The Cell Membrane

A membrane that lets all materials through is permeable, and a membrane that doesn’t let any materials through is impermeable. A cell membrane allows some materials to cross it, and not others. This is because the cell membrane is selectively permeable. The cell membrane carries out this function because of its structure. Imagine you have 2 bags. One bag is made of plastic, and the other is made of T-Shirt material. If you pour water into the plastic bag, it stays in the bag, as the plastic is impermeable to water. If you pour water into the T-Shirt material bag, it will run through because the T-shirt material is permeable to water. The structure of the materials that the bags are made of are different. Now, imagine you are pouring a mixture of water and sand into both bags. The plastic bag will remain impermeable to the mixture, but the T-Shirt material bag will become selectively permeable. It will allow the water to pass through, but will not the sand.

Diffusion

The structure of the cell membrane controls what can move in and out of a cell. Diffusion is what causes substances to move in the first place. In the photo below you can see how food colouring diffuses through the glass of water.

 

This can be explained by looking at particle theory. According to particle theory, the particles in all liquids and gases are constantly moving in every direction and bumping into each other. These collisions explain why particles that are concentrated in one area, like the food colouring blob in the picture, spread apart into areas where there are fewer ink particles, and thus fewer collisions. This “spreading-out” process is called diffusion. Eventually, the food colouring particles would become evenly distributed throughout the container of water. When this happens the individual food colouring particles would continue to move, but there would be no further change in the overall distribution of the food colouring in the water.

Diffusion also plays a part in moving substances into and out of cells. For example, imagine an amoeba living in the water. The concentration of dissolved carbon dioxide gas in the water is the same as the concentration of dissolved carbon dioxide inside the amoeba’s cytoplasm. Carbon dioxide particles therefore move in and out of the cell at the same rate, passing through openings in the amoeba’s selectively permeable cell membrane. However, if the amoeba is producing carbon dioxide as a waste product, the concentration of carbon dioxide particles inside the amoeba’s cytoplasm is now greater than the concentration of carbon dioxide in the surrounding water. As a result, more carbon dioxide particle move out of the cell by diffusion during a given time than move into the cell. The diffusion process will continue until the concentration of dissolved carbon dioxide gas on both sides of the cell membrane is once again equal.