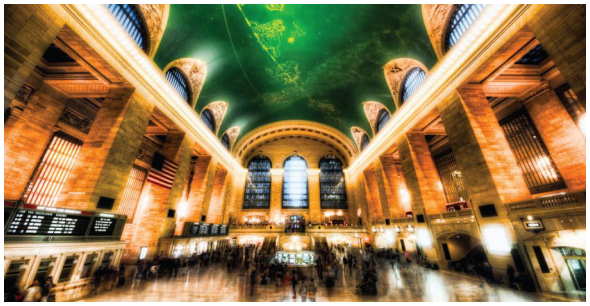
Key terms

- amphiphilic Having one surface consisting of hydrophilic amino acids and the opposite surface consisting of hydrophobic (or lipophilic) ones.
- fluidity A measure of the extent to which something is fluid.The reciprocal of its viscosity.
- hydrophilic having an affinity for water; able to absorb, or be wetted by water
- hydrophobic lacking an affinity for water; unable to absorb, or be wetted by water
- phospholipid Any lipid consisting of a diglyceride combined with a phosphate group and a simple organic molecule such as choline or ethanolamine; they are important constituents of biological membranes
- plasma membrane The semipermeable membrane that surrounds the cytoplasm of a cell.
- receptor a protein on a cell wall that binds with specific molecules so that they can be absorbed into the cell in order to control certain functions

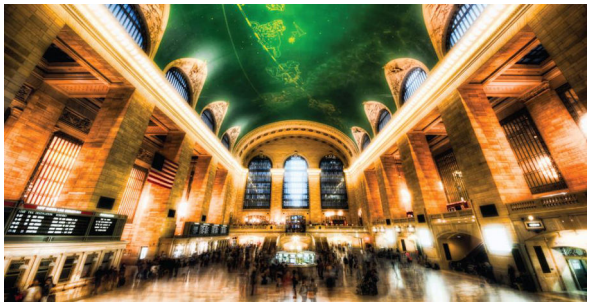
Components and Structure



- Introduction
- Fluid Mosaic Model
- Membrane Fluidity

Introduction

- The plasma membrane allows cells to block, take in, and excrete substances, all in controlled quantities.
- The plasma membrane is very flexible in order to allow certain cells, such as red blood cells and white blood cells, to change shape as they pass through narrow capillaries.
- The plasma membrane carries markers that allow cells to recognize one another.
- The plasma membrane has the ability to transmit signals via receptors.
- The principal components of a plasma membrane are lipids (phospholipids and cholesterol), proteins, and carbohydrates.



Plasma Membranes Analogous to Grand Central Station

Fluid Mosaic Model

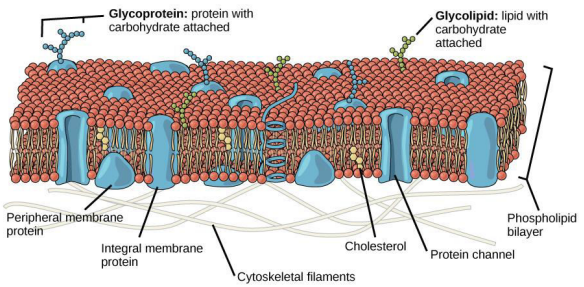
- The main fabric of the membrane is composed of amphiphilic or dual-loving, phospholipid molecules.
- Integral proteins, the second major component of plasma membranes, are integrated completely into the membrane structure with their hydrophobic membrane-spanning regions interacting with the hydrophobic region of the phospholipid bilayer.
- Carbohydrates, the third major component of plasma membranes, are always found on the exterior surface of cells where they are bound either to proteins (forming glycoproteins) or to lipids (forming glycolipids).

The Components and Functions of the Plasma Membrane	
Component	**Location**
Phospholipid	Main fabric of the membrane
Cholesterol	Attached between phospholipids and between the two phospholipid layers
Integral proteins (for example, integrins)	Embedded within the phospholipid layer(s). May or may not penetrate through both layers
Peripheral proteins	On the inner or outer surface of the phospholipid bilayer; not embedded within the phospholipids
Carbohydrates (components of glycoproteins and glycolipids)	Generally attached to proteins on the outside membrane layer

