

Questions!

- Vascular cambium
- Phloem
- Xylem
- Bundle sheath
- Vascular bundle

Label this drawing

Vascular bundle

Which way to the bark?
Left or right?
*

Where is translocation
happening?

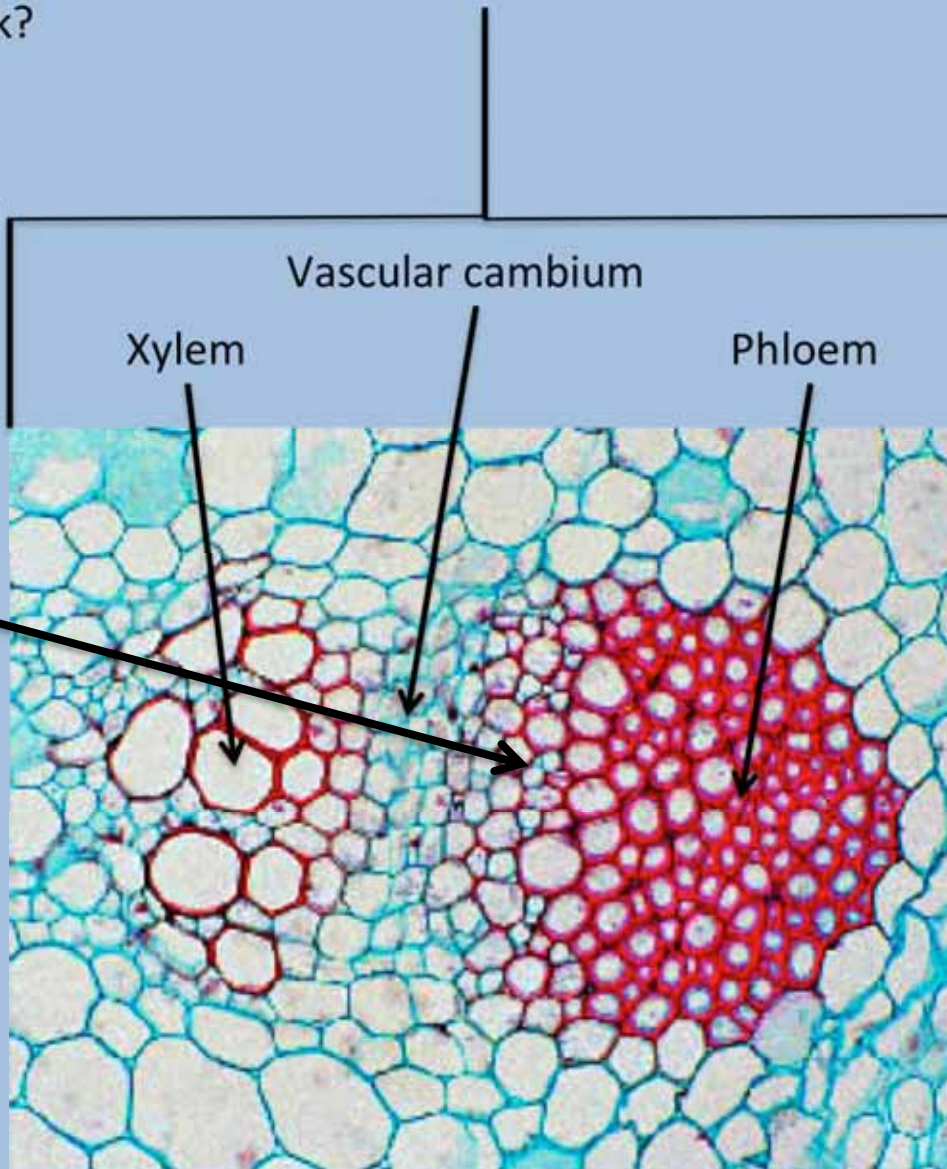
Phloem

Xylem

Vascular cambium

Phloem

Can you point out the
Functional phloem?



Ideas to know

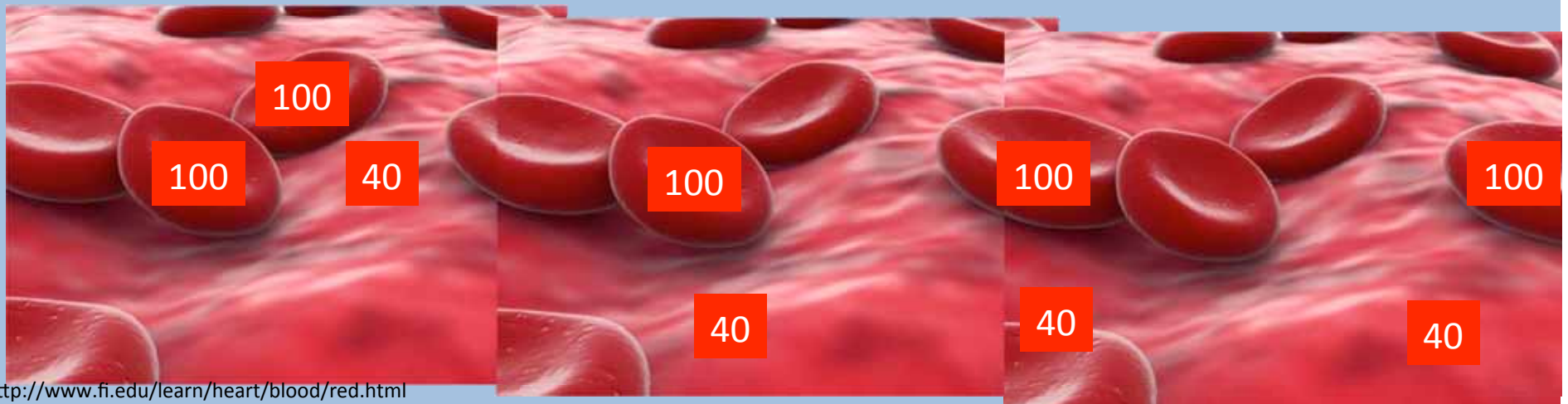
- Understand the relationship between the surface area to volume ratio and diffusion
- The difference between an open and closed circulatory system.
- Why a bird's circulatory system has a higher blood pressure than a fish's.

