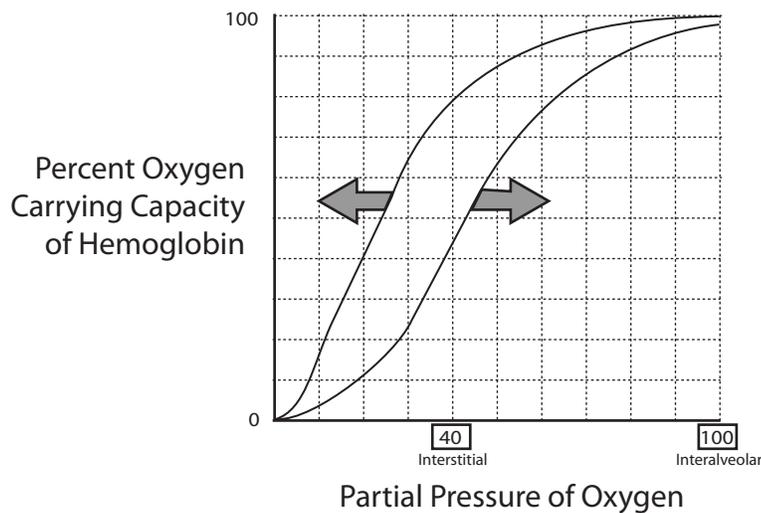


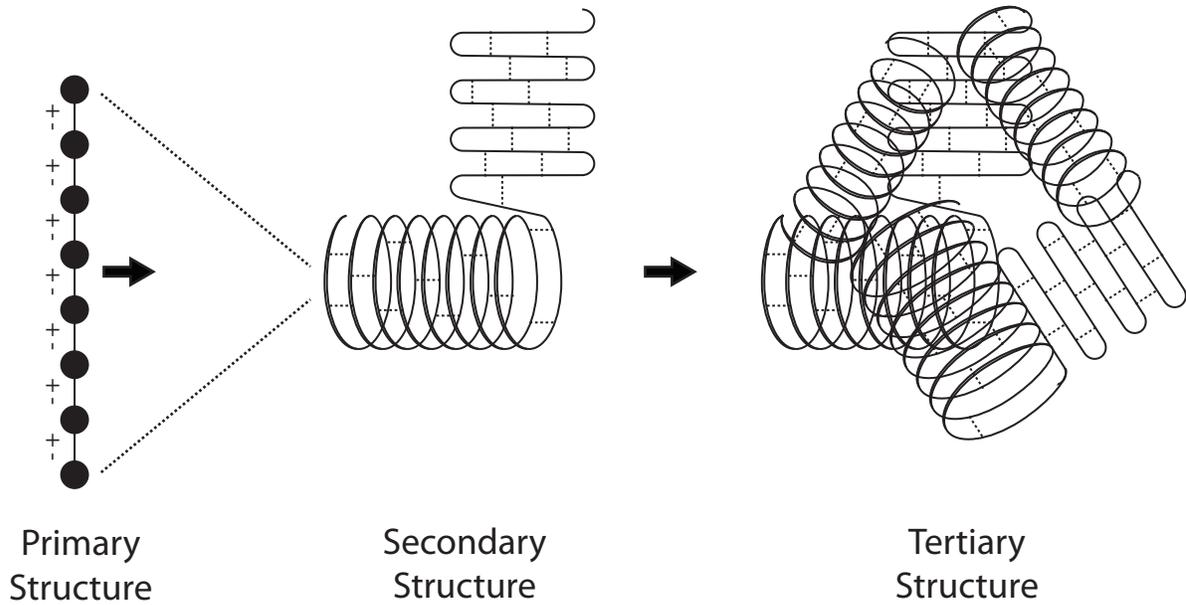
Oxygen Dissociation Curves

An Introduction to
Environmental Effects
on the structure of
Hemoglobin
and their effects on
Oxygen Carrying Capacity

