Unit 3: Circulatory and Respiratory Systems – Notes

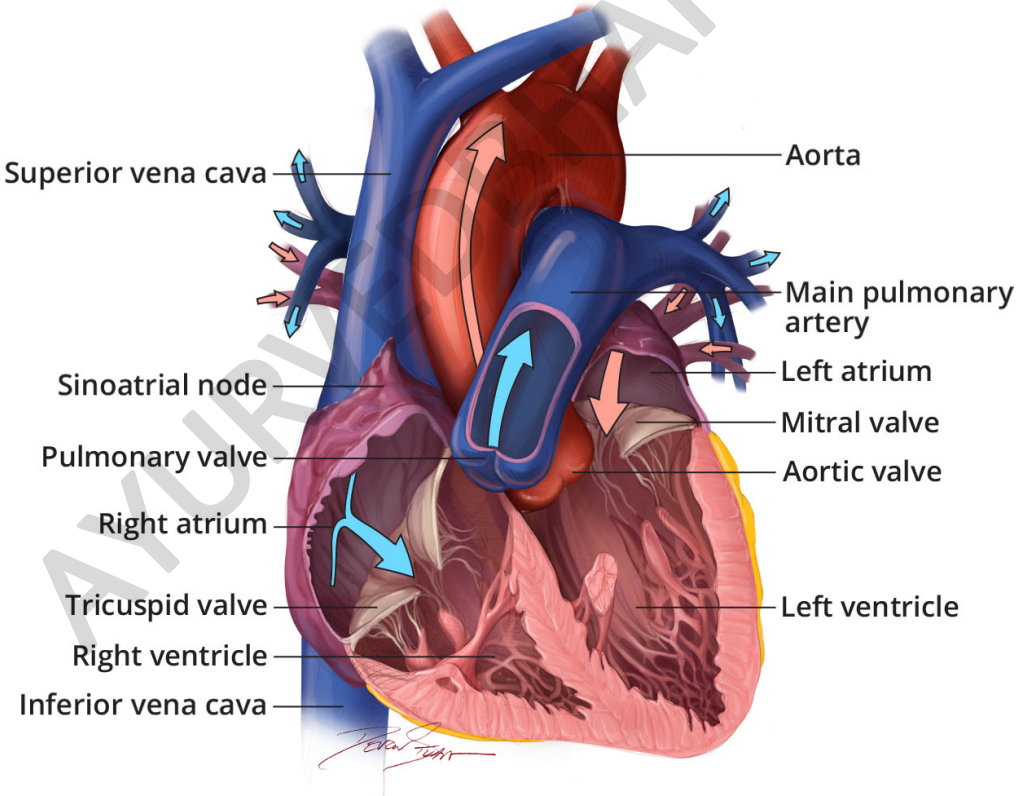
PART A · CIRCULATORY SYSTEM (CARDIOVASCULAR SYSTEM)

