

## Final-Term Assignment

Course Title: Biomechanics And Ergonomics I

DPT 2<sup>nd</sup> semester section B

Instructor: Dr. M .Shahzeb khan (PT)

Marks: 50

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### Note:

- Attempt all questions, all questions carry equal marks.
- Answer Briefly and to the point, avoid un-necessary details

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**Q1: (A) What is Humeroulnar Joint? Explain different movements at HU joint.**

**Answer:**

**Humeroulnar Joint:**

The humeroulnar joint (ulnohumeral or trochlear joint) is part of the elbow joint. It is composed of two bones, the humerus and ulna, and is the junction between the trochlear notch of ulna and the trochlea of humerus. It is classified as a simple hinge joint, which allows for movements of flexion extension and circumduction.

.It faces anteriorly and downward 45 from the shaft of humerus.

The concave trochlear fossa, on the proximal end, faces upward and anteriorly 45 from the ulna.

**Movements of humeroulnar Joint:**

The primary motion of this articulation is flexion and extension.

There is also slight medial and lateral sliding of the ulna, allowing the full elbow range of motion(ROM).

**(B) What is Humeroradial joint? Explain different movements at this joint**

**Answer:**

**Humeroradial joint:**

The humeroradial articulation is a hinge pivot joint, the laterally placed spherical capitulum at the distal end of the humerus is convex. The concave bony partner, the head of the radius, is at the proximal end of the radius.

**Movements of Humeroradial Joint:**

The movements of humeroradial joint are;

Flexion

Extension

Pronation

Supination.

**(C) What is carrying angle? Why it is important.**

**Answer: Carrying angle:**

The angle formed between the axis of humerus and the longitudinal axis of forearm.

In men it is 5 degree while in women it is 10 degrees, this is because due to the wider pelvis in women's.

**Cubitus Valgus:**

Increase in carrying angle.

**Cubitus valgus:**

Decrease in carrying angle.

**Q2: (A) What is Wrist complex? Explain joints, contribution and ROM of wrist complex**

**Answer:**

**Wrist Complex:**

- The wrist (carpus) consists of two compound joints:
- 1. radiocarpal joints
- 2. midcarpal joints

**The radiocarpal joints is composed of**

the radius and the radioulnar disk, with the scaphoid, lunate, and the triquetrum.

**The midcarpal joint** is composed of the scaphoid, lunate, and triquetrum with the trapezium, the trapezoid, the capitate, and the hamate

**Contribution:**

The major contribution of the wrist complex

- 1. to control length-tension relationships in the multi articular hand muscles
- 2. allow fine adjustment of grip
- 3. The wrist muscles appear to be designed for balance and control
- The adjustments in the length-tension relationship that occur at the wrist cannot be replaced by compensatory movements of the shoulder, elbow, or forearm (radio ulnar joint).

**Range of motion:**

The wrist complex is biaxial motions of extension/flexion

- ulnar deviation/radial deviation.
- Pronation / supination may found especially at the radiocarpal joint
  
- Normal ranges are
- 65 to 85 of flexion,
- 60 to 85 of extension,
- 15 to 21 of radial deviation,
- 20 to 45 of ulnar deviation.

(B) What is carpal Tunnel syndrome?

**Answer:**

**Carpal Tunnel Syndrome:**

When the median nerve becomes compressed within the carpal tunnel, a neuropathy known as carpal tunnel syndrome (CTS) proposed that the proximal edge of the TCL (Transverse Carpal Ligament) is the most common site for wrist flexion induced median nerve compression.

- When the TCL is cut to release median nerve compression, the carpal arch may widen.

**Q3: (A)** Write down definitions of Muscle Twitch, summation and Refractory period.

**Answer:**

***Muscle twitch:***

The mechanical response of a muscle to a single stimulus of its motor nerve is known as twitch.

the fundamental unit of recordable muscle activity

**Summation** occurs as successive stimuli are added together to produce a stronger muscle contraction.

When mechanical responses to successive stimuli are added to an initial response, the result is known as summation”

●***Refractory Period:***

If a second stimulus occurs during the latency period of the first muscle twitch, it produces no additional response and the muscle is said to be completely refractory

The greater the frequency of stimulation of the muscle fibers, the greater the tension produced in the muscle as a whole

**(B) Explain Types of Muscle contraction with example in your own words**

**Answer:**

**Types of Muscle Contraction:**

Following are the types of muscle contraction,

**Isometric:** A muscular contraction in which the length of the muscle does not change.

**2. isotonic:** A muscular contraction in which the length of the muscle changes. Or The tension is constant throughout a range of joint motion

Isotonic muscle contraction in the truest sense does not exist in the production of joint motion (Kroll, 1987)

**b)eccentric:** An isotonic contraction where the muscle lengthens.

**c)concentric:** An isotonic contraction where the muscle shortens.

**3. Isoinertial contraction ....**

When a constant external load is lifted

**(C) In Grade III muscle strain why we can't feel pain?**

**Answer:**

in grade three muscle strain we can't feel pain or minimum pain because in grade three because the nerve fibres also cut off with the severe strain.

