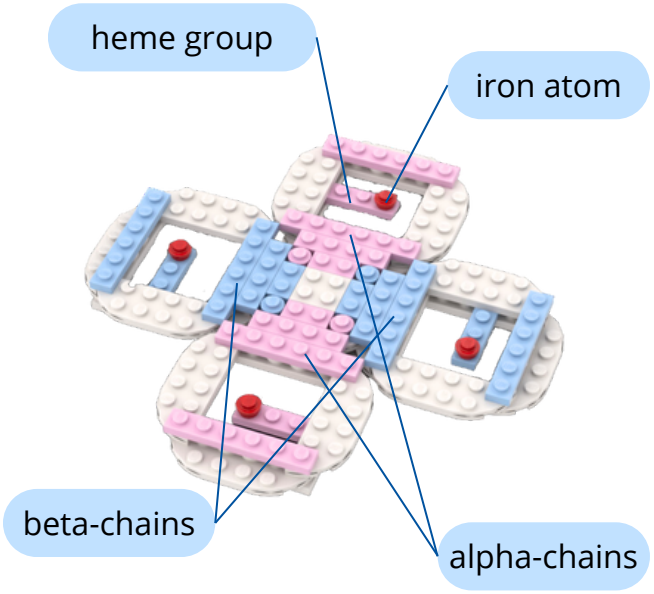
HEMOGLOBIN

Hemoglobin is a protein in your red blood cells that carries oxygen to different tissues around your body.

When we breathe, oxygen in the lungs passes through the thin-walled blood vessels and into the red blood cells, where it binds to hemoglobin. This oxygen is then transported around your body to where it is needed. Your body's cells are rich in carbon dioxide, which is a waste product of cellular processes. On its way back to the lungs to pick up and transport more oxygen, hemoglobin carries carbon dioxide out of the body.

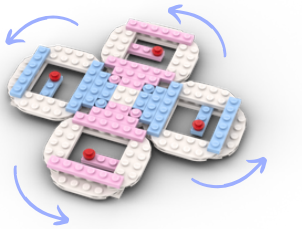
Hemoglobin is composed of four protein chainsHemoglobin is a remarkable molecule that is composed of four protein chains: two alpha chains (pink) and two beta chains (blue). Each chain contains a heme group and an iron atom (red). Oxygen binds to these four iron atoms and is transported through the blood in your body.



Just like LEGO bricks, biological molecules can be put together to form a wide range of complex structures. Unlike LEGO, however, the molecular building blocks of life are flexible, soft, plastic and dynamic.

Hemoglobin is an amazing dynamic molecule that uses small structural changes to help it carry oxygen. Once the first oxygen molecule is bound to the hemoglobin, it introduces small changes in the structure of the other protein chains, making them bind oxygen more easily. Thus, it is difficult to add the first oxygen molecule, but binding the second, third and fourth oxygen molecules gets progressively easier and easier.

Your LEGO hemoglobin is also dynamic. If you push all the protein chains you can find out what hemoglobin looks like when it is activated.

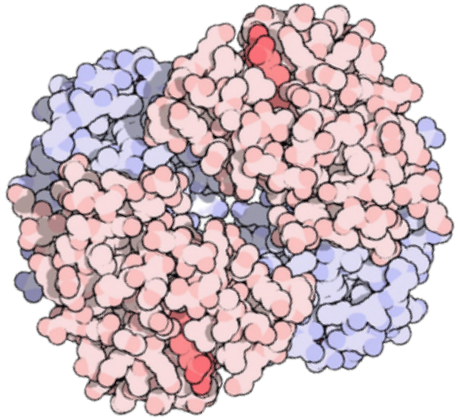


TO SEE A MOLECULE

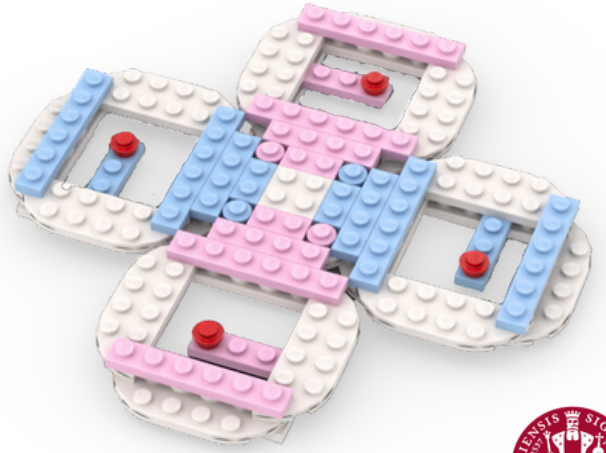
.

Molecules are extraordinarily small. In the tiny dot in the line above, there are over a hundred million molecules. They are so small that you can't even see them with a microscope. To find out what molecules look like, researchers use different techniques. The main ones are X-ray crystallography, cryo-electron microscopy and NMR spectroscopy.

In cryo-electron microscopy, researchers shoot an electron beam at frozen molecules. When the beam hits them, the molecules cast a shadow. The researchers use these shadow images to find out what the molecules look like.

