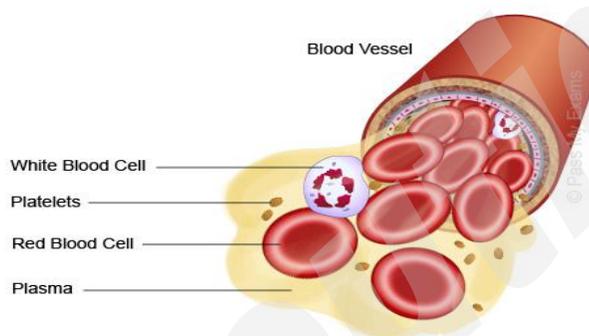


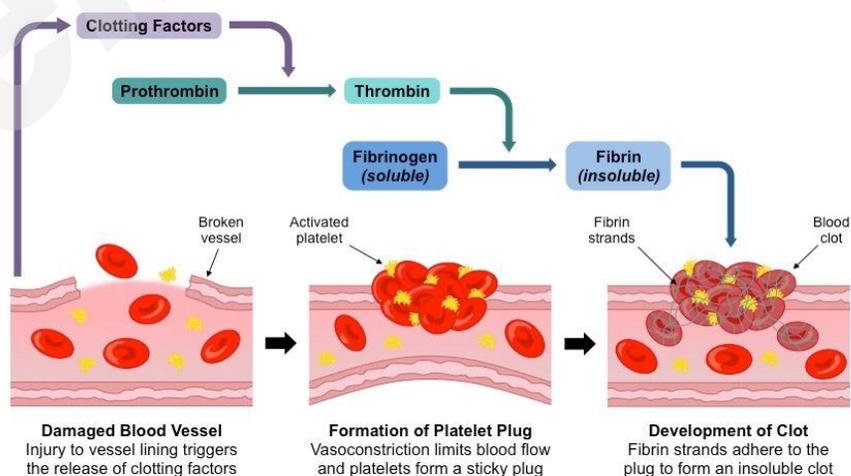
Transport in Animals

(IGCSE Biology Syllabus 2016-2018)

Blood



- **Red blood cells:** heamoglobin and oxygen transport
- **White blood cells:** phagocyte → phagocytosis (engulf pathogen, vesicles fuse with vacuole, enzymes digest bacteria); lymphocyte: antibody formation (antibodies are Y-shaped protein, bind to label pathogens, the pathogens are then destroyed by ingested by phagocytes)
- **Platelets:** blood clotting → reduces blood loss and keeps pathogens out
Fibrinogen (inactive) turns to **fibrin (activated)** and form a mesh to trap red blood cells, which eventually dries to form a scab.

