**Some practical questions**

1. Knowing the relationship between diffusion and viscosity (Stokes – Einstein equation):

where D – diffusion coefficient, k – Boltzmann constant. T absolute temperature (in K), r – molecular radius, – viscosity, please provide the units and estimate water viscosity at 25oC knowing that D=2.3\*10-9m2/s

1. Can the following function have a maxima or an inflection point? What should one do to reduce its increase its value for small x and decrease for large x?
2. The equation describes the water steam pressure as a function of temperature:

where

p- saturated vapour pressure at temperature t

p0 - saturated vapour pressure at temperature oC

*t* – temperature in oC

Please try to figure out whether the pressure *p* can reach saturation

1. Is it possible that diffusion coefficients follow the relationship:

where E is called and activation energy, R is referred to as gas constant and T is temperature in K?

1. The procedures applied in MRI (Magnetic Resonance Imaging) to increase the contrast between healthy and pathological tissues lead to increasing of A in the equation of point 2) and decreasing B. Let assume that A has been increased 1000 times and B has been decreased 100 times. At which x one can expect that the procedure will turn out to be beneficial (y(x) becomes larger).
2. The question reads: How many liters of a 70% alcohol solution must be added to 50 liters of a 40% alcohol solution to produce a 50% alcohol solution? Is the answer 80 liters plausible?
3. The following expression allows to predict the air pressure versus the height:

where:

p0 - reference pressure ([Pa](https://en.wikipedia.org/wiki/Pascal_(unit)))

T – air temperature (in K)

– air molar mass (0,0289644 kg/mol)

R – gas constant

T – temperature in K

Is it possible that the pressure drops by factor 2, 10 km above the zero level?

1. Is it possible that electromagnetic wave of the frequency of GHz has the length of the order of nm?
2. Knowing that the parameter B=Bo please try to figure out whether it is possible to reach o maximum of the equation of point 2 for a given x versus reciprocal temperature.
3. Two states on a streamline are linked by the following equation:

p+0.5ρv2+ρgh = const

ρ – density of the liquid

p-static pressure

h – height

g – Earth acceleration

Is it possible that in a tube of constant diameter the velocity changes by factor 2 when the high changed by 1 meter?