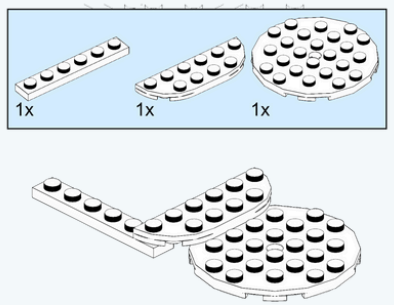


BUILD A MOLECULE HEMOGLOBIN

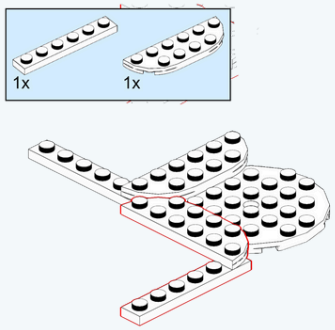


UNIVERSITY OF COPENHAGEN
INTEGRATIVE STRUCTURAL BIOLOGY CLUSTER

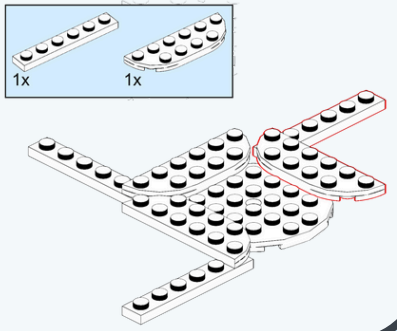
1



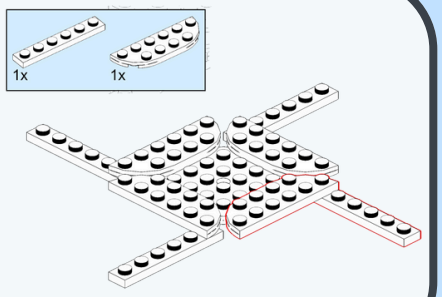
2



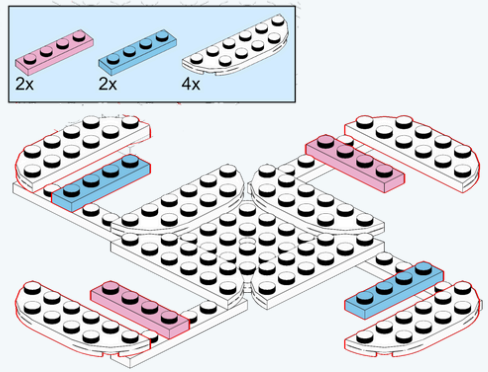
3



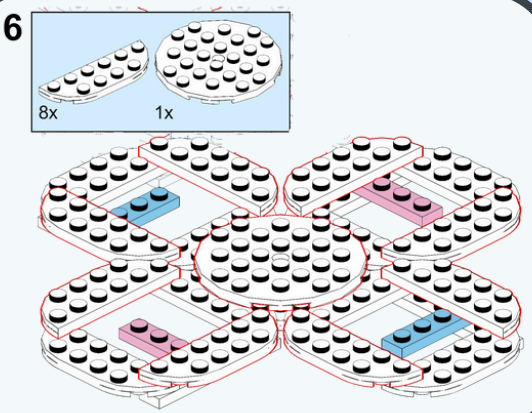
4



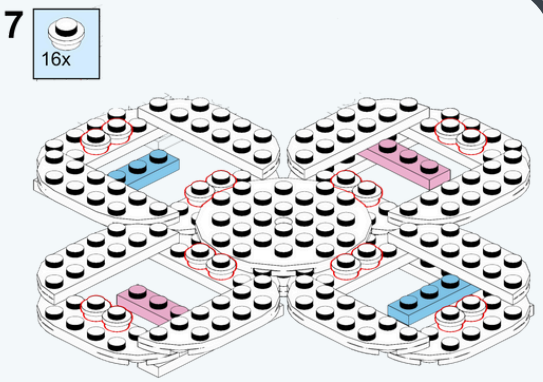
5



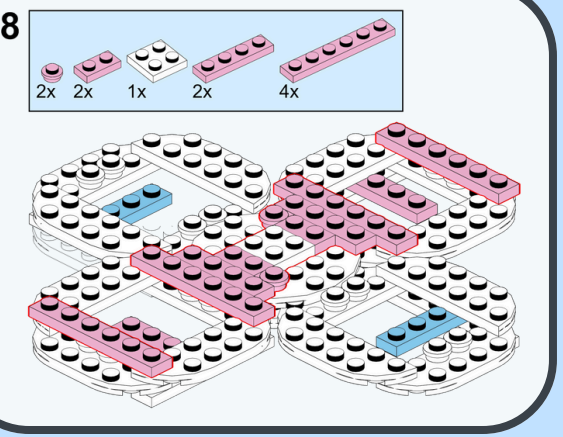
6



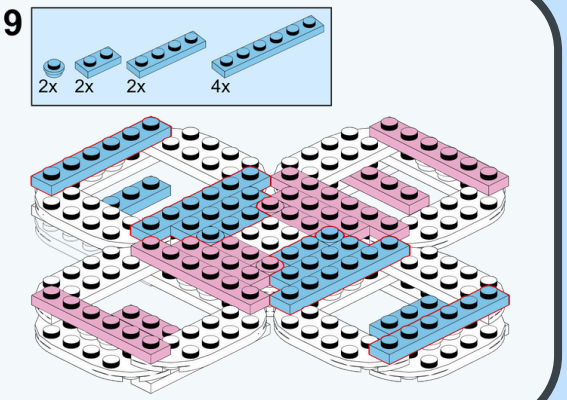
7



8



9



10