

Problem 1

i) Determine Equation of State (ES) for completely degenerate extreme relativistic 3 dimensional electron gas (energies larger compared to mc^2). Take the relation between energy and momentum as

$$\epsilon(p) = cp.$$

ii) Calculate a specific heat for extreme relativistic electron gas under condition i).

iii) Determine the Equation of State for complete degenerate relativistic 3 dimensional electron gas with the relation between energy and momentum

$$\epsilon(p) = \sqrt{(cp)^2 + (mc^2)^2}.$$

Problem 2

i) Find the relations between p_F and electrons density for 2 dimensional non-relativistic electron gas

$$\epsilon(p) = \frac{p_x^2 + p_y^2}{2m}.$$

ii) Determine Equation of State for the case i).

iii) Find quantum corrections to 2 dimensional Clapeyron's equation for 2 dimensional non-interacting fermions.