# Transport of Respiratory Gases

Air → $N_2$ → 78–79 %
Air → $O_2$ → 21 %
Air → $CO_2$ → 0.03–0.04 %

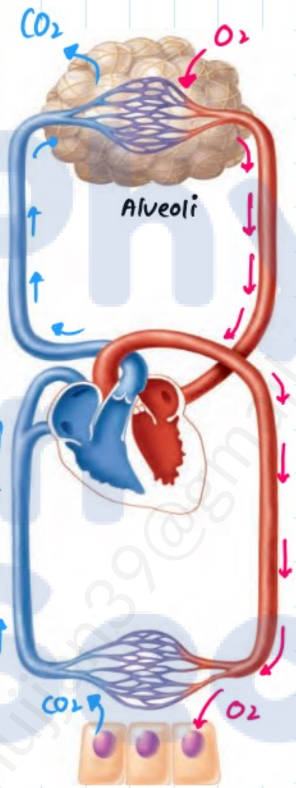
## Transport of Oxygen in Blood

Air → Lungs → Blood (RBC) → Aerobic tissues

- RBC → Chemical union
  97–98 %
- Blood Plasma → Dissolved
  2–3 %

EXTERNAL RESPIRATION

Pulmonary Artery ($P_{CO_2}$ 45 mm Hg) ←




→ Pulmonary Veins ($P_{O_2}$ 100 mm Hg)

Systemic Veins ←

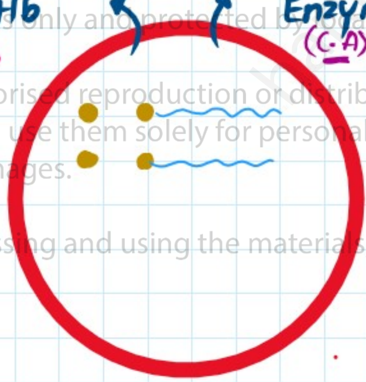
→ Systemic Arteries

INTERNAL RESPIRATION

$P_{O_2}$ = 40 mm Hg ↓↓
$P_{CO_2}$ = 45 mm Hg ↑↑



90 % Hb
95 % (PTB)
10 % Enzyme (C.A)



RED BLOOD CELL

$O_2$, CO, + Head

AFFINITY OF Hb :
CO > $CO_2$ > $O_2$


Hb + $O_2$ → Oxy – Hb
Hb + CO → Carboxy – Hb
Hb + $CO_2$ → Carb – Amino – Hb
Hb + $H^+$ → H–Hb (Acidic – Hb)

Hb (Purple Colour) + $4O_2$ ⟶ Hb $4O_2$ (Bright Red colour)

→ Bicarbonate – 70 %

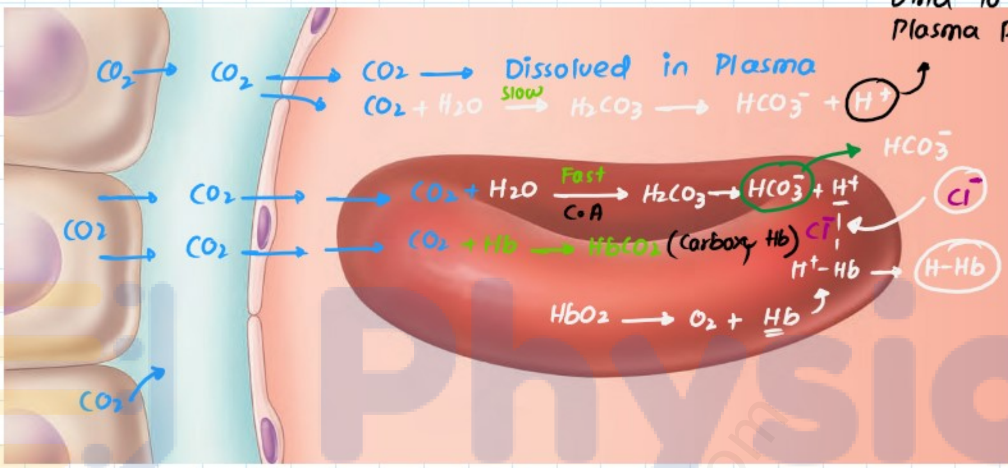
→ $CO_2$ more soluble than $O_2$.

