

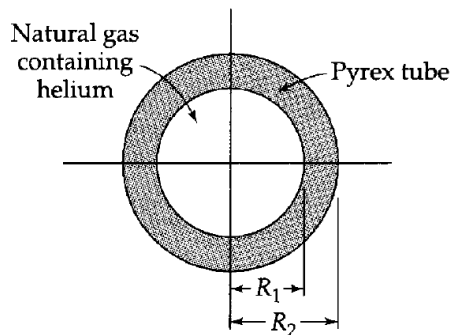
## KMÜ 427-21

### TRANSPORT PHENOMENA

#### HOMEWORK 4 (Due January 27, 2020)

1. Pyrex glass is almost impermeable to all gases but helium. For example, the diffusivity of He through pyrex is about 25 times the diffusivity of  $H_2$  through pyrex, hydrogen being the closest "competitor" in the diffusion process. This fact suggests that a method for separating helium from natural gas could be based on the relative diffusion rates through pyrex.

Suppose a natural gas mixture is contained in a pyrex tube with dimensions shown in the figure 1. Obtain an expression for the rate at which helium will "leak" out of the tube, in terms the diffusivity of helium through pyrex, the interfacial concentrations of the helium in the pyrex, and the dimensions of the tube.



**Figure 1.** Diffusion of helium through pyrex tubing. The length of the tubing is  $L$ .