

Assignment

Course Title: **Biomechanics And Ergonomics I**
DPT 2nd semester section B
Instructor: Dr. Shahzeb

ID:16121

Name: **Muhammad Zavyar Khan**

- **Q1: Explain “Biomechanics of Articular cartilage”**
Ans:ARTICULAR CARTILAGE:
- It is a poroelastic biological material that allows the distribution of mechanical loads and joint movements.

Function of articular cartilage:

- . Distributes joint load over a wide area , decreasing the stresses sustained by the contacting joint surface .
- . Allow relative movement of the opposing joint surface with minimal friction and wear.
- . Minimize peak stresses on subchondral bone
- . Surface roll or slide during motion
- . Provide a friction reducing weight bearing surface with friction coefficient of 0.0025

Function within a contact pressure range 2- 11 MPa

Type of cartilage:

Type	Appearance	Location
Hyaline	Glassy , smooth	Covers long bones , growth plates

Fibro	Dense	Inter vertebral disk , meniscus
Elastic	Yellow , opaque	Epiglottis, eustachian tube.

Biomechanics composition of articular cartilage:

- .Extracellular matrix
- .Proteoglycan (5-10%)
- .Collagen (10-20%) type I
- .Water , (68- 85%)

The Mechanical properties of articular cartilage depend on its extracellular matrix ,but the existence and maintenance of matrix depend on chondrocytes.

Q 2 : Explain “ Biomechanics of Tendon and Ligaments?:_

Tendon:

- .Tendon connect muscle to bone.
- .Tendon consists of bundle of collagenous fiber arrange in parallel.
- .Origin at muscle , crosses at least one joint and insert in bone.
- .Offer greater tensile strength.

Ligament:

- .Ligament connect bone to bone
- .Ligament consist mostly of bundle of elastin molecule formed into elastic fiber with some bundle of collagen .
- .Origins and insert into bone
- .More elastic and flexible than tendon
- .Offer less tensile strength.

Composition :

Component	Ligament	Tendon
Fibroblast	20%	20%
water	60-80%	60-80%
Solids	20-40%	20-40%
Collagen	70-80%	Slightly higher
Type I	90%	95-99%
Elastin	Up to 2x collagen	Scarce
Ground substance	20-30%	Slightly lesser

Anatomical position of tendon :

Tendon:

- .Tendon contain collagen fibrils Type 1
- .Tendon contain a proteoglycan matrix

.Tendon contain fibroblasts that are arranged in parallel rows

Type 1 collagen :

86% of tendon dry weight

Glycine (33%)

Proline (15 %)

Hydroxyproline (15%)

Anatomical position of ligament :

.Similar to tendon in hierarchical structure

.Collagen fibrils are slightly less in volume fraction

.Higher percentage of proteoglycan matrix than tendon

.Fibroblasts

Function:

Tendon :

Tendon carry tensile force from muscle to bone

They carry compressive force when wrapped around bone like a pulley.

They facilitates skeletal muscle movement

Proprioception

Secondary function : storage of energy

Ligament:

- .It maintain correct bone and joint geometry.
- .Ligament + associated joint capsule combinely functions as passive joint stabilizer.
- .Secondary function: proprioception.