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# HRIDAY

## ANALOGY

heart is like an underground chamber which are divided by atrial and ventricular septa. har chamber ke upar root yaani tree ke structure mein branches phaili huyi hain. right side mein rehne vale upar ke chamber mein superior aur inferior venacava khoon ke nadi ke pravah ko right atrium mein bhejte hain. uske baad upar se neeche yaani upar ke chamber se neeche ke chamber mein khoon jaata hain, ventricles ke dvaara ganda yaani impure blood jo carbondioxide se bhara hua hain pulmonary+artery (pulmonary=lung, artery) ke dvaara lungs mein jaata hain. lungs ko impure yaani ganda khoon pulmonary artery ke dvaara supply kiya jaata hain.

## STORYTELLING

once it rained and rained heavily in the heartland which caused all the roads of heartland to get filled with water, and there was no way out. since then no water came and the only way for getting water was through stomach land via mouth land. just IMAGINE if the roads on which red and blue cars travel were flooded with water what would happen, because of the presence of many red cars the water would appear red and on blue cars the water would appear blue. it is designed in such a way that water always remains constant in the transport system. input goes as output (45% of traffic is water/plasma) .. but the roads are always covered by a small amount of the water which is similar to the ocean water, the capillary cells always tries to remove water from the vessels road but it happens to come again through lymphatic vessels road.

- VO<sub>2</sub> max (also maximal oxygen consumption, maximal oxygen uptake, peak oxygen uptake or maximal aerobic capacity) is the maximum rate of oxygen consumption as measured during incremental exercise, most typically on a motorized treadmill.
- DO<sub>2</sub> = volume of the oxygen delivered to systemic vascular bed per minute

blood is a connective tissue formed of all elements, the formation of blood and blood vessels is quite complicated (red and blue cars, goods, foods from food trucks, air from gas tanks, proteins and albumin, ions and vitamins and minerals). these all are present on the way of transport system.

- red car = oxygen carrying from gas tanks
- blue car = carbondioxide carrying to gas tanks
- food trucks = glucose, fats and amino acids = tram trucks,
- water tanks = ions, minerals and vitamins

## PACEMAKER

pacemaker yaani yeh ek vidyuth (electric) ya bijli ke lay (rhythm) mein dhakke (impulse) dene vale ka aadhaar hain jo hruday ke sikudne (contraction) ko trigger ya shuru karta hain.

pacemaker ke paas uthpan hone vale dhakke ko yeh ventricles aur atria ko sanchalan karta hain. conduction of the impulses kaise hota hain hruday mein iska karaane vale ya karne vale fibres rehte

hain.ess system **ko** hum conducting system of **heart** kehte hain.

hamare hruday mein **do** nodes rehte hain SA node aur AV node en donon ka kaam hain electrical impulse **ko** hruday mein sab jagah bhejna.SA node mein specialised atrial cells rehte hain jiski **gati** autonomic nervous system **ke** asar daalne par nirbhar karti hain aur yeh waise hi depolarise hota hain.

normal (sinus) rhythm(laaya,**taal**) **ke** samay depolarisation ki lehar atrial myocytes **ke** dvaara jaati hain. annulus fibrosus conduct karne mein baadha daalta hain aur bachta hain sirf **ek** hi raasta ki wah jaaye to **av** node **ke** oor se jaaye.

ismein bundle of his AV node se lekar interventricular septum tak jaata hain aur uske baad right aur left bundle(katthe ) mein vibhaajan hokar interventricular septum **ke** andar se jaate hain aur left bundle ka branch purkinje fibres deta hain.