Animal Circulation

Oxygen and Carbon Dioxide binding

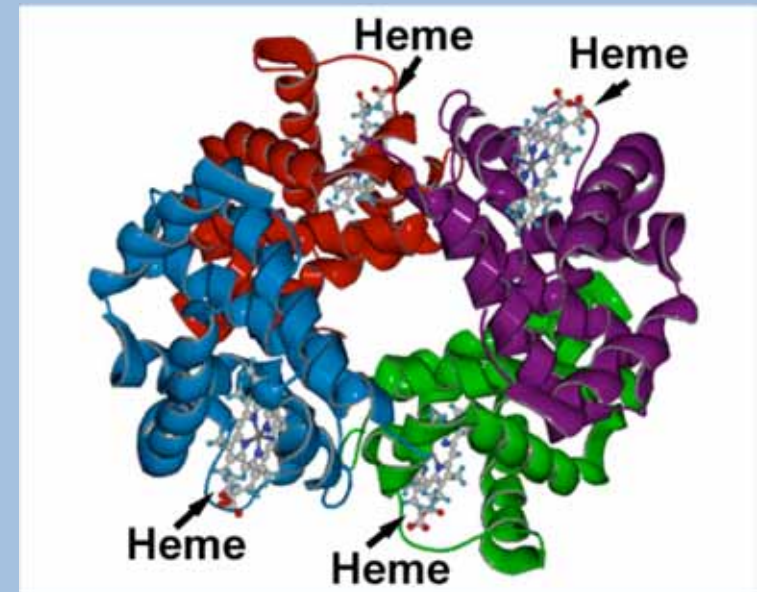
Gas Exchange in RBCs

- Oxygen moves to cells via diffusion
...with the **concentration gradient**
 - partial pressure
 - 100 mm Hg in RBC
 - 30 – 40 mm Hg in tissues



Cooperative Binding

- Gaining or losing an oxygen molecule changes the shape of hemoglobin
- Binding of one oxygen makes it more likely for another oxygen to bind
 - Makes gaining oxygen in the lungs easier
- Losing one oxygen makes it more likely for another oxygen to be lost
 - Makes donating oxygen to tissues easier