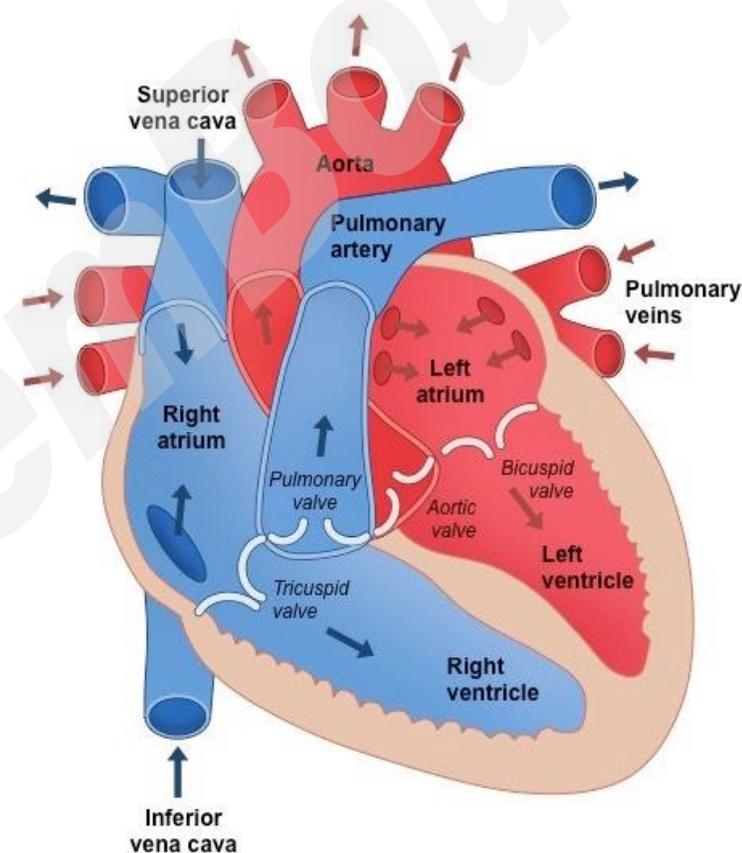


- **Plasma:** transport of blood cells, ions, soluble nutrients, hormones, carbon dioxide, urea and plasma proteins

Transport System

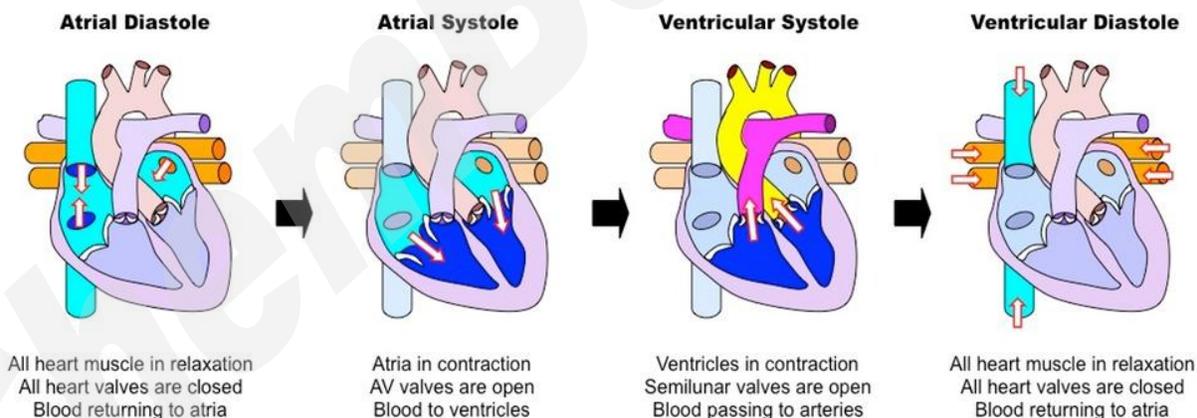
- **Circulatory system:** system of blood vessels (veins, capillaries, arteries) with a pump (heart) and valves (in heart and veins) to ensure one-way flow of blood
- **Double circulation system:**
 - Four heart chambers
 - Blood passes through heart twice
 - Blood is oxygenated in lungs, to heart, to body then back to heart
 - Advantage: delivers greater blood flow rate to tissues around the body as the heart pumps the oxygenated blood from the lungs

The Heart

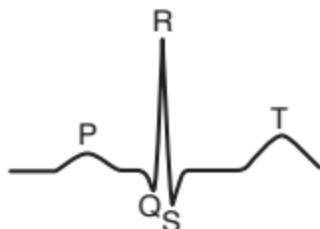


Structure	Function
Vena cava	Carries deoxygenated blood from the rest of the body to right atrium
Right atrium	Collect deoxygenated blood and pump it to right ventricle
Right ventricle	Pumps deoxygenated blood to lungs
Pulmonary artery	Carries deoxygenated blood from right ventricle to lungs
Septum	Separates left and right sides of the heart
Pulmonary vein	Carries oxygenated blood from the lungs to the left atrium
Left atrium	Collect oxygenated blood and pump it to left ventricle
Left ventricle	Pumps oxygenated blood from left ventricle to rest of body
Aorta	Carries oxygenated blood from left ventricle to rest of body
Tricuspid and bicuspid valves (atrio-ventricular valves)	Prevent backflow of blood into the atria when ventricles contract
Pulmonary and aortic valves (semi-lunar valves)	Prevent backflow of blood from the arteries into the ventricles

