

ENERGY USE LAB

This lab will help you learn what happens to the amount of energy your body uses during different activities. We will measure your energy use indirectly by measuring the amount of carbon dioxide waste your body produces. The more carbon dioxide you produce, the more energy you used up.

You will be using NaOH (sodium hydroxide) to test for the presence of carbon dioxide. The more drops of NaOH you must use in the experiment, the more carbon dioxide you produced and the more energy you used.

PROCEDURE

(NOTE: You must wear goggles to protect your eyes from NaOH. If you get any on your skin or in your eyes, flush with water immediately and tell the teacher. Do not put your straw down on the surface of the table; use a paper towel)

Sitting

1. Place 100 ml. of water into a flask. Add 5 drops of phenolphthalein. (Wait for your teacher. They may want you to time it together.)

2. Sit quietly for 1 minute. Put the end of a straw into the water/phenolphthalein mixture and bubble your breath into the water for exactly 15 seconds.

3. Add NaOH drop by drop until the water stays pink for at least 15 seconds. Gently swirl the flask after each drop. Record the number of drops of NaOH used to keep the water pink on the chart below.

4. RINSE FLASK AND STRAW CAREFULLY.

Running

5. Place 100 ml of water into the flask. Add 5 drops of phenolphthalein. (Wait for your teacher. They may want you to time it together.)

6. Run in place vigorously for 1 minute and then bubble your breath through the straw into the water/phenolphthalein solution for exactly 15 seconds.

7. Add NaOH drop by drop into the beaker until the solution stays pink for at least 15 seconds. Gently swirl the flask after each drop. Record the number of NaOH drops used on chart below.

8. RINSE FLASK AND STRAW CAREFULLY.

9. Place 100 ml of water into the flask. Add 5 drops of phenolphthalein.

Activity	Your name:	Partner's name:	Average	Class Averages
	# of drops of NaOH	# of drops of NaOH	$\frac{\text{You + partner}}{2}$	
Sitting				
Running				

1. In this lab, what does the number of NaOH drops added represent?

2. The more NaOH you added to keep the solution pink, the more carbon dioxide you produced.

a. When did you add the most NaOH? _____

b. When did you produce the most CO₂? _____

c. When did you use the most energy? _____

d. When did your cells do the most cellular respiration? _____

3. Plants produce carbon dioxide also. Do plants use energy? _____

4. Look at the classroom averages. What effect does exercise have on the amount of carbon dioxide produced? How does this relate to cellular respiration? Use specific data to support your answer.

5. Yeast cells produce carbon dioxide (That's what makes bread rise.) Do yeast cells use energy? _____

6. Look at the classroom results. Do people use energy to do math problems? Support your answer with **evidence** from the lab.

7. Why do doctors and teachers tell you to eat a good breakfast before coming to school or taking an important test?

Math Problems

$$\begin{array}{r} \text{A. } 974567 \\ + 479260 \\ \hline \end{array}$$

$$\begin{array}{r} \text{B. } 389627 \\ - 246417 \\ \hline \end{array}$$

$$\begin{array}{r} \text{C. } 527 \\ \times 23 \\ \hline \end{array}$$

$$\begin{array}{r} \text{D. } 98754 \\ + 45982 \\ 79356 \\ \hline 23974 \end{array}$$

$$\begin{array}{r} \text{E. } 5678923 \\ - 5432100 \\ \hline \end{array}$$

$$\begin{array}{r} \text{F. } 946 \\ \times 345 \\ \hline \end{array}$$

$$\begin{array}{r} \text{G. } 8913 \\ \times 0.17 \\ \hline \end{array}$$

$$\begin{array}{r} \text{H. } 98770 \\ - 98768 \\ \hline \end{array}$$

$$\begin{array}{r} \text{I. } 123 \\ \times 123 \\ \hline \end{array}$$