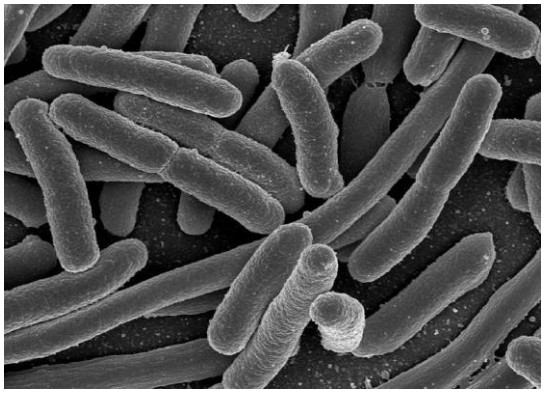
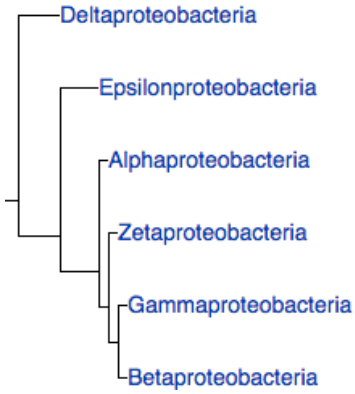
TOPIC: PROKARYOTIC DIVERSITY

Prokaryotic Lineages 1

- Proteobacteria – diverse clade of gram-negative bacteria, organized into 5 clades named with Greek letters (α, β, γ, δ, ε)
    - □ Include species involved in nitrogen fixation, and many pathogenic species

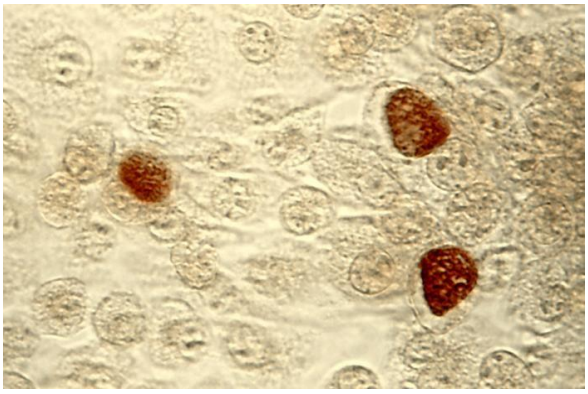
EXAMPLE:





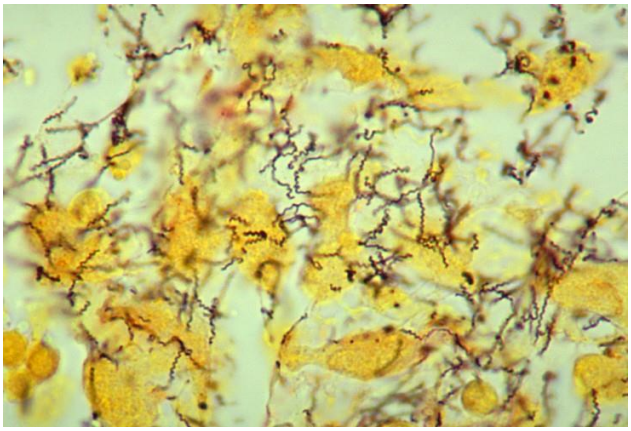
- Clamydiae – gram-negative bacteria that lack peptidoglycan in cell walls, all species are parasites that live inside host cell

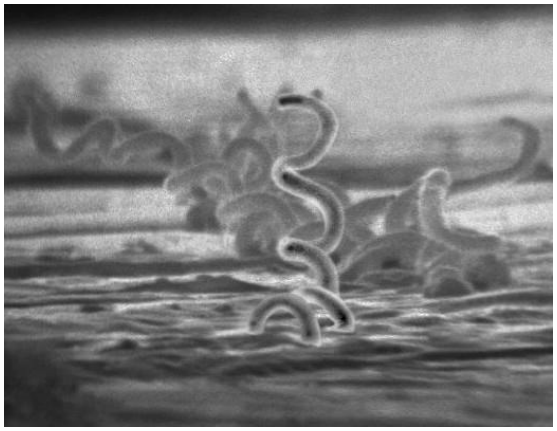
EXAMPLE:



- Spirochetes – gram-negative heterotrophs with distinct corkscrew shape, include many pathogenic species

EXAMPLE:



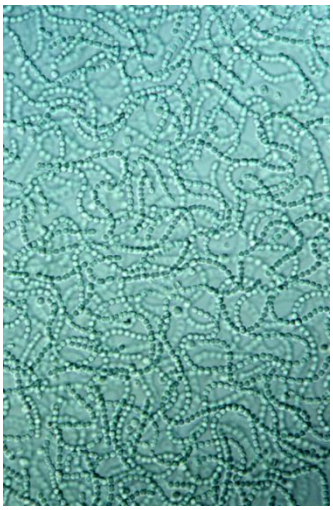


TOPIC: PROKARYOTIC DIVERSITY

Prokaryotic Lineages 2

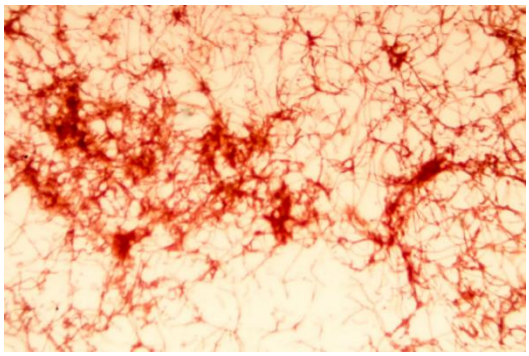
- Cyanobacteria – gram-negative photoautotrophs, many species perform nitrogen fixation, termed “blue-green algae”
  - □ Only bacteria to perform oxygenic photosynthesis, responsible for the origin of oxygen in the atmosphere

EXAMPLE:



- Actinobacteria – high-GC gram-positive bacteria, includes genus *Streptomyces* that has given rise to many antibiotics
  - □ Initially misclassified as fungi because of fungus-like morphology, chains of cells forming branching mycelia

EXAMPLE:



- Firmicutes – low-GC gram-positive bacteria, includes genus Lactobacillus that is very important to humans

EXAMPLE

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●*Recall:* _____ concentrations control the direction of osmosis across a cell membrane.

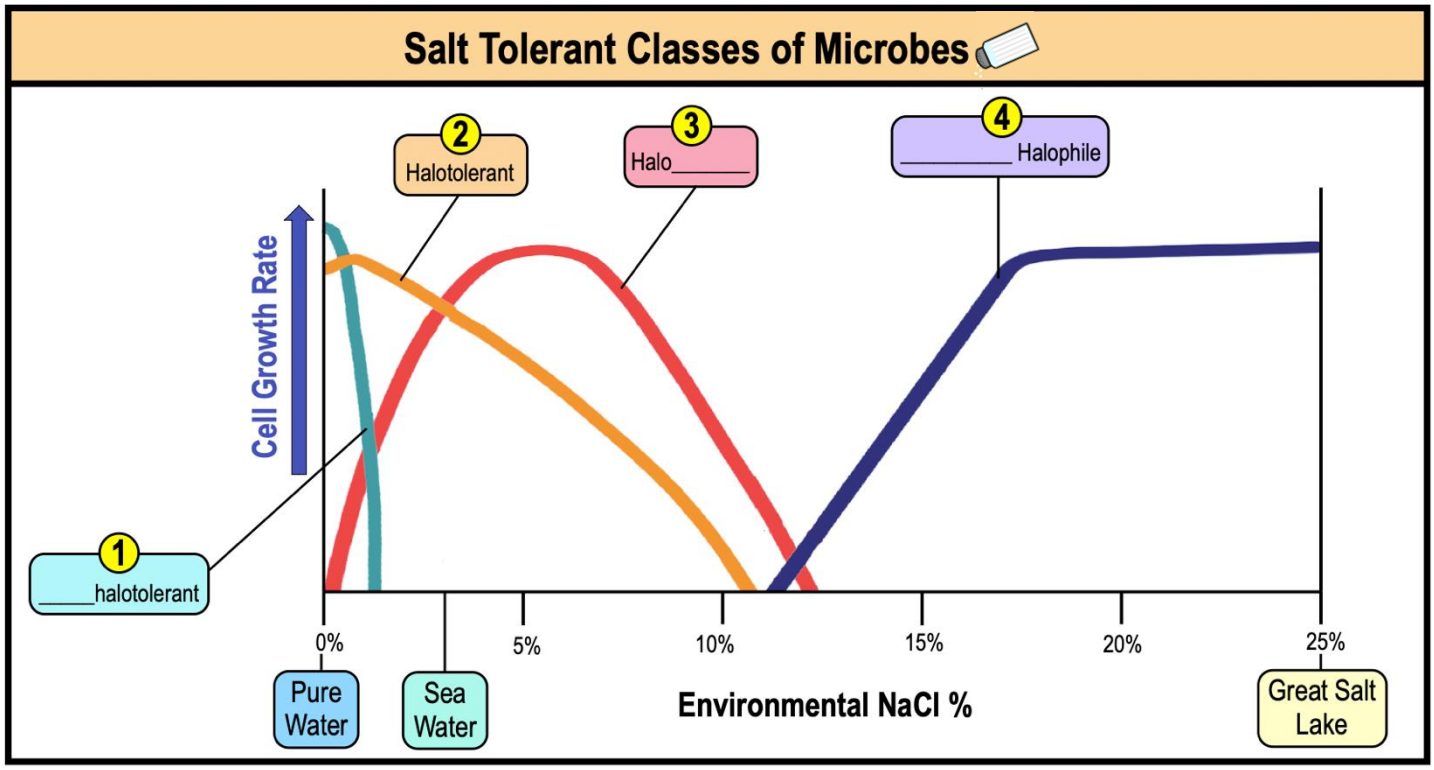
□ Water always flows from _____tonic to _____tonic solutions.