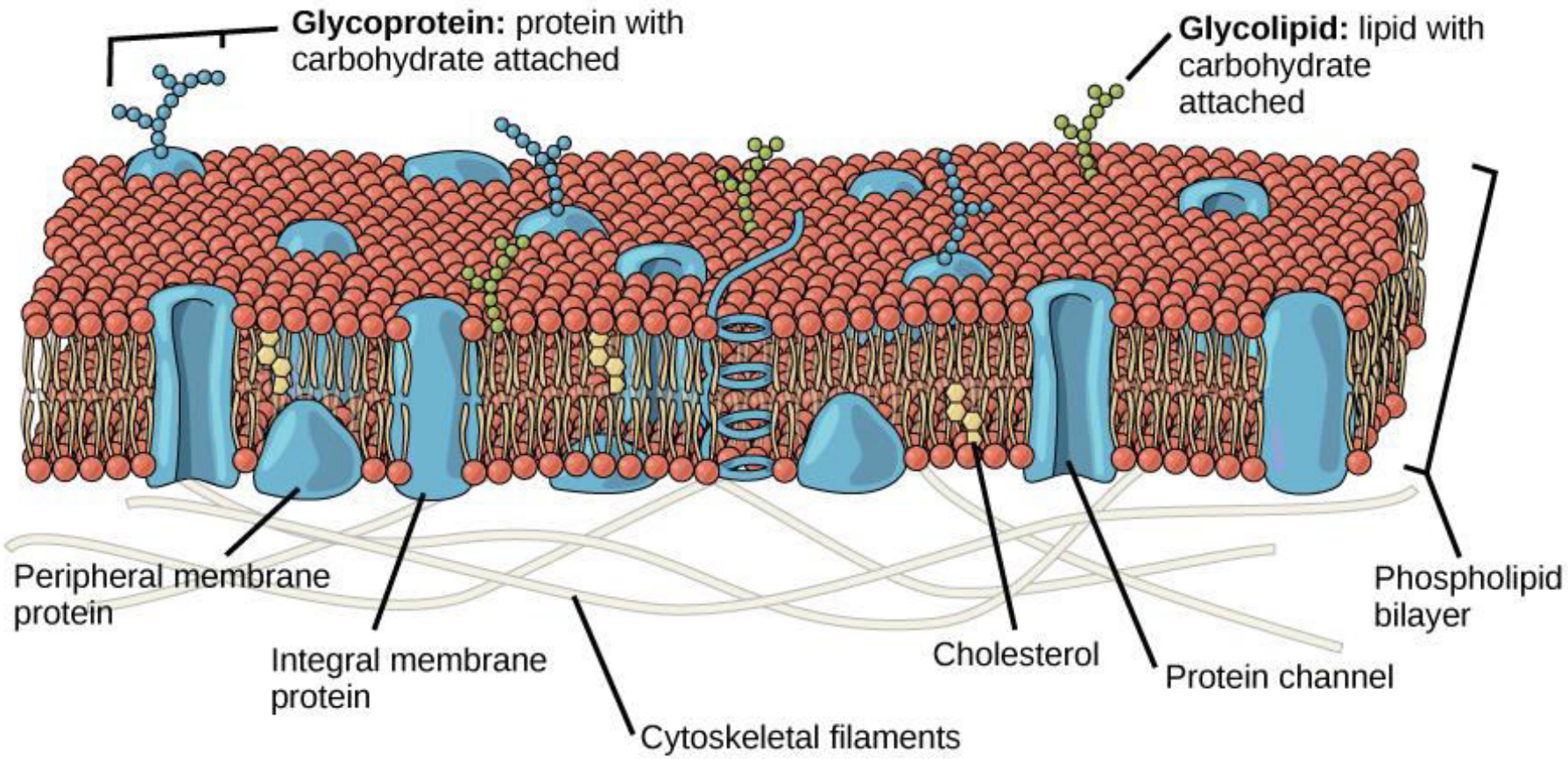
The Components and functions of the Plasma Membrane

Membrane Fluidity

- The membrane is fluid but also fairly rigid and can burst if penetrated or if a cell takes in too much water.
- The mosaic nature of the plasma membrane allows a very fine needle to easily penetrate it without causing it to burst and allows it to self-seal when the needle is extracted.
- If saturated fatty acids are compressed by decreasing temperatures, they press in on each other, making a dense and fairly rigid membrane.
- If unsaturated fatty acids are compressed, the "kinks" in their tails push adjacent phospholipid molecules away, which helps maintain fluidity in the membrane.
- The ratio of saturated and unsaturated fatty acids determines the fluidity in the membrane at cold temperatures.
- Cholesterol functions as a buffer, preventing lower temperatures from inhibiting fluidity and preventing higher temperatures from increasing fluidity.