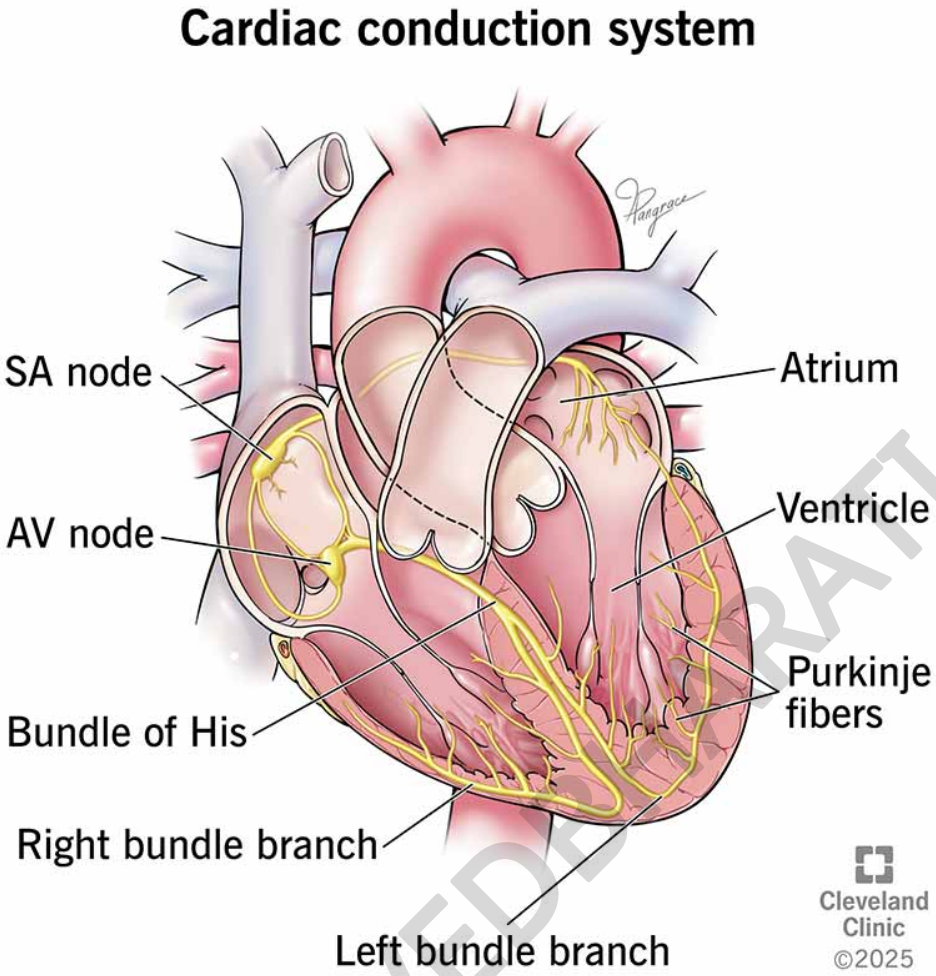
1 · Introduction

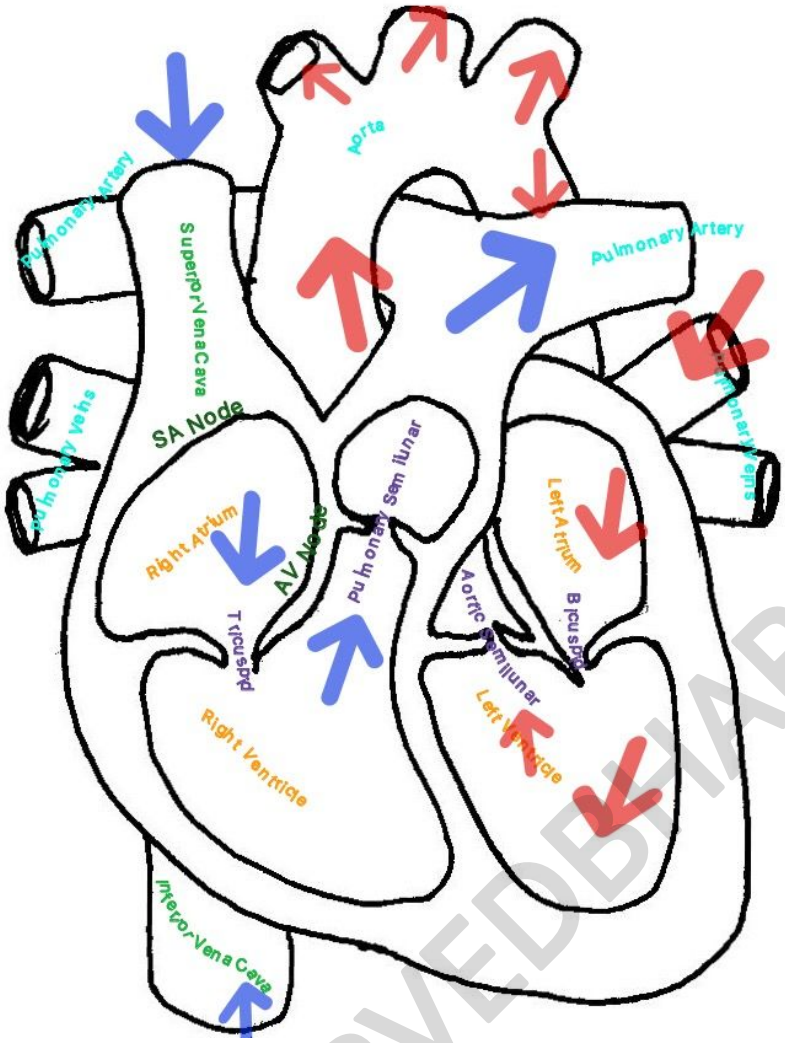
The circulatory system is responsible for **transport and distribution** of oxygen, nutrients, hormones, and waste products throughout the body. It maintains **homeostasis, temperature regulation, and pH balance**.

