YAKEEN NEET 2.0

2026

23.07.2025

BODY FLUIDS AND CIRCULATIONS

ZOOLOGY | Lecture – 6

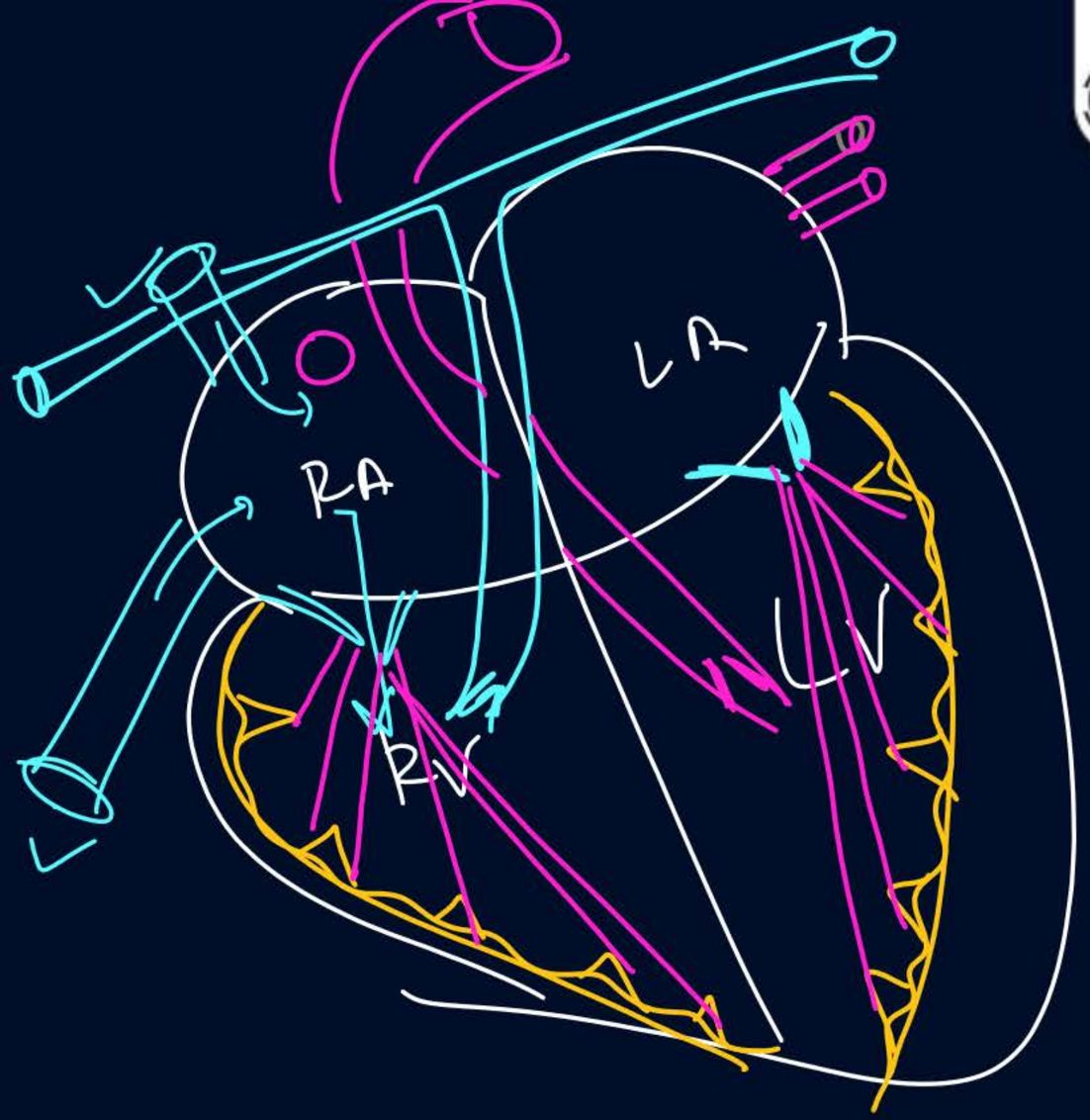
By- SAMAPTI MAM

Topics to be covered

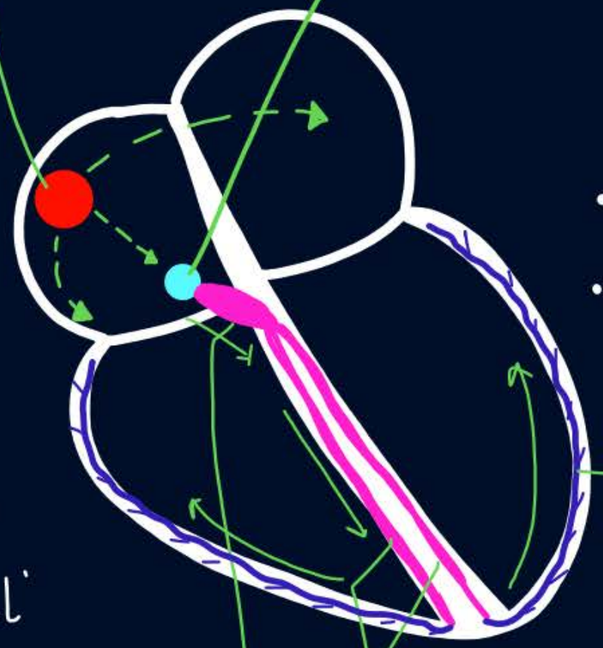
1. Conducting system, cardiac cycle
2.
3.
4.

MY TELEGRAM

#2amphiexpress



Nodal tissues:



1. SAN

- SA Node / Sino-atrial Node
- Location: Top, right Corner of Right atrium
- PACE MAKER of Heart

⌈WHY?

- It can generate max. no. of Action potential /min: 70-75 times/min
- It sends impulse (Current) to both atria & AVN
- Pacemaker: Also bc it initiates heart Beat.

② AVN

- AV-Node / Atrio-ventricular Node