Cooperative Binding

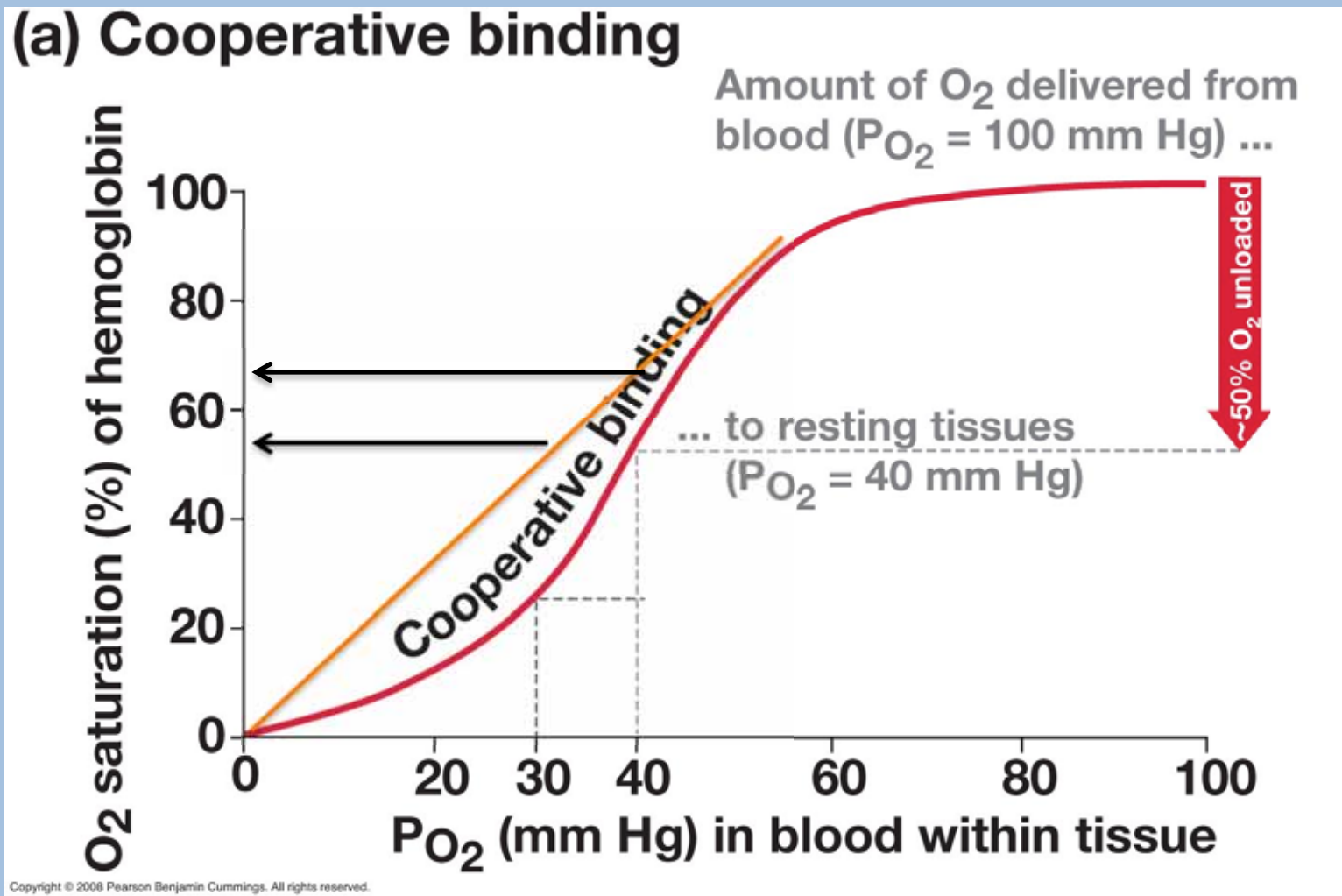


Fig 44.17 pg 990

Losing or gaining an electron has a domino effect on the other subunits

