**Data Analysis Problem**

by Marianna Pap and József Szeberényi

to accompany

*The Cell: A Molecular Approach,* Eighth Edition

Geoffrey M. Cooper

**DAP 3.3 The Bohr Effect**

This Data Analysis Problem does not appear in the textbook.

**Sources:** Jensen, F. B. 2004. Red blood cell pH, the Bohr effect, and other oxygenation-linked phenomena in blood O2 and CO2 transport. *Acta Physiol. Scand.* 182: 215–227.

Bohr, C., K. Hasselbalch, A. Krogh. 1904. Über einen in biologischer beziehung wichtigen einfluss, den die kohlensäurespannung des blutes auf dessen sauerstoffbedienung übt. *Skand. Arch. Physiol.* 16: 402–412.

**Level of difficulty:** High

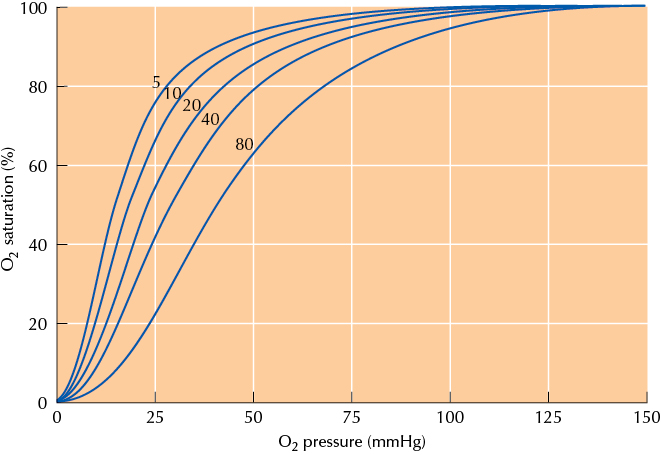
**Corresponding chapter(s) in the textbook:** Chapter 3

**Review the following terms before working on the problem:** red blood cells, hemoglobin, partial pressure (or tension) of O2 and CO2

**Experiment**

This figure presents the results of an experiment that demonstrates the Bohr effect, a physiological phenomenon described in 1904 by the Danish scientist Christian Bohr. It also provides a classic example of the interplay between biochemistry and physiology. In this experiment, O2 binding by dog red blood cells (*y* axis of the diagram) was measured at various O2 pressures (*x* axis) and various CO2 pressures (the numbers at each curve indicate the CO2 pressure in mmHg). In the blood of the capillaries of an actively working skeletal muscle, the O2 pressure is around 20 mmHg.

**Figure**



**Questions**

1. What protein in red blood cells is responsible for the Bohr effect?

2. How does CO2 pressure affect the oxygen affinity of this protein?

3. What is the physiological significance of the Bohr effect in muscle capillaries?

4. What is the physiological significance of the Bohr effect in lung capillaries?