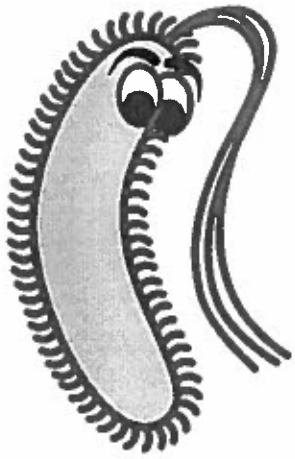
Name _____

Color a Typical Prokaryote Cell



A **prokaryote** is a unicellular organism that lacks a membrane-bound nucleus. Bacteria are prokaryotes that fall into two major categories: the Kingdom **Eubacteria** and the Kingdom **Archaebacteria**. Eubacteria are common types that occur all around us, usually they are on surfaces and in the soil. You can only find Archaebacteria in extreme environments, like hot sulfur springs. Archaebacteria are thought to be some of the oldest life forms on earth. Most bacteria don't make their own food. That means they must rely on other organisms to provide them with food. These bacteria break down, or **decompose**, other living things to obtain energy.

When most people hear the word bacteria, they think of something that is bad for you. In fact, very few bacteria cause illnesses. Some bacteria actually help you! Bacteria are used to make food, such as cheese and yogurt, and they can also help us break down harmful substances in the environment. Scientists created a type of bacteria that could gobble up oil from oil spills. Some bacteria live inside the guts of animals and help them to digest food.

Unfortunately, there are many types of bacteria that can make us ill. **Salmonella** bacteria can cause food poisoning, and certain types of bacteria are responsible for other infections. You might have had some experience with **Streptococcus**, the bacteria that causes strep throat.

The instructions below describe a typical prokaryote cell, though many bacteria come in different shapes, and sizes and not all contain some of the features described.

☐1. The cell wall protects the cell and gives it shape. It is the outermost layer on the image. Color the **cell wall** purple.

☐2. On the inside of the cell wall is the **cell membrane**. Its job is to regulate what comes in and out of the cell. Color the cell membrane pink.

☐3. The surface of some bacteria cells is covered in **pilus**, which help the cell stick to surfaces. Color the pilus light green.

☐4. Some bacteria can move within their environment by using structures called **flagella**, which resemble tails. Color the flagella dark green.

☐5. The watery interior of the cell is called **cytoplasm**. Color the cytoplasm light blue.

☐6. Throughout the cytoplasm are tiny round structures called **ribosomes**. Ribosomes make proteins for the cell. Color the ribosomes red.

☐7. Every prokaryote cell has a circular strand of **DNA** that floats within the cytoplasm. DNA contains the instructions for the cell and controls the cell's activities. Color the DNA yellow.

☐8. Many prokaryote cells have a small circular loop of DNA called a **plasmid**. The plasmid is used in sexual reproduction. Color the plasmid orange.

Name: _____

Questions:

1. What bacteria causes strep throat? _____
2. What are the oldest life forms on earth? _____
3. What bacteria is associated with food poisoning? _____
4. What part of the bacteria cell helps it stick to surfaces? _____
5. Name two foods that are made with the help of bacteria:

   _____

6. What does "decompose" mean? _____
7. What part of the bacteria cell helps it move? _____
8. Where do Archaebacteria live? _____
9 To what kingdom do common bacteria belong?

   _____

10. What structure controls the cell's activities? _____

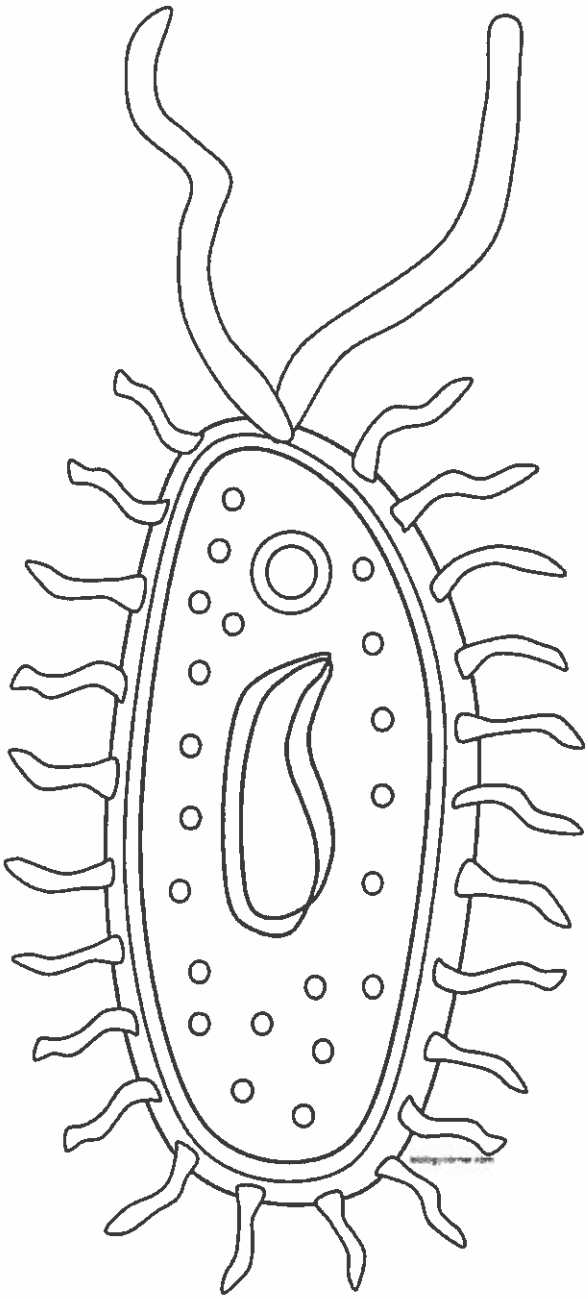
11. What is the function of ribosomes? _____

