

# FYS 3610

## EXERCISES WEEK 35

### EXERCISE 1

- Calculate the scale height for normal air (~21.5% O<sub>2</sub> and 78.5% N<sub>2</sub>) at T = 293 K and for T = 243 K. Calculate the scale height for atomic oxygen at T = 2500 K.
- What is the meaning of  $\omega_B = 0$ .
- Show that equation 3.22 can be written as

$$\omega_B^2 = \frac{g}{T} \left[ \frac{\partial T}{\partial z} - \frac{\partial T}{\partial z_{|ad}} \right]$$

### EXERCISE 2

Show that the maximum ion production at a zenith-angle  $\chi$  is given as

$$q_m = q_{m0} \cos \chi$$

where  $q_{m0}$  is the ion production for  $\chi = 0$ . This equation is a scaling factor for maximum ion production.

### EXERCISE 3

Maximum ion production occur at an altitude  $z'_m$  where  $\tau = \cos \chi$  and we have that

$$z'_m = \ln \sec \chi. \text{ Show that}$$

$$z_m = z_{m0} + H \ln \sec \chi$$

This is a scale law for how the height of maximum ion production varies with zenith-angle  $\chi$ .