Cardiac cycle



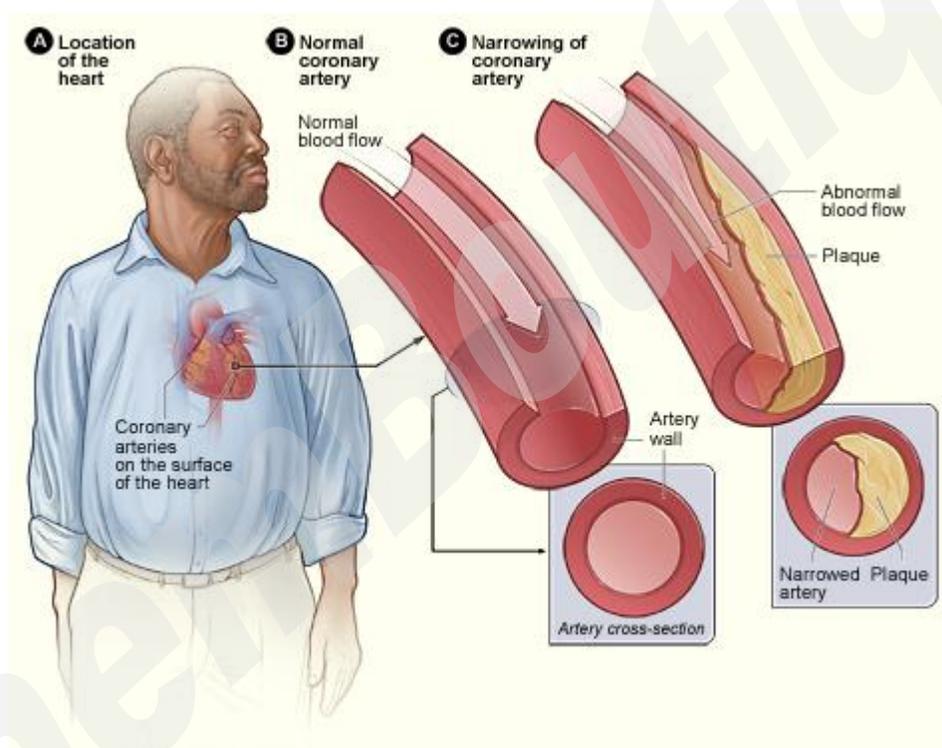
Electrocardiogram (ECG)



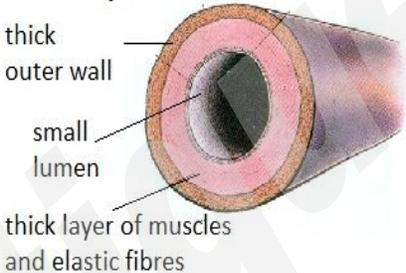
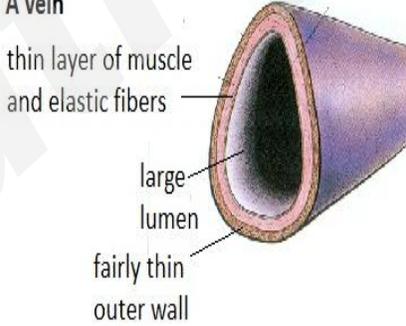
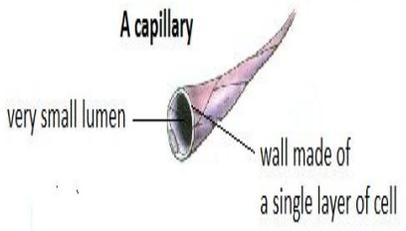
position on Fig. 3.1	result of electric activity	atrioventricular valves	semilunar valves
P	atria contract	open	closed ;
QRS	ventricles contract	closed	open ;
T	atria and ventricles relaxed	open	closed ;

