

Tutorial Sheet-1

Basic Concepts of Thermodynamics

1. A barometer reads 765 mm Hg. What will be the reading of MPa?
2. Determine the absolute pressure of a fluid flowing through a pipe if the manometer reads 50 kPa gauge. Given 1 atm pressure = 101 kPa.
3. Determine the absolute pressure of a gas if the manometer reads 60 kPa (vaccum). Take atmospheric pressure = 101 kPa.
4. What should be the height of the air column to develop a pressure of 103.3 kPa on the earth's surface? For atmospheric air, take the relation $PV^{1.4} = 250,000$ valid, where P is in Pa & V is in m^3/kg .
5. A temperature scale of certain thermometer is given by

$$t = a \ln P + b$$

where a and b are constants and P is the thermometric property of the fluid in the thermometer. If at the ice point & steam point the thermometric properties are found to be 1.5 and 7.5 respectively, what will be the temperature corresponding to the thermometric property of 3.5 on Celsius scale.

6. A thermocouple with test junction at $t^\circ C$ on gas thermometer scale and reference junction at ice point gives the emf ; $e = 0.20t - 5 \times 10^{-4} t^2$ mV.

The millivoltmeter is calibrated at ice and steam points. What will be the reading on the thermometer where the gas thermometer read $70^\circ C$?

7. The specific heat capacity of the system during a certain process is given by

$$C_n = (0.4 + 0.004 T) \text{ kJ/kg-}^\circ C$$

If the mass of the gas is 6 kg & its temperature changes from $25^\circ C$ to $125^\circ C$. Find

(i) Heat transferred. (ii) Mean sp. heat of the gases.

8. A tube contains an oil of sp. gravity 0.9 to a depth of 120 cm. Find the gauge pressure at this depth (kN/m^2).