## HOW TO DRAW AND READ AND ECG

ecg sirf **ek** graph hain jo poore **action** potential **ko** summation karke dikhaata hain

pehle hum **action** potential **ko** dekhenge jiske saath saath ecg **ke** waveforms aate hain.**action** potential mein five phases rehte hain 0,1,2,3,4 yeh poore phases ka summation hone par ECG wave form banta hain.

depolarization(yaani polarity ka ulta hona) aur repolarization(phir se wapas apne polarity mein aana) . depolarization ka matlab hain ki cardiac **muscle cell** ab contract hone wale hain.ismein **do** tarah **ke** cells rehte hain cardiac pacemaker **cell** aur cardiac **muscle cell**.at resting state - resting potential lekin en pacemaker cells **ko** sach mein resting potential nahi retha hain balki pacemaker potential rehta hain jo samay samay par **action** potential generate karta hain,

threshold potential - -40mv to -30mv repolarization occurs at -60mv resting membrane potential

This is a series of upward and downward spikes (labelled P, Q, R, S and T) that represent the depolarization (voltage becoming more positive) and repolarization (voltage becoming more negative) of the **action** potential in the atria and ventricles.

Similar to skeletal **muscle**, the resting membrane potential (voltage when the **cell** is not electrically excited) of ventricular cells, is around -90 millivolts (mV; 1mV=0.001V) i.e. the inside of the membrane is more negative than the outside. The main ions found outside the **cell** at rest are: sodium (Na<sup>+</sup>), and chloride (Cl<sup>-</sup>), whereas inside the **cell** it is mainly potassium (K<sup>+</sup>).

the number line s

0.1mV which becomes equal to 1 small square block of 1 millimetre block and 40 ms **time**.  
2milliseconds = in ventricular cells (going is very fast in the **muscle** cells) 10-20 milliseconds in SA nodal cells (phase of depolarization - going process because this is stimulating all the cells its function doesnot

depend on cardiac cycle .... net flow of positive charge inside **cell** ..... na<sup>+</sup> moves in but moved out by 3na<sup>+</sup> and k<sup>+</sup> moved out but moved in by 2na<sup>+</sup>

so net movement is inside negative or positive going out,but this becomes reverse in case of

potential.

In reality, the **heart** has several pacemakers known as autonomic foci, each which fires at its own intrinsic rate: SA node: 60–100 bpm Atrial foci: 60–80 bpm Junctional foci: 40–60 bpm Ventricular foci: 20–40 bpm

sabse pehle aata hain traffic **light**(pacemaker cells) yeh pacemaker cells **ko** button shuru karne **ke** liye chahiye,kyunki ye bina kisi **ke** permission **ke khud** apni marji **ek** rhythmic pattern mein button on karte hain aur **bandh** karte hain.. inka **ek** special rhythmic clock rehta hain jo determine karta hain ki kab jaayenge,to yeh clock hamare normal ghadi ki tarah nahi hain jismein minutes aur seconds dikhate hain balki yeh **ek** special clock hain jo pendulum **ke** tarah hain,**muscle** ka alag clock (yaani springs aur compressors ka alag clock hain ) aur SA node aur AV node ka alag clock hain.traffic ka signal dene par wah apna kaam shuru kar dete hain. Pacemaker persons ka clock ions **ke** oscillation **ke** upar nirbhar hota hain yaani iska resting membrane potential bahar se andar negative yaani -60 mV negative hain,andar jyaada negative ions hain.agar dekha jaaye to **ek** aadmi **ko ek** minute mein 72 baar dabaana padega traffic lights **ke** button **ko**,usmein bhi **do** baar **light** change hoyenge .SA node ne 100 baar signals AV node **ko** bheja AV node ne 80 baar JUNCTION KE PAAS SIGNAL KO BHEJA AUR JUNCTION NE 60 BAAR VENTRICLES KO SIGNAL BHEJA.... (dekha jaaye to signals bhejne ki tadaat jaise jaise aage jaate hain **kam** hoti jaa rahi hain). (YAANI SABSE BADA SABSE JYAADE BAAR CHILLAYEGA AUR SABSE CHOTA SIRF JYAAADA SUNEGA AUR KAM CHILLAYEGA) ...

