

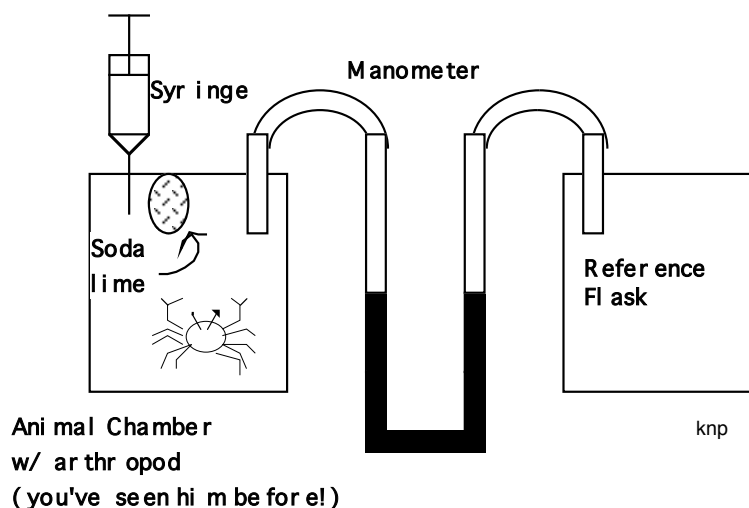
Reference: Another Method of Measuring Aerobic Respiration – Manometry¹

Biology 390 -- Physiology

A convenient if less automated way to measure $\dot{V}O_2$, especially of small ectothermic ("cold blooded") animals, is **manometry**. The method is quite simple and extremely sensitive but it tends to work best (it is safest) if the animals are small animals and have low metabolic rates.

The basic principals of manometric determination of oxygen consumption are as follows (see diagram):

- The heart of the system is the **measuring device** that consists of a **manometer** working with a syringe or other **calibrated gas delivery system** (more about this later)
- The organism is sealed in a closed chamber called the **metabolic or animal chamber** that is connected to one arm of a manometer. Enclosed with the organism is a material (soda lime -- a mixture of $CaCO_3$ to absorb water plus KOH and NaOH to absorb CO_2) that absorbs carbon dioxide.
- The other arm of the manometer is connected to a flask that is similar to the flask holding the organism except that it contains only air at the same temperature and pressure as the air enclosed with the organism at the start of the experiment. This flask is called the **reference flask**:



Basic Operation: Once the measurement period starts, the organism uses oxygen and the pressure in the metabolic flask drops relative to the original pressure present in its chamber, which is the pressure, still found in the reference flask. Note that the change in pressure only reflects the use of oxygen by the organism since any carbon dioxide the organism produces is absorbed by the soda lime. As a result, the manometer fluid starts to rise on the arm of the manometer connected to the organism's chamber. **If a gas is then injected in sufficient quantity to restore the manometer fluid to its original level, then that volume of gas was the amount of oxygen used by the organism over the time of the measurement period.**

? Why, for the purpose of measurement, can any gas be injected, not just oxygen?
Is there a long-term problem with using gases besides oxygen?

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