

CIRCULATION

Blood is the main
method of transport
around the body.

It is a **TISSUE** .

complete table

p 126 text book

There are 3 types of cells:

- **RED BLOOD CELLS**

- **WHITE BLOOD CELLS**

- **PLATELETS**

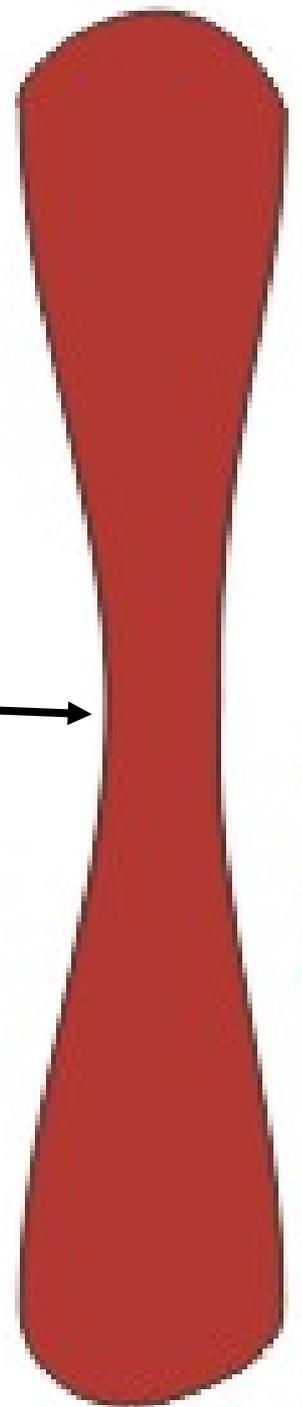
RED BLOOD CELLS

- Specialised cells adapted to carry oxygen
- Contain haemoglobin to carry oxygen
- Haemoglobin contains iron

RED BLOOD CELLS

- Biconcave shape increases the surface area to pick up oxygen
- No nucleus, gives more room for haemoglobin

thinner in the centre



WHITE BLOOD CELLS

Defence against disease.

White blood cells destroy foreign organisms that enter the body
e.g. **bacteria, fungi, viruses.**

LYMPHOCYTES

Produce antibodies
that destroy micro-organisms.

PHAGOCYTES

Digest micro-organisms by
phagocytosis.

A scanning electron micrograph showing a dense network of thin, light-colored fibers (fibrin) forming a mesh. Numerous small, reddish, disc-shaped platelets are embedded within and attached to this network, illustrating the process of blood clotting.

PLATELETS

Help to form blood
clots when you get cut

Blood contains a **soluble protein** called **fibrinogen**.

When platelets are **damaged**,
eg when a capillary is cut,
platelets release an **enzyme**.

This changes soluble fibrinogen
into **insoluble fibrin**.

The fibrin forms a **network** across the wound. Red blood cells and other platelets get caught in this network and form a **clot**.

As the clot dries the **fibrin contracts**, pulling the edges of the cut together.

PLASMA

A solution that transports

- Cells
- Food molecules
e.g. Glucose & Amino acids
- Hormones
- Carbon dioxide
- Urea

BLOOD VESSELS

blood vessels carry blood.

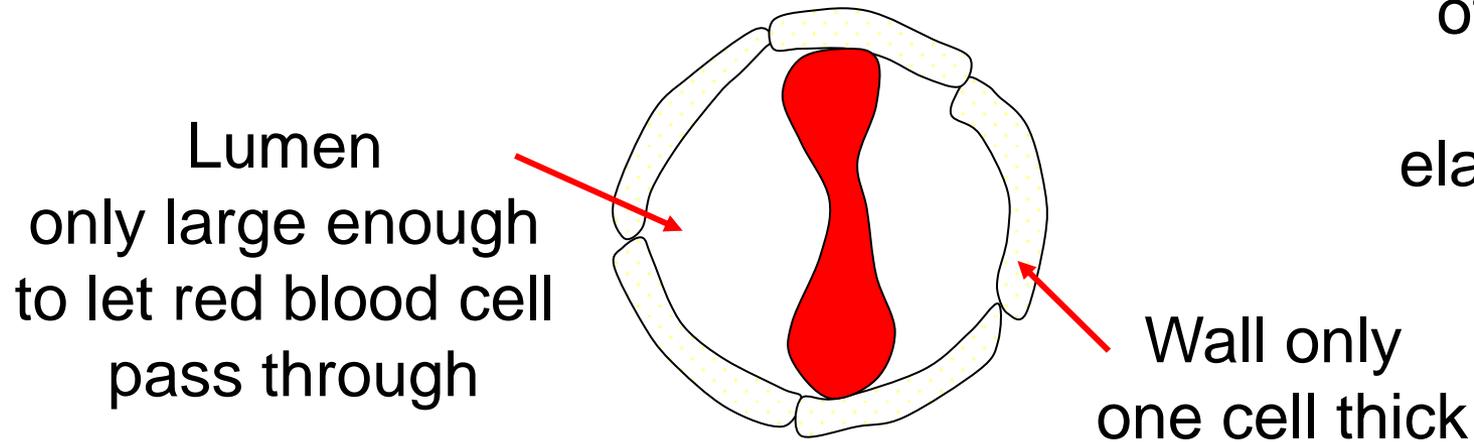
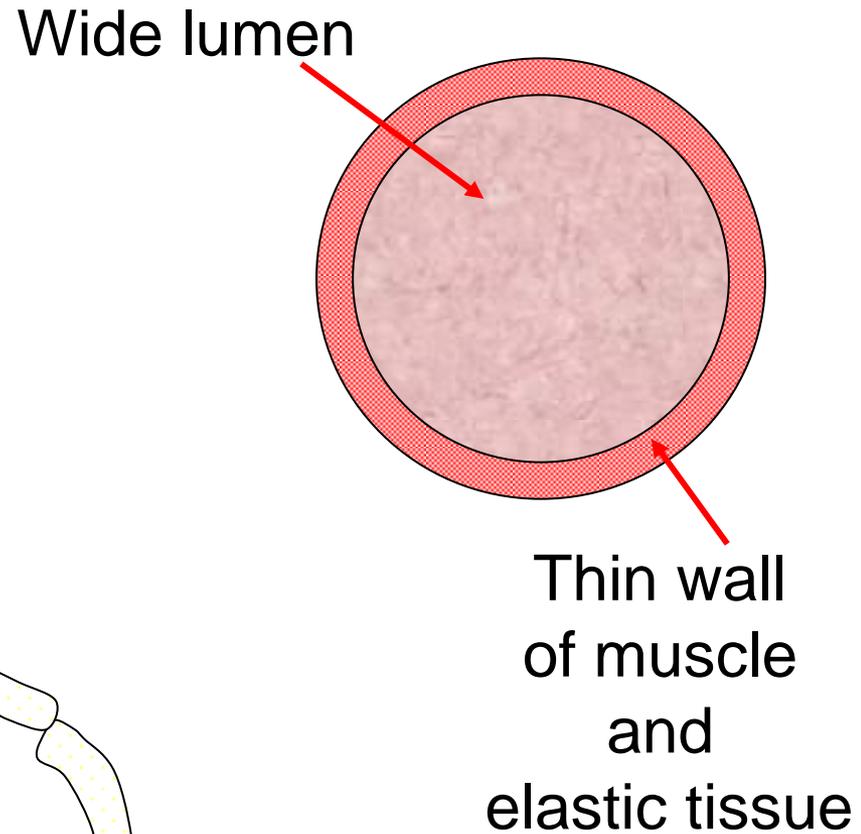
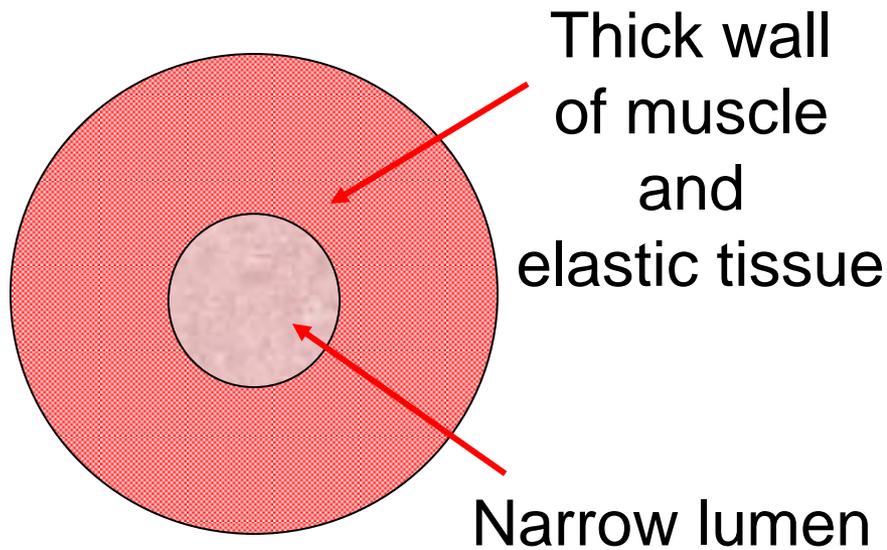
there are 3 types.

