

# most important definitions of physiology



stroke volume	<i>the amount of blood pumped by the heart within one beat .. equals (EDV - ESV)</i>
heart rate	<i>the frequency of heart beating within one minute</i>
cardiac output	<i>the amount of blood pumped by each ventricle one minute (also called minute volume)</i>
cardiac reserve	<i>the difference between the resting cardiac power and the maximum cardiac power</i>
Ejection fraction	<i>the percentage of blood within the chamber that is pumped out with every Herat beat</i>
Blood flow rate (BFR)	<i>volume do blood passing through blood vessels in one minute</i>
velocity of blood flow(VBF)	<i>blood flow rate / cross sectional area</i>
critical closing pressure	<i>the intraluminal pressure at Wich blood flow stops</i>
Active hyperemia (AH)	<i>increase in local blood flow in an active tissue</i>
Reactive hyperemia (RH)	<i>increase in LBF after temporary occlusion of blood supply</i>
Arterial blood pressure (ABP)	<i>the lateral force exerted by moving column of blood on the wall of lateral arteries</i>
systolic blood pressure (SBP)	<i>caused by rapid ejection of blood into aorta</i>
pulse pressure (PP)	<i>difference between SBP and DBP</i>
Mean systemic pressure	<i>average pressure of systemic arteries (93)</i>
Mean circulatory pressure	<i>average pressure of venules and viens (7)</i>
vasomotion (capillary tone)	<i>alteration of opened capillaries (10%) every few secs to few mins</i>

# قوانين

$$SV = EDV - ESV$$

$$C_{op} = SV \times HR$$

$$\text{Ejection fraction} = SV/EDV = (EDV - ESV) \div EDV$$

$$\text{Velocity of Bf} = BFR / \text{cross sectionnal area}$$

$$PP = SBP - DBP$$

$$MSB = DBP + 1/3 PP$$

$$Re = 2rvp/\eta$$

$$\text{Complaine} = \Delta V / \Delta P$$

$$F = \text{PRESSURE GRADIENT} / R$$

$$\text{POISEUILLE HAGEN} = 8L\eta/\pi r^4$$



# Influencing factor in heart rate

↑ Heart Rate

↓ Heart Rate

Bainbridge reflex (↑ venous return, ↑ RT atrium p.)

Stimulating of chemoreceptors

Inspiration

Moderate emotions

Skeletal muscles contraction

Moderate painful stimuli

Hypoxia

CO<sub>2</sub> excess

Blood hormones (adrenaline, thyroxine)

Increased blood temperature  
(1 °C » 10 beats)

Marx's law (↑ arterial blood pressure)

Carotid sinus syndrome  
(shaving, tight collar)

Coronary chemoreflex  
(Bezold-Jarisch reflex)

Pulmonary chemo reflex  
(J receptor reflex)

Severe emotions

Severe painful stimuli

Decreased blood temperature

Quite sleep

**Excitability** :- the ability of  $\heartsuit$  to respond to adequate stimulus

**Bathmotropism**

**Chronotropism**

**ARP**

- excitability Zero
- Phase 0, 1, 2,  $\frac{1}{2}$  3
- Systole + early diastole
- Significance :-
- Prevent tetanus and fatigue
- allows time for ventricular fill

**RRP**

- \* excitability starts to be restored but still less than normal
- \* occupy remaining Ph 3 diastole

**Supernormal**

- \* excitability higher than normal can respond to subthreshold stimuli
- \* Ph 4
- \* end of diastole
- \* vulnerable Period
  - ↳ arrhythmia
  - ↳ Ventricular fibrillation

- \* Rhythmicity :- the heart beats regularly
- \* Automaticity :- the ability of  $\heartsuit$  to initiate its own contraction independent of external stimuli
- \* Myogenic in Origin

**Facemakers**

SA node 1 <sup>st</sup>	AV node 2 <sup>nd</sup>	Purkinje 3 <sup>rd</sup>
highest (90-110)	45/60	25/40
normal Pacemaker sinus rhythm	SA blocked Nodal rhythm	AV block idioventricular

**Inotropism**

**Contractility**

The ability of  $\heartsuit$  to convert ~~mech~~ electrical energy into mechanical mech. opening of L-type Ca ch.

(in sarcolemma and t tubules)  $\rightarrow$  entry of small amount of Ca  $\rightarrow$  induce release of large amount of Ca (from SR)  $\rightarrow$  bind troponin C  $\rightarrow$  gliding of actin into myosin (Contraction)

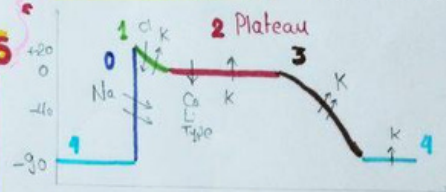
**Relaxation** \* active reuptak of Ca back to SR (Ca atpase)  
\* Na-Ca (exchanger) Na is restored by Na-K pump

The ability of  $\heartsuit$  to transmit impulses through **Excitatory-Conductive System**

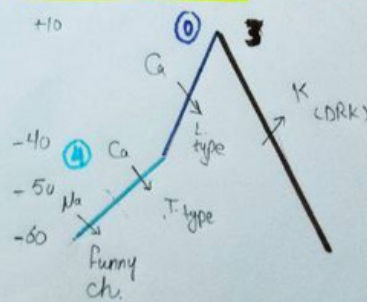
**Heart Properties**

by Dr. Manar

**AP of Cardiac ms** • fast response •



**AP of Pacemaker** - Slow -



**Prepotential** :-  
• Spontaneous  
• Slow  
• Diastolic depolarizati.

**SA node**

Impulse  $\rightarrow$  Lt Atrium (anterior inter atrial Pathway)  
 $\rightarrow$  AV node ant. mid. post. inter nodal pathway

**AV node + Bundle His**

- \* Slowest \* 0.02 - 0.05 m/s
- due to :-  $\downarrow$  gap  $\downarrow$  size  $\downarrow$  RMP
- significance :-
- \* Prevent Ventricular fibrillation
- \* allow atria to empty blood before ventricular contraction

**Purkinje**

- \* Fastest \* 1.5-4 m/s
- due to :-
- $\uparrow\uparrow$  gap junch
- large fibers