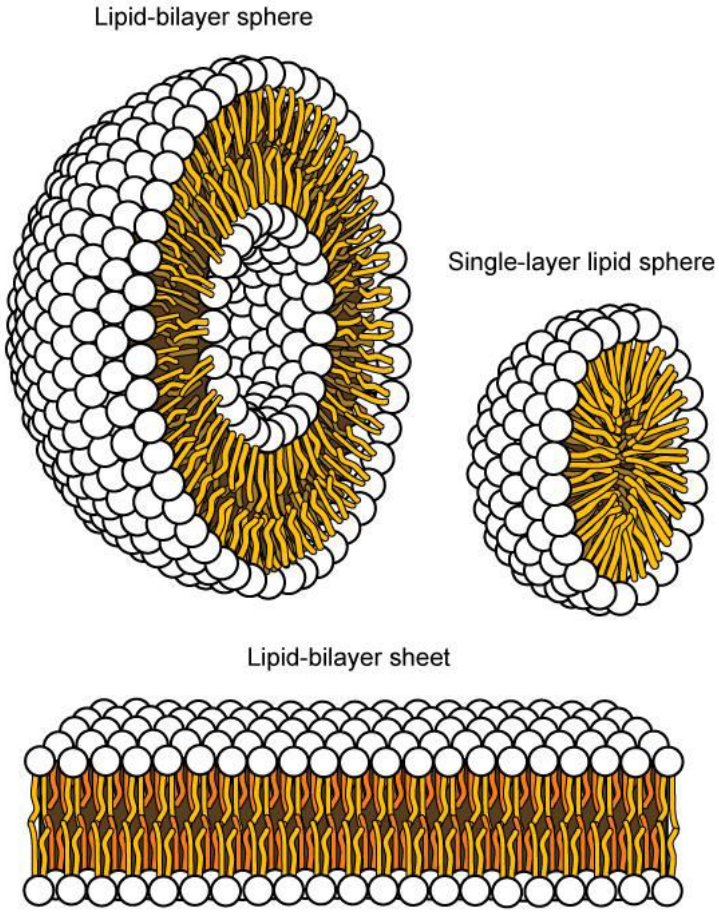


Membrane Fluidity



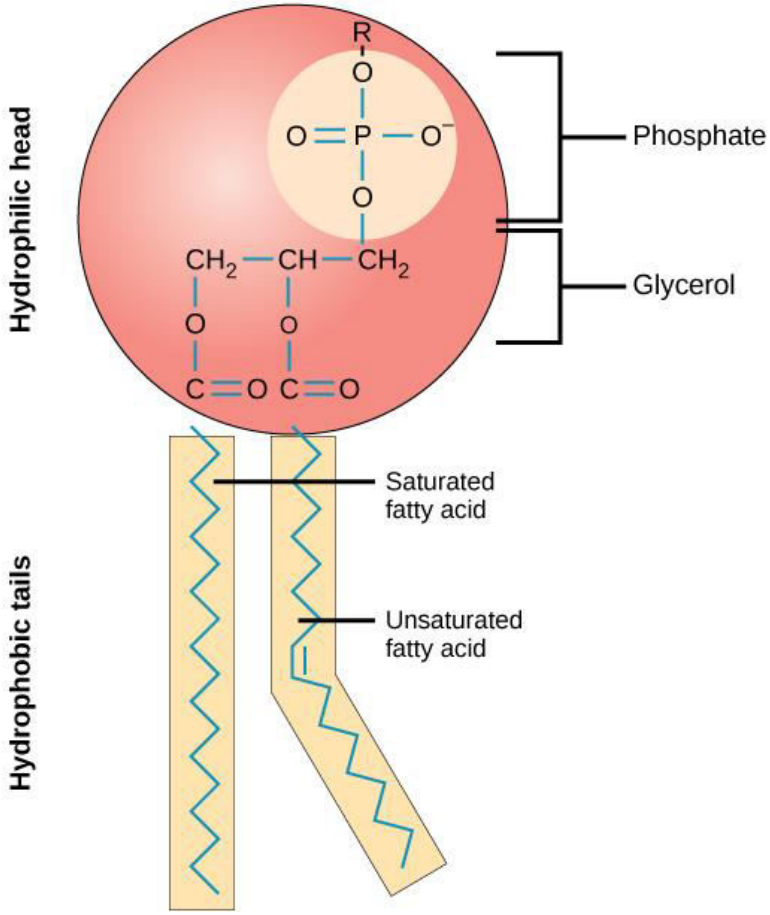
The fluid mosaic model of the plasma membrane

The fluid mosaic model of the plasma membrane describes the plasma membrane as a fluid combination of phospholipids, cholesterol, and proteins.Carbohydrates attached to lipids (glycolipids) and to proteins (glycoproteins) extend from the outward-facing surface of the membrane.