12. What is the function of the cell membrane?

    _____

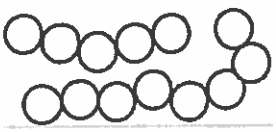
13. What is the watery environment that the DNA and ribosomes float within?

    _____



14. Bacteria cells can come in different shapes, some of them even form long chains.
Streptococcus is a bacterium that is circular and form chains. The chains can be any number in length.

Staphylococcus is a bacterium that is also circular but occurs in clumps. Draw how you would imagine staphylococcus would appear.



Chapter 2-4: The Cell Membrane

The cell membrane is also known as the plasma membrane, and we use the terms interchangeably in this book. The cell membrane is responsible for bringing essential materials into the cell and excreting metabolic waste products. In this plate, we will examine some of the components of the membrane. You should keep in mind that other membranes such as the endoplasmic reticulum and the nuclear membrane are similar to the cell membrane. These organelles were discussed in a previous plate.

This plate presents an enlarged view of the cell membrane. We will identify the various structures that make up the membrane and mention their activities. Begin your reading below.

The cell membrane is made up of proteins and carbohydrates as well as a phospholipid bilayer. It is an extremely thin structure that measures about 5 to 10 nanometers (nm) in thickness, and it can only be seen clearly through an electron microscope. The currently accepted hypothesis of membrane structure is referred to as the fluid mosaic model, and was proposed by Singer and Nicholson in 1976.

The most prominent element of the cell membrane is a fluid bilayer of lipids, in which a number of proteins are embedded. In the plate, the bracket outlines the **lipid bilayer (A)**, in which you can see individual **phospholipids (B)**. As the detailed diagram at the bottom of the plate indicates, a phospholipid consists of a somewhat circular phosphate group head, and two long, fatty acid chain tails. The head region is said to be **hydrophilic and polar (C)** because it is water-soluble, while the tail portions are **hydrophobic and nonpolar (D)** because they are not water-soluble. Notice that the hydrophilic heads of the lipid bilayer point toward the cell's exterior and interior, while the hydrophobic tails point inward. The brackets pointing out the hydrophilic heads and hydrophobic tails should be colored in bold colors, but the phospholipid (B) itself should be a single pale color.

Another type of lipid that is found within the lipid bilayer is the **cholesterol molecule (E)**. Cholesterol helps to maintain the fluid condition of the bilayer by breaking up the closely associated phospholipids. The detailed view shows several cholesterol molecules, which are types of steroid lipids.

We have discussed the basic structure of the cell membrane, and now we will focus on the proteins and carbohydrates associated with it.

Proteins that are embedded in the cell membrane carry out various cellular functions such as nutrient and energy transport and message transmission. One type of embedded protein is the **integral protein (F)**, which spans the entire width of the lipid bilayer and protrudes at both sides. These proteins function as channels through which ions and molecules can travel into and out of the cell.

