# THE EFFECTS OF EXERCISE ON PH AND CARBON DIOXIDE PRODUCTION

As fast as the body uses energy, it must be replaced. As we convert glucose into energy (ATP), we give off the product CO_2. Therefore, CO_2 is a product of metabolism. That means that the more energy we burn, the more we have to make and the more we make, the more CO_2 we produce. Given the opportunity, CO_2 will combine with water, giving off carbonic Acid. The reaction is shown in the following equation:

$$CO_2 + H_2O \rightarrow H_2CO_3 \leftrightarrow HCO_3^- + H^+ \text{ (+ Phenol Red = Yellow soln)}$$
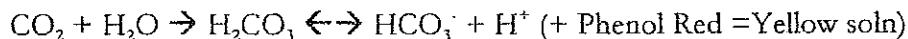
Carbonic Acid is Considered a week acid, but if you produce enough weak acid you can cause a pH shift (change). We will test this idea.

Materials:

Distilled water   150mL beaker
Plastic straws   1mL graduated pipet
Stopwatch or wall clock   0.02% Phenol red solution
Parafilm   0.1N NaOH solution

Procedure:
1. Place 100mL of distilled water into a 150mL beaker.
2. Using your 1mL graduated pipet, measure and add 2mL of 0.1N NaOH solution (two-1mL piptes) and pour it into the 100mL of distilled water. The 0.1N NaOH solution will give the water a basic pH.
3. Add 5 drops of the phenol red indicator solution to the distilled water/NaOH mixture. Mix by swirling. Phenol red is purple/red in basic solutions, orange in neutral solutions and yellow in acidic Solutions. What color is the solution? _____. Is this acidic, basic, or neutral? _____.
4. Sit quietly and exhale through a straw into the solution. Have your partner determine the time it takes to turn the solution from red/purple to yellow. It may help to place parafilm over the beaker to prevent splashing.
5. Repeat steps 1-4 after a two-minute vigorous exercise.
6. Change places with your partner and repeat steps 1-5.
7. Record all of your results in the table bellow. Does CO_2 have an influence on pH? _____. Does Exercise increase CO_2 production? _____.

Record the times required to produce an indicator color change in the table below.

STUDENT	TIME AT REST	TIME AFTER EXERCISE