The Muscular System (Myology)

Comprehensive Study Guide & Exam Analysis

Subject: Myology is the study of muscles.

Goal: To understand the classification, structure, and function of the muscular system based on the strict university curriculum.

Note: This guide uses the official course text. Yellow highlights indicate past exam questions;Green highlights indicate high-yield study facts.

Introduction & Physiological Properties

Definition:

The muscular system is formed by contractile organs called muscles.

Role:

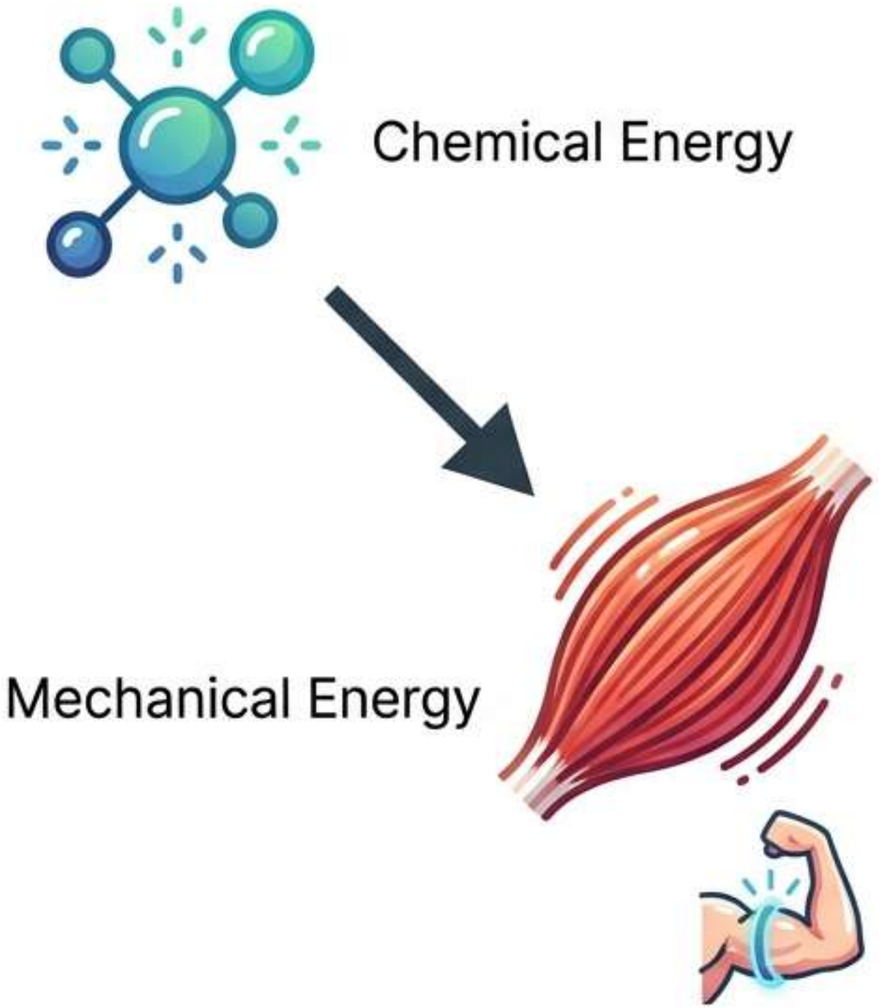
Main role is the transformation of chemical energy into mechanical energy: muscle contraction.

