CHAPTER 17 EXAMPLES:

• A gas consist of 10^{27} atoms at a pressure of 10^6 J/m^3 and a temperature of 300 K. It's in a container. What's the volume of the container?

Answer: 4.14 m^3 or 4140 liters.

• A certain substance melts at 100 K and has heat capacity 20 J/(kg-K). If L_f is 50 J/kg and there are 10 kg of the substance, initially at 50 K, how much heat must be added to liquify it completely?

Answer: 1.05 $\times 10^4$ J.

• A material has $\beta = 10^{-5}$/K and is initially at a density of 1000 kg/m^3. If its temperature changes by $\Delta T = 100$ K, how does its density change?

Answer: $\Delta\rho = -1$ kg/m^3, a change of 0.1%.

• A gas consists of molecules with a mass of 5.3 $\times 10^{-26}$ kg, at a pressure of 1 $\times 10^5$ J/m^3, at a temperature of 300 K. What is its density?

Answer: 1.28 kg/m^3. (The typical density of air, which is mainly O_2 and N_2, is 1.2 kg/m^3 at sea level and 15° C.