

CHEM-E7130 Pre-exam
11.9.2020

Examination time is 45 min.

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1. Expand (do not solve the differential equation!) $\frac{dN}{dh} = 0$ if $N = cv - D \frac{dc}{dh}$ in cases where:

- D and v do not depend on h (1.5p)
- D and v are functions of h (1.5p)
- The above equation states that molar flux is constant along length h. c is concentration, v is velocity (m/s), and D is diffusion coefficient (m²/s). Write the result of a) in dimensionless form by using a change of variables $h=Lz$, where L is the total (physical) length (m) and z is dimensionless length. Collect all parameters (v, D, and L) together in a single dimensionless group. What does it describe? (2p)

2. Solve the following differential equation

$$\frac{dy}{dx} + ay = 0$$

- In general case by using a trial function $y=A\exp(\lambda x)$
- when $y(0)=y_0$