The nerve fibres are also cut off because of it the sensation connection is also damaged due to which we cannot get the sensation because of this we feel no or less pain.

**Q4: (A) What is difference between cranial and spinal nerve? How ventral and dorsal ramus form from ventral and dorsal root?**

**Answer:**

**Cranial nerve:**

- Those nerve which originate from brain called cranial nerve.
- We have 12 pairs of cranial nerves.

**Spinal nerves:**

- Those nerve which originate from spinal cord.
- We have 31 pairs of spinal nerve.
- From spinal cord two root originate one ventral and one dorsally, root on ventral or anterior side is called ventral root and root on dorsal or posterior side is called dorsal root.

Dorsal root has ganglion, The dorsal **root** is the afferent sensory **root** and carries sensory information to the brain.

- The ventral **root** is the efferent motor **root** and carries motor information from the brain.
- These two roots ventral and dorsal unite and form spinal nerve.
- Each spinal nerve give rise to ventral and dorsal ramus.

**(B) What is difference between Neuropraxia, Axonotmesis and Neurotmesis?**

**Answer**

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**Neuropraxia:** is a type of peripheral nerve injury, and is known as the mildest form of nerve injury. It is classified as a transient conduction block of motor or sensory function without nerve degeneration, although loss of motor function is the most common finding.

Seddon(1942) coined the term 'neurapraxia' to describe a reversible physiological nerve conduction block in which there is loss of some types of sensation and 'muscle power, followed by spontaneous recovery after a few days or weeks. It is due to mechanical pressure causing segmental demyelination and is seen typically in 'crutch palsy', pressure

paralysis in states of drunkenness ('Saturday night palsy') and the milder types of tourniquet palsy.

### **Axonotmesis:**

The second degree in which the axon is damaged but the surrounding connecting tissue remains intact is called **axonotmesis**

- severe form of nerve injury, seen typically after closed fractures and dislocations. There is loss of conduction but the nerve is in continuity and the neural tubes are intact. Distal to the lesion, and for a few millimetres backward, axons disintegrate and are resorbed by phagocytes.
- This degeneration is called wallerian degeneration (named after the physiologist, Augustus Waller, who described the process in 1851)

### **Neurotmesis:**

The last degree in which both the axon and connective tissue are damaged is called **neurotmesis**

- neurotmesis meant division of the nerve trunk, such as may occur in an open wound. It is now recognized that severe degrees of damage. If the injury is more severe, whether the nerve is in continuity or not, recovery will not occur. As in axonotmesis, there is rapid wallerian degeneration, but here the endoneurial tubes are destroyed over a variable segment.

## **Q5: (A) What is Wolf's Law?**

### **Answer:**

#### **Wolff's law:**

was proposed in 1892 by Julius Wolff, a German anatomist and surgeon. It states that bone grows and remodels in response to the forces that are placed upon it in a healthy person. After an injury to a bone, placing specific stress in specific directions to the bone can help it remodel and become normal, healthy bone again.

*Wolff's law* states that bones develop a structure most suited to resist the forces acting upon them, adapting both the internal architecture and the external conformation to the change in external loading conditions.

**(B) How fracture repair? Explain different stages of fracture repair.**

**Answer:**

While some bones can heal by wearing a cast, others may require more invasive treatments, such as **bone fracture repair**. **Bone fracture repair** is a **surgery** to **fix** a broken **bone** using metal screws, pins, rods, or plates to hold the **bone** in place.

**Different stages of fracture repair:**

**Stage 1**

Immediately after the fracture, extensive bleeding occurs. Over a period of several hours, a large blood clot, or fracture hematoma, develops.

B. Bone cells at the site become deprived of nutrients and die. The site becomes swollen, painful, and inflamed.

**Stage 2**

Granulation tissue is formed as the hematoma is infiltrated by capillaries and macrophages, which begin to clean up the debris.

B. Some fibroblasts produce collagen fibers that span the break, while others differentiate into chondroblasts and begin secreting cartilage matrix.

- Osteoblasts begin forming spongy bone.
- This entire structure is known as a fibrocartilaginous callus and it splints the broken bone.

**Stage 3**

Bone trabeculae increase in number and convert the fibrocartilaginous callus into a bony callus of spongy bone. Typically takes about 6-8 weeks for this to occur.

**Stage 4**

During the next several months, the bony callus is continually remodeled.

B. Osteoclasts work to remove the temporary supportive structures while osteoblasts rebuild the compact bone and reconstruct the bone so it returns to its original shape/structure.