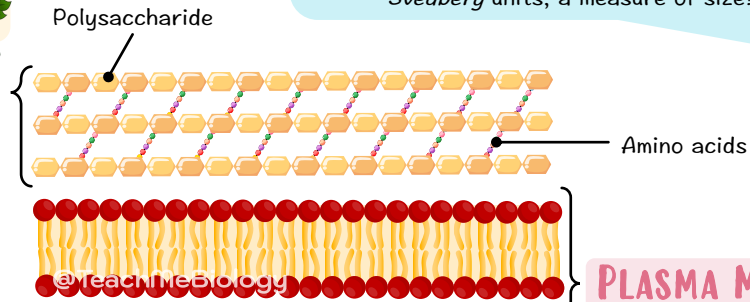
DON'T FORGET!

Prokaryotic cell wall contains peptidoglycans.
Plant cell wall contains mainly cellulose.

CELL WALL

Contains **PEPTIDOGLYCANS** (also called murein)
= Polysaccharide combined with amino acids
(Chapter 2).

It gives protection to the cell and prevents
it from bursting.



BIG BRAIN TIP!

Notice how ribosomes are present in both
eukaryotic and prokaryotic cells, but they have
a slightly different size: 80S in eukaryotes and
70S in prokaryotes, where 'S' refers to
Svedberg units, a measure of size!

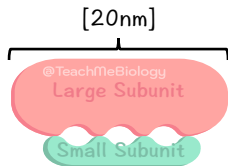


RIBOSOMES

The site of protein synthesis
70S (Prokaryotic)
"Svedberg" units

Targeted by
antibiotics!

More on page 3



TIP! E for Eighty → Eukaryotes = 80S

NUCLEOID

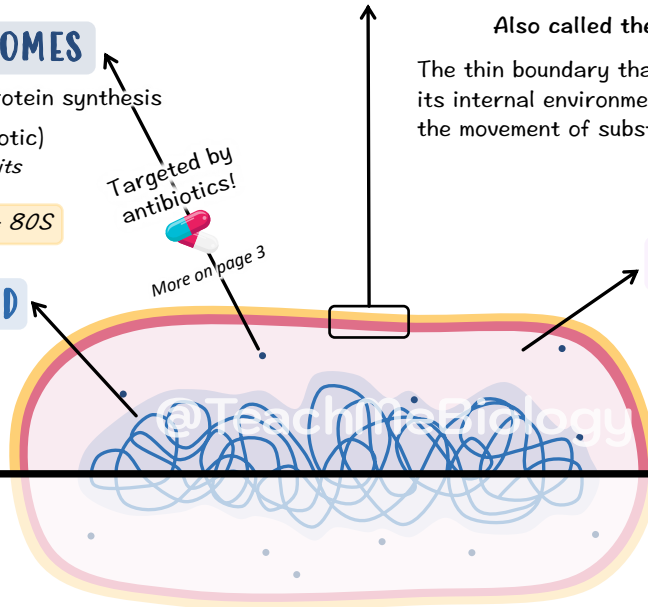
The region containing DNA
(circular), it has no membrane and
no histones: we call it **NAKED** DNA.

ALL have

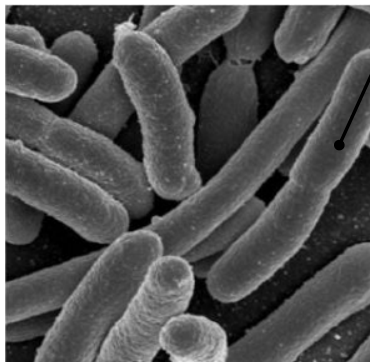
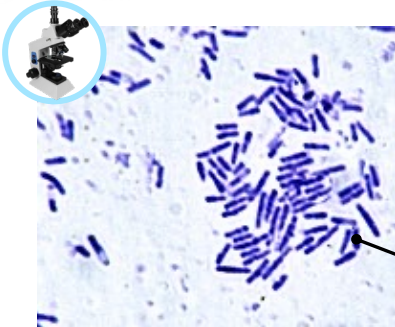
CYTOPLASM

The entire interior of the cell, as
there are no membrane-bound
organelles.

