

SECTION D — (2 × 10 = 20 marks)

21. (a) Derive Langevin equation of Polar-molecules.

Or

(b) Show that

(i) The momentum of charged particle in an electromagnetic field is given by

$$P = mV + A$$

(ii) The Lagrangian function of the charged particle in an electromagnetic field is given by

$$L = \frac{1}{2}mv^2 - q(\phi - V \cdot A)$$

22. (a) Derive the Rayleigh's resistance formula for Strong Scattering.

Or

(b) Show that the scattering cross-section when plane monochromatic waves are incident on

(i) free electron is $\sigma_T = \frac{8\pi}{3}r_0^2$

(ii) bound electron is $\sigma_R = \left(\frac{\omega}{\omega_0}\right)^4$

σ_T (if $\omega \ll \omega_0$).