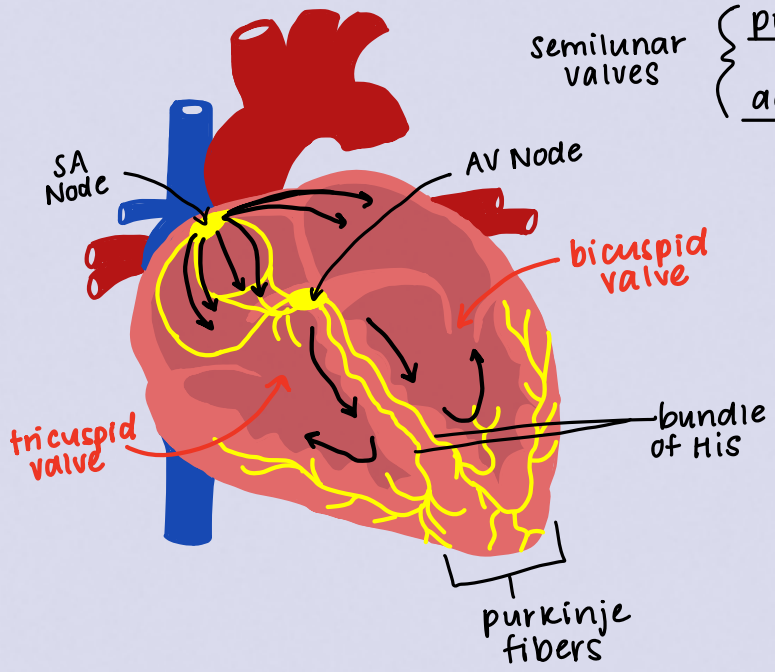
CARDIOVASCULAR SYSTEM



semilunar valves
- pulmonary valve: separates RV from pulmonary circulation
- aortic valve: separates LV from aorta

ELECTRICAL CONDUCTION

- impulse initiation begins @ SA Node
  - ↳ atria contract simultaneously (contraction)
- atrial systole: results in an ↑ in atrial pressure, forcing more blood into ventricles ↑V of blood (atrial kick)
- signal (depolarization) then reaches AV node. Signal is delayed here to allow ventricles to fill completely before contracting
- signal then travels down bundle of His and to purkinje fibers

CONTRACTION

systole: ventricular contraction + closure of AV valves occurs as blood is pumped out of ventricles

diastole: ventricles relax, SL valves are closed, blood from atria fills ventricles

cardiac output: total blood volume pumped by a ventricle in a minute

$CO = HR \times SV$

↳ volume blood pumped per beat

VASCULATURE

- all blood vessels lined with endothelial cells
- arteries have more smooth muscle than veins

- superior vena cava returns blood to the heart from portions of body above the heart, inferior vena cava from below the heart

- deoxygenated blood enters RA → tricuspid valve → RV → contraction → pulmonary valve, pulmonary arteries → lungs

- oxygenated blood enters LA → bicuspid (mitral) valve → LV → contraction → aortic valve → aorta → arteries
  - ↳ arterioles → capillaries

WHICH BLOOD TYPES AM I COMPATIBLE WITH?

BLOOD TYPE	CAN GIVE TO	CAN RECEIVE FROM
A+	A+, AB+	A+, A-, O+, O-
O+	O+, A+, B+, AB+	O+, O-
B+	B+, AB+	B+, B-, O+, O-
AB+	AB+	EVERYONE
A-	A+, A-, AB+, AB-	A-, O-
O-	EVERYONE	O-
B-	B+, B-, AB+, AB-	B-, O-
AB-	AB+, AB-	AB-, A-, B-, O-

GOOD HOUSEKEEPING

	antigens produced	antibodies produced
A	A	anti-B
B	B	anti-A
AB	A and B	none
O	O	anti-A and anti-B

(+) can recieve donation from (+) and (-)

(-) can only receive from (-)

BLOOD PRESSURE

- largest drop in BP occurs across the arterioles

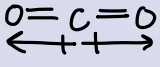
$\Delta P = CO \times TPR$

ΔP: pressure differential across the circulation
TPR: total peripheral resistance

ANP: when blood sodium & pressure ↑, ANP is secreted from the heart
- promotes salt secretion, lowers blood volume, relaxes vessel

HEMOGLOBIN & BOHR EFFECT

- CO_2 (biproduct of cellular resp. etc.): nonpolar, dipole moments cancel out.



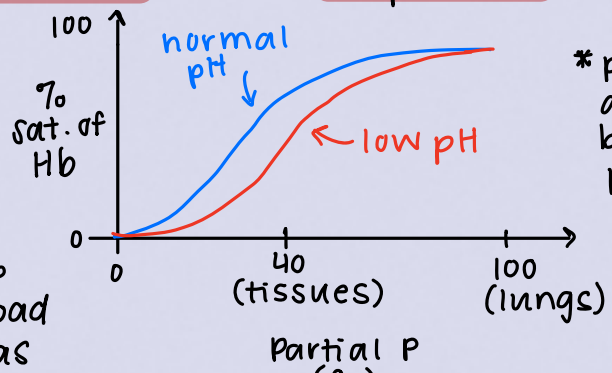
- CO_2 will not dissolve in H_2O/blood plasma easily
- $CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$ (carbonic anhydrase; red blood cells)

$\{\uparrow CO_2 = \uparrow H^+ = \downarrow pH\}$

BOHR EFFECT!

HCO_3^-: soluble in plasma

- H^+/CO_2 can bind to Hb allosteric site, conformational change, ↓ ability of Hb to bind to O_2



* pH does not affect ability of Hb to bind O_2 @ high partial pressure values

- right shift means ↓ affinity of Hb for O_2, meaning that Hb will unload O_2 into exercising tissue that was producing ↑CO_2

FLUID BALANCE

- hydrostatic pressure: force per unit area that the blood exerts against vessel walls. Generated by contraction of the heart and elasticity of the arteries
  - pushes fluid out of blood stream into interstitium through the capillary walls

- osmotic pressure: "sucking" pressure generated by solutes as they attempt to draw water into bloodstream (sometimes called oncotic pressure)