what are they called?

what does each vessel do

and how is it adapted

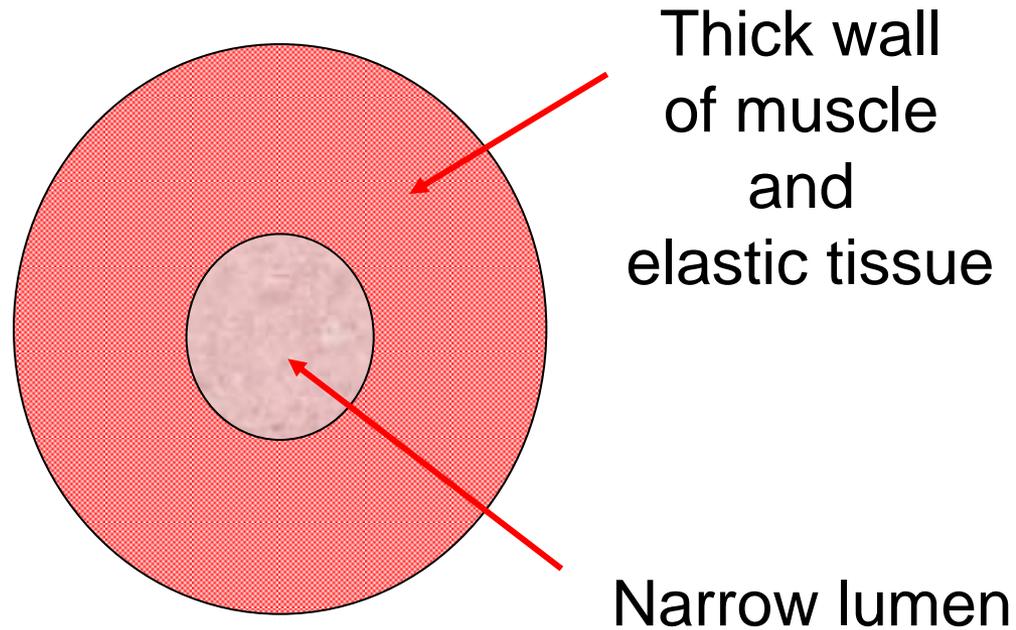
to carry out this function?



name the vessel and explain your decision

Structure

Artery



Arteries

The **elastic** tissue in the walls allows them to **stretch** as blood is pushed out of the ventricles at **high pressure** and **recoil** as the ventricles refill.

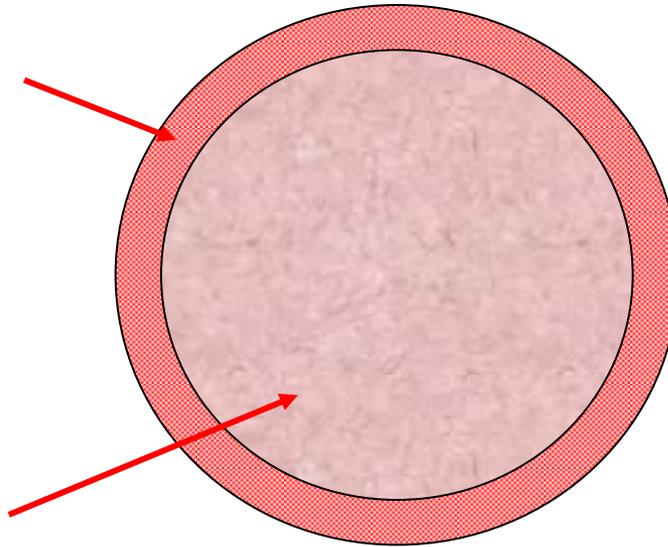
Thick muscle helps to withstand high pressure

The **pulse** is felt as the blood is forced through the arteries.

ARTERIES DO NOT PUMP BLOOD!!!

Vein

Thin wall
of muscle
and
elastic tissue



Wide lumen

Veins

Blood is at **low pressure**, therefore veins contain **less elastic** and muscle tissue.

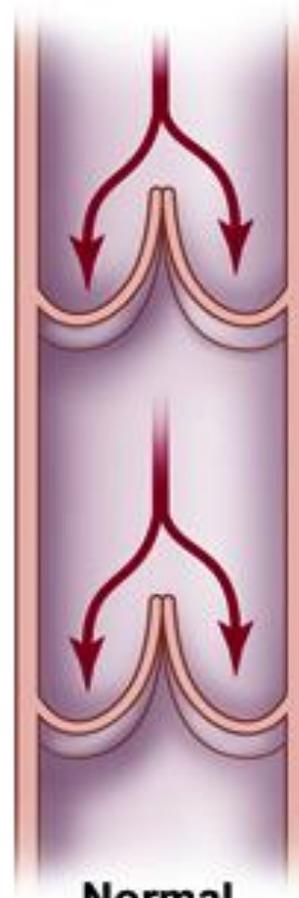
The walls have one way **valves** to ensure all blood returns to the heart.

Most large veins are found deep inside skeletal muscle. As this contracts it helps to push the blood towards the heart.



