Abdelhafid Boussouf University Center - Mila Academic year 2024–2025

Institute of Natural and Life Sciences

Department of Ecology and Environmental Sciences

Module: Biophysics

Series N° 1 : States of matter

Exercise: 1

Provide the dimensions and fundamental units of the various physical quantities listed below: speed v, acceleration a, force F, area A, volume V, density ρ, energy E, pressure P, and charge q.

Exercise: 2

Initially, a perfect gas with a volume of $V_1 = 5\ m^3$ is at a pressure of $P_1 = 500$ Pa. It is compressed, while maintaining a constant temperature, to a volume of $V_2 = 2\ m^3$. What is the final pressure P_2?

Exercise: 3

1. What is the volume of 4 moles of an ideal gas if P = 3 atm and T = 300 K?
2. A gas occupies a volume of 6 m^3 at a pressure of 1 atm. What will the pressure be if the volume changes to 4.5 m^3, with the temperature remaining constant?
3. If the temperature of a gas increases from 0°C to 100°C at constant pressure, by how much will the volume change.

Given: Boltzmann constant k_B=.38×10^{-23}J/K;

Ideal gas constant R=0.082 L. atm .mol^{-1}.K^{-1}=8.31 J.mol^{-1}.K^{-1}

Exercise:4

If dry air is considered a homogeneous mixture of perfect gases with a molar mass

M=29 g/mol, consisting of 78% nitrogen (N_2) and 21% oxygen (O_2) with other gases present in small quantities, and if the pressure of the air at sea level is 1 atm, calculate at 0°C:

-The partial pressures of oxygen and nitrogen at sea level.