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**DPT 2nd Semester**

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**Assignment: Biomechanics & Ergonomics**

**Submitted To: Dr.Shahzeb**

Q1: Explain “Biomechanics of Articular cartilage”.

***Answer:***

**Biomechanics of Articular cartilage:**

Introduction:

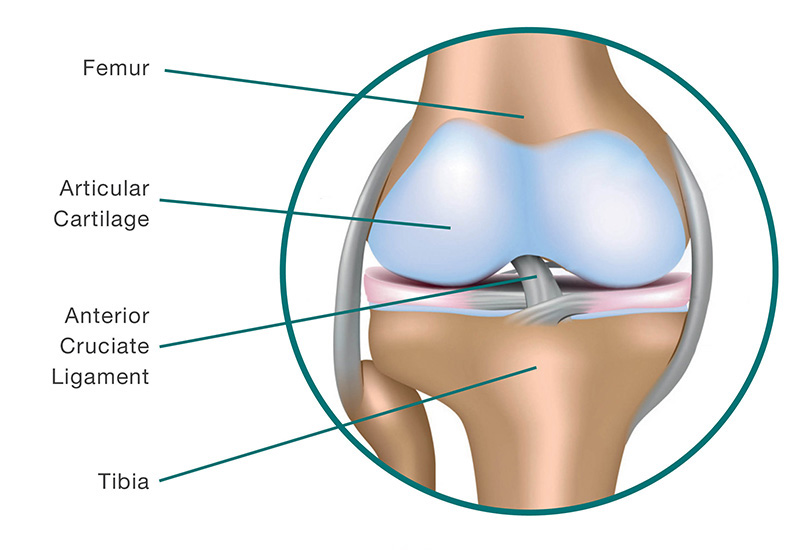
* Articular cartilage is found in synovial joints.
* Articular cartilage functions:
* It increases the load distribution area.
* It allow movement while reducing friction and wear.

Articular cartilage Composition:

* Articular cartilage is multiphasic.
* Matrix of collagen and proteoglycan (25%).
* Free interstitial fluid (75%).
* Ion phase.

**Biomechanical Behaviour Of Articular Cartilage:**

* Cartilage treated as a biphasic material with
* Interstitial fluid phase.
* Porous-permeable solid phase.
* Cartilage is highly stressed material.
* To understand cartilage response to stress
* Intrinsic mechanical properties must be determined.
* Compression,tension and shear are considered.
* Intrinsic material properties and resistance to flow of solid matrix define interstitial fluid pressurization.
* Interstitial fluid pressurization influences
* Load bearing capacity.
* Lubrication capacity.



Q2: Explain “Biomechanics of Tendon and Ligament”

***Answer:***

**Biomechanics Of Ligaments:**

* Ligaments are viscoelastic structures with unique mechanical properties.
* The ligaments are plaint and flexible.
* Allowing natural movements of bones to which they attach, but are strong and in-extensible so as to offer suitable resistance to applied forces.
* Sustain chiefly tensile load during normal and excessive load.
* When injury happens, the degree of damage is related to the rate of loading as well as the amount of load.

**Factor That Effect The Biomechanical Properties Of Ligaments And Tendons:**

* Maturation and aging .
* Pregnancy.
* Mobilization and immobilization.
* Diabetes mellitus .
* Non steroidal anti – inflammatory drugs .
* Comorbidities .

**Biomechanics of Tendon :**

* Tendon is a highly organized connective tissue joining muscle to bone, capable of resisting high tensile forces while transmitting forces from muscle to bone.
* The dense, regularly arranged collagenous tissue is made up of fibers, cells of various shapes and ground substance.
* The mechanical and physiological characteristics of collagen (nearly 85% of the dry weight of tendon) dictate the qualities of tendon.
* In addition, tendon is flexible so that it can bend at joints, as well as acting as a damping tissue to absorb shock and limit potential damage to muscle.
* Tendon also shows a degree of flexibility. If the strain used to stretch a tendon could be recovered, a beneficial elastic effect would be achieved. Muscles lengthen and shorten in a cyclical manner. During the lengthening period, elastic energy can be stored and used as elastic recoil.
* For example:
* The Achilles tendon is stretched late in the stance phase as the triceps surae muscles contract and the ankle dorsiflexes.
* Prior to plantarflexion, muscle activation ceases and stored energy helps to initiate planter flexion.

**Biomechanical Effects:**

* Exercise strengthens tendons.
* Immobilisation has detrimental effects.
* Tensile strength decrease with age.
* Strength varies with hydration,PH & temperature.