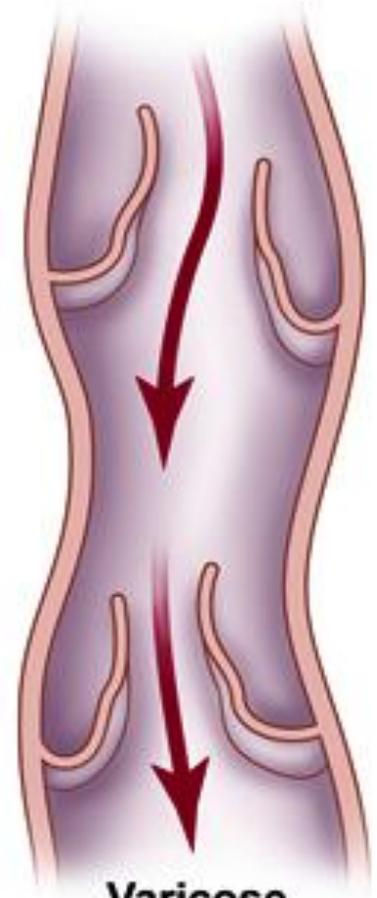
Valve closed
blood cannot move back

Valve open
blood moves forward



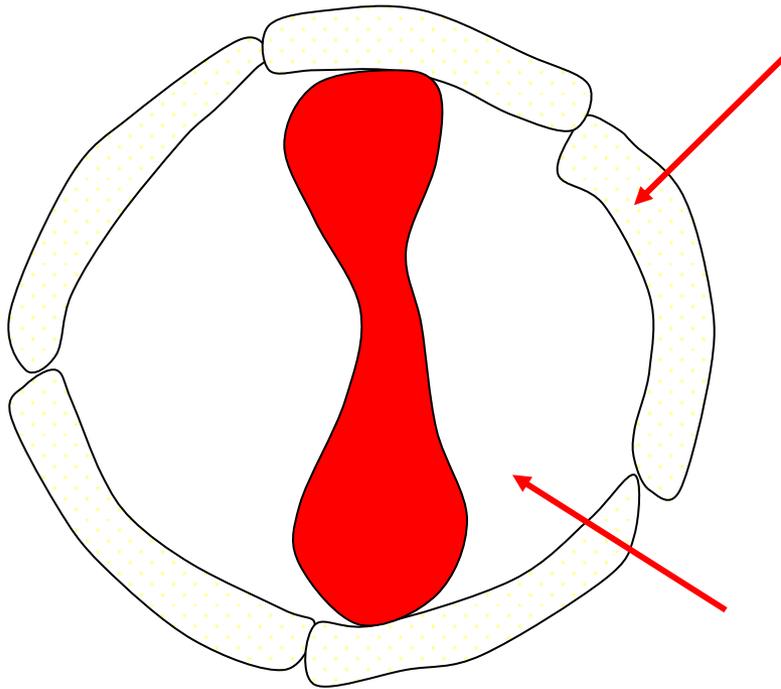
Normal vein

Copyright SVS 2004



Varicose vein

Capillary



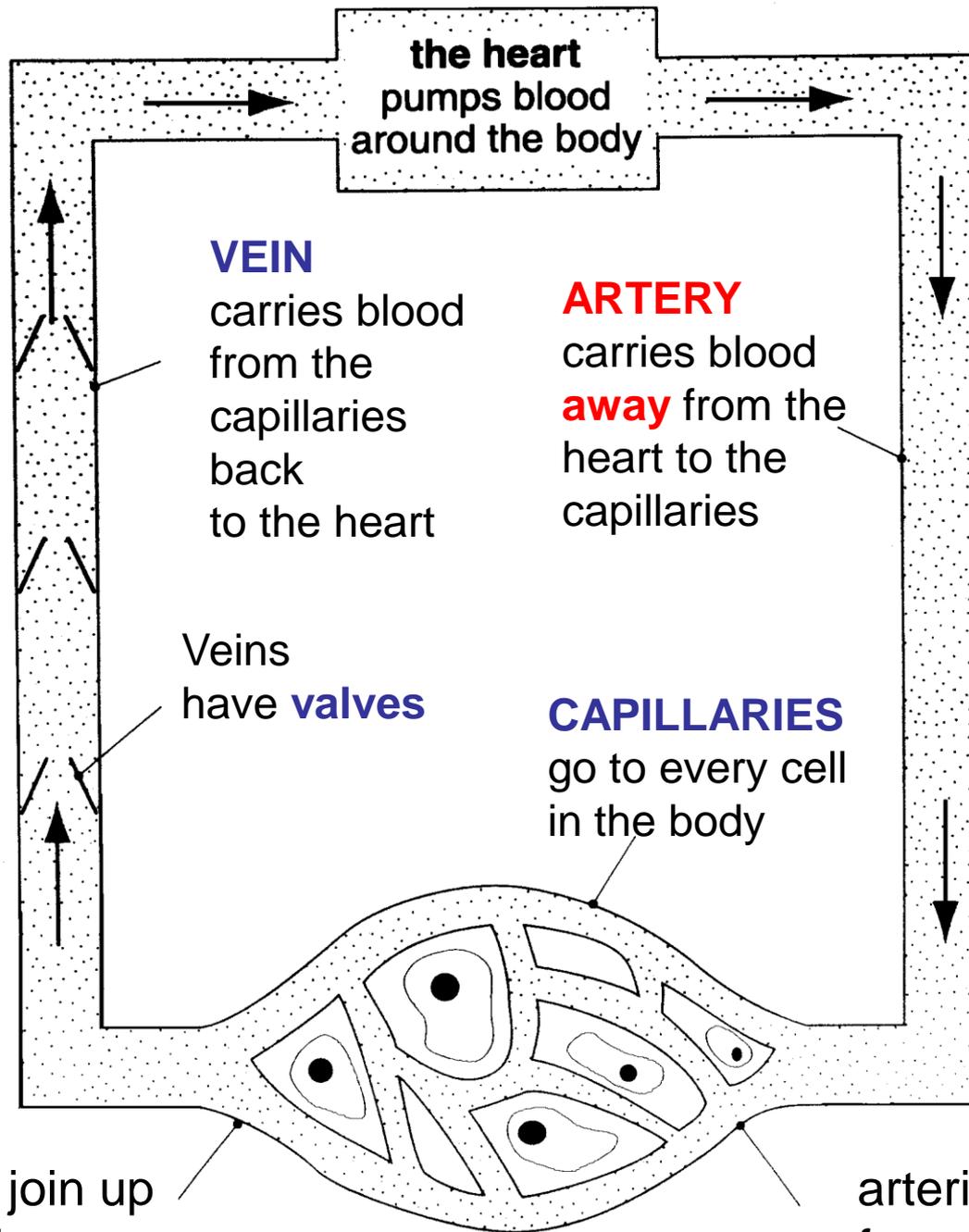
Wall only
one cell thick

Lumen
only large enough
to let red blood cell
pass through

Capillaries

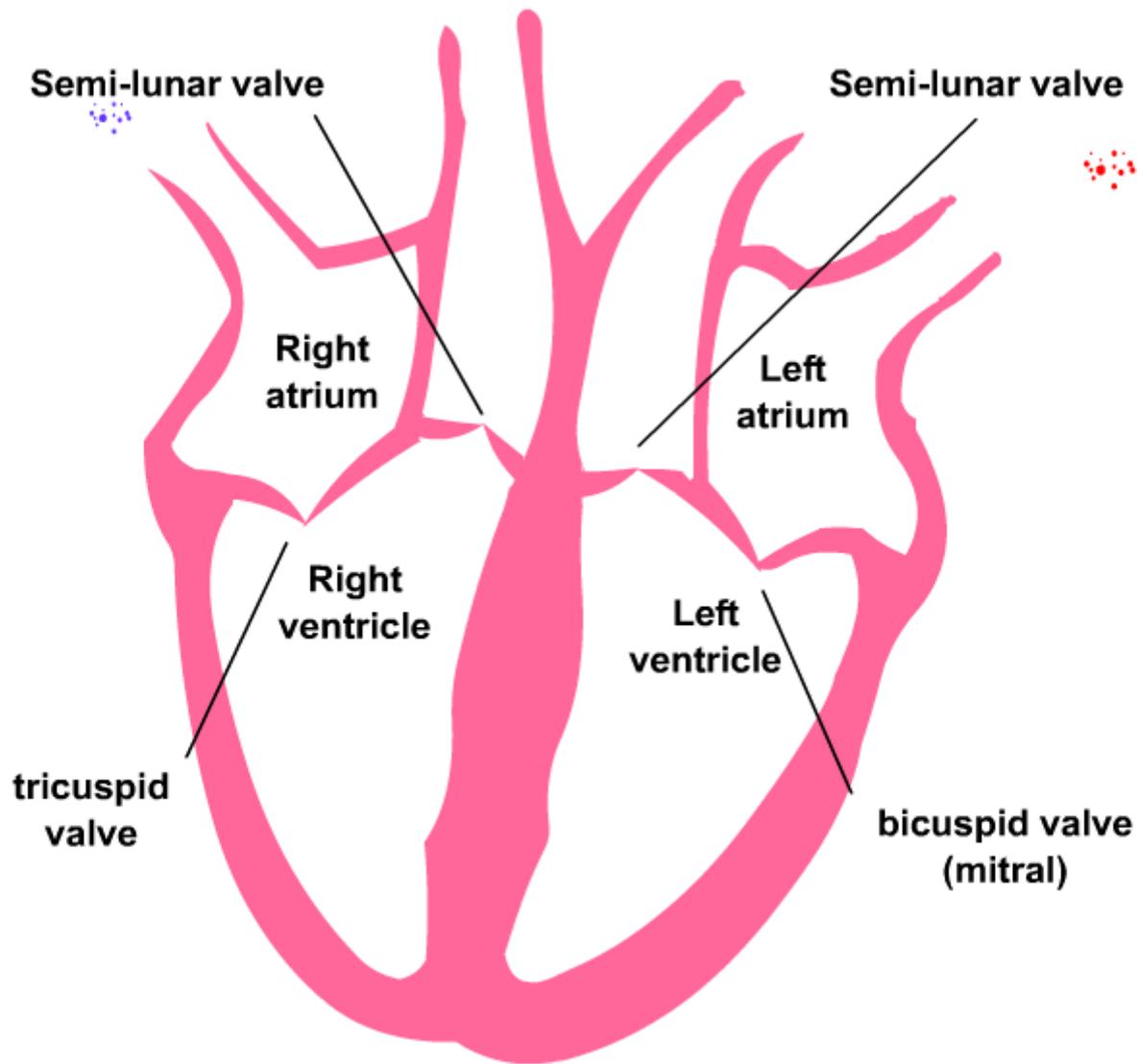
As the wall is only **one cell thick** it is easy for substances to leave and enter the blood here. This is the only place where **gas** and **nutrient exchange** can occur.

