CONCEPT: INTRODUCTION TO BACTERIAL CELL WALLS

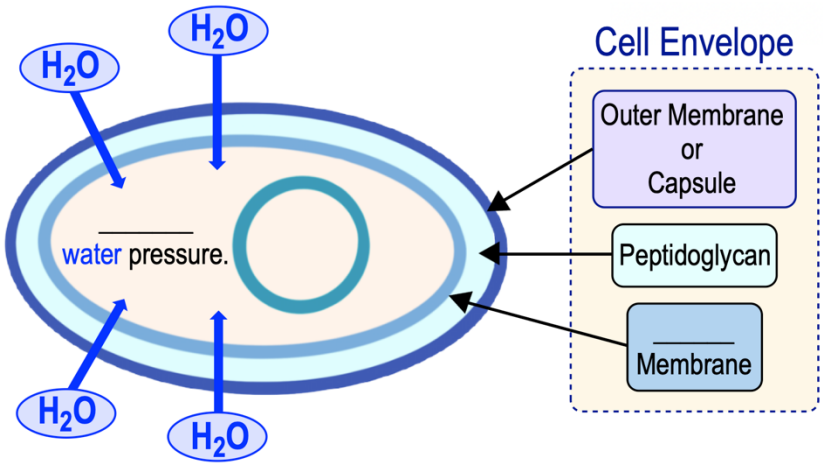
●Water pressure _____ a bacterial cell is typically *higher* than its surroundings.

□ Requires the cell to have a _____ layer around it.

●**Cell Wall:** semi-rigid structural layer located on the _____ of the *cell membrane* & is part of the *cell envelope.*

□ **Cell** _____**:** collection of the *cell wall, cell membrane* & *outer membrane* (if present).

EXAMPLE: The cell wall protects the cell from rupturing from high water pressure.



PRACTICE: Which is (are) true concerning the cell wall of prokaryotes?

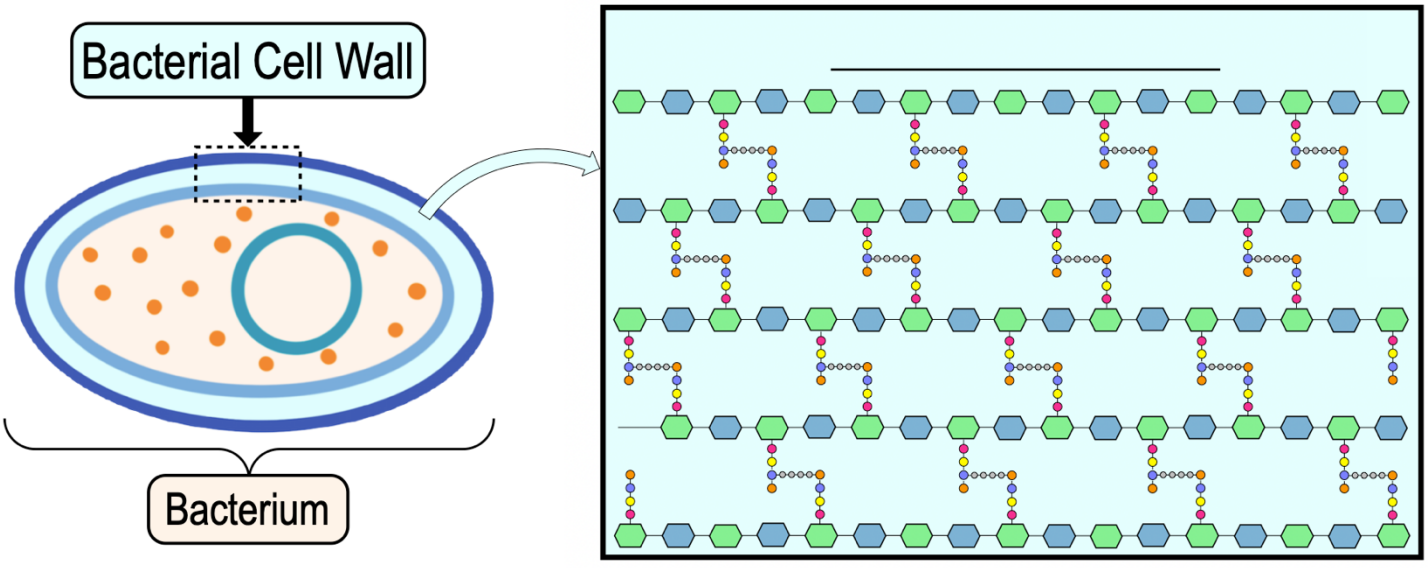
a) It determines the shape of the bacteria.
b) It is part of the cell envelope.
c) It prevents the bacteria from bursting.
d) All of the choices are true.