□ Solutes such as _____ *(NaCl)* can interact with water molecules which the cell can no longer use.

Salt Tolerant Classes of Microbes

●Different microbes have different tolerances to salt concentrations in their environment:

1. **Non-halotolerants:** can _____ tolerate moderate salt concentrations.
2. **Halo*tolerants*:** can _____ moderate salt concentrations (like your skin).
3. **Halophiles:** require _____ levels of salt (between 1-14%) to survive (marine bacteria).
4. ***Extreme* Halophiles**: require *very high* levels of salt (_____ than 15%) to survive.



PRACTICE: An organism that requires an environment of high salt concentration describes an *Extreme*:

a) Halophile.

b) Thermophile.

c) Acidophile.

d) Alkaliphile.

TOPIC: PROKARYOTIC DIVERSITY

PRACTICE: A cell is most likely to experience plasmolysis (contraction or shrinking of the cell) when:

a) The solute concentration inside of the cell is equal to the solute concentration outside the cell.
b) The solute concentration inside of the cell is less than the solute concentration outside of the cell.
c) The solute concentration inside of the cell is greater than the solute concentration outside of the cell.

PRACTICE: All organisms have specific environmental conditions in which they thrive. Most organisms cannot live in extremely salty environments. If a bacterium that normally lives in a fresh water environment is placed in an environment that is excessively salty, what will happen?

a) The bacterium's cytoplasm will fill with water and cause the plasma membrane to rupture.
b) Water will leave the bacterium's cytoplasm causing the plasma membrane to shrivel.
c) Nothing will happen, salt concentrations outside of the cell do not affect the cytoplasm within the cell.

PRACTICE: There are two groups of bacteria which live in the Great Salt Lake: Halobacterium and Halococcus. The Great Salt Lake's average salinity is around 13%. What class of microbes do the Halobacterium and Halococcus species belong to?

a) Non-halotolerant.
b) Halotolerant.
c) Halophile.
d) Extreme Halophile.

