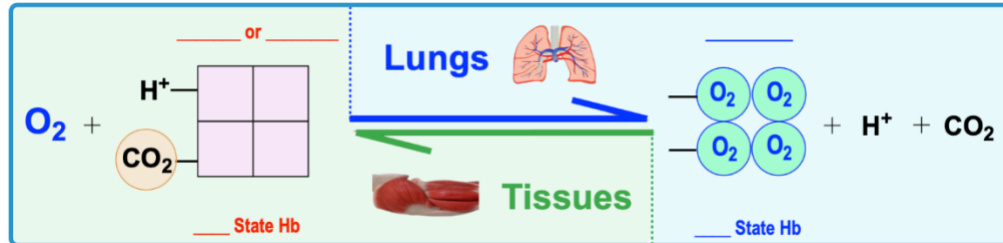


CONCEPT: HEMOGLOBIN BINDING IN TISSUES & LUNGS

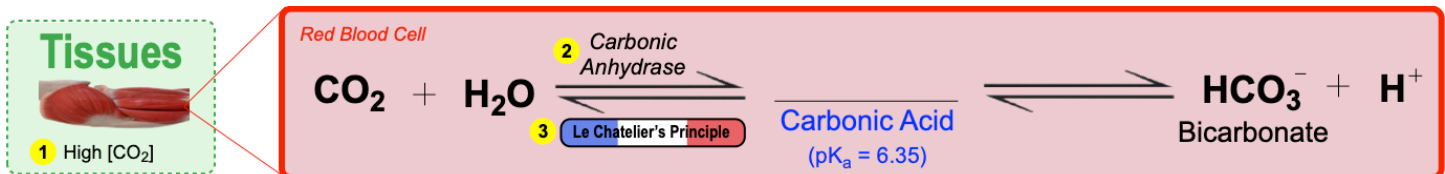
Hemoglobin Binding to CO₂ & H⁺

- **Bohr Effect:** describes the effect of [] AND pH ([]) on hemoglobin's binding & release of O₂.
- Under low O₂ conditions, Hb _____ O₂ but can bind & transport CO₂ (HbCO₂) and H⁺ (HHb⁺).
 - CO₂ & H⁺ act as _____-tropic allosteric _____ to Hb's O₂-binding activity.
 - Hb carbonation & protonation both stabilize Hb's _____ state (causing Hb's release of O₂).

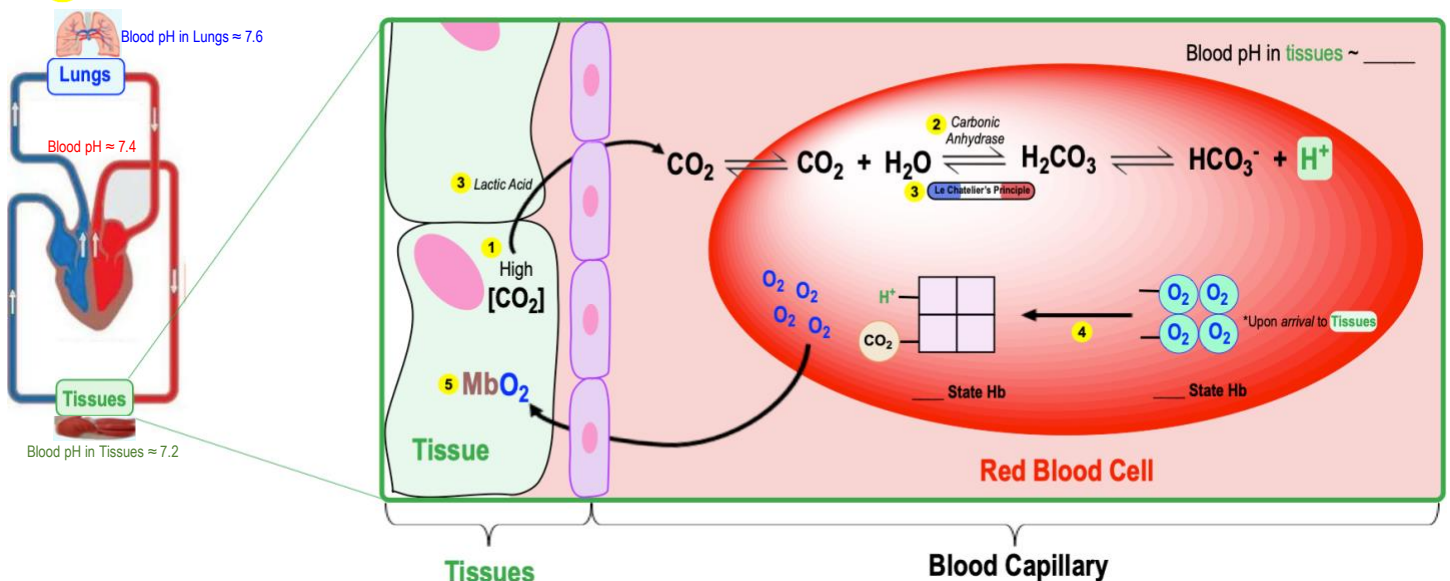


Hb Releases O₂ in Tissues

- In muscle tissues, O₂ is consumed (_____ pO₂ ≈ 20 torr) & lots of _____ is produced by metabolism (_____ [CO₂]).
- 1 High amounts of CO₂ produced by respiring tissues diffuses into the capillaries & into _____.
- 2 _____ anhydrase inside RBCs catalyzes CO₂ + H₂O ⇌ H₂CO₃, which breaks up into HCO₃⁻ & H⁺.