Peptidoglycan

●**Peptidoglycan:** a rigid, mesh-like *polysaccharide* & *protein* mix that is the main component of _____ cell walls.

□ Provides _____ support (or maintains *rigidity*) for the cell.

EXAMPLE: Peptidoglycan is the primary structural component of the cell wall.



CONCEPT: INTRODUCTION TO BACTERIAL CELL WALLS

PRACTICE: The peptidoglycan molecule is responsible for the:

a) Entry and exit of molecules into and from the cell.
b) Flexibility of the cytoplasmic membrane.
c) Motility of the bacterial cell.
d) Genetic characteristics of the bacterial cell.
e) Semi-rigid cell wall structure of prokaryotes.

Peptidoglycan Structure

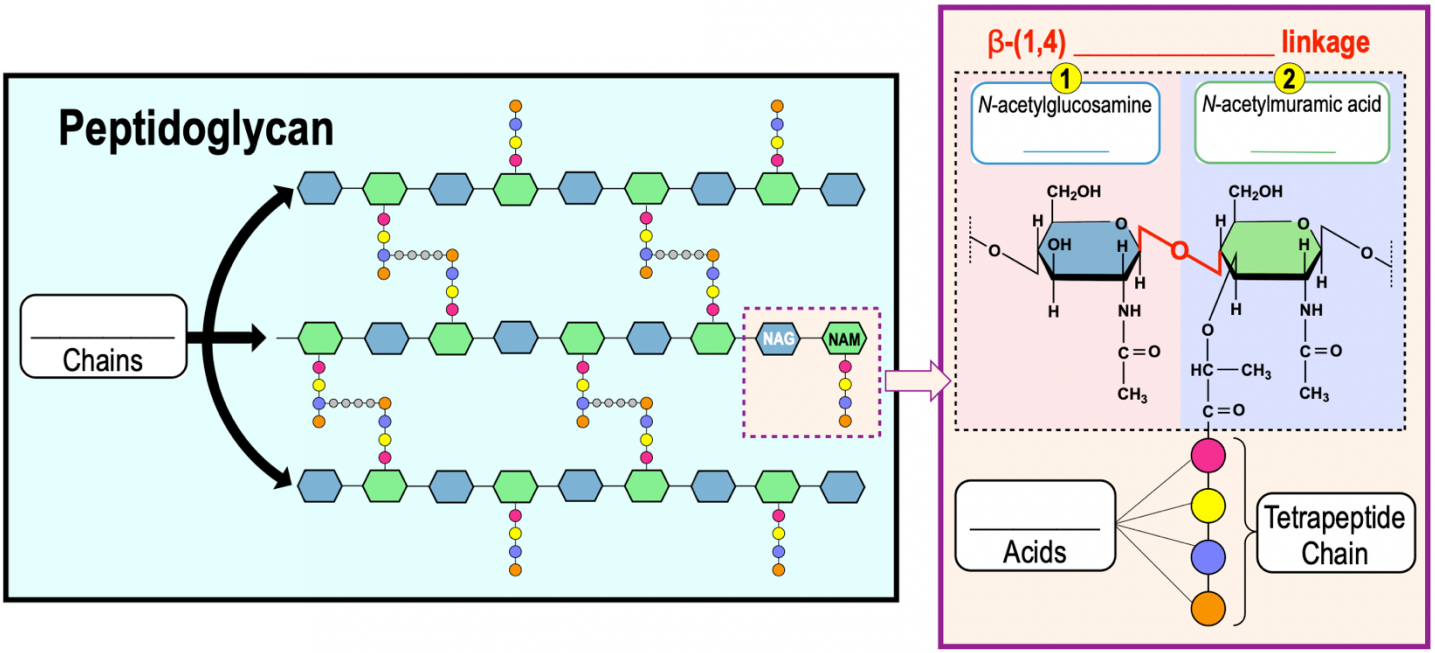
●Peptidoglycan is repeating units of 2 different _____saccharides linked via a **β-(1,4) *glycosidic* linkage**:

1) N-acetylglucosamine (_____) & **2) N-acetyl-_____ acid (NAM)**

●**Glycan Chain:** a sugar "_____" that is formed by repeating units of *NAG* & *NAM*.

●A 4 *amino acid* chain *(_____-peptide)* is attached to each _____ molecule & is important for cell wall structure.

EXAMPLE: Structure of peptidoglycan.



PRACTICE: Peptidoglycan is made up of:

a) N-acetylglucosamine.
b) N-acetylmuramic acid & N-acetylglucosamine.
c) N-acetylmuramic acid, N-acetylglucosamine, & amino acids.
d) N-acetylmuramic acid, N-acetylglucosamine, & phospholipids.
e) N-acetylmuramic acid, N-acetylglucosamine, & ribosomes.

CONCEPT: INTRODUCTION TO BACTERIAL CELL WALLS

PRACTICE: The NAG and NAM molecules of peptidoglycan are connected by a:

a) A tripeptide chain.
b) β-(1,4) glycosidic linkage.
c) A disulfide bridge.
d) β-(1,6) glycosidic linkage.
e) A phosphodiester linkage.

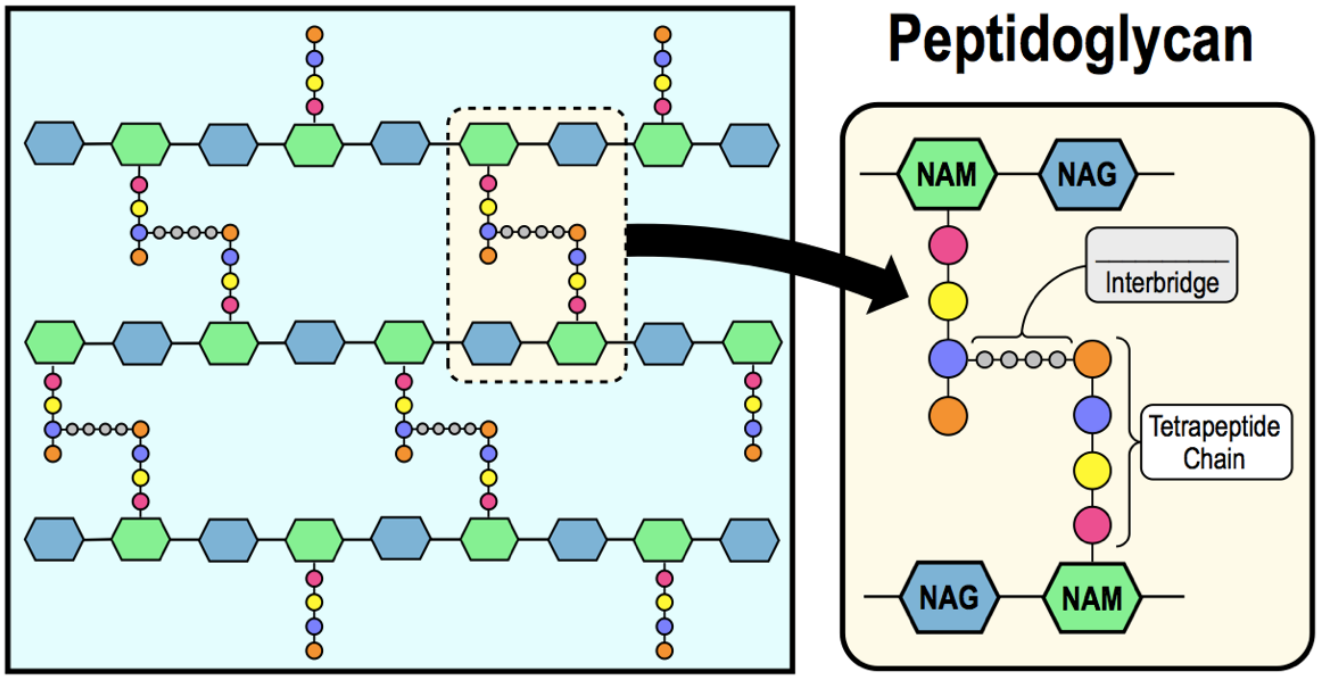
Peptide Interbridge

●**Peptide Interbridge:** the _____-link between tetrapeptides of adjacent glycan chains.