Not all oxygen used!

At rest, your RBCs carry ~50% of the O₂ back to your lungs.

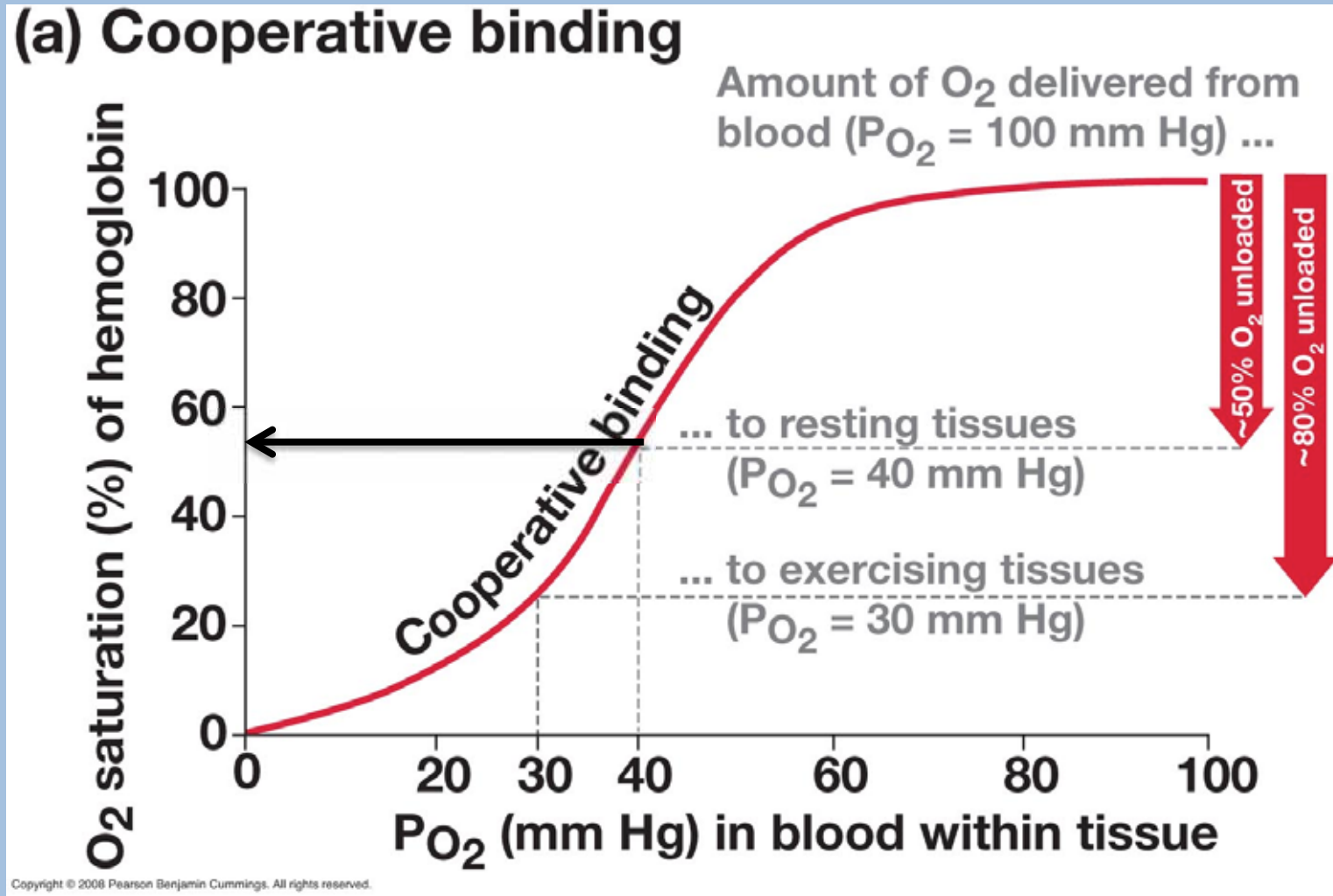
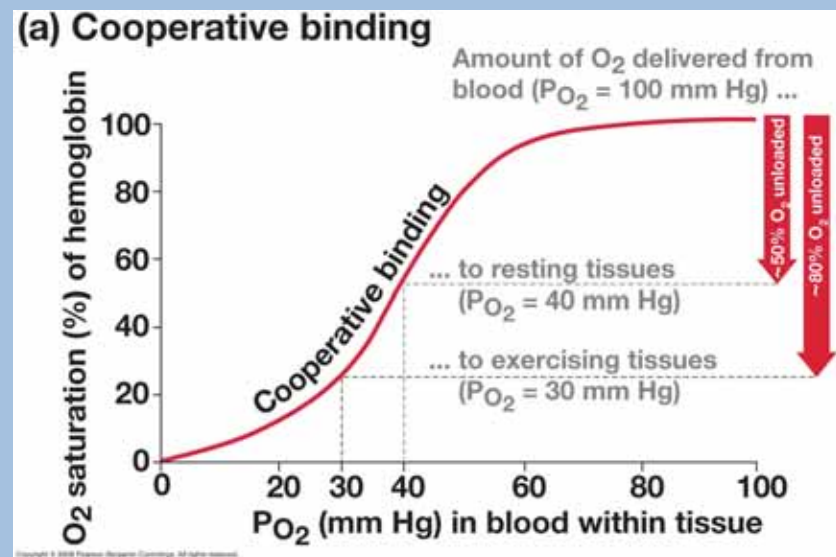


