

Q- A 1 m^3 rigid closed tank contains 10 kg of water (in any phase or phases) at 150°C. What is the pressure in the tank?

Solution:

The tank is maintained at 150° C and it is not indicated that the tank is evacuated, the quantity of water is 10 kg having volume 10 L = 0.01 cubic meter means that the tank at this temperature contains water and water vapours.

As the temperature is increased the water starts boiling but as the tank is closed the vapours are not allowed to leave the tank and the pressure within the tank as well as boiling point of water increases (as in a pressure cooker). Finally, at 150° C after some time the vapours will become saturated and water at 150° C remain in equilibrium with the vapor at 150° C. In this situation the pressure within the tank is equal to saturated vapor pressure at 150° C for water.

Saturated vapor pressure of a substance varies with temperature and is determined experimentally. According to the tables S.V.P. for water at 150° C is 3569 mm of mercury, which is equal to 4.757×10^{5} Pa.

Hance, pressure in the tank is $4.757*10^5$ Pa.

INN.