2 · Components of Circulatory System

2.1 Heart







Structure:

- 4 chambers → Right atrium, Right ventricle, Left atrium, Left ventricle
- Valves → Tricuspid, Mitral, Aortic, Pulmonary

Function:
Acts as a **double pump**:

- Right heart → Pulmonary circulation
- Left heart → Systemic circulation

2.2 Blood Vessels

Type	Function
Arteries	Carry blood away from heart
Veins	Return blood to heart
Capillaries	Exchange of gases, nutrients, wastes

2.3 Blood

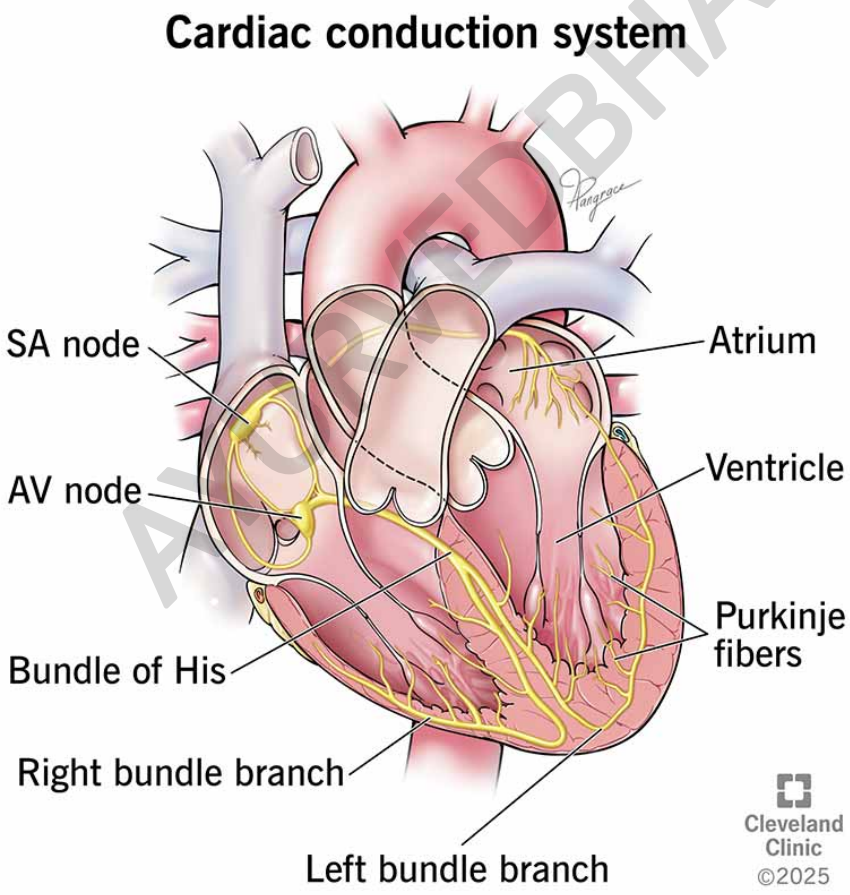
Component	Function
RBC (Erythrocytes)	Oxygen transport (hemoglobin)
WBC (Leukocytes)	Immunity
Platelets	Blood clotting
Plasma	Transport medium