The small lumen slows the blood down, **reducing** the **pressure**.

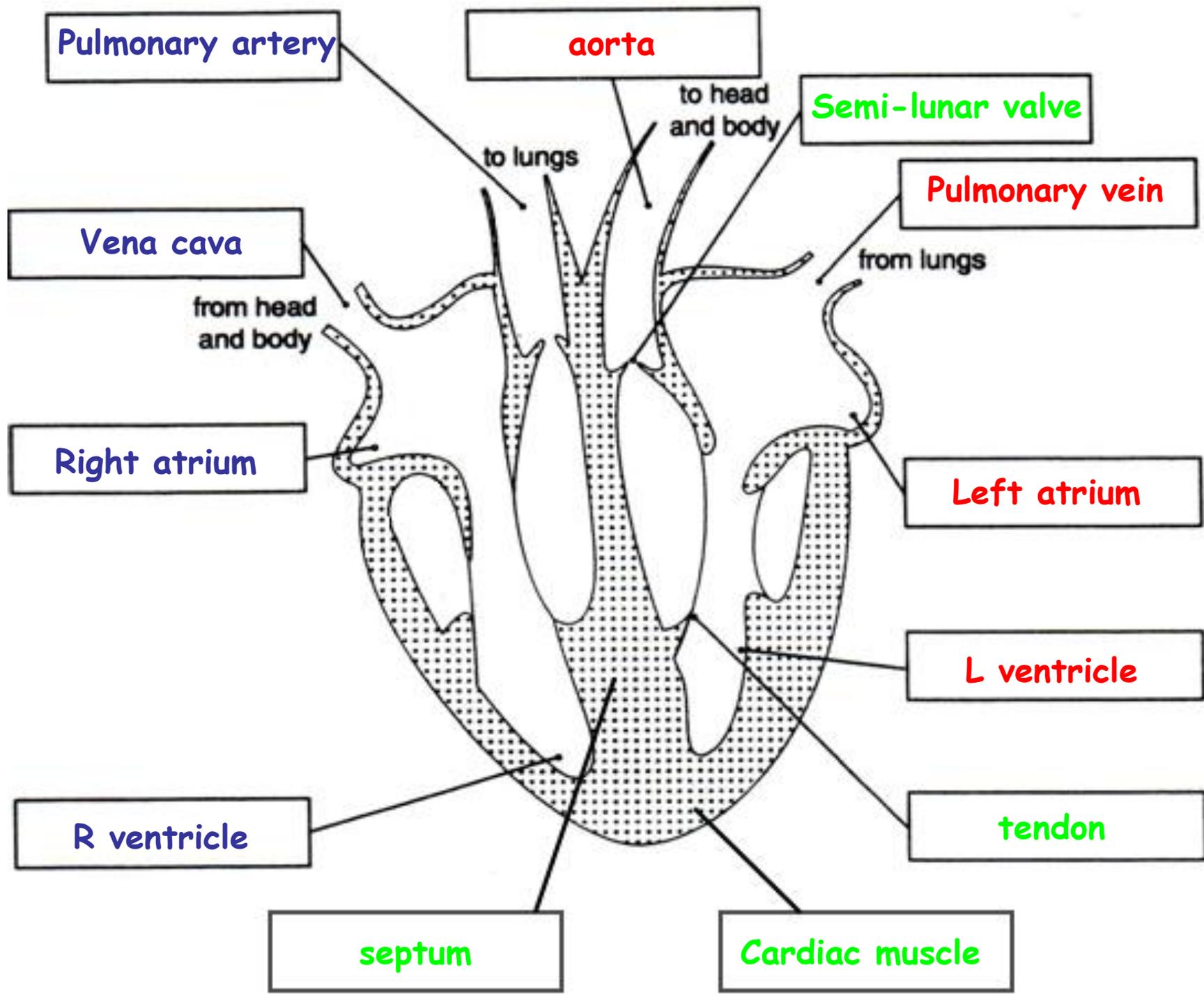


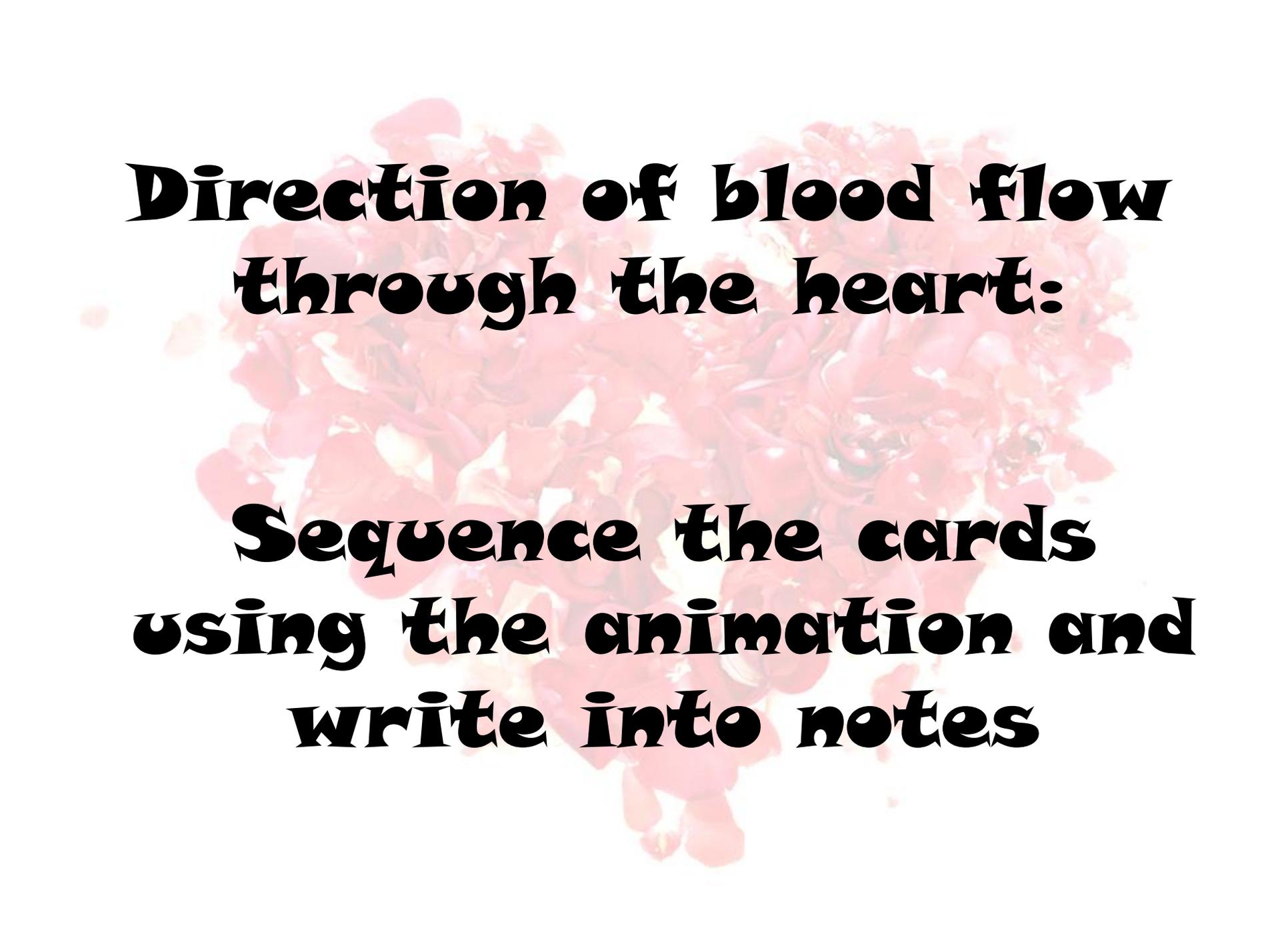
capillaries join up to form veins

arteries split up to form capillaries



**Label
heart
diagram**





**Direction of blood flow
through the heart:**

**Sequence the cards
using the animation and
write into notes**

CORRECT SEQUENCE

BODY

→ vena cava → right atrium

→ tricuspid valve → right ventricle

→ semi-lunar valve → pulmonary artery

→ LUNGS → pulmonary vein → left atrium

→ bicuspid valve → left ventricle

→ semi-lunar valve → aorta → BODY



Virtual heart dissections

[http://www.bristol.ac.uk/anatomy/media/elearning/
internet/letsdissect/letsdissectheart/index.html](http://www.bristol.ac.uk/anatomy/media/elearning/internet/letsdissect/letsdissectheart/index.html)

