5. Empty sack

1) The pressure at the floor $P = p + \sigma g$, hence $\sigma L g = (p + \sigma g)c$, from which $c = L/\left(\frac{p}{\sigma g} + 1\right)$.

2) Here we provide a solution departing from the recommendations (finding the other solution is left for the reader). Let the tension of the material at some contact point with floor P_0 be T_0. Consider the energy balance of a piece of material between the points P and P_0 for a tiny virtual displacement δ, tangential everywhere to the material (thus, the shape of the material is preserved). The potential energy change (per unit length of the sack) is $\sigma\delta g x$ (because the piece of material of length δ will get from the floor to the height x); the work done equals to $(T - T_0)\delta$. The energy balance yields $T = \sigma g x + T_0$, hence $\alpha = \sigma g$.

3) The force balance between the left and right halves of the sack can be written as $T_1 + T_0 = pa$. Bearing in mind that $T_0 = T_1 - \sigma g a$, we find $T_1 = (p + \sigma g)\frac{a}{2}$.

4) The force balance between the lower and upper halves of the sack: $2T_2 + L_1\sigma g = pb$, where T_2 is the tension at the widest point, and $L_1 \approx L/2$ — is the length of the upper half. The tension T grows linearly with the height, and the widest point is approximately at the half height; hence $2T_2 \approx T_1 + T_0 = pa$. Substituting it into the first equation, we obtain $p(b-a) = L\sigma g/2$. Taking into account that the sack is almost of a circular cross-section, we write $\pi(b + a) \approx 2L$; hence, we finally obtain $\varepsilon \approx \frac{\pi g \sigma}{4p}$.