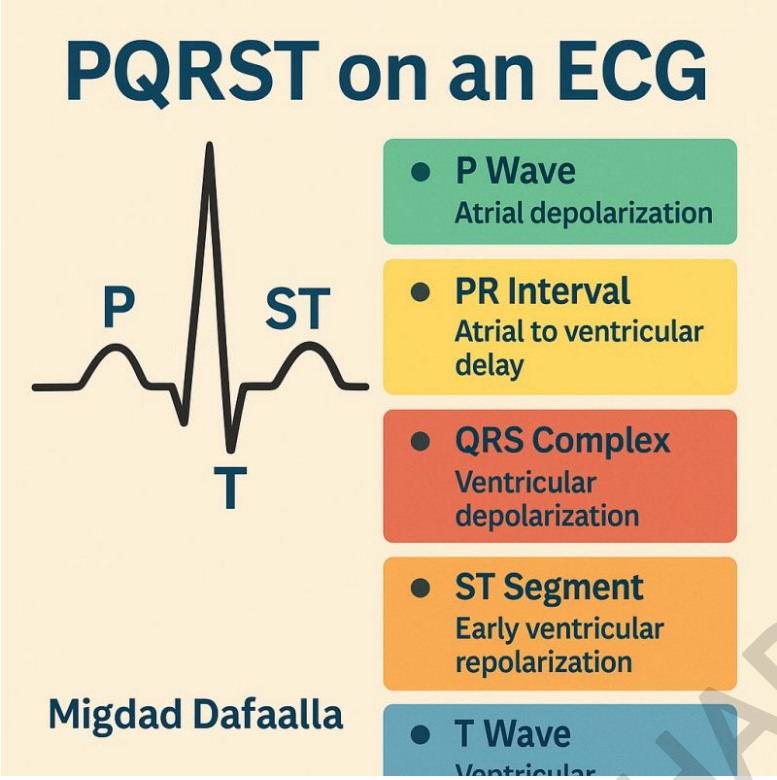
3 · Cardiac Physiology

3.1 Cardiac Cycle

Phase	Event
Diastole	Ventricular filling
Systole	Ventricular contraction

3.2 Electrical Conduction System





Sequence:
SA Node → AV Node → Bundle of His → Purkinje fibers

3.3 Cardiac Output

Formula:
Cardiac Output = Heart Rate × Stroke Volume

Normal ≈ **5 L/min**

---

4 · Blood Pressure Regulation

Factor	Effect
Cardiac output	Directly proportional
Peripheral resistance	Increases BP
Blood volume	Increases BP

Regulation Mechanisms:

- Neural → Baroreceptors
- Hormonal → RAAS, ADH
- Renal → Fluid balance

---

5 · Circulation Types

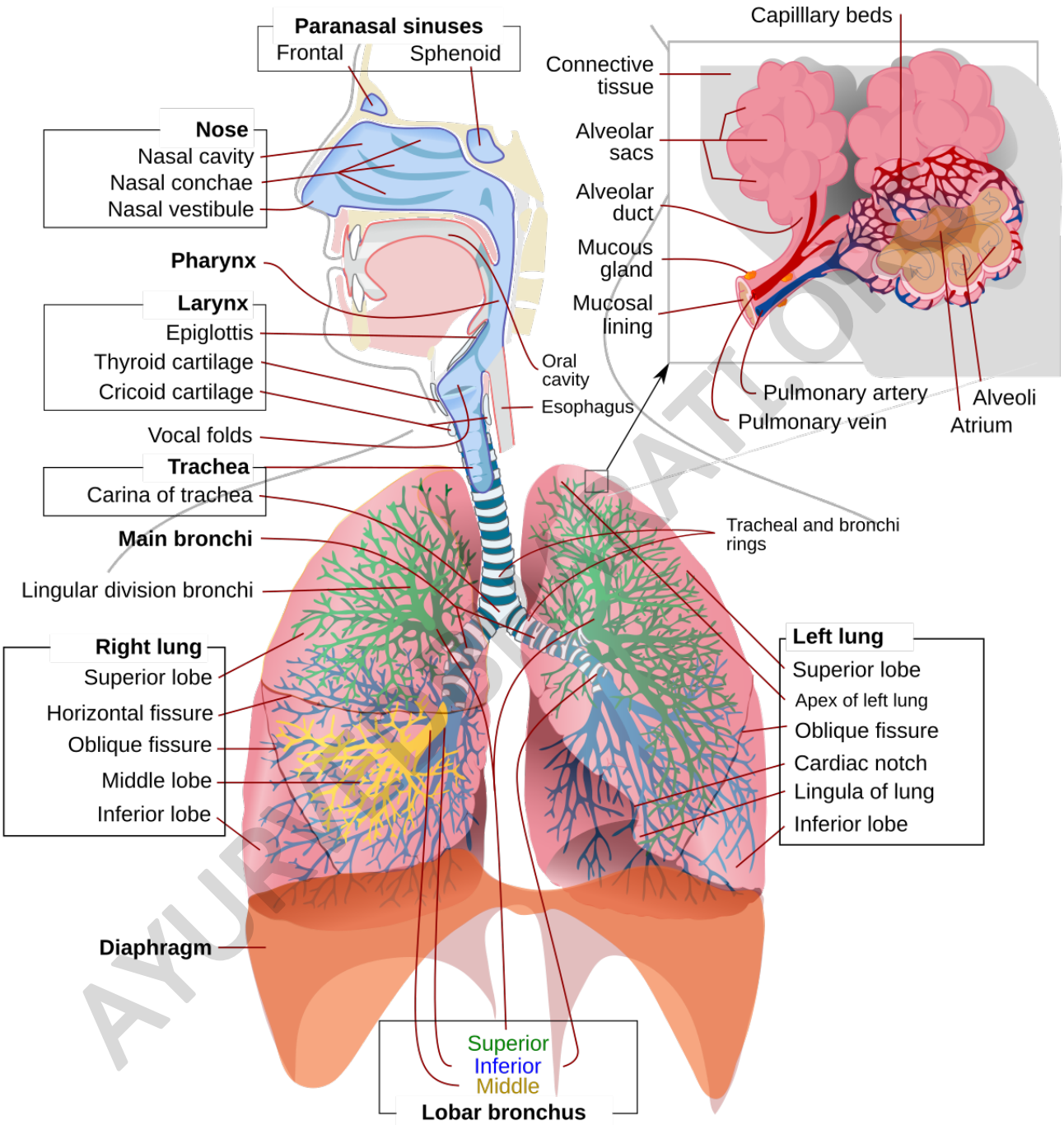
Type	Description
Systemic	Heart → Body → Heart
Pulmonary	Heart → Lungs → Heart
Coronary	Blood supply to heart muscle