<http://www.gwc.maricopa.edu/class/bio202/heart/inthrt.htm>

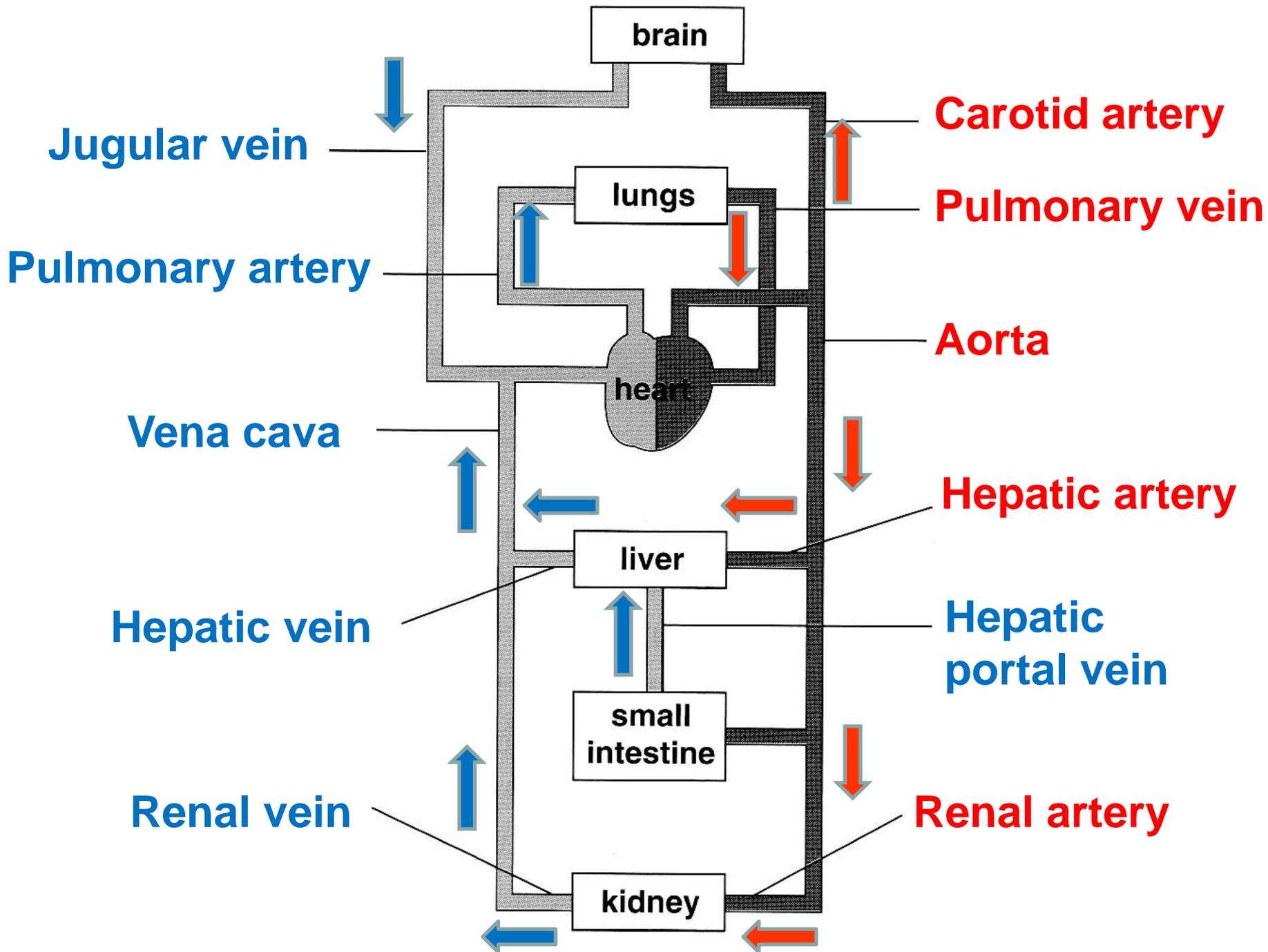


The Human Circulation

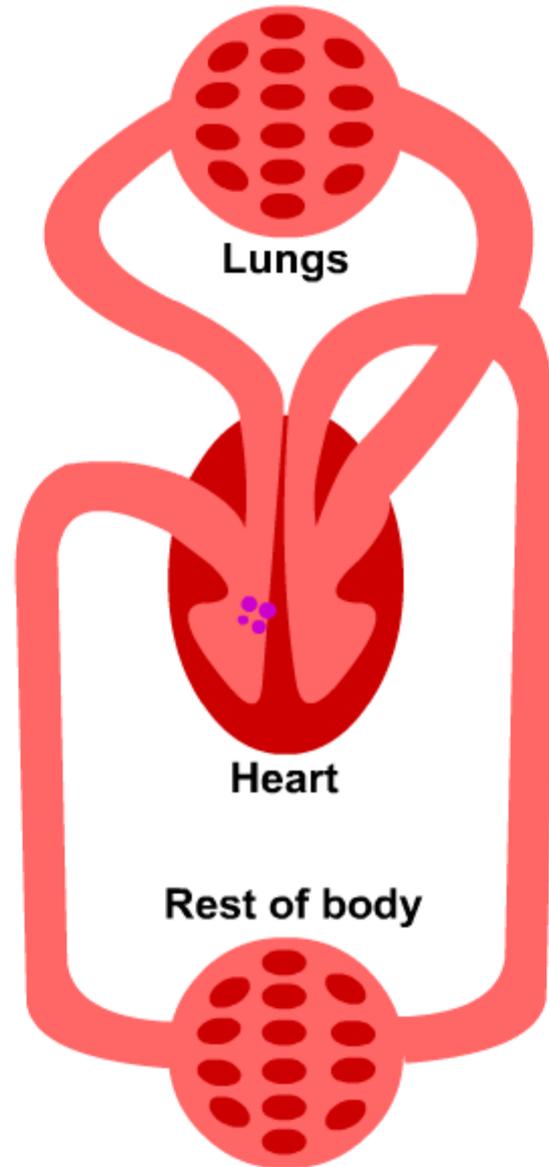


- Blood leaves the heart to travel round the body in the **AORTA**. This splits up into smaller arteries which deliver **oxygenated** blood containing, glucose and other materials to the **ORGANS**. Blood carrying carbon dioxide and waste leaves each organ in a vein. These veins join up to form the **VENA CAVA** which carries **deoxygenated** blood back to the heart.
- The heart has its own blood supply, the **coronary** blood vessels. An artery supplies the heart muscle with oxygen and glucose for respiration. This releases energy which allows the heart to contract. Carbon dioxide and waste materials must be carried away from the heart muscle in a vein.

