Exercises N7 1.04.2025 Electromechanics

7.1 Make a quantitative estimation of s_{33}^*/s_{33}, from the example in slides 31-32 (Lecture 7-1).
For your calculations use the following numerical values : $s_{33}=15\times10^{-12}m^2/N$, $d_{33}= 100pm/V$, $K_{33}=150$

7.2 A hypothetical material is made of molecules having the horseshoe shape placed in the sites of a cubic lattice, laying in the plane XY as shown in Fig.1 (a). To measure Young modulus, two samples are made from this material (Fig.1(b)). The experimental technique is following: the pressure p is applied on (001) faces, and the change in distance between these faces ΔL is measured in order to obtain Young modulus, the other 4 faces are kept mechanically free.
 The electrode configuration is following: in sample **I**, the faces parallel to (010) are electroded and electrically connected; in sample **II**, the (100) faces are electroded and connected.
Show that the measured Young moduli will be different. In which sample the Young modulus is larger?

(a)   **(b)-I**   **(b)-II**
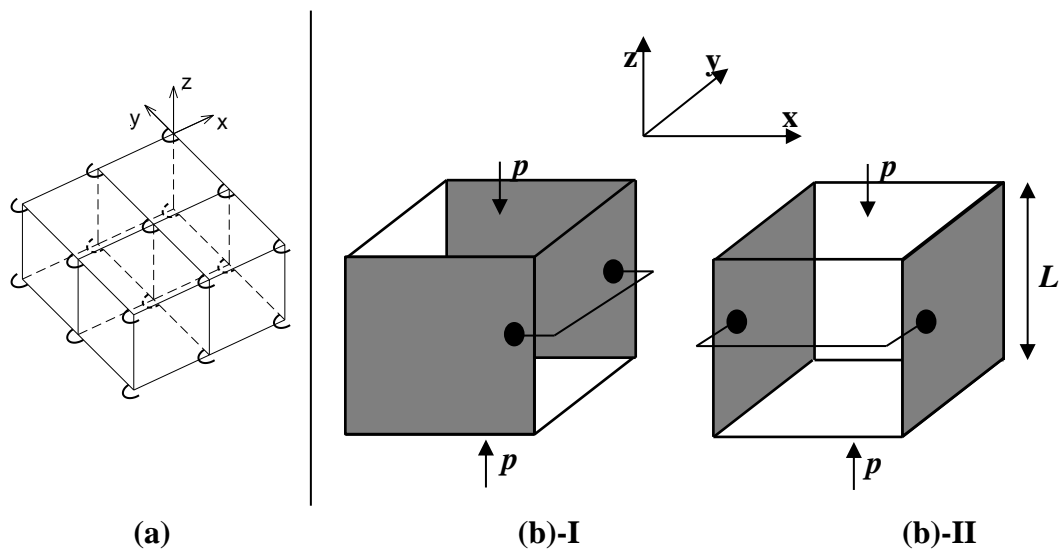
Fig.1. (a) Lattice structure of the hypothetical material. **(b)**. Samples I and II.