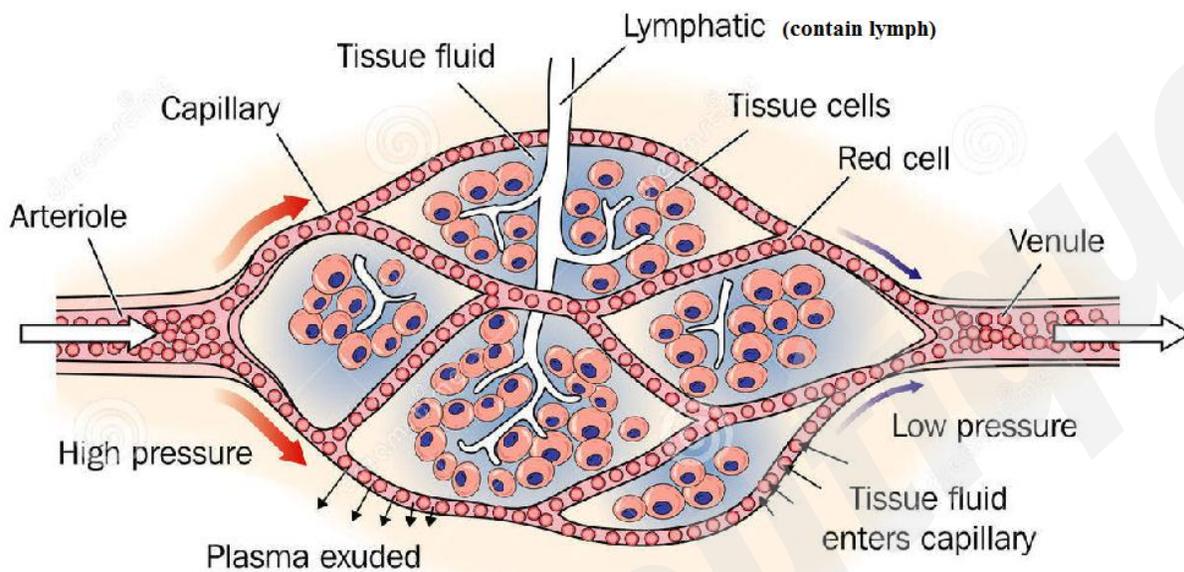
Coronary Heart Disease

- Coronary artery becomes blocked, interrupting the supply of blood to the heart muscle
- The heart muscle cells are deprived of oxygen and glucose, and poisonous wastes such as lactic acid build up
- Part of the heart muscle stops contracting, causing a heart attack
- Caused by stress, smoking, poor diet, poor lifestyle and genetically
- Can be prevented by not smoking, avoiding fatty food and exercising regularly
- Treated by aspirin and surgery (stents, angioplasty and by-pass)



