Why do organisms have a transport system:

Diffusion is fast enough for transport over short • distances. The efficient supply of materials over larger distances requires a mass transport system.

Specialist exchange surfaces are required to absorb nutrients and excretory products. These exchange surfaces are located in specific regions of the organism. A transport system is required to take materials from cells to exchange surfaces and from exchange surfaces to cells. Mater als have to be transported being in Exchange surfaces and the Program.

As organisms have evolved into larger and more complex structures, the tissues and organs of which they are made have become more specialised and dependant upon one another.

The lower the surface area to volume ratio, and the more active the organism, the greater is the ^{1.} need for a specialised transport system with a pump.

Circulatory system of a mammal

Features of Transport Systems:

- A suitable medium in which to carry materials (like blood). This is normally a liquid based on water because water readily dissolves substances and can be moved around easily but can be a gas such as air breathed in and out of the lungs.
- A form of mass transport in which the transport medium is moved around in balk over large distances = in P. Explu diffusion.
- A closed system a tubular vessels that contains the transport medium and forms of a branching a twork to distribute it to all parts of the organism.
- A mechanism for moving the transport medium within vessels. This requires a pressure difference between one part of the system and another.

Its achieved in two main ways:

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- animals use muscular contraction either of the body muscles or of a specialised pumping organ, such as the heart.
- 2. Plants rely on natural, passive processes such as the evaporation of water:
- a mechanism to maintain the mass flow movement in one direction (like valves)
- A means of controlling the flow of the transport medium to suit the changing needs of different parts of the organism.
- A mechanism for the mass flow of water or gases (like the diaphragm and intercostal muscles.)

Circulatory system in mammals:

Mammals have a closed, double circulatory system in which blood is confined to vessels and passes twice through the heart for each complete circuit of the body. This is because when blood is passed through the lungs, its pressure is reduced. If it were to pass immediately to the rest of the body its low pressure would make circulation very slow.

Blood is therefore returned to the heart to boost its pressure before being circulated to the rest of the tissues. As a result, substances are delivered to the rest of the body quickly, which is necessary as mammals have a high body temperature and hence a high rate of metabolism.

The vessels that make up the circulatory system of a mammal are divided into three types: arteries, veins and capillaries.

Although a transport system is used to move substances longer distances, the final part o the journey to cells is by diffusion. The final exchange from blood vessels into cells is rapid because it takes place over a large surface area, across short distances and there is a steep diffusion gradi-

