

BME 5210: Musculoskeletal Biomechanics

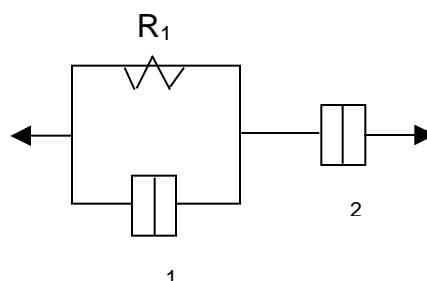
Midterm 2 Winter 2001

Name: _____

True and False

1. Type I collagen is the major constituent of tendon and cartilage. T F
2. Normal articular cartilage is “hyaline” cartilage. T F
3. The collagen structure in healthy articular cartilage is such that fibers are oriented perpendicular to the cartilage surface. T F
4. A sufficient blood supply is critical in the healing processes for tendon and ligament. T F
5. Tenocytes in healthy, mature tendons are spindle-shaped. T F
6. Type III collagen is found in tendon, ligament, or cartilage that has gone through a healing process. T F
7. The closest match for human tendon, ligament, and cartilage in terms of material properties is primate (monkey) tissue. T F
8. The collagen in tendon and ligament is arranged into groupings termed bundles. T F
9. GAGs in tendon, cartilage, and ligament provide tensile strength. T F
10. In osteoarthritis the endpoint of the disease is complete loss of the articular cartilage and painful bone-to-bone contact. T F
11. Superficial fissures (cracks) in the articular cartilage surface located in areas with low force loading are unlikely to propagate (worsen). T F
12. The bone under cartilage is termed subarticular bone. T F
13. Human cartilage relaxes faster than rabbit cartilage under an applied constant deformation. T F
14. When articular cartilage lesions heal, the tissue that is formed is usually fibrocartilage. T F

15. The long chain proteoglycan molecule in articular cartilage provides strength by attempting to expand against the restraining collagen fiber network. T F
16. The primary collagen fiber orientation in meniscus is the circumferential direction. T F
17. The major constituent of meniscus is elastin. T F
18. The meniscus of the knee functions by converting compressive loads in the joint to annular (circumferential) loading in the meniscus. T F
19. Mechanical tests performed at higher strain rates increase the stiffness of the material. T F
20. If a soft tissue's mechanical response can be characterized by a Kelvin model, its response to an instantaneous applied strain (which is then held constant) is a force that is initially high but then decays to a lower force, T F
21. The triphasic theory takes into account contributions of fluid, solid, and ionic charge to the total mechanical response. T F
22. The quasi-linear viscoelastic theory allows the time dependent and strain dependent portions of the mechanical response to be separated. T F
23. Structural models for tendon and ligament generally describe the tensile response of the tissue but do not address the time varying quality of that response. T F
24. In biphasic theory the stress in the solid does not depend on the fluid pressure in the tissue. T F
25. The effective stress is the portion of stress in the solid that produces deformation in the solid. T F
26. A ligament's mechanical response is to be characterized by the model sketched below. Obtain the differential relationship between the stress and strain for this model.



27. Explain why tendon and ligament have a toe region in their mechanical response. (Hint: Explain what is meant by a toe region, theories for what produces this response and physiologic relevance)

28. Calculate the pressure in a cartilage specimen under purely axial loading when the total applied stress is 28 MPa and the stress in the solid is 15 MPa. Assume $\nu_s = .75$

29. Explain how each of the following biological factors affects the mechanical properties of tendons/ligaments.

a. Aging

b. Immobilization

c. Maturation

30. Name 4 factors that can contribute to a variation of the tensile modulus in articular cartilage.