- PACESETTER of the Heart
- Location: Lower Left corner of Right atrium
- Action potential: 60-65 times/min

④ PURKINJE FIBRES

- 'BOH' give rise to minute fibres throughout VENTRICULAR WALL
- Action potential: 20-25 times/min.
- When current/impulse reach here: Ventricle contract.

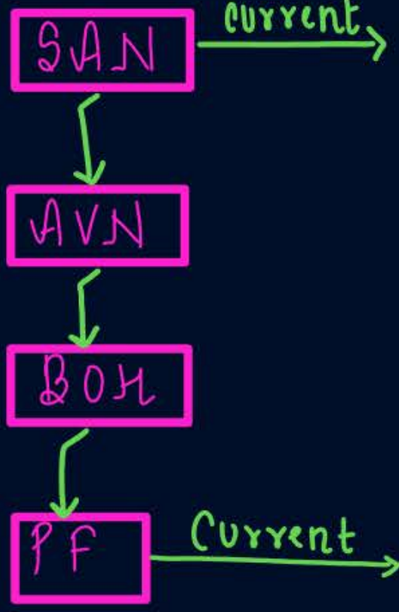
AV-Bundle

Right & Left Bundle

Together

③ BOH Bundle of His

- Action-potential: 40-45 time/min



current → Both ATRIA → Both DEPOLARISED → Leads to ATRIAL SYSTOLE

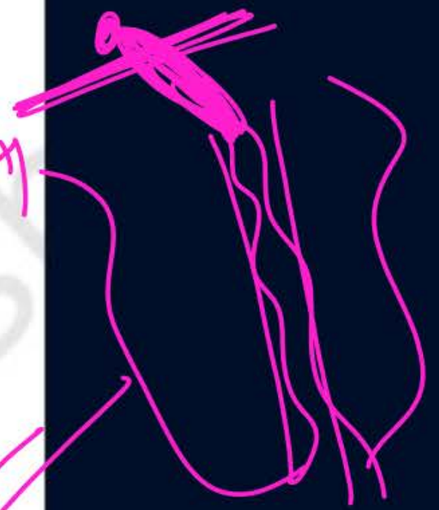
Current → Both VENTRICLE → Both DEPOLARISED → Leads to VENTRICULAR SYSTOLE