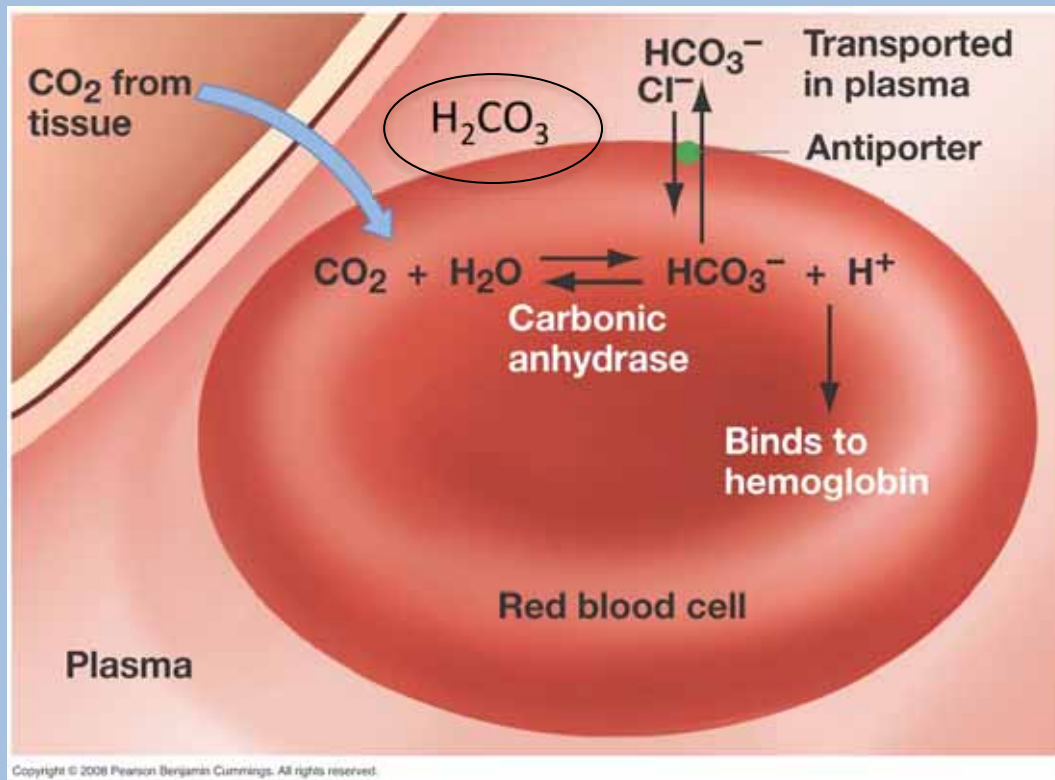
Fig 44.17 pg 990

Exercising and Oxygen loss

- In exercising muscles, partial pressure of oxygen is reduced, so the “extra” oxygen is pulled from hemoglobin
- But more CO_2 is also produced through respiration



How does the circulatory system get rid of the CO₂ ?