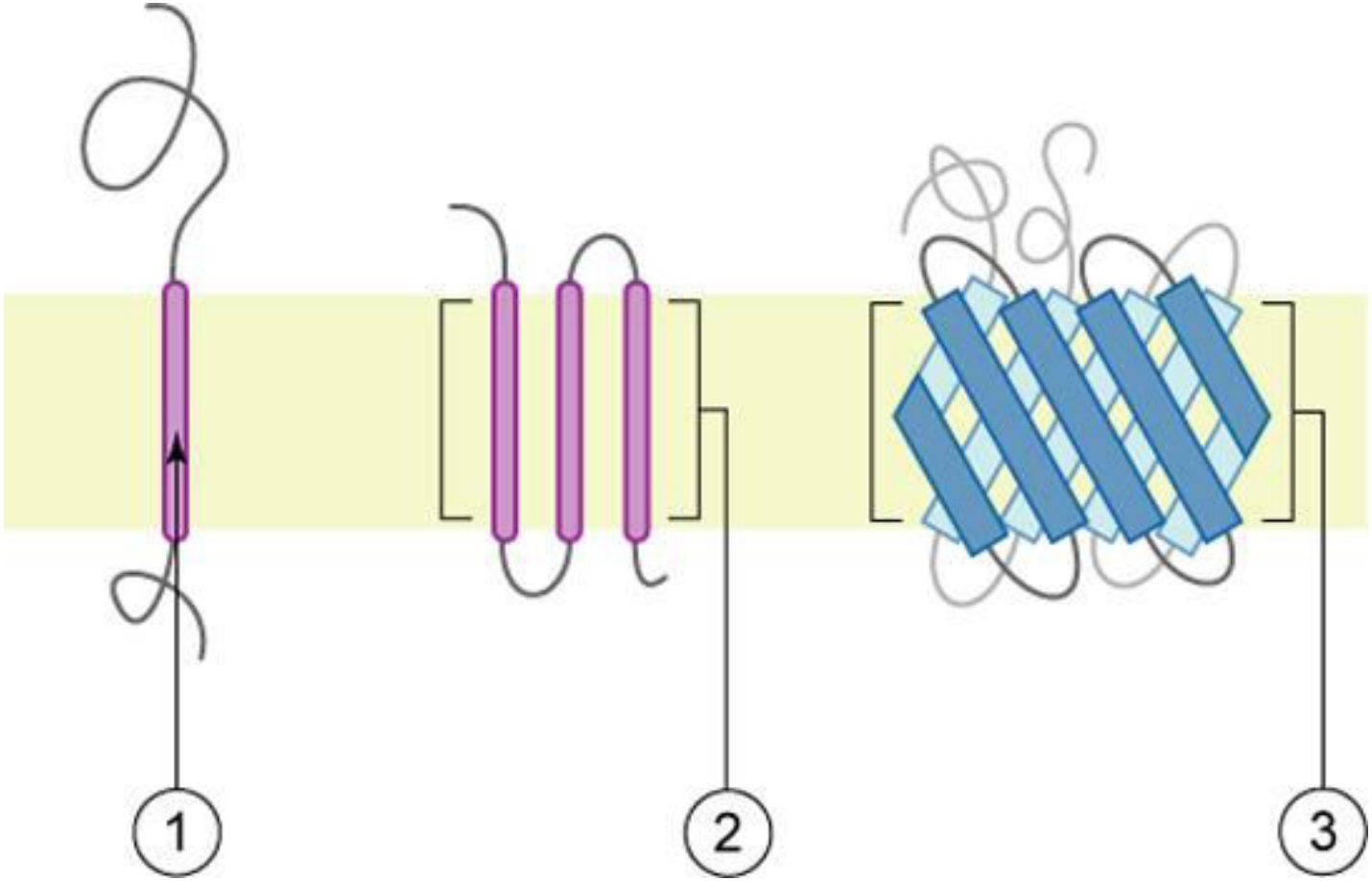
Phospholipid aggregation

In an aqueous solution, phospholipids tend to arrange themselves with their polar heads facing outward and their hydrophobic tails facing inward.



The structure of a phospholipid molecule

This phospholipid molecule is composed of a hydrophilic head and two hydrophobic tails.The hydrophilic head group consists of a phosphate-containing group attached to a glycerol molecule.The hydrophobic tails, each containing either a saturated or an unsaturated fatty acid, are long hydrocarbon chains.



Structure of integral membrane proteins

Integral membrane proteins may have one or more alpha-helices that span the membrane (examples 1 and 2), or they may have beta-sheets that span the membrane (example 3).