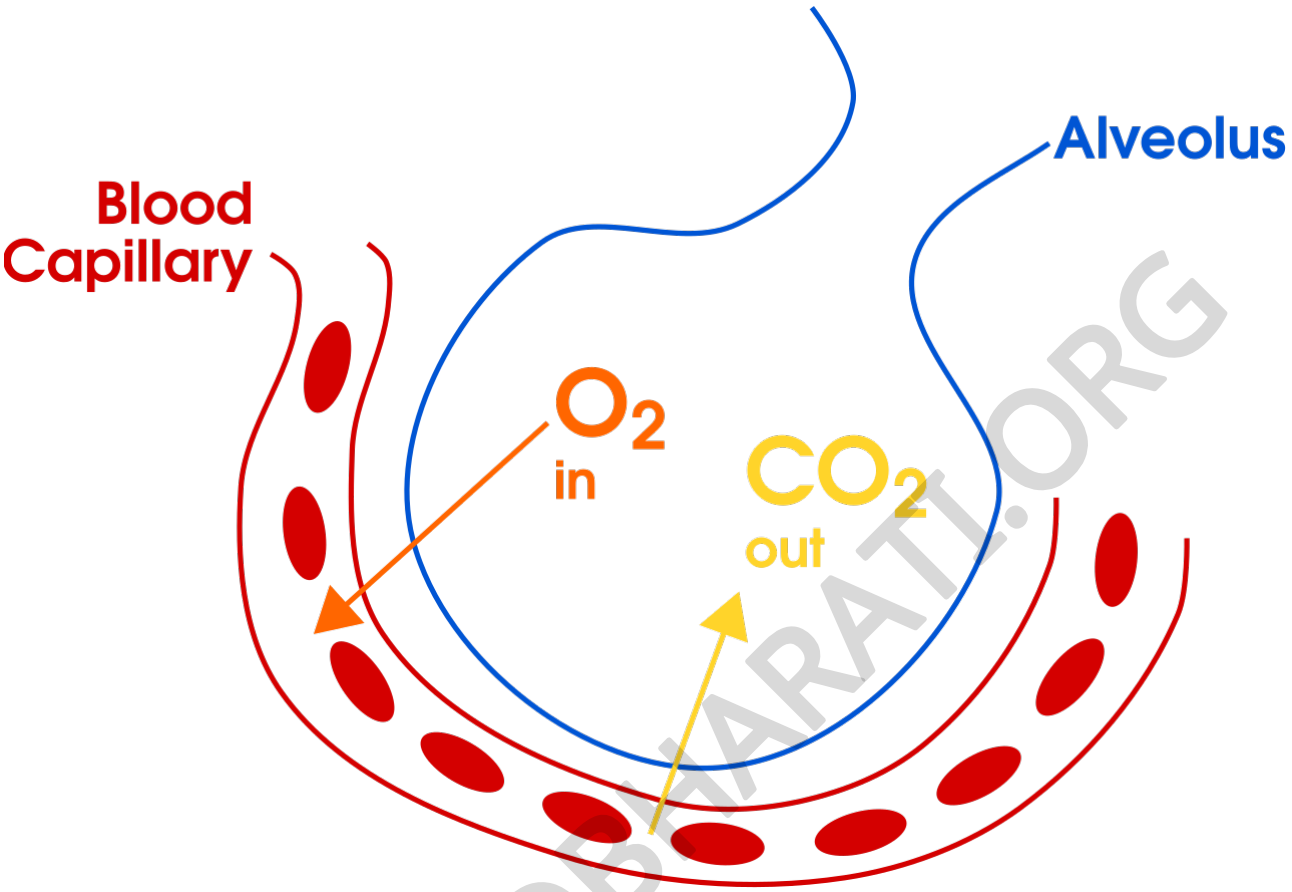
PART B · RESPIRATORY SYSTEM

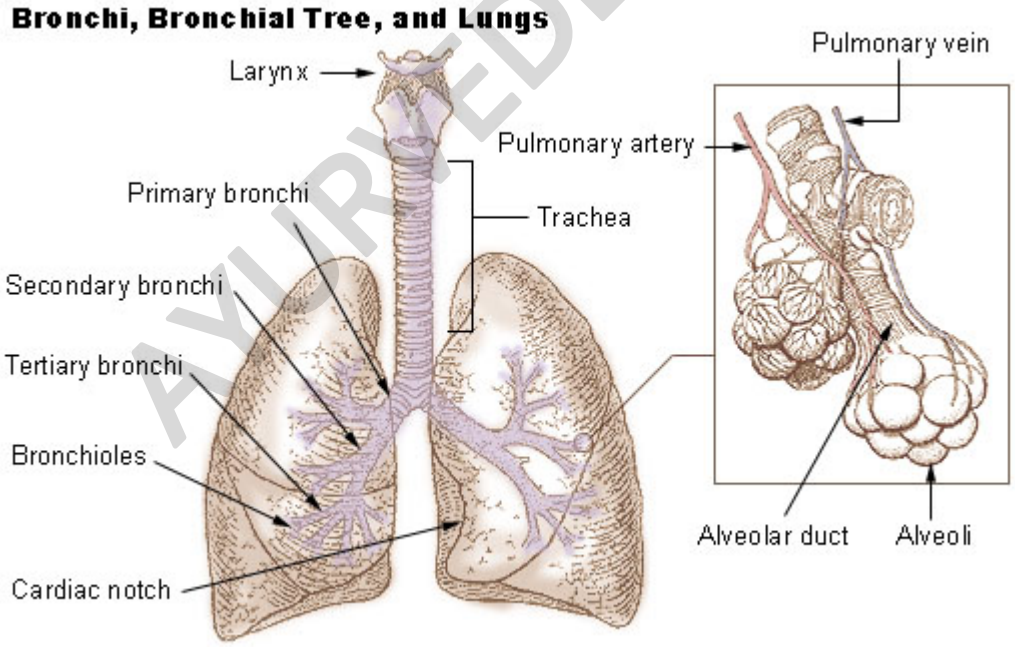
6 · Introduction

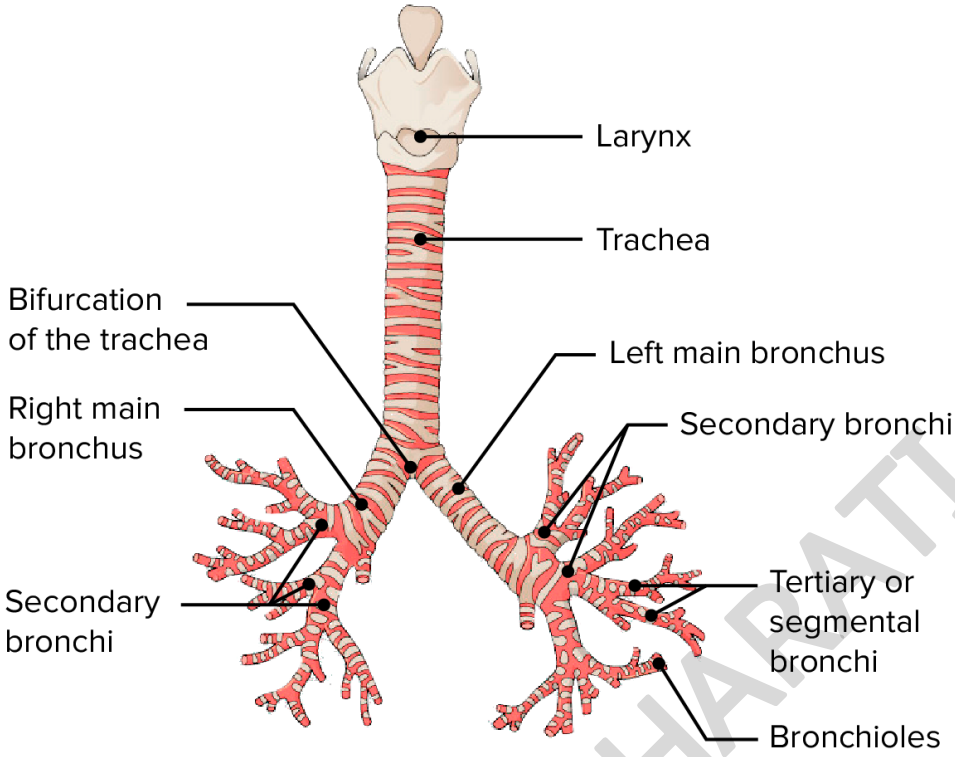
The respiratory system ensures **gas exchange (O_2 and CO_2)** and plays a key role in **acid-base balance and voice production**.

7 · Structure of Respiratory System









Component	Function
Nose & nasal cavity	Air filtration, warming
Pharynx	Air passage
Larynx	Voice production
Trachea	Air conduction
Bronchi & bronchioles	Distribution
Alveoli	Gas exchange

8 · Mechanism of Breathing

8.1 Inspiration

- Diaphragm contracts ↓
- Thoracic cavity expands
- Air enters lungs

8.2 Expiration

- Diaphragm relaxes
- Thoracic cavity decreases
- Air expelled

9 · Gas Exchange

9.1 External Respiration

Alveoli ↔ Blood

9.2 Internal Respiration

Blood ↔ Tissues

---

