THERMAL AND STATISTICAL PHYSICS H.W № 1

Salwa Al Saleh

PROBLEM (1)

1. Having a pot of water at temperature $78°F$. How many degrees Celsius should be increased in order to make its temperature $112°F$?

2. The change in the temperature for a brass rod from $120°C$ to $50°C$ is given in Kelvin and Fahrenheit by ?

PROBLEM (2)

1. What is the SI unit of compressibility $\chi = \frac{1}{V}\frac{\partial V}{\partial p}$?

2. Two containers having identical gases, and identical volumes. However, the gas in the first container is twice as hot as the gas in the second. What is the ratio between the pressures of the gases in the two containers ?

3. If the temperature of a free (not contained) ideal gas is increased, what happens to the distances between its molecules?

PROBLEM (3)

20 Moles of a gas having a pressure of 3.4×10^5 Pa. Contained in a container with volume $0.5 m^3$. What is the temperature of that gas ?
Assume we slowly allowed the volume of the container to increase to $1.2 m^3$, keeping the temperature fixed, what is the new pressure ?
What is the name of this process?

PROBLEM (4)

What does it mean for an object to have a negative heat capacity ?

PROBLEM (5)

Recall that the ' internal' energy is linked to the temperature by :

$$E = k_B T$$

If you know the internal energy for the atomic nucleus, is on average 8 MeV, what is the corresponding temperature ?

PROBLEM (6)

A beam of light having 10^{20} photon/sec, each photon having wavelength of $240 nm$, is shed on a material that completely absorbs the light and convert it to heat.
What is the rate of which the material is heated (dT/dt) ?
knowing that the heat capacity of the material is $C = 0.129$ J/g°C.

PROBLEM (7)

A chemist having $12 g$ of Potassium Chloride KCl in a beaker, How many liters of water he should dissolve this quantity in in order to get a solution of concentration $0.5 Mol/L$?
Knowing that the atomic weights of K and Cl is given respectively by: 39.09 and 35.45 amu.