CO₂ exits tissues

Combined with water it forms carbonic acid

This lowers the blood pH, which:

increases the breathing rate
increases oxygen binding
keeps the CO₂ gradient high

The Bohr shift makes hemoglobin more likely to release oxygen to tissues with low pH

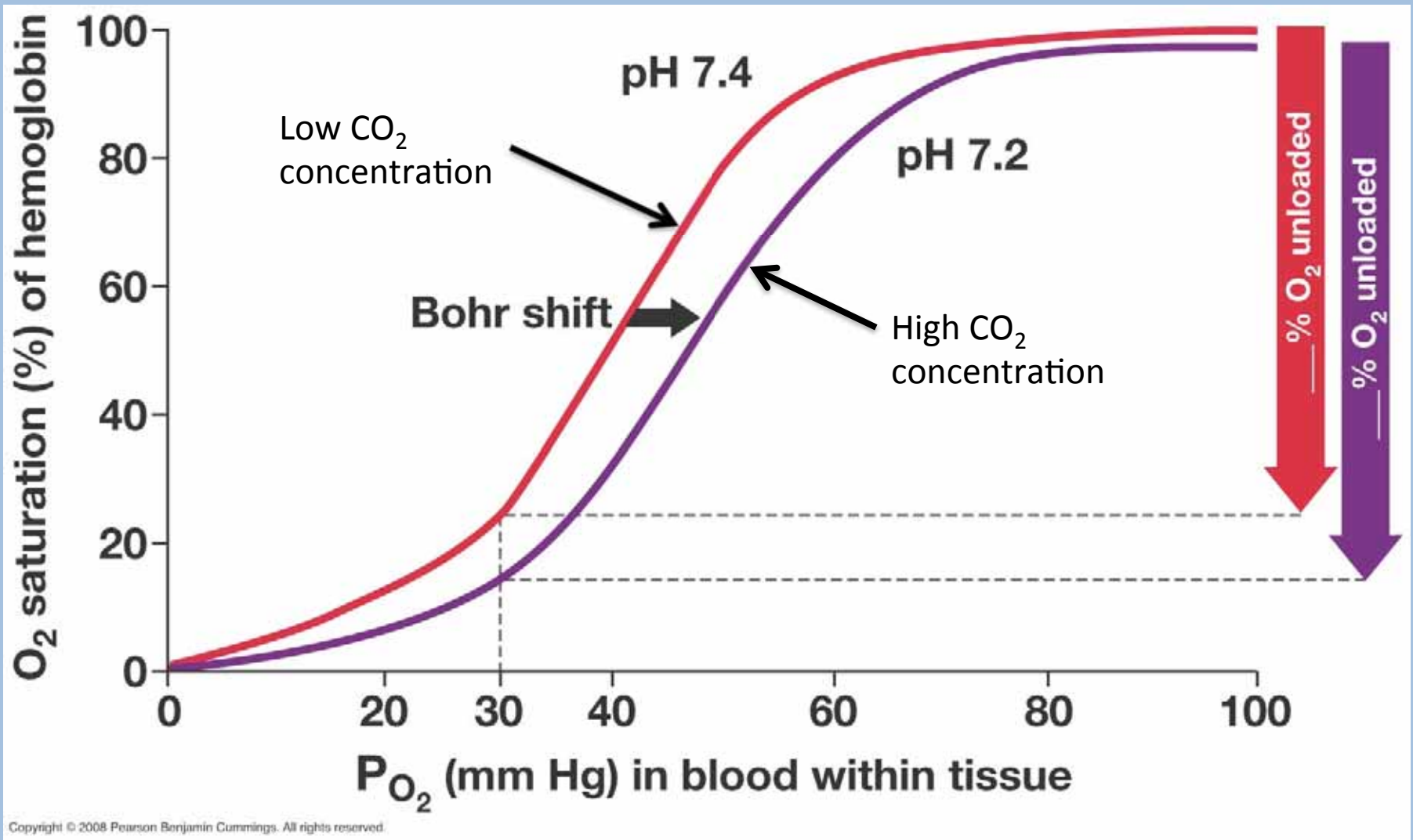
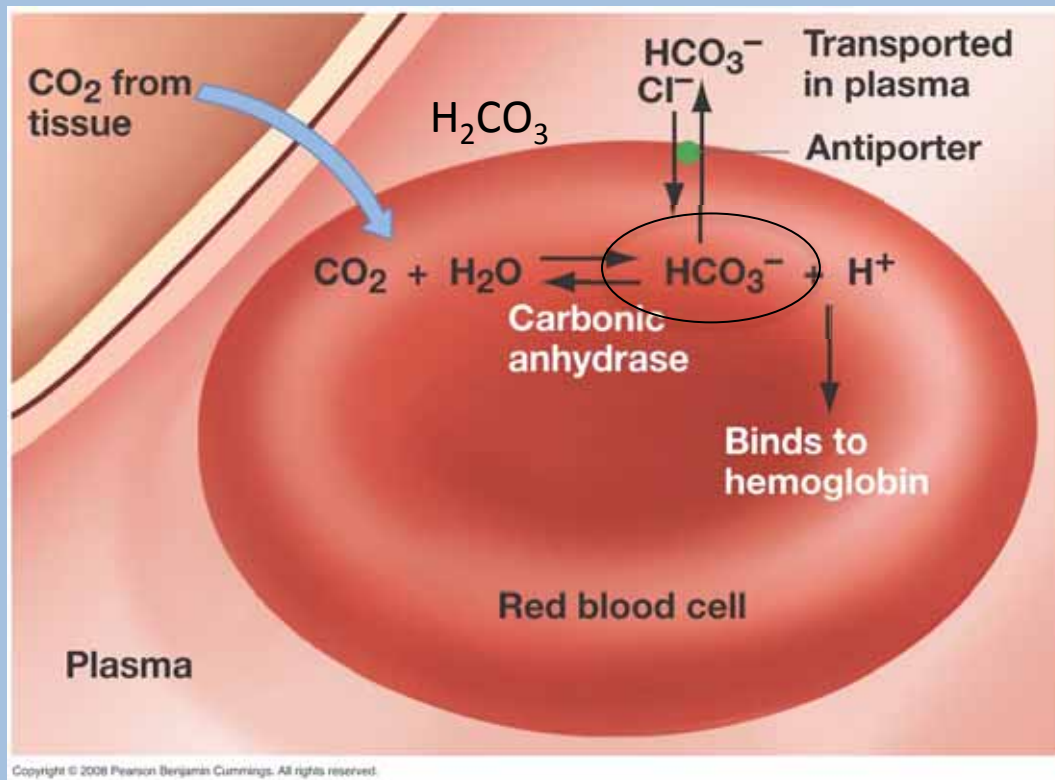