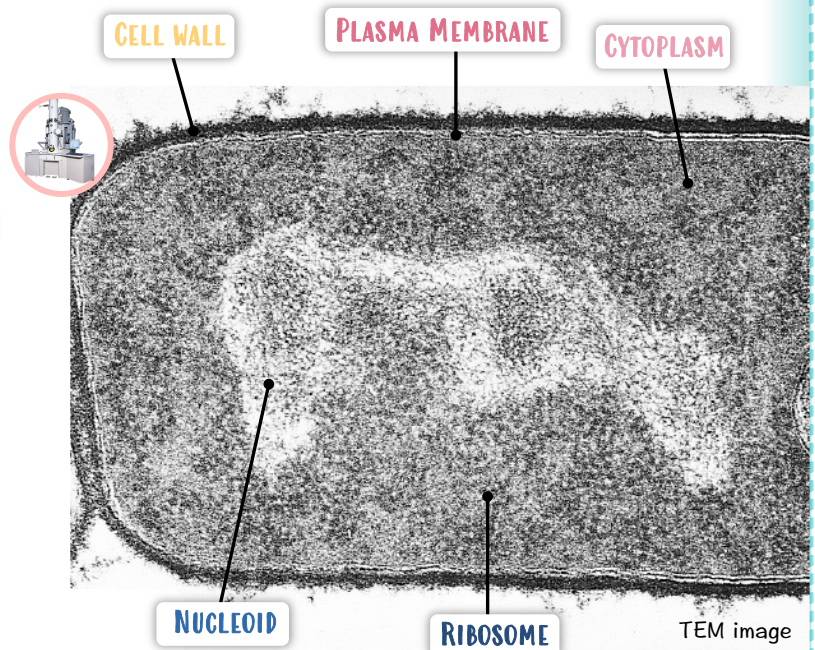
(everything except the cell wall
and plasma membrane)



IMAGING



SEM image



TEM image

STRUCTURES SOME PROKARYOTES HAVE

Made of polysaccharides (chapter 2)

CAPSULE

Plays a role in **protection**:

- From drying out (dehydration)
- From antibiotics
- From white blood cells

Targeted by antibiotics!

Antibiotics target the **CAPSULE** and **70S RIBOSOMES** in prokaryotes (not the 80S in eukaryotes). This difference allows antibiotics to inhibit protein synthesis in bacteria without affecting human cells. The capsule is specific to prokaryotes, therefore it does not affect our cells.

PILI

Thin rods, numbers can vary.
Used for attachment and **gene transfer (conjugation)**.
These pili are longer

Remember...

In eukaryotic cells a **WHIP-LIKE** motion occurs.

V.S

In prokaryotic cells a **ROTATORY** motion occurs.

Used for **LOCOMOTION** (movement), but has a different structure from the eukaryotic flagella!

FLAGELLA

long

Rotatory motion

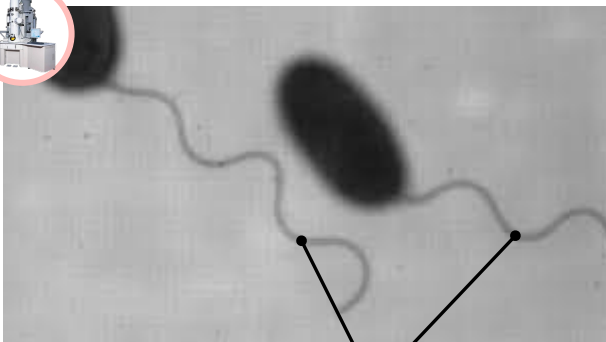
SOME have

PLASMID

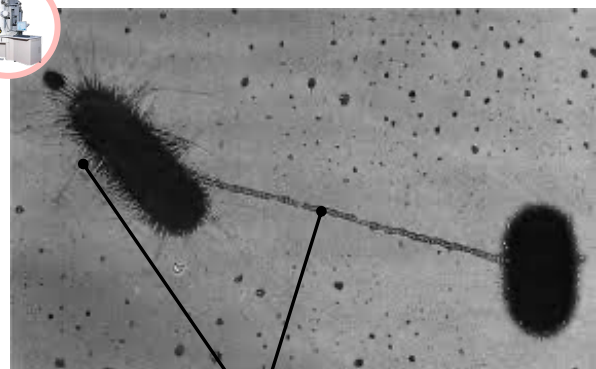
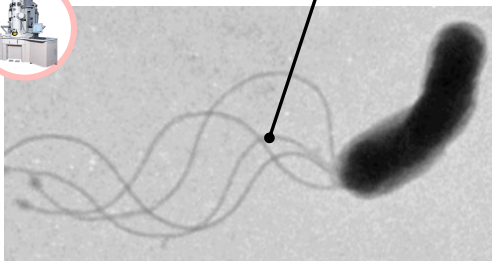
A circular DNA molecule which contains only a few genes. It codes for non-essential proteins.

E.g., codes for genes that give resistance to antibiotics, such as penicillin.

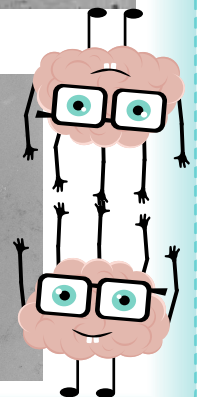
IMAGING



FLAGELLA



PILI



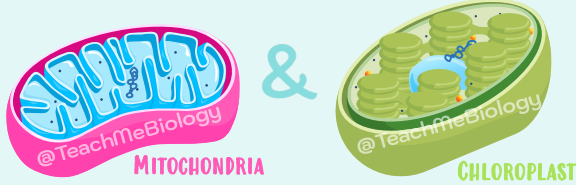
NOT IN THE SYLLABUS

Eukaryotic cells come from Prokaryotes!