10 · Transport of Gases

Gas	Transport Form
Oxygen	98% Hb-bound, 2% dissolved
CO_2	70% bicarbonate, 23% Hb-bound, 7% dissolved

---

11 · Regulation of Respiration

Control Center	Location	Function
Medullary centers	Medulla	Basic rhythm
Pneumotaxic center	Pons	Rate control
Chemoreceptors	Carotid & aortic bodies	CO_2, pH sensing

---

12 · Respiratory Volumes

Parameter	Value (Approx)
Tidal Volume	500 mL
Vital Capacity	3–5 L
Residual Volume	1–1.5 L

---

13 · Integration of Circulatory & Respiratory Systems

Process	System Involved
Oxygen intake	Respiratory
Oxygen transport	Circulatory
Cellular respiration	Metabolic
CO_2 removal	Both systems

Key Concept:
 Efficient oxygen delivery = **lung function + cardiac output + hemoglobin**

---

14 · Clinical Correlation

PDF generated on 21 Apr 2026, 01:55 pm IST

Condition	System	Mechanism
Hypertension	Circulatory	Increased resistance
Heart failure	Circulatory	Reduced cardiac output
Anemia	Circulatory	Reduced oxygen carrying capacity
Asthma	Respiratory	Bronchoconstriction
COPD	Respiratory	Airflow limitation
Hypoxia	Both	Inadequate oxygen supply

15 · Key Takeaways

1. Circulatory system = **transport system of body**
2. Respiratory system = **gas exchange system**
3. Heart and lungs work in **close coordination**
4. Blood is the **connecting medium**
5. Oxygen delivery depends on **three factors**: lungs, heart, hemoglobin

Self-Assessment

1. Explain cardiac output and its regulation.
2. Describe oxygen transport in blood.
3. Differentiate internal and external respiration.
4. Explain the role of hemoglobin in oxygen transport.
5. Describe how respiratory and circulatory systems are interdependent.