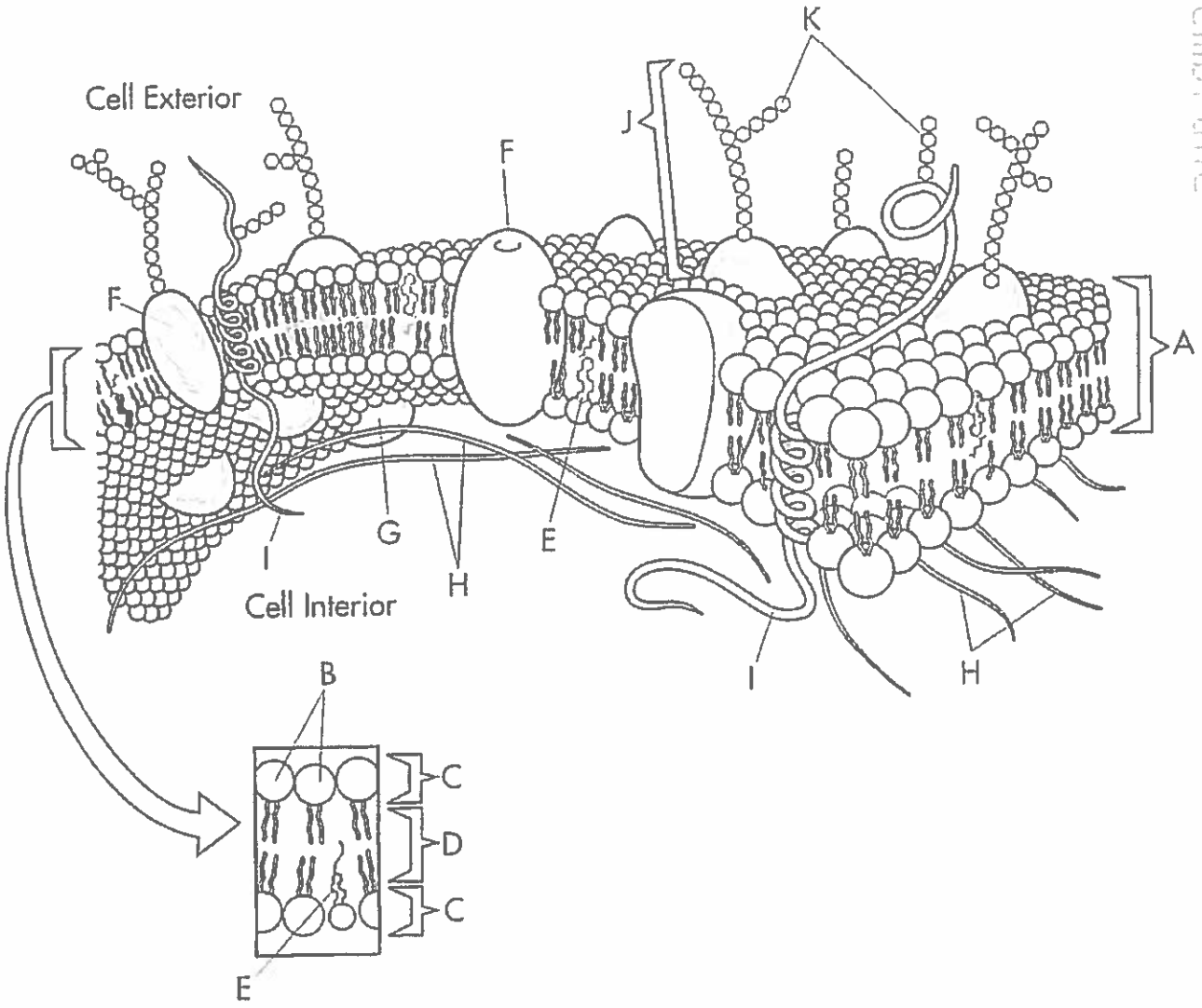
Other membrane proteins include **peripheral proteins (G)**, which are not embedded in the lipid bilayer, but sit on the outside and are bound to exposed regions of integral proteins. Peripheral proteins are often connected to **cytoskeleton filaments (H)** on the cell's interior. Several filaments are shown in the plate.

Another type of protein found in the membrane is the **alpha helix protein (I)**, which is wound like a coil. It extends through the membrane, as the plate indicates, and acts as a channel for nutrients entering the cytoplasm.

Having mentioned the lipids and proteins involved in the cell membrane, we will now focus on carbohydrates. Continue your reading below and complete the coloring of the plate.

Glycoproteins (J) consist of a protein with an attached **carbohydrate (K)**. In the diagram, we show a string of hexagonal molecules that represent the glucose molecules in a polysaccharide. The carbohydrate molecules are involved in cell recognition as receptors, and they also aid in the cell's adhesion to other cells. For example, hormones attach to the carbohydrates on the membranes of target molecules. Research on these membrane carbohydrates is ongoing.

Label each letter to its corresponding structure! Points will be deducted if you do NOT Label!



The Cell Membrane

- ○ Lipid Bilayer .....A
- ○ Phospholipids.....B
- ○ Hydrophilic Polar Head C
- ○ Hydrophobic Nonpolar Tail .....D
- ○ Cholesterol Molecule ..E
- ○ Integral Protein .....F
- ○ Peripheral Protein ....G
- ○ Cytoskeleton Filaments.....H
- ○ Alpha Helix Protein ..I
- ○ Glycoprotein .....J
- ○ Carbohydrate .....K