Fig 44.18 pg 991

How does the circulatory system get rid of the CO₂ ?



Most of the CO₂ is taken up by the RBC and converted to bicarbonate

The hemoglobin binds the excess H⁺, acting as a pH buffer

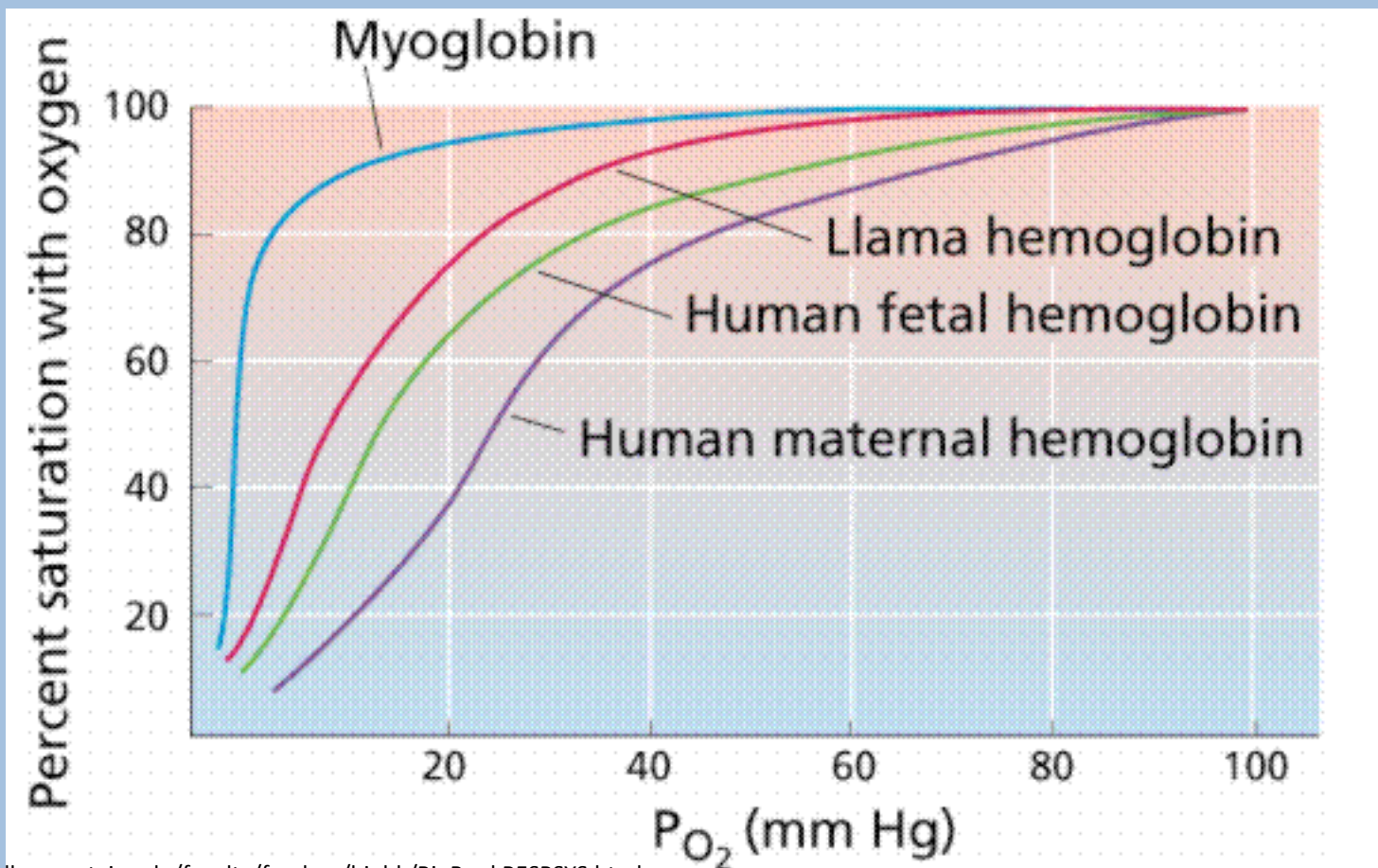
CO₂ Transport



Other oxygen-binding molecules

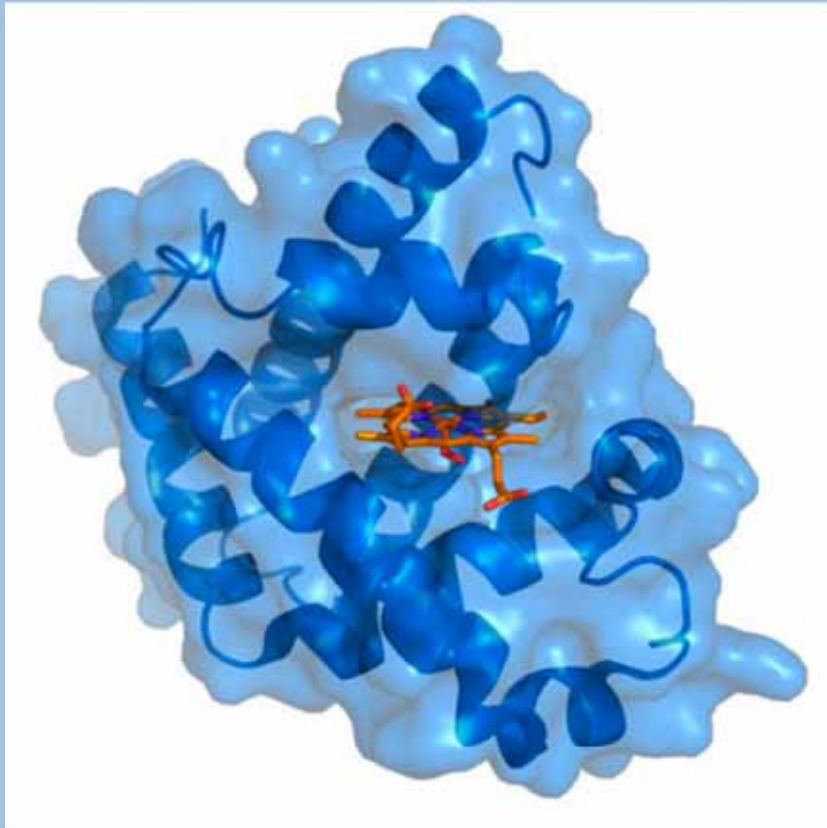
Myoglobin is a single polypeptide chain that has one heme molecule. It is found in the muscle tissue.

Does the myoglobin bind more or less tightly to oxygen than hemoglobin and why is that important?