Note

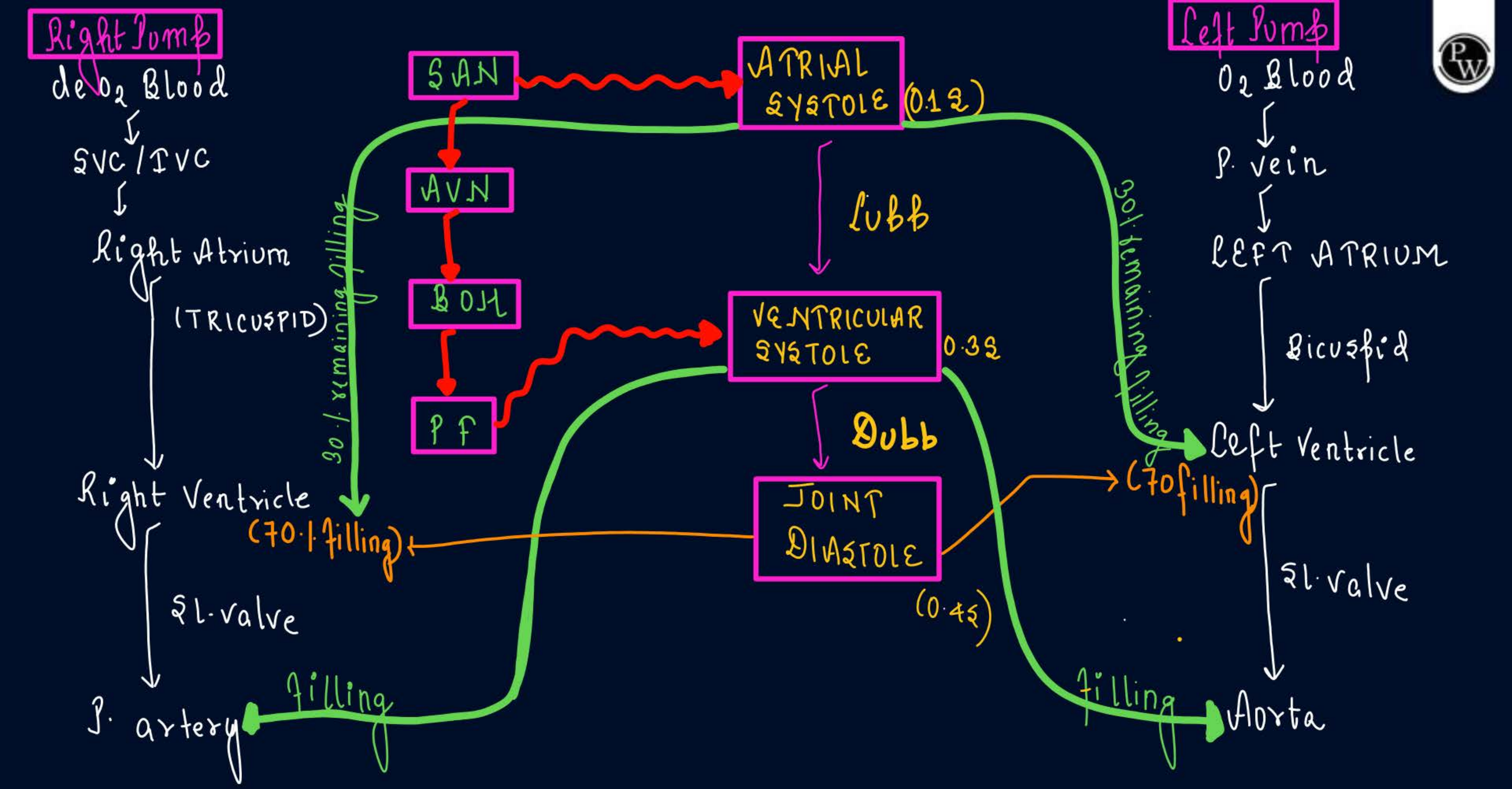
Depolarisation: Leads to Contraction → means SYSTOLE

Repolarisation: Leads to Relaxation → means DIASTOLE

The entire heart is made of cardiac muscles. The walls of ventricles are much thicker than that of the atria. A specialised cardiac musculature called the nodal tissue is also distributed in the heart (Figure 15.2). A patch of this tissue is present in the right upper corner of the right atrium called the **sino-atrial node** (SAN). Another mass of this tissue is seen in the lower left corner of the right atrium close to the atrio-ventricular septum called the **atrio-ventricular node** (AVN). A bundle of nodal fibres, atrio-ventricular bundle (AV bundle) continues from the AVN which passes through the atrio-ventricular septa to emerge on the top of the inter-ventricular septum and immediately divides into a right and left bundle. These branches give rise to minute fibres throughout the ventricular musculature of the respective sides and are called purkinje fibres. The nodal musculature has the ability to generate action potentials without any external stimuli, i.e., it is autoexcitable. However, the number of action potentials that could be generated in a minute vary at different parts of the nodal system. The SAN can generate the maximum number of action potentials, i.e., 70-75 min^{-1}, and is responsible for initiating and maintaining the rhythmic contractile activity of the heart. Therefore, it is called the pacemaker. Our heart normally beats 70-75 times in a minute (average 72 beats min^{-1}).