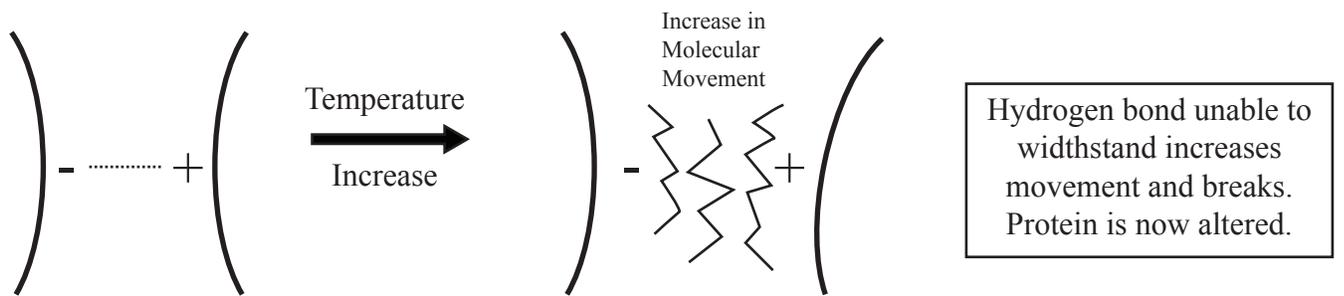


By Noel Ways

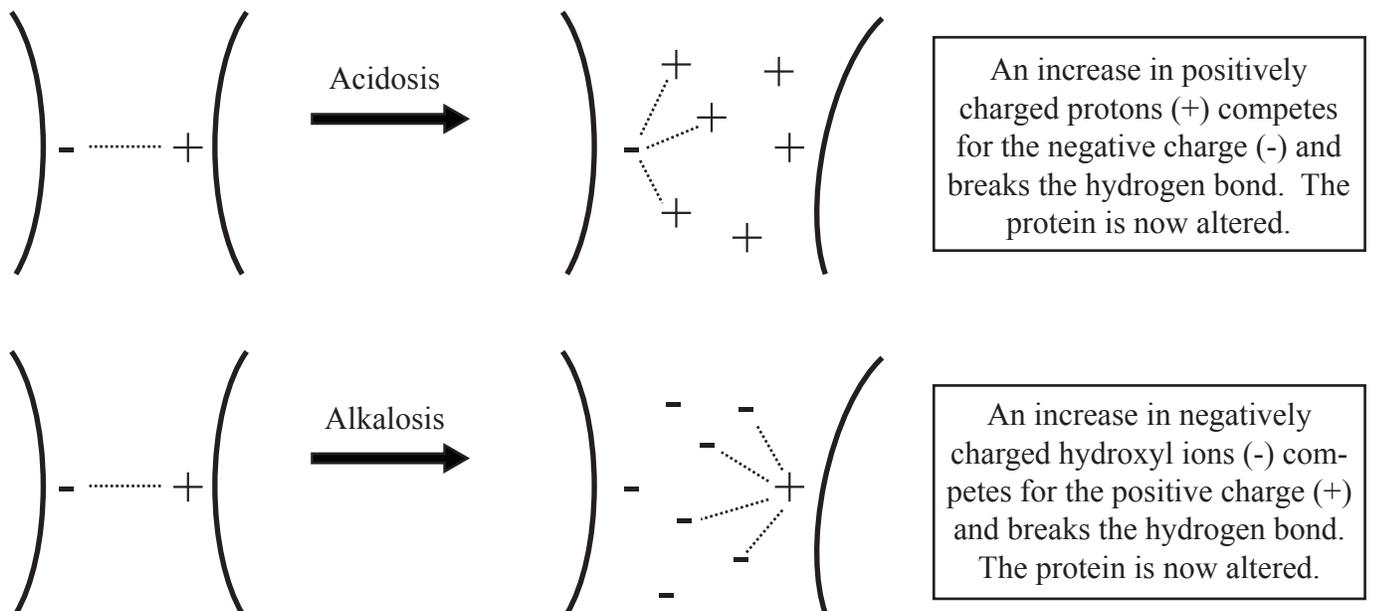
Protein Structure Review



The Effect of Heat on Protein Structure

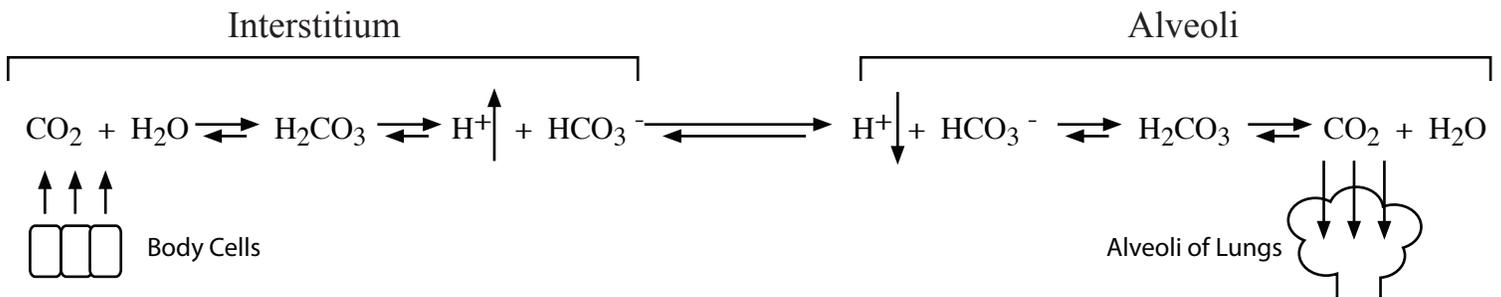