AV NODE DELAY = ISO ELECTRIC OR SILENT LINE ON ECG ISOVOLUMIC RELAXATION = ISOELECTRIC LINE OR SILENT LINE OF ECG

-90 mV Ventricular **muscle cell ko** yaani ventricles **ke** paas **message** signal **ke roop** mein aate hi wah apna kaam shuru karte hain

THE TRAFFIC LIGHT AND THE SPRING WITH COMPRESSORS ARE LOCATED IN THE HEARTLAND,WHEN THE TRAFFIC SIGNALS TO GO THE SPRING AND THE COMPRESSORS START COMPRESSING IN A WAY DECREASE THE TRAFFIC BY SENDING THEM TO THE VENTRICLES,THE COMPRESSION PHASE IS CALLED THE CONTRACTION PHASE AND THE RELAXATION PHASE IS CALLED TENSION PHASE BECAUSE MUSCLES EXPANDS TO ITS GREATEST GEOMETRIC LENGTH TO FILL THE COMING TRAFFIC.

(THE TRAFFIC LIGHT SIGNALS BY STARTING AS AN ALARM - Hhhhhhhhhrrrrrrrrnnnnnnnggggggggg .... ) ANALOGY OF TRAFFIC LIGHTS TO CARDIAC PACEMAKERS (these speed of this **light** cycle can **be** modified externally by higher centres through messages from nervous system)

Sino atrial node = TRAFFIC LIGHT 1 (which regulates the traffic flow from atria to ventricles) (IT is located between a groove called crista terminalis in right atrium which lies between entrance of superior and inferior venacava == but it regulates the entry from atria to ventricles) ...

atrio ventricular node = traffic **light** 2 (which regulates the traffic flow from ventricles to blood vessels )

traffic signal cycle = cardiac cycle the frequency of cardiac cycle is described by **heart** rate(beats per minute) = frequency of traffic signal cycle by signal cycles per minute .if in one minute the there are 75 signal cycles per minute then the **time** for each cycle = 0.8

Left ventricle ..... Purkinge fibres ..... Left bundle branch ..... Bundle of his ..... Av node ..... Sa node ..... Bachman bundle ..... Left atrium ...

Mnemonic leave the right to lungs ..... Because the persons living in Anatomyland does not need right **heart** to intrude ...

Green for go Yellow for slow ... About to turn red Red for stop

Green is opposite for stop Traffic **light** always faces the drivers or travellers ... One travels from A .... V whether it is left or right ... A has point **up** and v has point down ... Atrium is for entry upwards V is for exit downwards .. SABPV ..... Mnemonic for passa

Electrical **heart** Left **heart** x right **heart**

green **light** = indicates traffic can move (from resting membrane potential to threshold potential = depolarization phase) red **light** = indicates stop (from hyperpolarization to repolarization the traffic is yellow **light** = indicates the warning sign because it is about to turn red (from threshold to hyperpolarization - the traffic is still moving) stop at = resting membrane potential go after = depolarization yellow **light** (go on but warning to stop) = hyperpolarization

go - this is generated by the cardiac pacemaker cells (these are the persons which pull the trigger or start the button-SA node) which causes the **light** to turn green. which signals the muscular compressors and springs to contract and the gates open move the traffic out or let them go. we are about to turn off the compressors and springs so stop at resting membrane potential, this signals the **heart** to stop contracting rather tells to relax

traffic **light** 2 go - generated by AV node but also a frequency added by SA node

two communication lines av junctional and other purkinje fibres. this acts as the line to motors through which this traffic **light** is connected,

green **light** indicates when the traffic with blue cars and traffic with red cars can move freely without any stop,

the traffic with blue cars reaches the main heartland, it enters the right upper square so that it can move in to lower right square and go to its destination.

here to simplify this blue cars are collecting vehicles while red cars are distributing vehicles. while collection is a process the waste materials are collected through this route .

