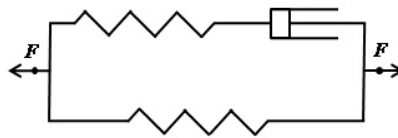


Assignment 8: Cell and Tissue Mechanics

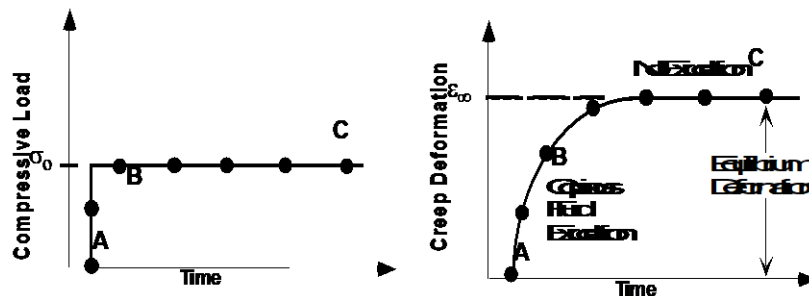
EN 585.729 Cell and Tissue Engineering

Problems

1. The Hagen-Poiseuille equation describes flow through a cylindrical tube. We discussed this in the context of blood flow but it is also applicable to respiration where air flows through cylindrical alveoli. Please use this equation to explain why breathing is so difficult for someone suffering from just mild asthma.
2. Derive the ordinary differential equation for the Kelvin viscoelastic solid (pictured below). Show **all of your work** (each step!) for full credit.



3. In lecture we discussed the biomechanics of articular cartilage and how important it is for tissue engineers to understand these mechanics in order to design successful tissue substitutes.
 - a. Based on the shape of the confined compressive load test on cartilage what type of model would you use to describe it mechanically and why?
 - b. What components (dashpots and springs...) describe the behavior shown below on the right? What phase(s) of cartilage are represented by the component(s)?



4. Over the last two weeks you've read on the use of microscale topographies (Nikkhah et al. *Engineering microtopographies to control the cell-substrate interface*). In 300 words or less please explain how microtopographies can be employed in the development of engineered tissues. What tissue properties can they influence? What cell behaviors can they control?

Rubric

Question	Component	Total Point Value
1		4
2		8
3	A	4
	B	4
4		10
	Total Point Value	30