Plasma Membranes Analogous to Grand Central Station

Despite its seeming hustle and bustle, Grand Central Station functions with a high level of organization.People and objects move from one location to another, they cross or are contained within certain boundaries, and they provide a constant flow as part of larger activity.Analogously, a plasma membrane's functions involve movement within the cell and across boundaries in the process of intracellular and intercellular activities.

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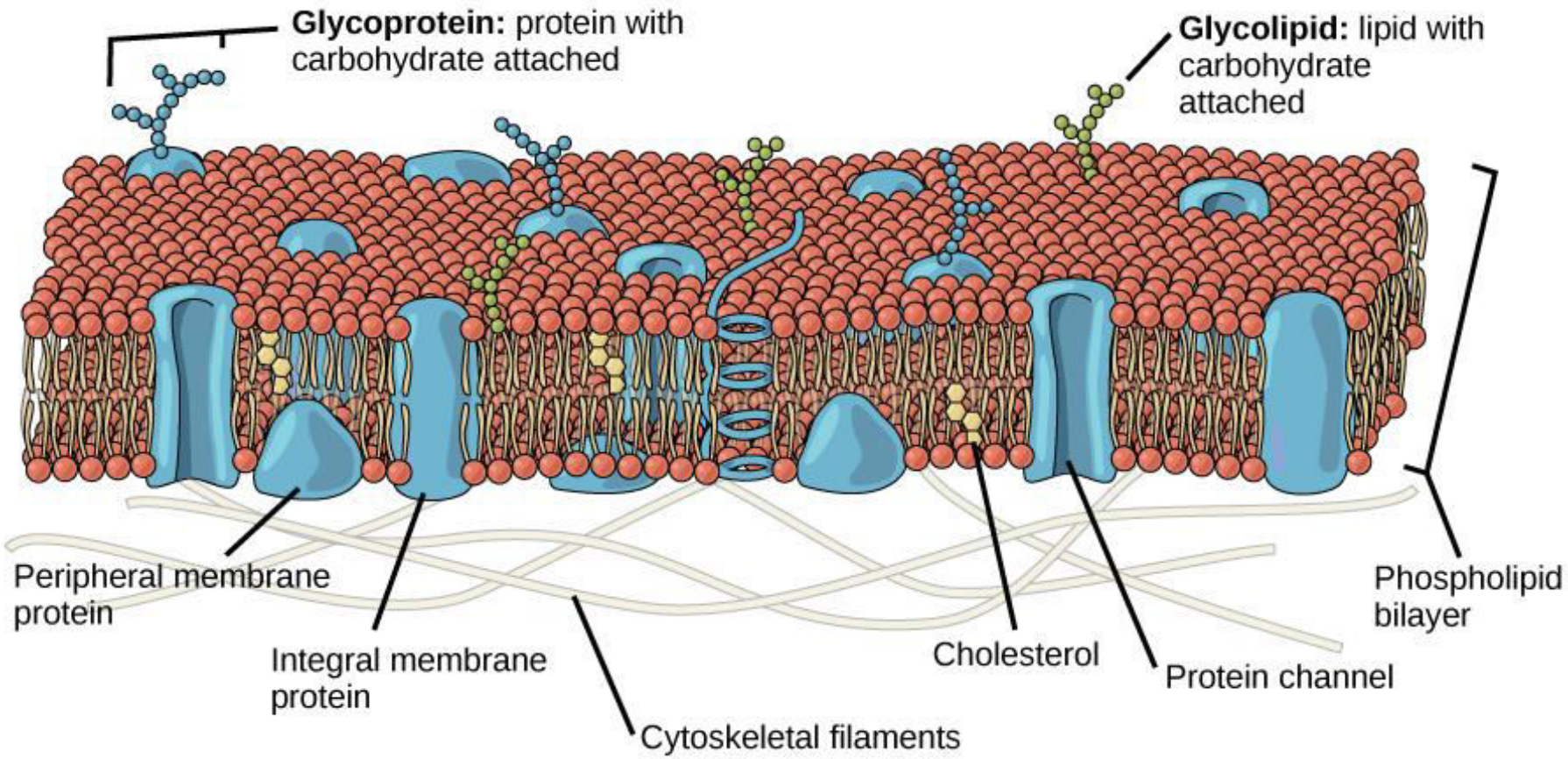
The Components and functions of the Plasma Membrane

The principal components of a plasma membrane are lipids (phospholipids and cholesterol), proteins, and carbohydrates attached to some of the lipids and some of the proteins.



Membrane Fluidity

The plasma membrane is a fluid combination of phospholipids, cholesterol, and proteins.Carbohydrates attached to lipids (glycolipids) and to proteins (glycoproteins) extend from the outward-facing surface of the membrane.