there are two waves p wave and qrs complex wave - p wave marks the beginning of atrial systole while qrs complex = ventricular systole. the qrs complex peak is high due to its **muscle** mass when summed together produces a greater **action** potential which causes its peak to go high . COMPRESSION WAVE OF ATRIA = P WAVE COMPRESSION WAVE OF VENTRICLES = QRS COMPLEX TENSION WAVE OF VENTRICLES = U WAVE

let us discuss about the gates, there are two central gates in the heartland which are called tricuspid and bicuspid valve . there are two semilunar valves = semi circle shaped gates which are present at the exit from heartland. (Mnemonic - how to remember names of gates === LAB RAT or **tri** and right (both have ri ) so tricuspid valve is right and bicuspid valve is left) mitral valve = bicuspid valve,,, left heartland has named gate

the central gates are closed when the cars and traffic causes turbulence in the relay squares. when ever the gates are closed it produces a **sound** which causes or acts like a signal for the rest of the traffic.

to break the continuum of movement and start emptying the traffic in ventricles, they close the gates and also start emptying at the same **time**, this causes easy movement and decreases the **time** for stopping the traffic movement.

## Heart sounds

FROM LEFT WE GO TO RIGHT ( IN A ORDER WHILE WRITING WE ALWAYS WRITE FROM LEFT TO RIGHT) BUT IF WE IMAGINE WRITING ON YOUR FACE (FROM LEFT TO RIGHT) AND WRITING ON SOME OTHER PERSONS FACE. WHEN WE WRITE FROM LEFT TO RIGHT WE ARE WRITING ON OTHER PERSON'S FACE, TO KNOW THE FACE OF OURS WE SHOULD INVERSE THIS SITUATION.

IMAGINATION(FICTION) X REALITY

THE AXIS OF ROTATION REMAINS THE SAME BUT THE SIDES CHANGE WHEN YOU SEE IN A MIRROR,(REMEMBER THE AXIAL VERTEBRA AS THE AXIS OF ANATOMYLAND)...

GATE SOUNDS = WRUMPTH IS LIKE THE LUB(FIRST DOOR OR GATE) AND DUB(SECOND DOOR OR GATE) SOUNDS PRODUCED WHEN THE VALVES CLOSE MURMUR = AND SHAND BAKNA NO MUSIC OR RHYTHM

HERE ALL THE HEART SOUNDS ARE DUE TO CLOSURE OR GATES (because opening of gates is done slowly and closing occurs harshly and suddenly)

HOW ARE THE SOUNDS NAMED AND WHAT IS THE KIND OF TUNE PRODUCED Sounds are named firstly on the basis of order or occurrence, which **sound** is heard first and which **sound** is heard second. if the **sound** is heard first it is called first **heart sound** (denoted by number -1) and if the **sound** is heard second it is called second **heart sound** (denoted by number 2)

(Mnemonic — red cars are always in a hurry of delivering fastly so the first component of any **sound** comes from left heartland that is M1 Precedes T1 and A2 precedes P2)

mitral valve closure (M1)

Tricuspid valve closure (T1)

pulmonary valve closure (P2)

aortic valve closure (A2)

abnormal **heart** sounds

OPENING SNAP = it is a **heart sound** which . An opening snap that is a high-pitch additional **sound** may **be** heard after the A2 (aortic) component of the second **heart sound** (S2), which correlates to the forceful opening of the mitral valve. The mitral valve opens when the pressure in the left atrium is greater than the pressure in the left ventricle. This happens in ventricular diastole (after closure of the aortic valve), when the pressure in the ventricle precipitously drops.

opening snap in mitral stenosis = as the gates are tough to open, they cause resistance and produces sounds so opening snap **sound** occurs in M1. Mitral stenosis — (as the gates become tough) — they produce large **sound** or LOUD M1 AFTER MITRAL STENOSIS »» CAUSES »» pulmonary hypertension — the exit gate Or pulmonary valve after mitral stenosis becomes loud so Loud P2

Rheumatic **heart** disease presents with mitral stenosis »» so these **sound** can **be** heard.

GATES ——— CLOSING OF THE GATES LOUDLY CLOSING OF THE GATES SLOWLY/LATE CLOSING OF THE

## GATES WITHOUT NOISE OPENING OF THE GATES WITH NOISE/HARSHLY

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