ENDOSYMBIOTIC THEORY

Eukaryotic cells have a **PROKARYOTIC ORIGIN**

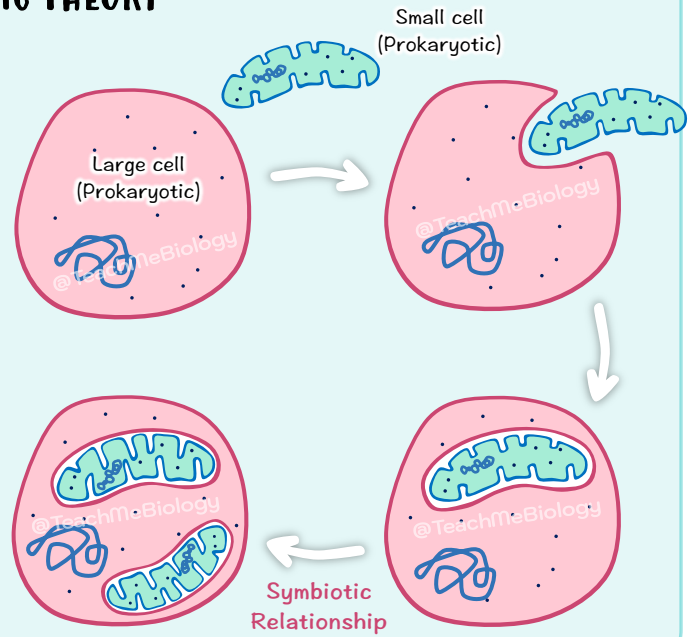
Progression from a simple **NON-COMPARTMENTALIZED** prokaryote to a complex, **COMPARTMENTALIZED** eukaryote.



Mitochondria and chloroplast provide good evidence:

- (1) Have their own DNA (circular like prokaryotes).
- (2) Have 70S ribosomes.
- (3) Small in size.
- (4) Have a double membrane. An extra from being engulfed.

This suggests that they were once free roaming prokaryotes, but now they form an organelle of a eukaryotic cell.

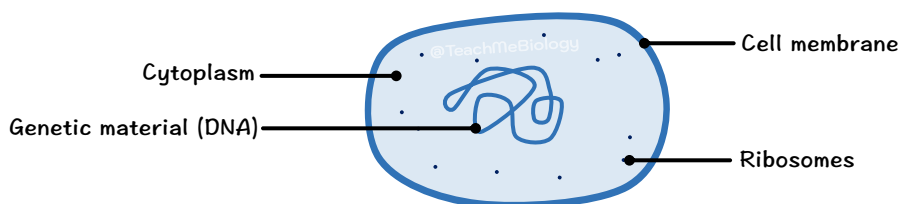


Prokaryotic Cell Structures Summary

CELL COMPONENT	FUNCTION
All prokaryotic cells have	
Plasma membrane	Selectively permeable membrane. Controls the movement of substances in and out of the cell.
Cell wall	Barrier surrounding the cell. Protective function. Comprised of peptidoglycan.
Cytoplasm	Everything confined within the plasma membrane of the cell. No compartmentalization.
Nucleoid	A region inside the cell where the genetic material (DNA) is located.
Ribosomes (70S)	Site of protein synthesis.
Some prokaryotic cells have	
Capsule	A polysaccharide structure. Prevents dehydration. Protection against antibiotics and white blood cells.
Flagella	Locomotion. Anchored to the cell wall. Rigid corkscrew structure that propels a cell using a rotatory motor.
Pili	Fine rod-like structures. Plays role in plasmid transfer (conjugation), and attachment.
Plasmid	Small piece of circular DNA. Codes for non-essential proteins.

Common Features of All Cells

(found in both eukaryotic and prokaryotic cells)



Summary Prokaryotic vs Eukaryotic Cells



BIG BRAIN TIP!

This is a concept very commonly tested on the exam, make sure you nail it!

FEATURE	PROKARYOTIC CELLS	EUKARYOTIC CELLS
Size	~1µm	~10µm
Origin	3.5 billion years ago	2 billion years ago
Organelles	Yes, Few. None of which are membrane bound	Yes. Many. Single m. — Lysosomes, Golgi, Vacuoles, ER Double m. — Nucleus, Mitochondria, Chloroplast No m. — Ribosomes, Centrioles, Microtubules
Nucleus	No nucleus, envelope, or nucleolus	Yes nucleus, envelope, and nucleolus
DNA	Circular & free in the cytoplasm Not associated with histone proteins May have plasmids	Not circular, and membrane bound Associated with histone proteins Does not have plasmids
Ribosomes	70S (relatively smaller, 15nm)	80S (relatively bigger, 30nm)
Cell wall	Yes (Made of peptidoglycan)	Yes (plants & fungi) [cellulose & lignin in plants] [chitin in fungi]
Flagella	Sometimes present Simple, Lack microtubules, Extracellular	Sometimes present Complex. '9+2'. Intracellular.
Division	Binary fission (Chapter 6)	Mitosis or Meiosis (Chapter 6)
Other	Some carry out nitrogen fixation	None carry out nitrogen fixation

NOTES

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.