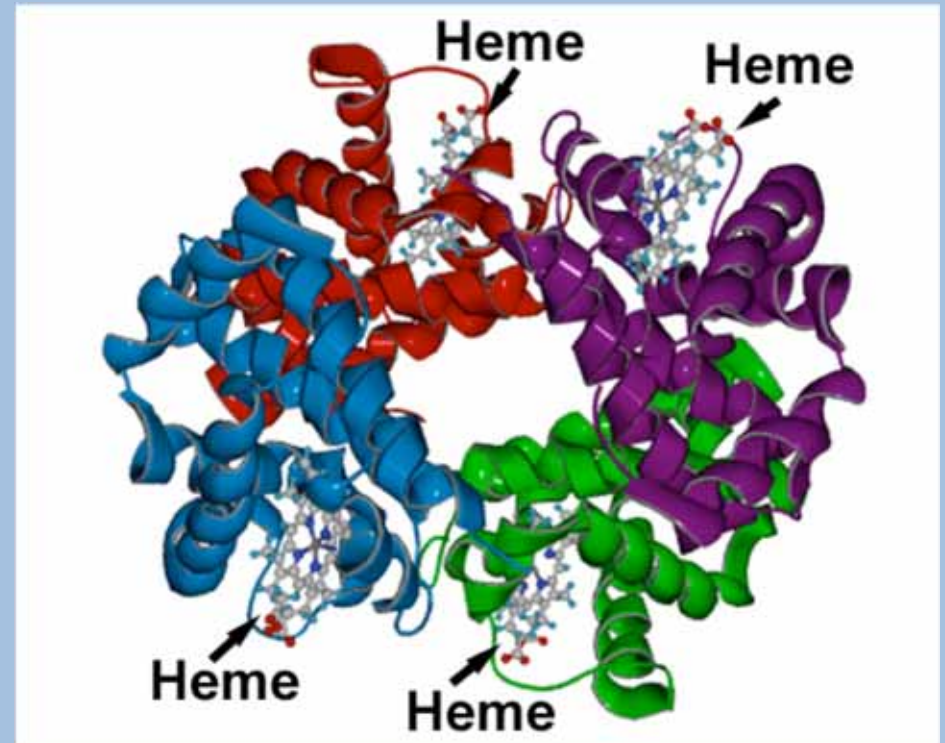


Myoglobin vs. Hemoglobin

Myoglobin



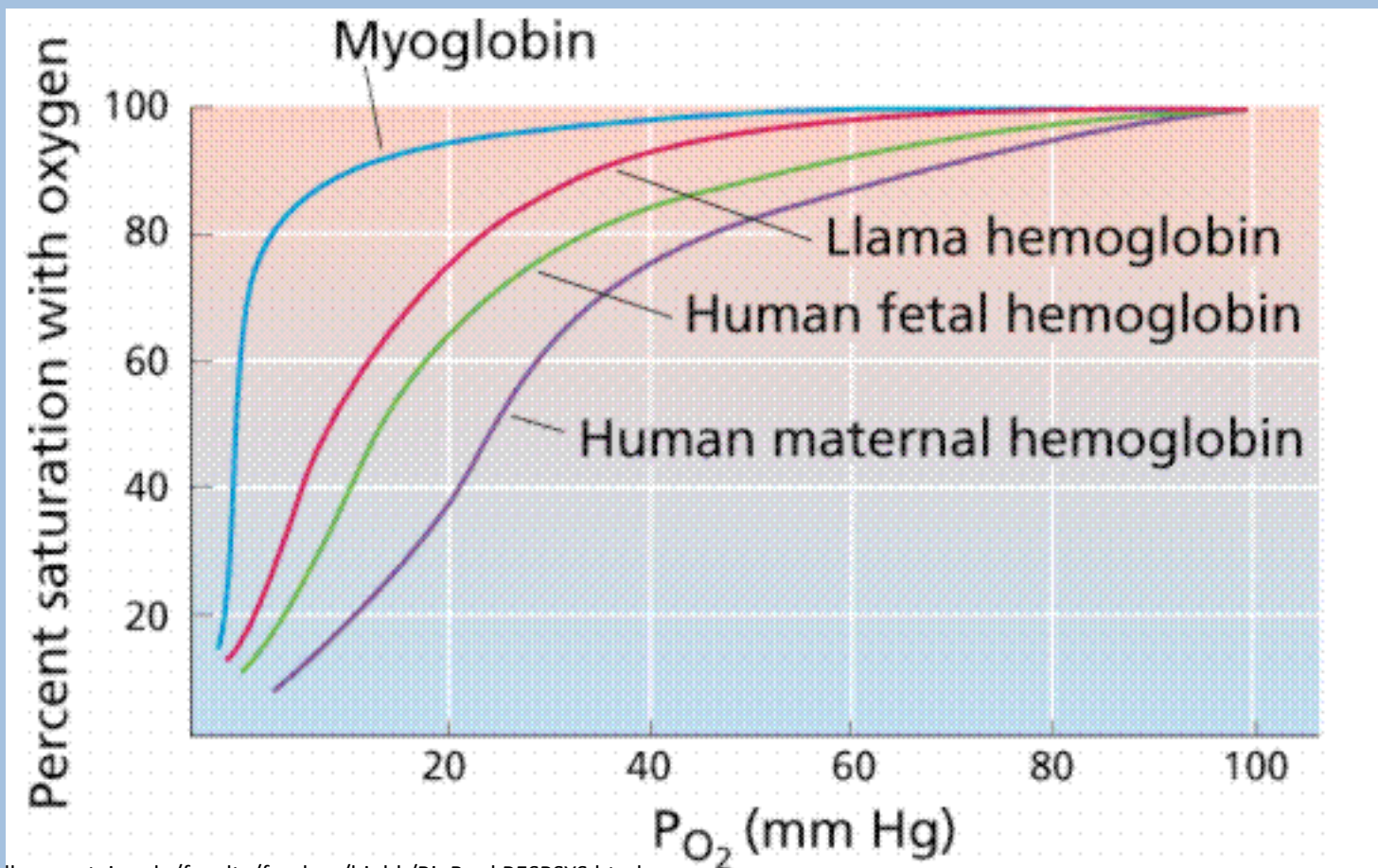
Hemoglobin



Other oxygen-binding molecules

Does human fetal hemoglobin have a higher or lower oxygen affinity than maternal hemoglobin?

Explain why.



Other oxygen-binding molecules

What would explain the fact that Llama hemoglobin has a higher oxygen affinity?

Where would you expect to find this adaptation?