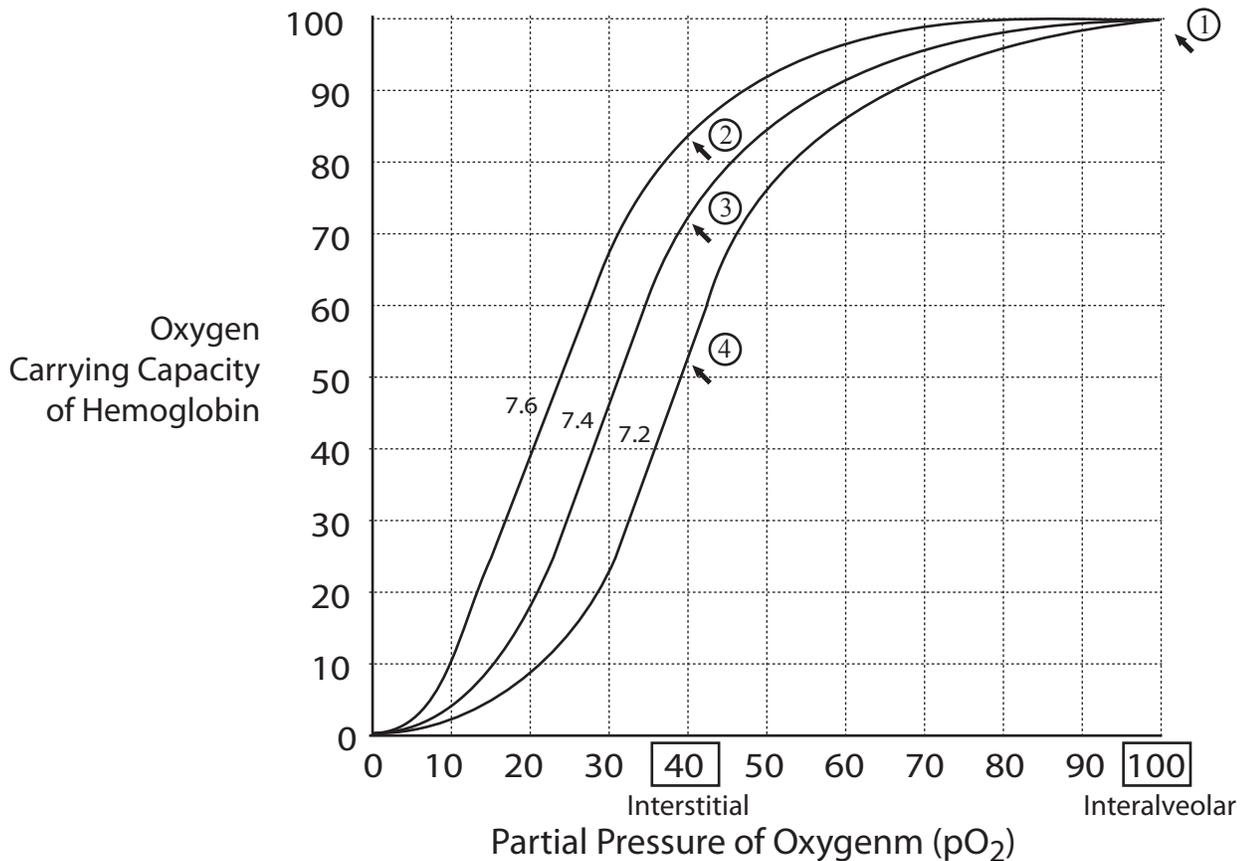


The Effect of Changing pH on Protein Structure



Oxygen Dissociation Curves for pH

The graphs below depict the dissociation curves under three different pH conditions.

