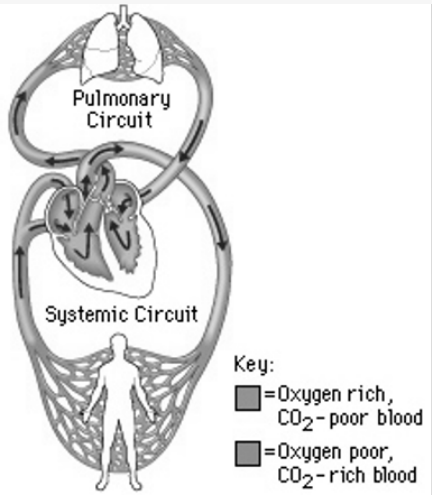
organs/structures

organs	heart, blood vessels, blood
structures	layers of heart - pericardium, epicardium, myocardium, endocardium
	valves
	chambers
	major vessels
	major cell types of blood

thickness of cardiac walls

myocardium of left ventricle is thicker than right - to do with demands of pumping blood away from heart.

Blood flow



arteries & veins

have:

> three major layers: the tunica interna (featuring the endothelium); tunica media (featuring circular smooth muscle & elastic fibers); and tunica externa (featuring elastic & collagen fibers).

arteries & veins (cont)

elastic arteries

> large arteries with more elastic fibres & less smooth muscle, are able to receive blood under pressure & propel it onward, also called conducting arteries as they conduct blood from the heart to medium sized muscular arteries

muscular arteries

> medium-sized arteries with more muscle than elastic fibres in tunica media, capable of greater vasoconstriction & vasodilation to adjust rate of flow - walls are relatively thick, called distributing arteries as they direct blood flow

aorta divisions

1. ascending aorta
2. arch of aorta
3. thoracic aorta
4. abdominal aorta

regulation of heart rate

nervous control from cardiovascular centre in medulla: sympathetic impulses increase heart rate & force of contraction, parasympathetic impulses decrease heart rate, baroreceptors (pressure receptors) detect change in BP & send info to cardiovascular centre (located in arch of aorta & carotid sinuses).

heart rate is also affected by hormones:

- adrenaline, noradrenaline, thyroid hormones
- ions NA+, K+, Ca2+
- age, gender, physical fitness & temperature

cell types

heart	blood vessels	blood
pericardium	endothelium	leukocytes; WBCs
epicardium		
myocardium - cardiac monocytes	.	
valves		
conducting nerve bundles (SA/AV Nodes)	.	
pericardium		

venules

- small veins collecting blood from capillaries
- tunica media contains only a few smooth muscle cells & scattered fibroblasts - very porous endothelium allows for escape of many phagocytic WBCs
- venules that approach size of veins more closely resemble structure of vein

arterioles

- small arteries delivering blood to capillaries - tunica media containing few layers of muscle
- metarterioles form branches into capillary bed - to bypass capillary bed, precapillary sphincters close & blood flows out of bed in throughfare channel, vasomotion is intermittent contraction & relaxation of sphincters that allow filling of capillary bed 5-10 times/-minute.

veins of systemic circulation

- drain blood from entire body & return it to right side of heart
- deep veins parallel the arteries in the region
- superficial veins are found just beneath the skin
- all venous blood drains to either superior or inferior vena cava or coronary sinus

circulatory routes

systemic

> left side heart to body & back to heart

hepatic portal

> capillaries of GI tracts to capillaries in liver

pulmonary

> right side heart to lungs & back to heart

foetal

> fetal heart through umbilical cord to placenta & back

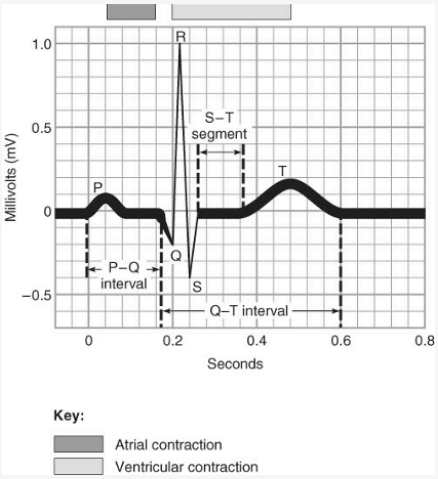
physiological functions

heart	pumps over 1 million gallons / year, over 60 000 miles of blood vessels
vessels	retain & circulate blood, help regulate pulse pressure
blood	erythrocytes - distribute oxygen from & CO2 to lungs
	leukocytes - circulating immune cells to combat infection

cardiac muscle histology

- branching, intercalated discs with gap junctions, involuntary, striated, single central nucleus per cell.
- desmosomes between myocytes allow depolarisation of adjacent fibers.
- Striations are created by the organisation of myofilaments, actin & myosin

electrocardiogram - ECG or EKG



ECG - action potentials of all active cells can be detected & recorded

- P wave = atrial depolarization
- P to Q = conduction time from atrial to ventricular excitation
- QRS complex = ventricular depolarization
- T wave = ventricular repolarization
- Q-T = time for ventricular depolarization & repolarisation to occur
- S-T segment = ventricular fibres depolarised (plateau phase of AP)

electrical conductance

1. SA-Node (in right atrium)
2. AV-Node
3. AV-Node (bundle of His)
4. right & left bundle branches
5. Purkinje fibres

valves & blood circulation

- valves open & close in response to pressure changes as hear contracts & relaxes.
- dense connective tissue rings surround the valves of the heart, fuse & merge with the interventricular septum.
- support for heart valves, insertion point for cardiac muscle bundles, electrical insulator between atria & ventricles.

capillaries

found near every cell but more extensive in highly active tissue (muscles, liver, kidneys & brain)
entire capillary bed fills with blood when tissue is active lacking in epithelia of: cornea & lens of eye & cartilage
walls are composed of only one layer of endothelium cells & basement membrane

layers of heart wall

pericardium

> dense irregular connective tissue

epicardium

> visceral layer of serous pericardium

myocardium

> cardiac muscle layer

endocardium

> chamber lining & valves, smooth lubricating layer