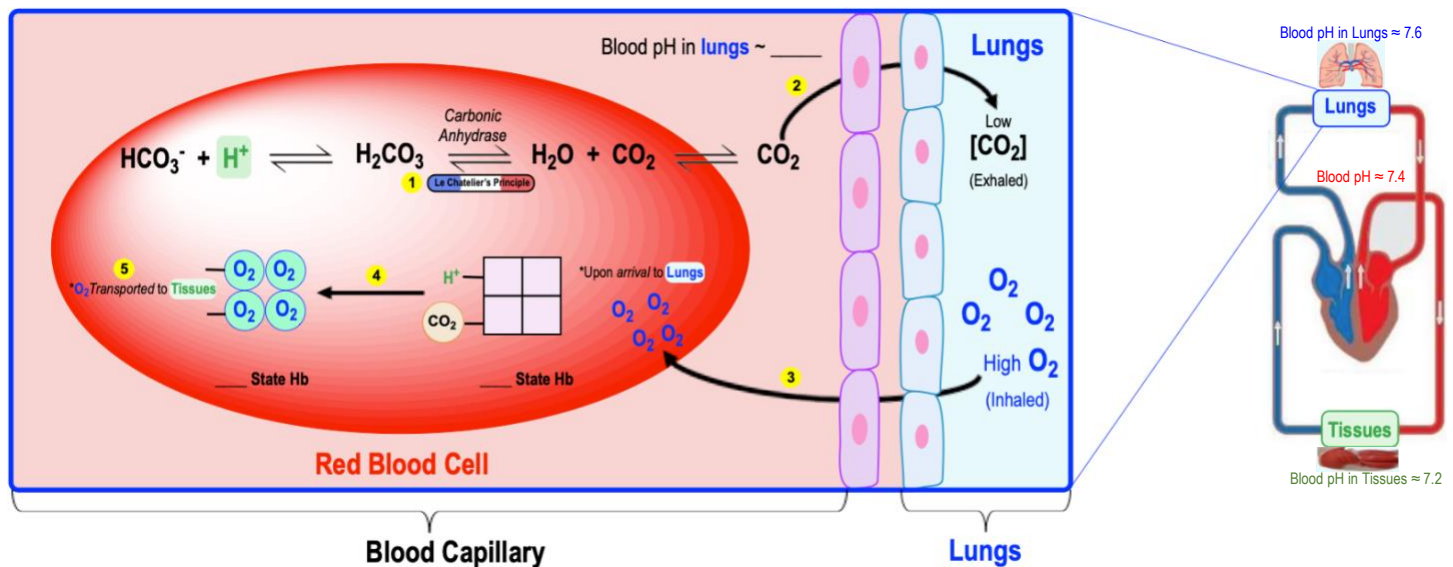
- 3 Equilibrium shift towards H⁺ & tissues' lactic acid production _____ [H⁺] (decreases pH to ~7.2) in tissues.
- 4 Recall: Hb near the tissues _____ CO₂ & H⁺ while _____ O₂ (Hb _____ State → Hb _____ State).
- 5 Recall: Myoglobin (____) in tissues has a stronger O₂-affinity than Hb & facilitates O₂-diffusion into tissues.



CONCEPT: HEMOGLOBIN BINDING IN TISSUES & LUNGS

Hb Binds O₂ in Lungs

- In the lungs, lots of O₂ is *inhaled* (_____ pO₂ ≈ 100 torr) & lots of CO₂ is _____ (_____ [CO₂]).
- 1 Causes reaction equilibrium to *shift towards* CO₂, _____ [H⁺] (*increases* pH to ~7.6) in the *lungs*.
- 2 _____ CO₂ in the *lungs* via _____ halation causes CO₂ *diffusion* into the lungs.
- 3 _____ O₂ in the *lungs* via _____ halation causes O₂ *diffusion* into the *capillaries* & into _____.
- 4 When near the lungs, Hb _____ O₂ while _____ CO₂ and H⁺ (Hb _____ State → Hb _____ State).
- 5 Oxygenated Hb ready to deliver O₂ to tissues.



PRACTICE: In the lungs, the _____ pressure of CO₂ causes hemoglobin to _____ CO₂ and H⁺. The _____ pressure of O₂ causes O₂ to _____ hemoglobin, allowing for its transportation to the tissues.

- Low; Bind; Low; Release.
- High; Bind; Low; Release.
- High; Bind; High; Release.
- Low; Release; High; Bind.
- High; Release; Low; Bind.
- Low; Release; Low; Bind.

CONCEPT: HEMOGLOBIN BINDING IN TISSUES & LUNGS

PRACTICE: Which of the following explains why hemoglobin in RBCs binds to O₂ in the lungs but releases O₂ in muscle tissues? (Select all that apply).

- a) pH is lower in the lungs than in the tissues.
- b) $p\text{CO}_2$ is lower in the lungs than in the tissues.
- c) BPG is produced at higher levels in tissues compared to the lungs.
- d) The temperature of the lungs is generally higher than the temperature in actively contracting muscle tissues.
- e) None of the above are true.

PRACTICE: How is the vast majority of carbon dioxide transported in the blood from the tissues to the lungs?

- a) As diffused gas bubbles of CO₂, just as in carbonated soft drinks.
- b) As bicarbonate ions (HCO₃⁻).
- c) As carbamate groups bound directly to deoxyhemoglobin.
- d) As carbon monoxide.
- e) As carbon compounds and oxygen radicals.