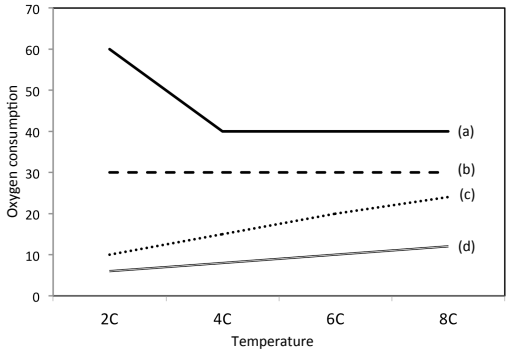
As an avid pet keeper, Pat has a large dog, a cat, a gecko, a snake, and a fish tank with a large gold fish, and several small guppies. The Arctic vortex has brought a severe ice storm to Oklahoma. The storm knocks down power lines and Stillwater is without power for 10 days. Because there is no wood or gas burning furnace in Pat's house, it begins to cool down eventually reaching 2ºC.

Pat's animals can have the following environmental temperature by oxygen consumption relationship →



Pat's dog drinks 250 ml per kg of body mass, while his cat drinks less, only 40 ml per kg of body mass.

Pat leaves the country for two weeks, and hires a pet sitter. Unfortunately, the pet sitter forgets to feed the fish. Pat returns to find that the gold fish has died of starvation.

A retired science teacher has planted 30 tomato plant seeds in his backyard each year for the past 3 years. He observed that some years he has taller plants with more tomatoes than other years and he wants to know why.

Dr. Sal A. Mander notices that a newly identified bacterium (*Gypdinium newsii*) is found in the small intestine of amphibians that are suffering from loss of color, loss of appetite, and malnutrition leading to death. Dr. Mander also notes that *G. newsii* is found on the wings of the small insects on which the amphibians prey. To test the relationship between the *G. newsii* and the symptoms that the amphibians exhibit, Dr. Mander feeds the amphibians the wings of the small insects. As expected, the amphibians exhibit the symptoms. Delighted, Dr. Mander submits a manuscript entitled "Theory proven, *G. newsii* kills amphibians", to the Journal of Amphibian Diseases. The reviewers criticize the paper extensively and Dr. Mander, disappointed but accepting of the need for revision, sets off to redo the work.

During the experiments, Dr. Mander notices that as the temperature in the lab decreased, the amphibians began to eat less and as the temperature increased, they began to eat more. Curious about this, Dr. Mander sealed the amphibians, individually, in small

chambers and measured the volume of gas in the chamber at various temperatures. Dr. Mander also noticed that when the salinity (salt concentration) of the water in which the amphibians were housed increased, the amphibians rapidly lost weight.

Dr. Mander houses the amphibians along with some equally sized rodents in the lab. One of each escapes into one of our recent 12^{o}F (-11^{o}C) Oklahoma winter nights.

Eukaryotic cells conduct cellular respiration within mitochondria, the organelle most likened to "the powerhouse of the cell".