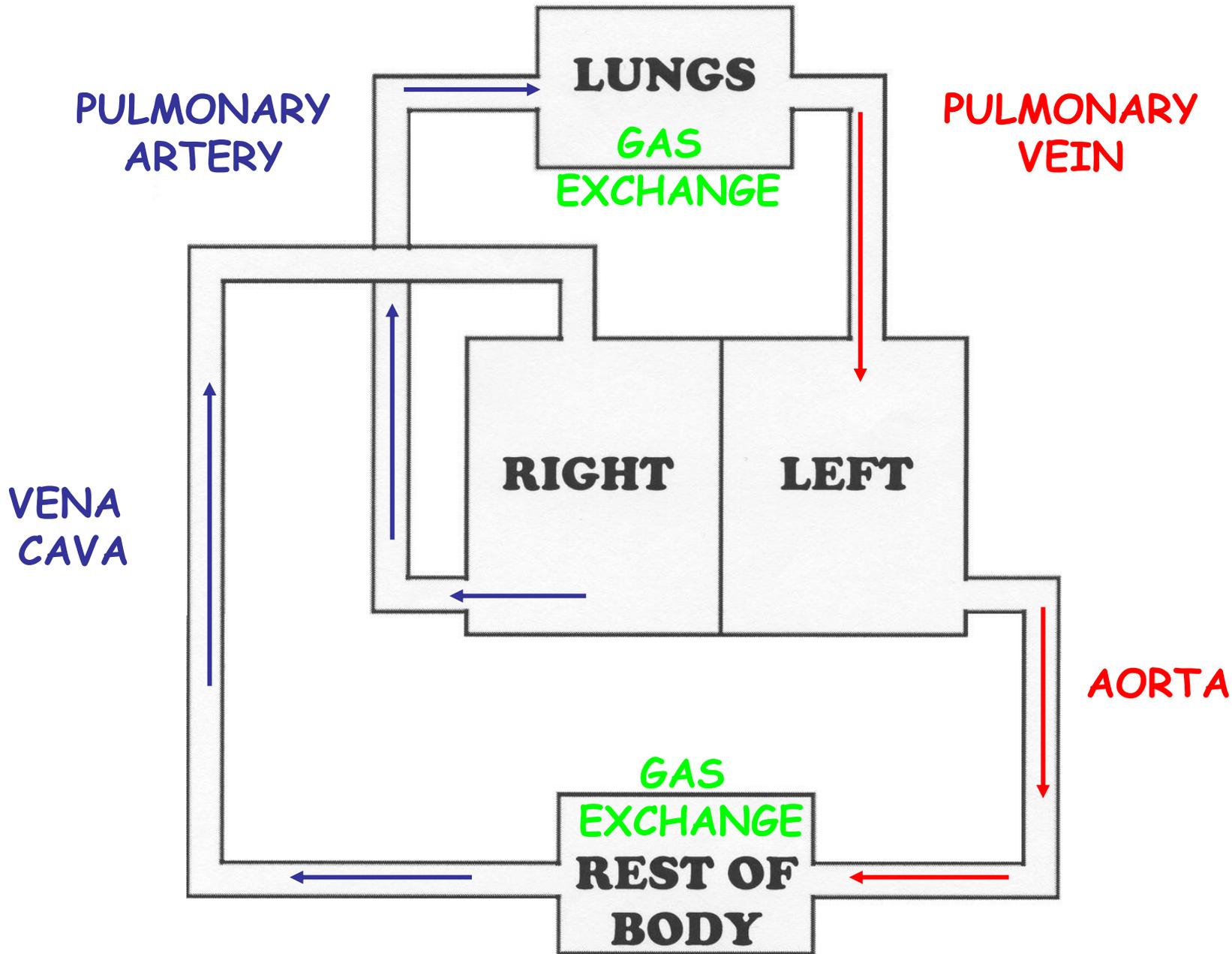
Organ	Artery into organ	Vein out of organ
HEAD/ BRAIN	CAROTID ARTERY	JUGULAR VEIN
LUNGS	PULMONARY ARTERY	PULMONARY VEIN
LIVER	HEPATIC ARTERY	HEPATIC VEIN
SMALL INTESTINE	MESENTERIC ARTERY	HEPATIC PORTAL VEIN
KIDNEY	RENAL ARTERY	RENAL VEIN
HEART	CORONARY ARTERY	CORONARY VEIN



Double circulation



Blood travels through the heart
TWICE
in one circulation
of the body

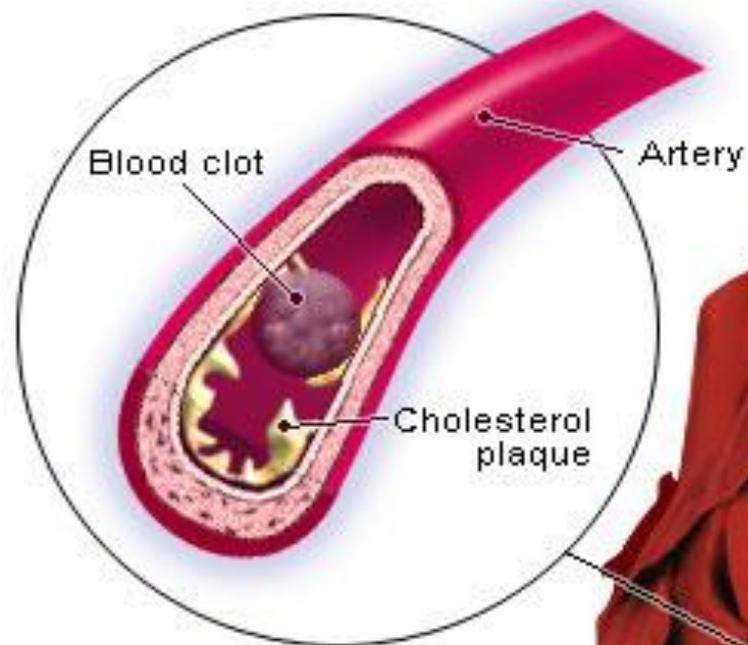


blockages in
blood vessels



- Blood vessels become blocked with deposits of cholesterol
- This leads to clots forming
- This reduces blood supply to cells
- The cells get less oxygen and glucose
- Therefore they respire less
- Less energy is produced
- Cells die



