International System of Units (SI)

Basic SI units:

Meter	Second	Kilogram	Kelvin	Mole
m	s	kg	K	mol

$F = ma$

Force, Newton

$$1N = 1\frac{kg \cdot m}{s^2}$$

$W = Fd$

$E_{kin} = \frac{mv^2}{2}$

Work & Energy, Joule

$$1J = 1N \cdot m = 1\frac{kg \cdot m^2}{s^2}$$

$P = \frac{F}{A}$

Pressure, Pascal

$$1Pa = 1\frac{N}{m^2} = 1\frac{kg}{m \cdot s^2}$$

$Power = \frac{\Delta W}{\Delta t}$

Power, Watt

$$1W = 1\frac{J}{s} = 1\frac{kg \cdot m^2}{s^3}$$

Homework

Below is a list of various experimentally measureable quantities:

- Universal gas constant: R=8.1 J/(mol K);
- Speed of sound in water $s \approx 1.5 \cdot 10^3$ m/c
- Room temperature: T=300 K
- Viscosity of water (at 20^0C) $\eta \approx 10^{-3}$ kg/(m · s)
- Molar mass or air: μ=29 g/mol = 0.029 kg/mol
- Price of drinking water in a water park P≈ 3.00 $/liter
- Density of water : $\rho \approx 1000$ kg/m^3

Problem 1. Use dimensional analysis to find the speed of sound in air at room temperature. It may depend on the parameters from the list above (pick three that look relevant). Remember that Joule J= kg · m^2/s^2; 'mol' is mole, and 'K' is degree Kelvin.

Problem 2. Now select 3 quantities from the list that are *physical properties* of water.. Construct a formula for certain length using only these three parameters, and compute its value. What is the physical meaning of this length?