

# Chem11 Gases Introduction : Notes - 10

**Properties** - Unlike solids and liquids, gases have a low density, exert pressure, are compressible, and have no shape. They will easily mix with other gases to form a homogeneous gaseous solution. (e.g. air is a homogeneous mixture of 78% N<sub>2</sub>, 21% O<sub>2</sub> and 1% Ar)

**Pressure** - Pressure is the force exerted per unit area. The units are Newtons per square meter or Pascals (Pa). A large cubic block of wood with a volume of 1.0 m<sup>3</sup> and a mass of 850 kg exerts a pressure of  $(850 \times 9.8) / 1.0 = 8.3$  kPa (kiloPascals). The pressure the atmosphere exerts is 101.3 kPa at sea level. This is also called one atmosphere of pressure (atm). This pressure is due to the weight of an imaginary column of air that has the height of the atmosphere. This pressure is equal to that produced by the weight of a 10. m column of water or a 76 cm column of mercury.

**Barometer** - The mercury barometer is used to measure pressure. The average height of the Hg column is 760 mm or 760 torr at sea level. One torr equals the pressure of one mm of Hg. If the barometer is taken to the top of Mount Everest, its height will be about half of this or 380 mm. This is why breathing is difficult on the top of Mt. Everest. If the barometer is taken under water to a depth of 10. meters, the height will rise to about twice the height at sea-level or 1520 mm.

## Problems :

- 1) Give five properties of a gas.
- 2) What is the percentage of oxygen in the air ?
- 3) A brick has a mass of 3.2 kg. The dimensions of the brick are : 8.0 cm by 6.0 cm by 15 cm. When this brick is placed on each of its sides, the three pressures from smallest to largest are : a) \_\_\_\_\_ . kPa, b) \_\_\_\_\_ . kPa, c) \_\_\_\_\_ . kPa.
- 4) The pressure of the atmosphere is : \_\_\_\_\_ atm or \_\_\_\_\_ kPa or \_\_\_\_\_ torr or \_\_\_\_\_ cm of mercury.
- 5) The pressure at a depth of ten meters of water is \_\_\_\_\_ atm.
- 6) What does a barometer measure ?
- 7) How can you make a barometer ?

Answers : 1) low density, exerts pressure, no shape, compressible, mixes easily with other gases. 2) 21%, 3)a) 2.6, b) 3.5, c) 6.5, 4) 1.0,

101.3, 760, 76, 5) 2.0, 6) air pressure, 7) Take a sealed tube, about 1.0 m long and fill it with mercury. Invert this tube in a bowl of mercury. The column of mercury will be about 76 cm high and the space in the tube above the mercury will be a vacuum. The height of the column will depend on the local air pressure. (Note: This is dangerous because mercury is poisonous)