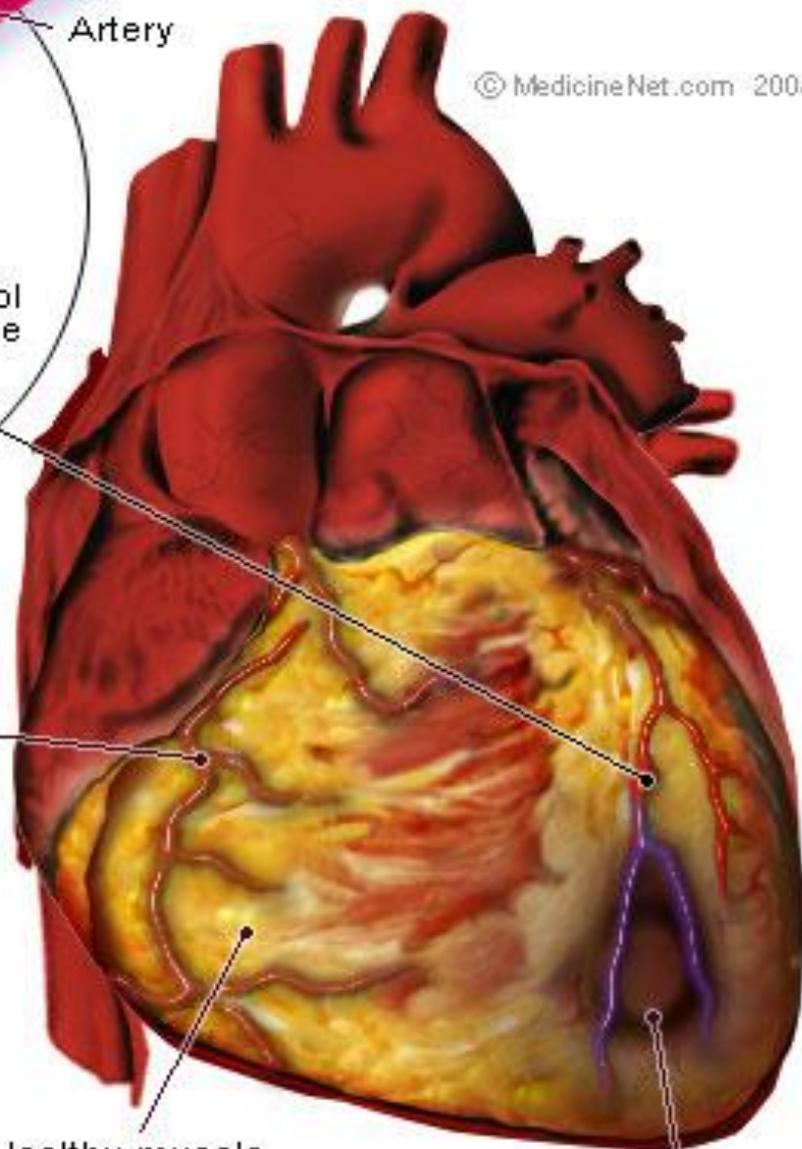


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Coronary arteries

Healthy muscle

Dying muscle



Blockage in the coronary blood vessels of the heart

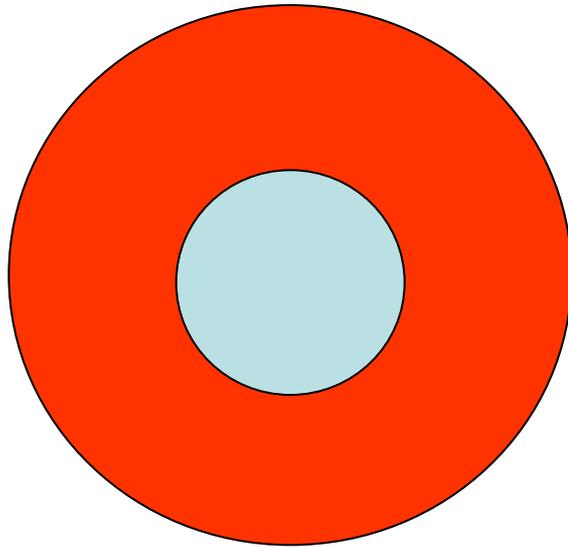
- Restricts blood flow to the heart muscle
- and causes heart muscle cells to die
- Heart stops beating causing a
HEART ATTACK



Blockage in the blood vessels of the brain

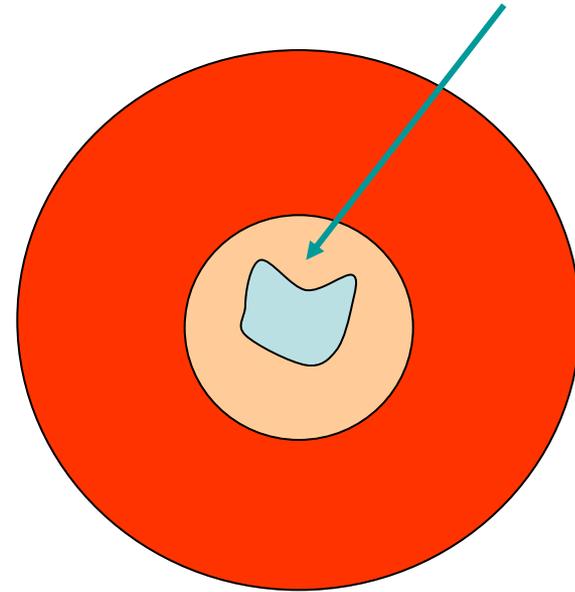
- Restricts blood flow to the brain cells
- and causes brain cells to die
- Reducing brain function
- Causing a **STROKE**





**HEALTHY
ARTERY**

Thick deposits
of fat and cholesterol
block the lumen



**DISEASED
ARTERY**

Heart disease & stroke

Risk Factors

- Poor diet: too much fat, cholesterol and salt
- Smoking
- Lack of Exercise
- Stress
- Drinking too much alcohol
- High blood pressure

There is also a genetic link



anaemia

CAUSES	DUE TO	SYMPTOMS
<ul style="list-style-type: none">•Shortage of RBCs•Low haemoglobin levels	<ul style="list-style-type: none">•Not enough iron in diet•Blood loss	<ul style="list-style-type: none">•Extreme tiredness•Pale complexion•Rapid pulse rate

