**Experiment 11: HUMAN RESPIRATION**

## Assessed criteria

|  |  |  |
| --- | --- | --- |
|  | Autonomy | Cooperation |
| 5-6 | The student **requires no guidance** to work safely and uses material and equipment **competently**. The student works responsibly with regards to the living and non-living environment. | When working as part of a group, the student cooperates with others. |

**Task**

To determine the amount of carbon dioxide produced by your metabolism under different situations and to compare it with the metabolism of yourfellow students, and thus to gauge the rate of respiration of the human body.

# Materials

* + 50 mL graduated cylinder
  + Erlenmeyer flask
  + 1 M NaOH solution
  + Phenolphthalein solution
  + Soda Straw
  + Dropper
  + Stop watch

# Procedure

1. Measure 50 mL of tap water in a graduated cylinder and transfer it to the flask.
2. Add 2 to 4 drops of phenolphthalein indicator to the flask. The flask should be light pink. If not, add a few drops of NaOH until it is.
3. Taking normal breaths, blow through a soda straw into the flask for exactly one minute. **Breathe in normally (without the tube in your mouth) but exhale through the straw.** Start counting time with an inhalation. Observe the color change as you blow.
4. Now slowly and carefully, drop by drop, add sodium hydroxide (NaOH) solution to the solution in the flask using a pipette. Swirl the water gently in the flask WHILE adding the NaOH. Continue to add NaOH until the light pink color stays for one minute. Record on your data table how many drops you added.
5. Wash all materials and repeat steps 1 and 2.

1. Now alter the **rate of metabolism** by running in place (or doing jumping jacks) for 3 minutes. Immediately after, repeat steps 3 and 4. Again record your data.
2. After doing the calculations, bring your data to the front of the class to be recorded on the class data table.

Drops of NaOH needed to titrate CO2 expelled into water

|  |  |
| --- | --- |
| Situation | nº of drops of NaOH |
| Rest |  |
| Exercise |  |

1. Convert the number of drops of NaOH into **grams of CO2** by multiplying the number drops by 0.044. SHOW YOUR WORK!!

nº of drops of NaOH x 0.044

Amount of CO2 expelled

|  |  |
| --- | --- |
| Situation | Grams of CO2 |
| Rest |  |
| Exercise |  |

Results

* Show all the group data on a table.
* Represent the grams of CO2 average before and after exercise on a graph.
* Come up with conclusions from your results.
* Identify errors and indicate possible sources.
* Give any suggestions on how to decrease these errors.

**Questions**

1. Why was there a difference between the rest data and the exercise data?
2. What does the “rate of metabolism” mean? (see nº 6 in procedure)
3. How is the amount of CO2 related to your metabolism?
4. What affect does increasing your rate of metabolism have on the amount of ATP available to your cells?