Arteries, Veins and Capillaries

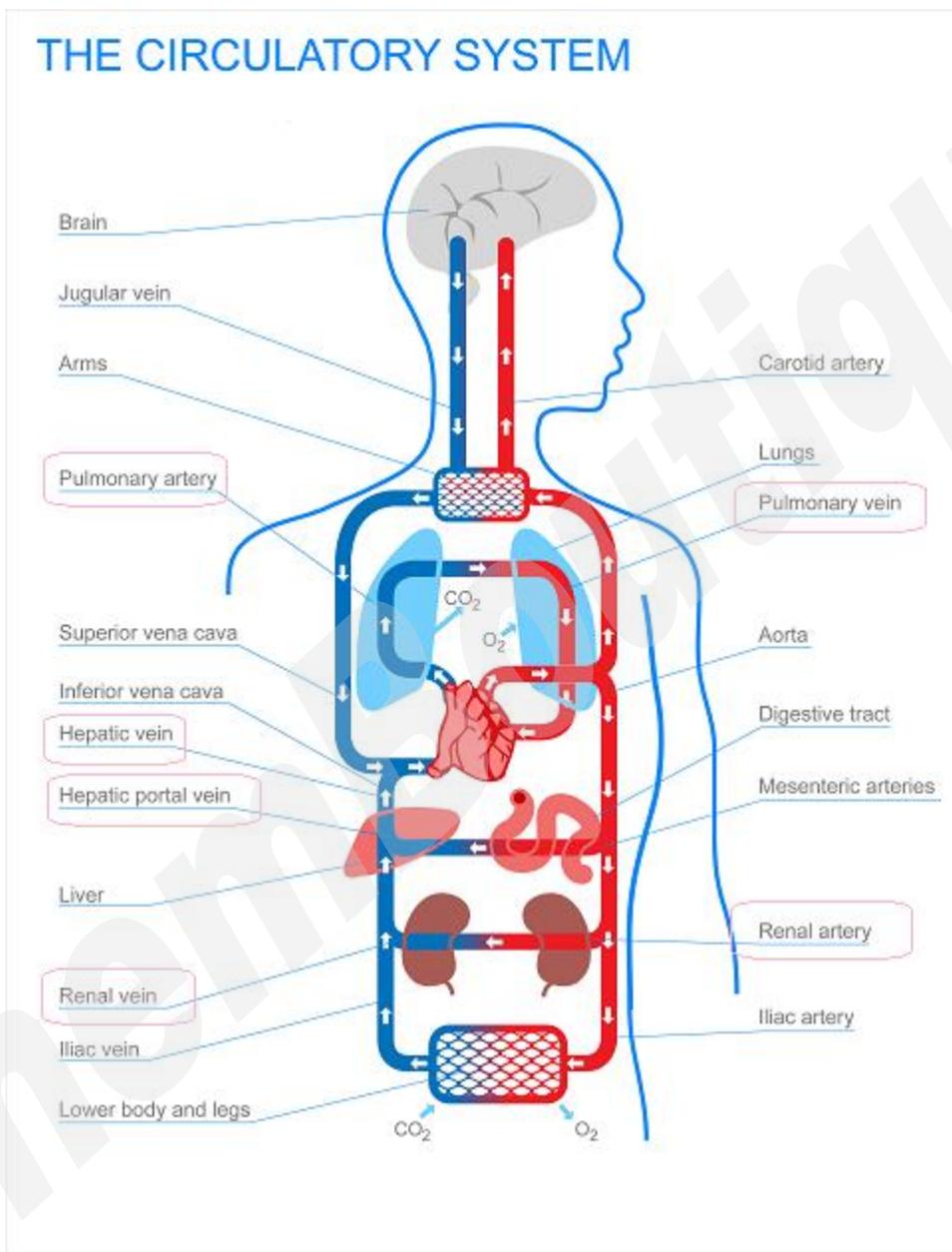
Vessel	Function	Structure	Diagram
Artery	Transport high pressure blood away from heart	<ul style="list-style-type: none"> -Elastic walls expand and relax as blood is forced out; causes pulse -Thick walls withstand high pressure -Rings of muscle narrow or widen artery to control blood flow 	<p>An artery</p>  <p>thick outer wall</p> <p>small lumen</p> <p>thick layer of muscles and elastic fibres</p>
Vein	Transport low pressure blood to the heart	<ul style="list-style-type: none"> -Valves prevent backflow of blood -Blood is at low pressure, but nearby muscles squeeze veins and help push blood to the heart -Large diameter and thin walls reduce resistance to flow of blood 	<p>A vein</p>  <p>thin layer of muscle and elastic fibers</p> <p>large lumen</p> <p>fairly thin outer wall</p>
Capillary	Allow substances to diffuse into cells	<ul style="list-style-type: none"> -One cell thick walls for easy diffusion -Highly branched, large surface area -Capillary beds constantly supplied with fresh blood, so diffusion occurs 	<p>A capillary</p>  <p>very small lumen</p> <p>wall made of a single layer of cell</p>



- Useful substances (glucose, amino acids, oxygen) move out of plasma of capillaries into **tissue fluid** (fluid in between cells in tissues)
- Cells need oxygen and nutrients, and produce waste products such as carbon dioxide. Waste products will move into the plasma of capillaries and travel to lungs (exhalation: exhale carbon dioxide)
- Capillaries are constantly supplied with new blood, otherwise diffusion could not occur

Lymphatic System

- Circulation of body fluids and the production of lymphocytes
- Lymph node contains many lymphocytes which filter lymph
- Lymph vessels collect lymph and return it to the blood



Lungs → heart (pulmonary vein)	Heart → Lungs (pulmonary artery)
Liver → heart (hepatic vein)	Heart → Liver (hepatic artery)
Kidneys → heart (renal vein)	Heart → Kidneys (renal artery)