blood donation adverts



the
virtual
donor

i needed a
blood transfusion



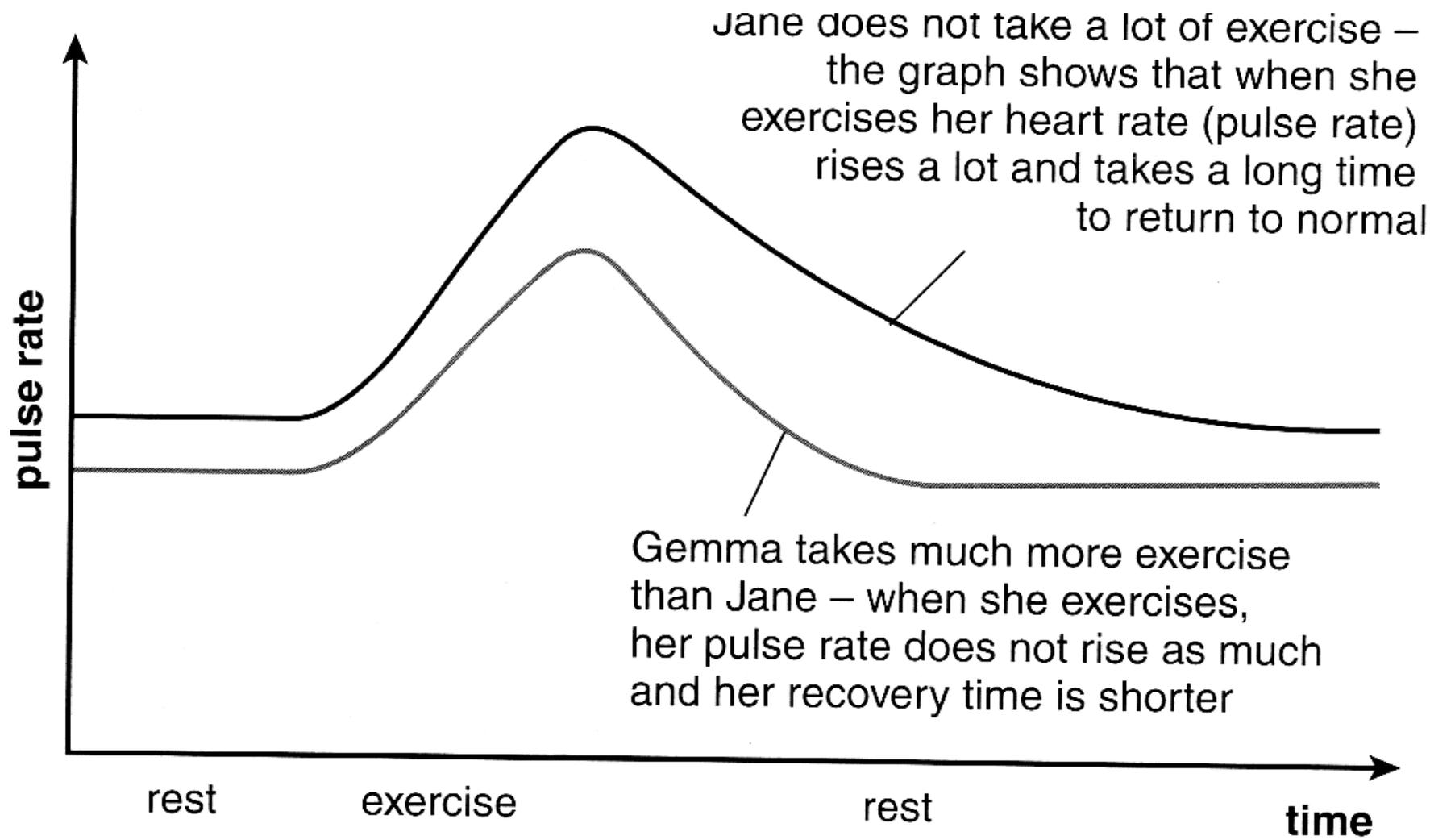
literacy
activity
blood
donation



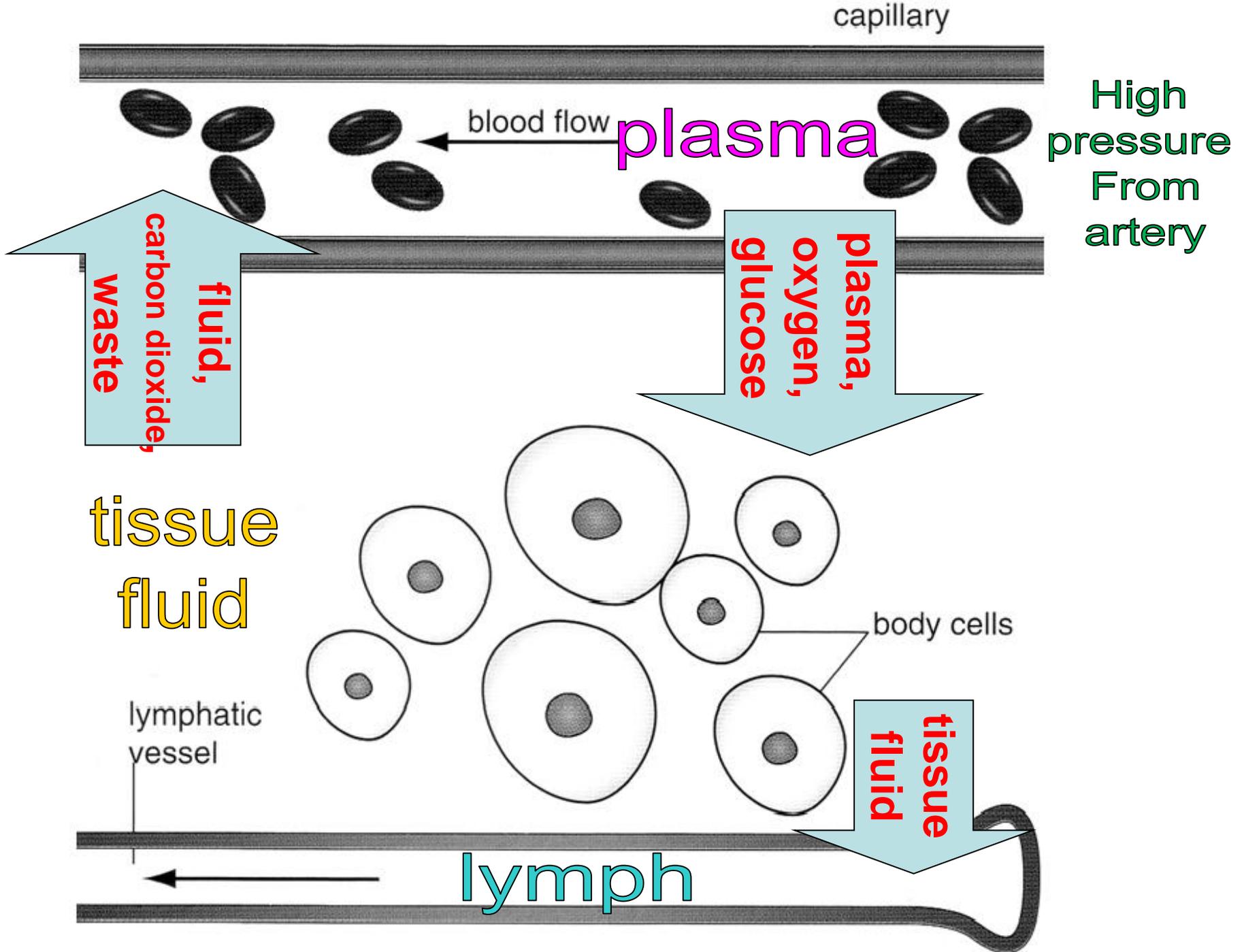


effects of exercise

- The heart rate **increases** with exercise. This occurs in order to supply the working muscle with sufficient **oxygen** and **glucose** for **respiration** and to carry away waste products such as **carbon dioxide** and **water**.
- The pulse rate returns to normal **gradually** after exercise. Although the muscles are no longer working **oxygen** is needed to dispose of **waste** products.
- The recovery rate is **the time it takes for the pulse or heart rate to return to normal after exercise**.
- It is usually shorter for people who exercise or play a lot of sport.
- Regular exercise helps to strengthen the heart muscle. A stronger heart will have an increased output (**pumps more blood per beat**) even when not exercising.
- This means that the heart is under less strain because **it has to pump less often to get the same amount of blood around the body over a period of time**.



plasma
tissue fluid
& lymph



- The liquid part of the blood is called **PLASMA**. The pressure of the blood in the capillaries causes plasma to pass through the thin capillary wall and surround the cells. The plasma is rich in glucose and oxygen, which the cells can use.
- The fluid that surrounds the cells is called **TISSUE FLUID**. Most of this fluid diffuses back into the blood capillaries, carrying carbon dioxide and other waste materials from the body cells.
- Some of the fluid moves too far away from the capillaries to diffuse back in. This fluid enters lymphatic vessels and become **LYMPH**. It will be returned to the blood as it returns to the heart in the vena cava.