(2.2) What is the atomic fraction of deuterium in water with the mole fraction of 0.81 for H_2O, 0.18 for HDO, and 0.01 for D_2O?

First we define the given mole fractions of the three types of water molecules:

$$x_{H2O} := 0.81 \qquad x_{HDO} := 0.18 \qquad x_{D2O} := 0.01$$

The total number of normal hydrogen atoms in one mole of water is given by:

$$n_H := 2 \cdot x_{H2O} + 1 \cdot x_{HDO}$$

and the total number of heavy hydrogen atoms in one mole of water by:

$$n_D := 1 \cdot x_{HDO} + 2 \cdot x_{D2O}$$

From eqn. (2.2) on p. 13 we get:

$$x_D := \frac{n_D}{n_D + n_H} \qquad\qquad x_D = 0.100$$