<table>
<thead>
<tr>
<th></th>
<th>ARTERIAL BLOOD</th>
<th>BLOOD FLOW/MIN</th>
<th>CAROTID BODY END</th>
<th>ENERGIZED RESPIRATION</th>
<th>CAROTID BODY RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O₂ Saturation (%)</td>
<td>P₅ (torr)</td>
<td>O₂ Content* (ml O₂/100 ml)</td>
<td>O₂ Removed (ml O₂/100 ml)</td>
<td>O₂ Content* (ml O₂/100 ml)</td>
</tr>
<tr>
<td>1. Normal (15 gm Hb)</td>
<td>98.5</td>
<td>100</td>
<td>19.7 + 0.3 = 20.0</td>
<td>normal</td>
<td>0.5</td>
</tr>
<tr>
<td>2. Hypoxemia (15 gm Hb)</td>
<td>50.0</td>
<td>27</td>
<td>10.0 + 0.08 = 10.08</td>
<td>normal</td>
<td>0.5</td>
</tr>
<tr>
<td>3. Hypotension</td>
<td>98.5</td>
<td>100+</td>
<td>19.7 + 0.3 = 20.0</td>
<td>2/₅ normal</td>
<td>2.0</td>
</tr>
<tr>
<td>4. Anemia (50%) (7.5 gm Hb)</td>
<td>98.5</td>
<td>100</td>
<td>9.85 + 0.3 = 10.15</td>
<td>normal</td>
<td>0.5</td>
</tr>
<tr>
<td>5. Anemia (20%) (3 gm Hb)</td>
<td>98.5</td>
<td>100</td>
<td>3.04 + 0.3 = 4.24</td>
<td>normal</td>
<td>0.5</td>
</tr>
<tr>
<td>6. Saline (no Hb)</td>
<td>98.5</td>
<td>150</td>
<td>0.45</td>
<td>2 x normal</td>
<td>0.25</td>
</tr>
<tr>
<td>7. HbCO (7.5 gm active Hb)</td>
<td>98.5</td>
<td>99+</td>
<td>9.85 + 0.3 = 10.15</td>
<td>normal</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* The O₂ content is calculated as the sum of O₂ combined with Hb and O₂ dissolved in the blood. This calculation is explained in Chapter 14 and Figure 14-1. 
* There is no measurable difference between O₂ in arterial blood entering the carotid body and venous blood leaving it when blood flow is rapid. The value in this column is computed from the measured difference of 2 ml O₂/100 ml blood when blood flow is deliberately reduced to 2/₅ normal. This may be a high value because of increased chemoreceptor activity during ischemic. 
* Normal blood is assumed to contain 15 gm Hb/100 ml. Each gm can combine with 1.34 ml O₂; the O₂ capacity of Hb of 100 ml of this blood is 20 ml (Fig. 14-1). 
* Fifty percent of total Hb is active and is 98.5% saturated with O₂.
Respiratory minute volume (L/min, BTPS)

\[ \Delta \text{RMV} = 35 \text{ L/min} \]

- \( P_{\text{CO}_2} \) constant at 42.6 mm Hg

- \( P_{\text{CO}_2} = 34.2 \)

Alveolar \( P_{\text{O}_2} \) (mm Hg)

- 29.7
- 36.8
- 38.6
- 38.6
Hypoxic Response

Index

\[ \Delta V_{E40} = \text{Isocapnic increase in } V_E \text{ when } P_{AO2} \text{ is reduced to 40 mmHg} \]
Medullary Oscillator

\[ V_T \]

\[ V_D \]

\[ V_A \]

Peripheral Chemoreceptors

\[ \text{Aterial } P_{O2} \]

\[ \text{Alveolar } P_{O2} \]

Alveolar Ventilation

\[ f \]
\[ H_2O + CO_2 \xrightarrow{C.A.} H_2CO_3 \xrightarrow{\text{(lungs)}} H^+ + HCO_3^- \xrightarrow{\text{(kidneys)}} \]

Henderson Hasselbalch Equation

\[ \text{pH} = 6.1 + \log \frac{\text{HCO}_3^-}{0.03*P_{CO_2}} \]

\[ 7.4 = 6.1 + \log \frac{24\text{ m Eq/L}}{1.24\text{ mM CO}_2/L} \]

Acidosis: pH < 7.4
Alkalosis: pH > 7.4
CO$_2$ Sensitivity

Figure 7. A stimulus-response curve of the respiratory control system for the CO$_2$ stimulus. Art. P$_{CO_2}$ is increased above the "normal" value while art. P$_{O_2}$ is held at the "normal" value.
Respiratory minute volume (L/min, BTPS)

Alveolar Pco₂ (mm Hg)

P₀₂

45

60

100

140
Medullary Oscillator

Peripheral Chemoreceptors

Blood [H+]

Aterial \( P_{CO2} \)

Alveolar \( P_{CO2} \)

CSF [H+]

Medullary Chemoreceptors

\( V_T \)

\( V_D \)

\( V_A \)

Alveolar Ventilation

Blood-Brain Barrier