Biology
The Need for Transport Systems in Larger Organisms

Why We Need Transport Systems:
All organisms need to exchange substances with their internal and external environments, in order to take in needed molecules and to expel waste. Large organisms need systems which can transport food, oxygen and other materials to keep all cells in good supply. Unlike unicellular organisms which can exchange substances with their environment simply by diffusion, active transport and osmosis, all cells in a multi-cellular organism do not necessarily have contact with the external environment and therefore there is a need for transport systems, to supply all cells with the substances they need, to keep working. Diffusion, active-transport and osmosis are still essential mechanisms which are needed in transporting substances in and out of cells. However, not all organisms have such complex systems as we do. We are a large organism (increased distance from the nutrients and the cells requiring them) and have high levels of activity, therefore having high oxygen and nutrient requirements. We produce large amounts of waste which need to be removed – and this is, therefore, all achieved by our complex transport systems.

Circulatory System:
The circulatory system comprises a group of organs that transport the blood and the substances it carries, to and from all parts of the body. In humans, the heart pumps blood around the body through the blood vessels. The blood vessels carry the blood around the entire body. We have a double circulatory system: the blood is transported from the heart to the lungs, to collect oxygen, then back to the heart – the systemic circulation; the blood is then pumped to the rest of the body (before returning to the heart for the cycle to repeat) - the pulmonary circulation. This is so that every cell in every organ receives oxygen in order to work/respire as well as the distribution or collection of certain substances from different organs (e.g. urea is passed into the kidney and taken away from other organs). We have three main types of blood vessels – each adapted to suit their purpose. Arteries carry blood away from the heart and subdivide into smaller vessels called arterioles. These subdivide into microscopic vessels called capillaries which carry blood through the organs, and then join up to form veins. Veins return blood to the heart.

Arteries: - Have a thick wall compared to the diameter of their lumen. The outer layer is fibrous tissue under which is a thick layer of elastic tissue and smooth muscle, the inner layer is very thin folded endothelial tissue. Arteries have a small lumen. When the ventricles, in the heart, contract, blood fills the arteries, at high pressure. This stretches the folded endothelial tissue and elastic walls. Then, when, the ventricles relax it's the elastic recoil of the artery wall that keeps the blood pressure up, otherwise organs such as the kidneys would not be able to function, if the blood pressure dropped too low between heartbeats. Arterioles - are narrower than arteries and have a higher proportion of smooth muscle fibres and a lower proportion of elastic tissue. When the circular muscles fibres of an arteriole contract, the diameter of the lumen is reduced, so less blood flows through that vessel. Arterioles can control the amount of blood flowing to a particular organ.
Capillaries: - Bring the blood close to every cell in the organ. Substances are transferred between the blood in the capillary and the cells. Capillaries, one-cell thick - made up of endothelial cells, are microscopic so that they 'fit' between cells and allow materials to pass through their walls easily. Veins: - The pressure of the blood is much lower in the veins than the arteries. So puts little pressure on the walls of the veins. They allow blood to flow through and prevent the backflow of blood as they have 'watch-pocket' valves. A vein has a very large lumen and relatively thin walls containing some elastic tissue and smooth muscle.