Summary of chapter 5

Definitions include flux, transport coefficients, diffusion coefficient $D$, Fick’s Law, mobility $\mu$, ambipolar diffusion.

You should be able to

Do calculations of

Debye length $\lambda_D = \sqrt{\frac{\varepsilon_0 kT}{n_e e^2}}$, the derivation will not be examinable.

Explain sheaths and use the equations derived for planar collisionless sheaths, floating wall potential and high-voltage (including matrix) sheaths.

Do calculations of diffusion and mobility coefficients.

Neutral particles

$$D = \frac{kT}{m\nu} \quad D \approx \frac{\lambda_D^2}{\tau}$$

$$\mu = \frac{e}{m\nu}$$

Weakly ionized plasma

$$D_a = \frac{\mu_e D_i + \mu_i D_e}{\mu_e + \mu_i}$$

In magnetic field

$$D_{\perp e} \approx \frac{r_{i,e}^2}{\tau}$$