

(2) If a person when breathing were perfectly efficient at extracting oxygen from the air, how much air would supply the person's daily requirement of oxygen?

From our One-page Handbook (January 1983) I take for the heat of combustion, food, or fuel, 10 kcal/g. (Remember that a "food calorie" is 1 kcal.) Then to maintain a 3000-kcal diet the daily requirement is 300 grams of fuel. If that were pure carbon, burning it to CO_2 would require 25 moles of O_2 , or approximately 3000 liters of air. That says we need the oxygen in about one liter of air for every kcal of energy obtained by oxidizing food. But of course we don't eat plain carbon. How does it work out for some reasonable assortment of fats, carbohydrates, and protein? If you look up the enthalpy of combustion to CO_2 and H_2O of these materials you will find that the yield in energy is remarkably uniform if it is expressed, not in kcal per gram of fuel, but in kcal per mole of oxygen used. I can remember it most easily as 5 eV per molecule of oxygen. This is correct within 25 percent for the complete combustion of carbon, hydrocarbons, fats, proteins, and carbohydrates. It is a useful "universal" figure and as such ought to replace the entry for heat of combustion of fuel in our One-page Handbook. I am indebted to Ralph Baierlein, who suggested the problem, for pointing this out. We conclude that the minimum requirement for almost any diet is one cubic meter of air for every thousand food calories.