Properties:

Muscles have specific properties [Ref: Q10]:

- **Excitabilité** (Excitability)
- **Elasticité** (Elasticity)
- **Tonicité** (Tone)
- **Contractilité** (Contractility) [Ref: Q10]

(Note: Rigidité is NOT a property) [Ref: Q10]



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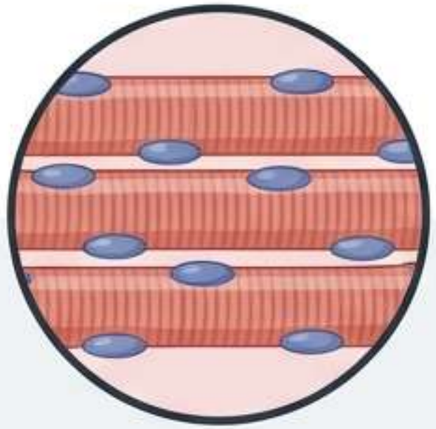
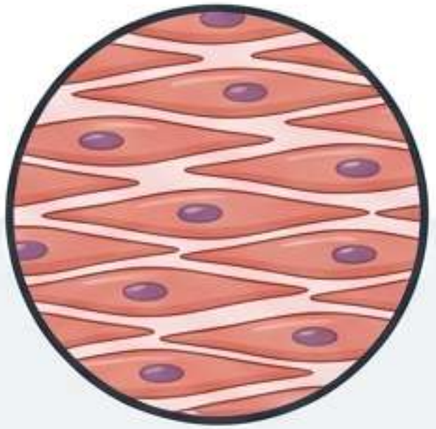
Classification of Muscle Tissue



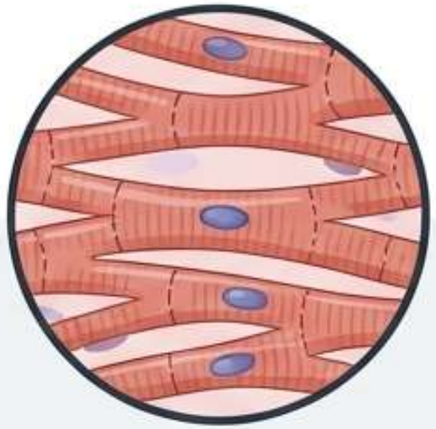
Muscle Strié (Striated Muscle)

- Red, voluntary, and contracts quickly [Ref: Q1].
- Controlled by the central nervous system.
- Attached to bones (skeletal) or attached to the skin (cutaneous/peauciers) [Ref: Q8].
- Accessory (eyes, tongue).



Muscle Lisse (Smooth Muscle)

- No striations, found in walls of viscera (digestive tract, bladder, arteries) [Ref: Q1, Q5, Q8, Q11, Q12].
- White, involuntary [Ref: Q5].
- Contracts less rapidly than skeletal muscles, but contraction lasts longer [Ref: Q1, Q5].
- Muscles of vegetative life.



Le Muscle Cardiaque (Cardiac Muscle)

- Forms the contractile wall of the heart.
- It is striated (like skeletal muscles) [Ref: Q6, Q7, Q8, Q12].
- Cells are branched.
- It is involuntary, controlled by the autonomic nervous system [Ref: Q7, Q12].

Skeletal Muscle: Generalities

Attachment:

