Metabolism

You should be able to answer the following questions before taking the Metabolism Physiology Lab Methods quiz. It will be due at the start of your lab.

- What is closed chamber respirometry?
- What variables will you measure?
- What variables will you calculate?
- What data will you use for your lab report?

In this lab, you will use a technique called closed chamber respirometry to measure oxygen consumption as an indicator of metabolic rate of an organism (in this case, cockroaches) at two different temperatures. You will put the organism into a chamber and then seal it. The air in the chamber when you seal it will be room air (20.95% O_2 and 0.035% CO_2). As time passes, the organisms will consume the O_2 in the chamber and produce CO_2. After a pre-determined period of time, you'll measure the $\%O_2$ and $\%CO_2$ in the chamber. As long as you know the elapsed time and the volume of the chamber, we can calculate the volume of O_2 consumed ($=Vo_2$) and the volume of CO_2 produced ($=Vco_2$).

1) You will need to measure the mass of your cockroaches. (You can do this now, or at the end.) You will have two tupperware containers at your lab bench. Weigh each container empty. Then, place two or three cockroaches into each container (either control or experimental, depending on which was assigned to your group), and weigh the chambers again. Record the difference (i.e., the mass of the cockroaches) for each chamber in the Data Worksheet and transfer your organism to a glass chamber. **(Figure 1)**
2) Close the jar, and cover the openings with tape, so that the chamber is completely sealed and no fresh air can enter. Record the time at which the chamber was first sealed shut. Put each chamber into a different water bath (23 and 30^{o}C). Put one of the magnets on top of the chamber so that the chamber doesn't tip over in the water bath.
3) Leave the cockroaches sealed in their chambers for at least 90 minutes. The longer the better.
4) At the end of the incubation period, **take only one jar** to the gas analyzers. Proceed to the gas analysis procedure below.

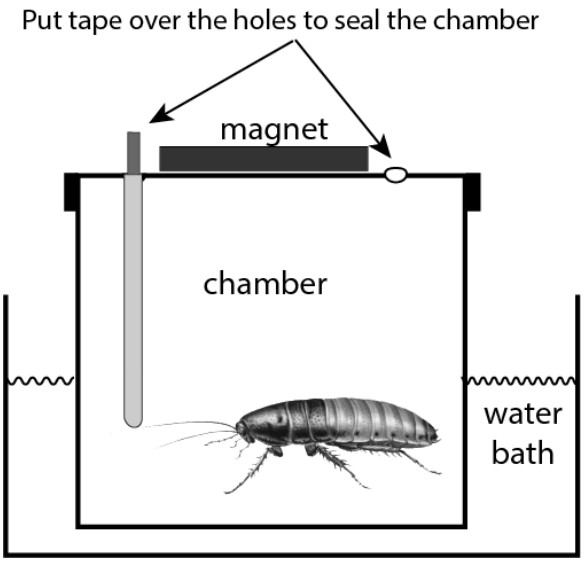

Figure 1. Metabolic chamber set-up. You will have three roaches in a glass chamber. Put tape over the two openings in order to seal it before you put it into the water bath. Place a magnet on top so that it doesn't fall over.

Gas analysis

Only take one jar at a time to the gas analyzers.

1) Stop the timer. Record the duration of the incubation period, to the nearest minute, convert it to hours and record it on the Data Worksheet. (For example, 95 min = 1.58 hrs)
2) Start the BIOPAC recording.
3) Uncover both openings and attach the tube from the gas analyzers to the connector on the lid of the chamber. The other opening must be uncovered, to allow fresh air into the chamber as the analyzers remove the experimental air. It should take about 2 minutes get these readings.
4) Disconnect your chamber and stop recording.
5) Record the lowest $\%O_2$ and the highest $\%CO_2$ for your chamber.
6) If you didn't weigh your cockroaches at the beginning, do that now.
7) Put the cockroaches back into the appropriate containers.
8) Input VO_2 (in ml O_2/hr/g), VCO_2 (in ml O_2/hr/g), and RER at both temperatures in this spreadsheet: http://bit.ly/E112L_Metabolism_F2019