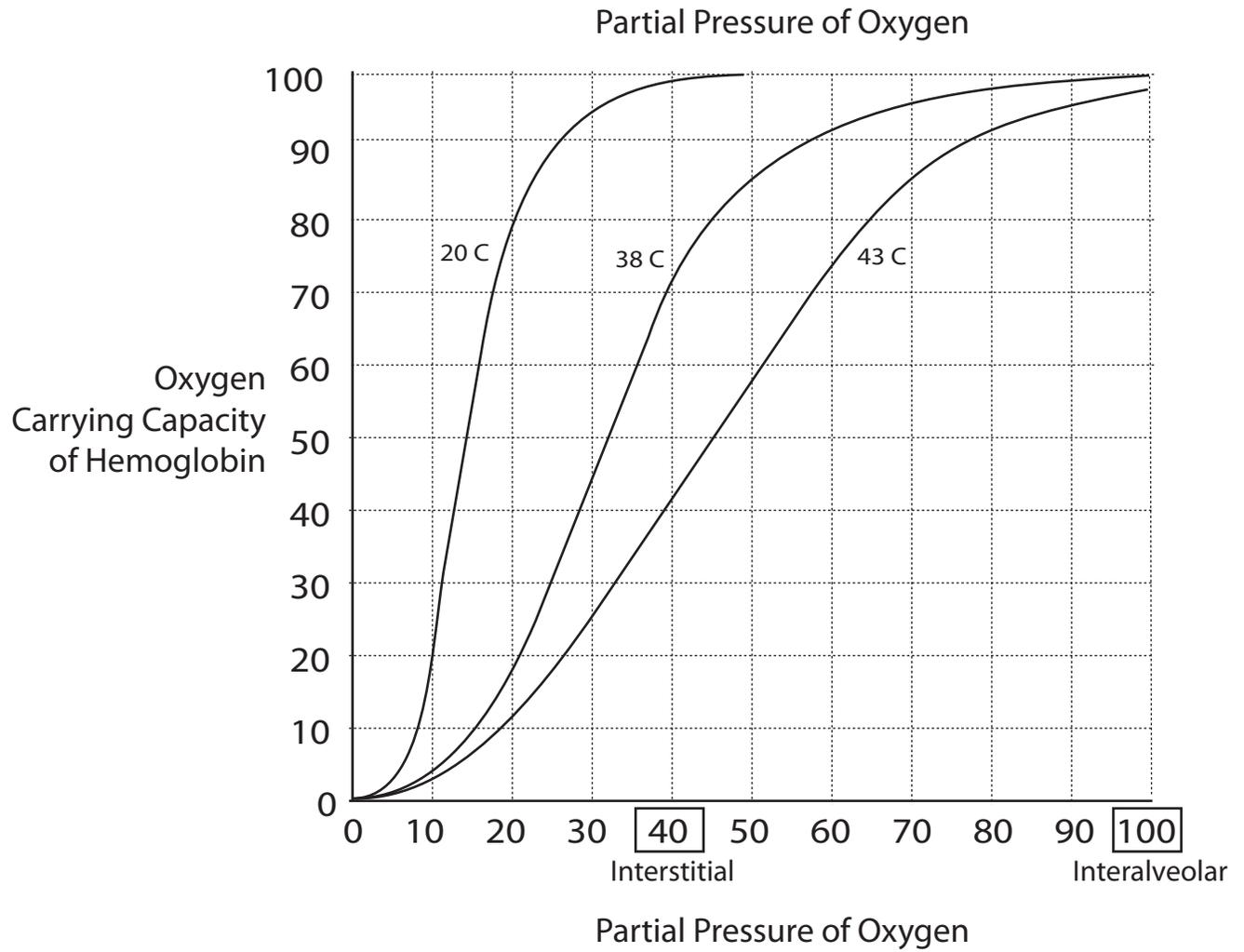


At the lungs (1), as CO₂ is being lost the H⁺ concentration is likewise going down (pH is going up). As it does so the carrying capacity of hemoglobin rises and more oxygen can be attached to hemoglobin.