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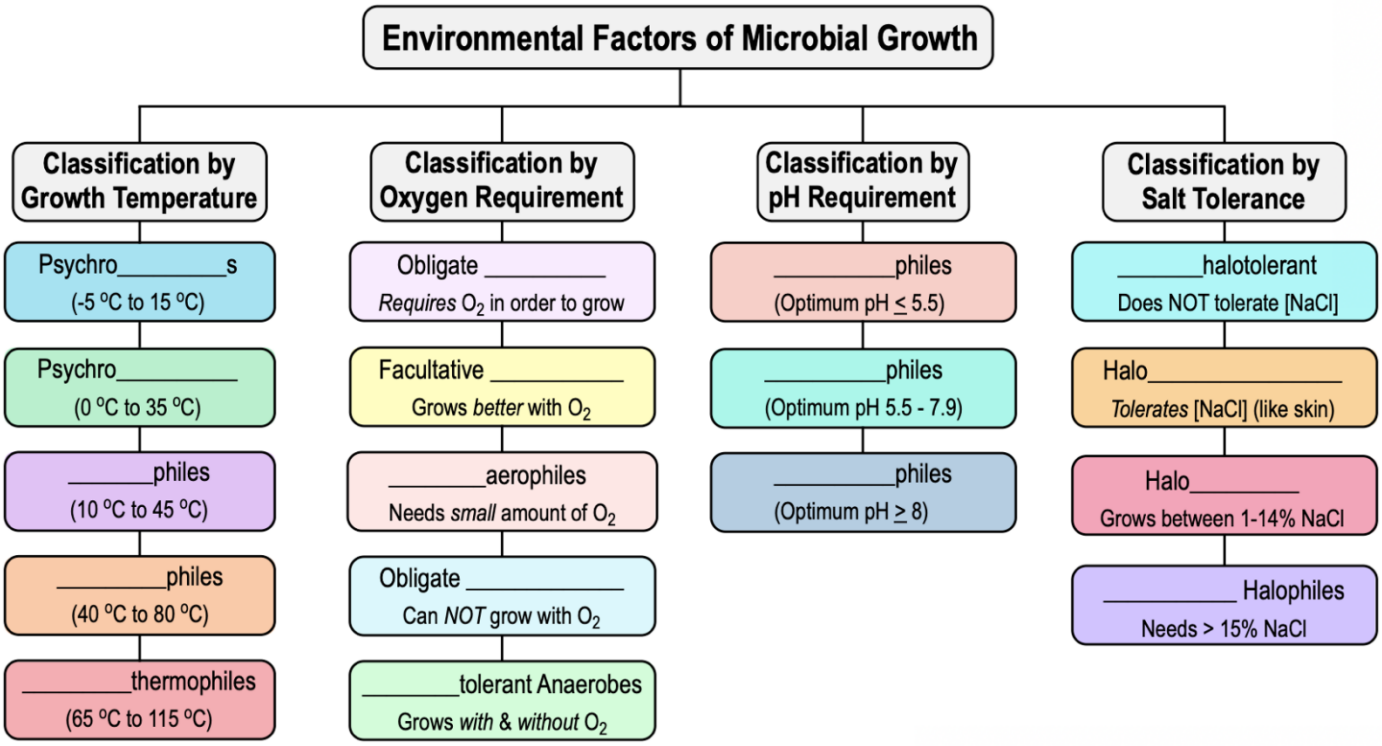
Reviewing the Environmental Factors of Microbial Growth

EXAMPLE: Fill-in the following blanks throughout the flow chart below



PRACTICE: *Methanopyrus kandleri* is a species of archaea that lives in the hydrothermal vents of the Pacific Ocean. This species' optimal temperatures are between 100-122 ºC. This species also does not require oxygen, as it survives off of hydrogen gas and releases methane gas. What environmental classifications would this archaeal species fit into?

a) Mesophile & Obligate Aerobe.
b) Non-halotolerant & Psychrophile.
c) Neutrophile & Facultative Aerobe.
d) Hyperthermophile & Obligate Anaerobe.

PRACTICE: *Acidobacterium capsulatum* is a species of bacteria that grows better in the absence of oxygen but can survive if oxygen is present. This species of bacteria also thrives in soil and water with a pH between 3.0 and 6.0. What environmental classifications would this bacterial species fit into?

a) Extreme Halophile & Mesophile.
b) Facultative Anaerobe & Acidophile.
c) Facultative Aerobe & Alkaliphile.