$CO_2$ → Bicarbonate — 70%
→ Blood Plasma — 7%
→ Carb- Amino Hb (23%)

→ $CO_2$ more soluble than $O_2$.
→ $CO_2$ is more important.
→ P.P of $O_2$ in Blood ↓↓ → stimulate $CO_2$

## Gaseous Exchange at Cell Levels

Bind to Plasma Protein



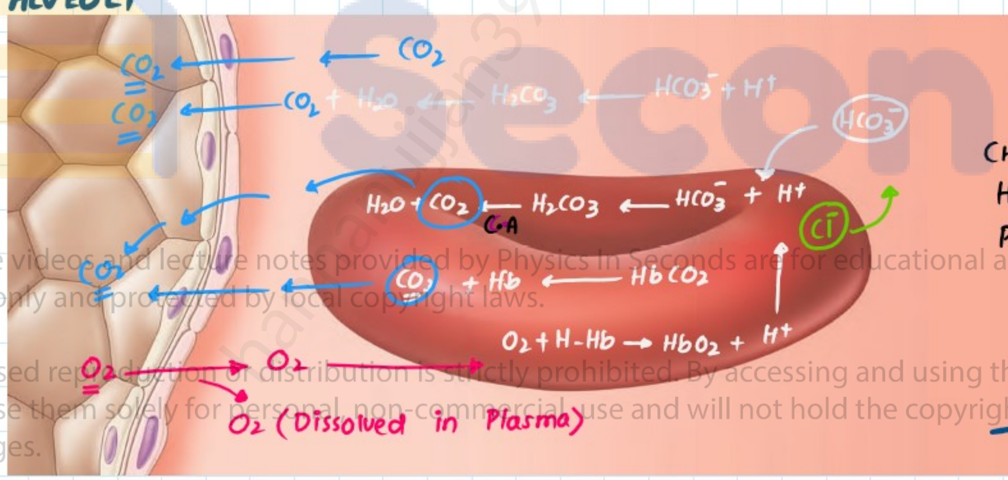

Hamsburger Phenomenon (Chloride shift)

$H^+$ ↑↑
$O_2$ – release

$CO_2 + H_2O \xrightarrow{C.A} H_2CO_3 \rightarrow H^+ + HCO_3^-$

## Gaseous Exchange at Lungs

ALVEOLI




CHLORIDE SHIFT/ Hamsburger Phenomenon

→ Blood Plasma

$O_2$ → Pressure derived

Max. $O_2$ → 20 ml / 100 ml (100% Saturation)
115 mm Hg → 19.6 ml / 100 ml (98% Saturation)

$\frac{19.6}{20} \times 100 = 98\%$

100 ml of Blood → 15 gm of Hb (1g Hb → 1.34 ml $O_2$)
→ $15 \times 1.34 = 20$ ml

| VENOUS BLOOD | ARTERIAL BLOOD |
|---|---|
| → 14.4 ml of $O_2$ | 19.6 ml $O_2$ / 100 ml |
| → 54 ml of $CO_2$ | 50 ml $CO_2$ / 100 ml |
| Pulmonary Artery | Pulmonary Vein |

→ 54 ml of $CO_2$ Pulmonary Artery

50 ml $CO_2$ / 100 ml . Pulmonary Vein

| FACTORS | $O_2$ – CARRYING CAPACITY | $O_2$ - RELEASE |
| --- | --- | --- |
| → $CO_2$ ↑↑ | ↓↓ | ↑↑ |
| → Temp. ↑↑ | ↓↓ | ↑↑ |
| → pH ↑↑ | ↑↑ | ↓↓ |
| → $H^+$ concentration ↑↑ | ↓↓ | ↑↑ |

**HIGH METABOLIC RATE**

- Muscles ⟶ $O_2$ ↑↑
- Production of ATP ↑↑
- Large no. of $O_2$ dissociate from Hb.
- $O_2$ release ↑↑ ⟶ Tissue level

**LOW METABOLIC RATE**

- Less $O_2$ utilization
- Production of ATP ↓↓
- Less $O_2$ molecule dissociate.