□ Interbridge only found in gram-_____ cells (tetrapeptides are linked directly in gram-negative cell walls).

□ Forms an *inter*-_____ network of peptidoglycan fibers.

EXAMPLE: Peptide interbridges forming an interconnected network of fibers.



PRACTICE: The glycan chains of adjacent peptidoglycan molecules are connected by:

a) A sugar backbone.
b) Phosphodiester linkage.
c) A lipid bilayer.
d) Polypeptide chain crosslinking.
e) Disulfide linkages.

CONCEPT: INTRODUCTION TO BACTERIAL CELL WALLS

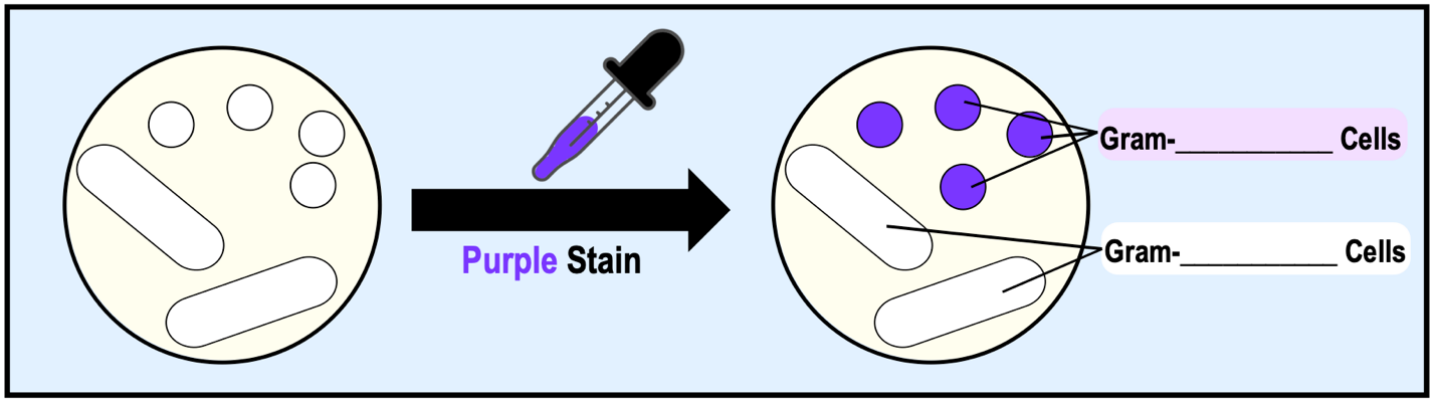
Gram-Positive & Gram-Negative Bacteria

●Bacterial cells are categorized based on whether or not they take up the _____ stain.

□ **Gram Stain** *differentiates* bacteria based on differences in their *cell* _____.

●*Gram-positive* bacteria _____ the stain; HOWEVER, *gram-negative* bacteria do _____ absorb the stain.

EXAMPLE: The Gram Stain differentiates Gram Positive & Gram-Negative bacteria.



PRACTICE: The Gram stain works because of differences in the _____ of bacteria.

a) Genetic characteristics.
b) Cell membranes.
c) Cell walls.
d) Capsules.

Types of Bacterial Cell Walls

●The two types of bacterial cells are grouped by the structure of their cell walls:

1) **Gram-Positive Bacteria:** have a _____ peptidoglycan layer.

2) **Gram-Negative Bacteria:** only have a _____ peptidoglycan layer & a complex *outer membrane*.

EXAMPLE: Gram positive vs. Gram negative cell walls.