Cardiac cycle: It is a sequential event that occurs cyclically to pump the Blood to Body.


Right Pump
deO2 Blood
SVC/IVC
Right Atrium
(TRICUSPID)
Right Ventricle
Sl. valve
P. artery
SAN
AVN
Bdl
PF
ATRIAL SYSTOLE (0.1s)
Lubb
VENTRICULAR SYSTOLE
0.3s
Dubb
JOINT DIASTOLE
(0.4s)
30% remaining filling
(70% filling)
filling
Left Pump
O2 Blood
P. vein
LEFT ATRIUM
Bicuspid
Left Ventricle
(70% filling)
Sl. valve
Aorta

Why 'AVN' : Pacesetter?

→ Impulse conduction across AVN is little slower to ensure that Atria contracts completely before Ventricles starts to Contracts.

- When Ventricle begin to contract ; Ventricle Pressure ↑
  - first AV- close (fUBB)
  - further ↑ in Pressure due to systole → SL- open
- When Ventricles empty into ; P. artery & Aorta ; Ventricle Press ↓
  - SL-Closes (DUBB)
  - further decline in Pressure, AV- opens

15.3.2 Cardiac Cycle

How does the heart function? Let us take a look. To begin with, all the four chambers of heart are in a relaxed state, i.e., they are in joint diastole. As the tricuspid and bicuspid valves are open, blood from the pulmonary veins and vena cava flows into the left and the right ventricle respectively through the left and right atria. The semilunar valves are closed at this stage. The SAN now generates an action potential which stimulates both the atria to undergo a simultaneous contraction – the atrial systole. This increases the flow of blood into the ventricles by about 30 per cent. The action potential is conducted to the ventricular side by the AVN and AV bundle from where the bundle of His transmits it through the entire ventricular musculature. This causes the ventricular muscles to contract, (ventricular systole), the atria undergoes relaxation (diastole), coinciding with the ventricular systole. Ventricular systole increases the ventricular pressure causing the closure of tricuspid and

bicuspid valves due to attempted backflow of blood into the atria. As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery (right side) and the aorta (left side) are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways. The ventricles now relax (ventricular diastole) and the ventricular pressure falls causing the closure of semilunar valves which prevents the backflow of blood into the ventricles. As the ventricular pressure declines further, the tricuspid and bicuspid valves are pushed open by the pressure in the atria exerted by the blood which was being emptied into them by the veins. The blood now once again moves freely to the ventricles. The ventricles and atria are now again in a relaxed (joint diastole) state, as earlier. Soon the SAN generates a new action potential and the events described above are repeated in that sequence and the process continues.

This sequential event in the heart which is cyclically repeated is called the cardiac cycle and it consists of systole and diastole of both the atria and ventricles. As mentioned earlier, the heart beats 72 times per minute, i.e., that many cardiac cycles are performed per minute. From this it could be deduced that the duration of a cardiac cycle is 0.8 seconds. During a cardiac cycle, each ventricle pumps out approximately 70 mL of blood which is called the stroke volume. The stroke volume multiplied by the heart rate (no. of beats per min.) gives the cardiac output. Therefore, the cardiac output can be defined as the volume of blood pumped out by each ventricle per minute and averages 5000 mL or 5 litres in a healthy individual. The body has the ability to alter the stroke volume as well as the heart rate and thereby the cardiac output. For example, the cardiac output of an athlete will be much higher than that of an ordinary man.

During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves. These sounds are of clinical diagnostic significance.

Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

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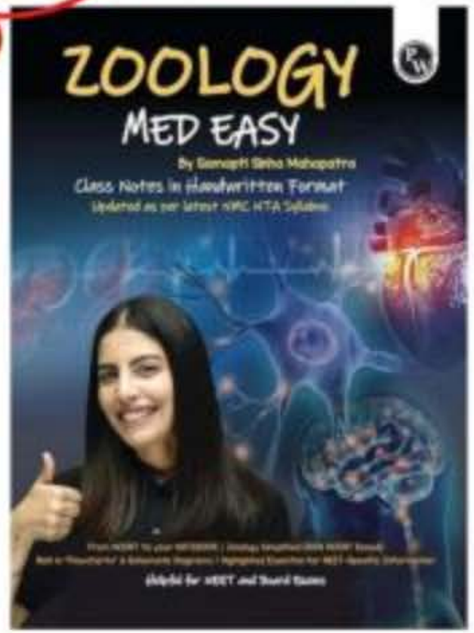

THANK YOU