Thermal Physics

Problem sheet 1

Each question carries 5 marks

28st September 2021

Reading Assignment 1 : First six sections of the class XII NCERT book, Chapter 12 (Thermodynamics)

Reading assignment 2: From the book Principles of Thermodynamics by N.D.Hari Dass CRC Press Section 1.1 (discusses thermometry first six pages)

1. Show that constant volume thermometers using an ideal gas as well as a van der Waals gas both yield the same temperature scale when uniform scales are adopted. Equation of state for ideal gas is $PV = nRT$ and for van der Wall gas is
$$\left(p + \frac{an^2}{V^2}\right)(V nb) = nRT$$

2. A bimetallic strip of total thickness x is straight at temperature T. What is the radius of curvature of the strip, R, when it is heated to temperature $T + T$? The coefficients of linear expansion of the two metals are $_1$ and $_2$, respectively, with $_1 >_2$. Assume each metal has thickness $x/2$, and that $x << R$.

3. Which of the following quantities are extensive and which are intensive? (a) The magnetic moment of a gas. (b) The electric field E in a solid. (c) The length of a wire. (d) The surface tension of an oil film.