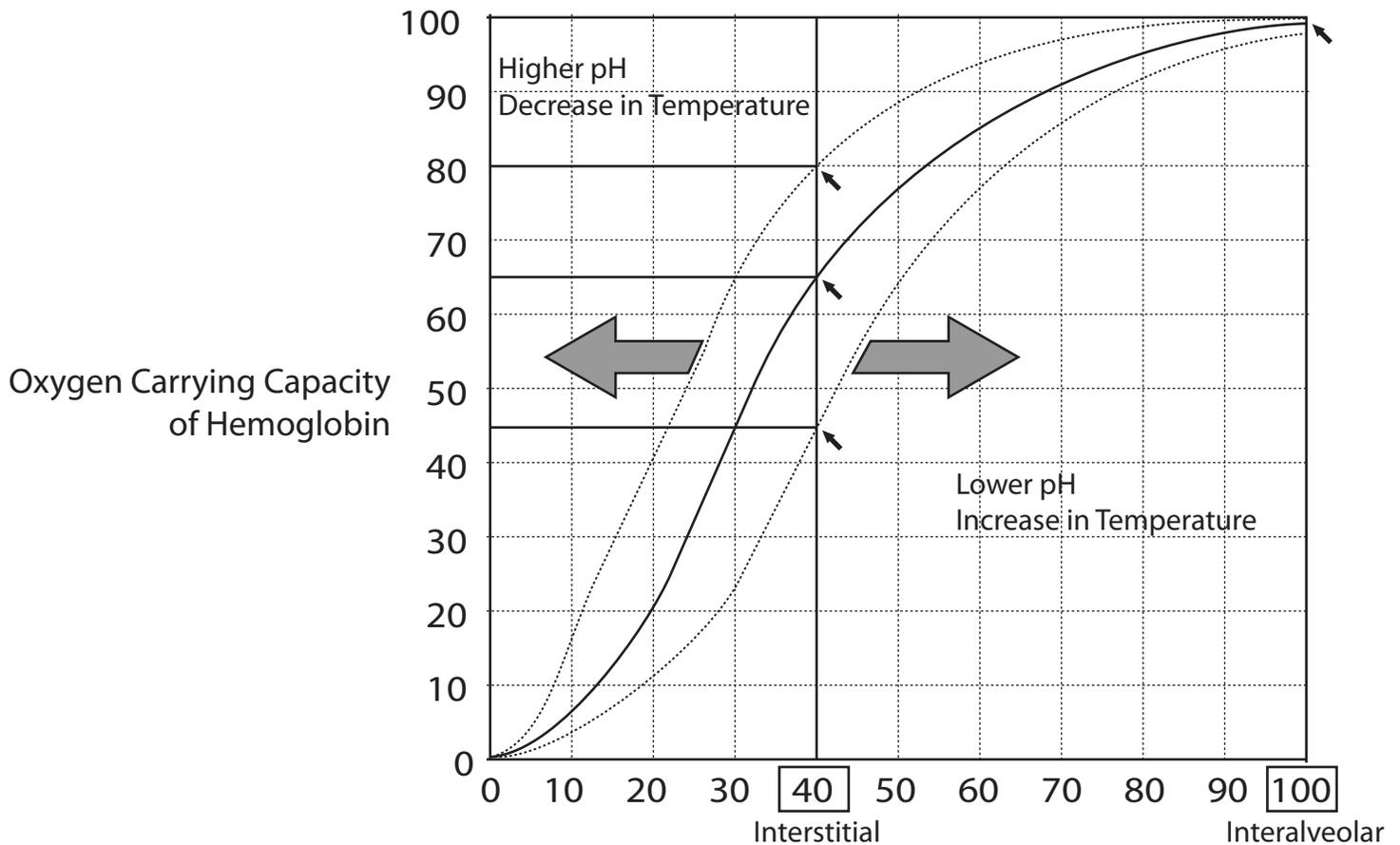
Among interstitial cells (2), (3) and (4) as CO₂ is produced which increases H⁺ and the interstitium is therefore acidified (pH is going down). The lowering of the pH alters hemoglobin structure in such manor as to lower it's oxygen carrying capacity. Therefore, oxygen is released. If metabolic continues to increases, more CO₂ will be produced and the carrying capacity will be further lowered and even more O₂ will be released.

- (2) A tissue with low metabolic activity. The environment is more alkaline, less O₂ is released.
- (3) A tissue with moderate metabolic activity. The environment is being acidified, more O₂ is being released.
- (4) A tissue with high metabolic activity. The environment is being further acidified and even more O₂ is being released.

Oxygen Dissociation Curves for Temperature



Oxygen Dissociation Curve Compilation



Left Shift / Right Shift

This sigmoidal curve depicts the oxygen-carrying capacity of hemoglobin. It illustrates that by altering various physiological variables, the curve will exhibit either a “Left Shift” or a “Right Shift.” In this handout, we only dealt with two of these variables: pH and temperature.

We note that in metabolically active tissues there will be an increase in temperature and a lowering of the pH. This alters the structure of hemoglobin in such a manner as to release oxygen. Hemoglobin has less affinity for oxygen, and oxygen will be released. The curve shifts Right.

In tissues with lower metabolic activity, the temperature will be lower, and the pH will be higher. Under these conditions, the hemoglobin structure alters in such a manner as to absorb oxygen. Hemoglobin has a greater affinity for oxygen, and oxygen will be absorbed. The curve shifts Left.