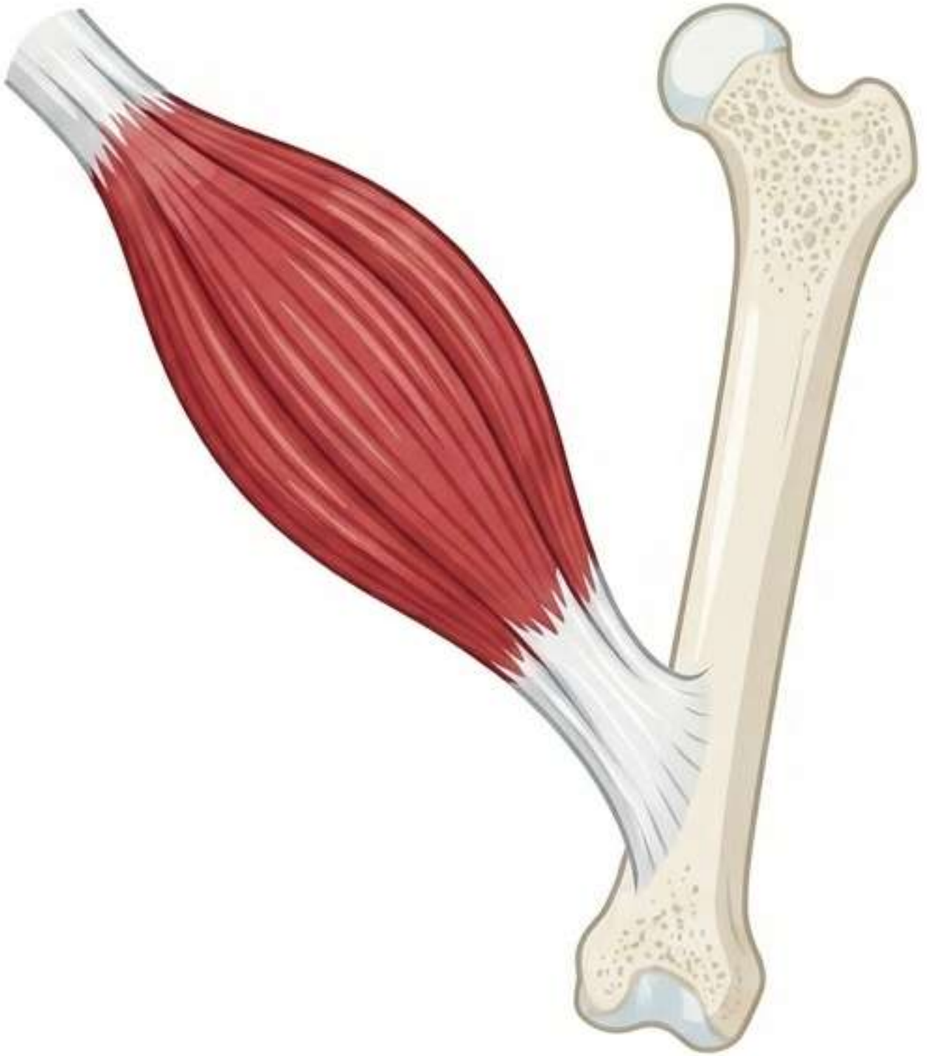
Attached to the skeleton [Ref: Q1] or to the skin (muscles peauciers) [Ref: Q6, Q8, Q9].

Quantity:

Their number is around 600 [Ref: Q13]

Weight:

They represent 40% of body weight. [Ref: Q7]



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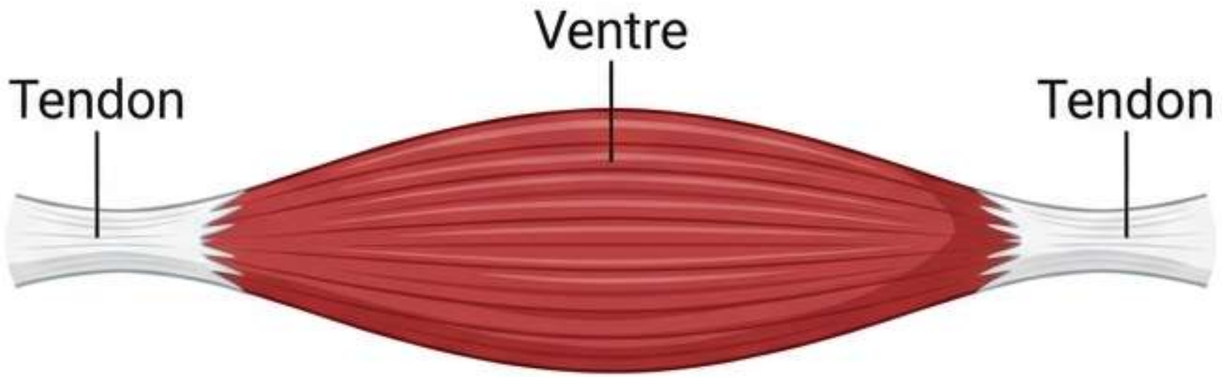
Macroscopic Constitution



The skeletal muscle has a body (belly) and two ends (tendons).

Le Corps (The Body):

- Fleshy and contractile [Ref: Q3].
- Formed by muscle fibers or myocytes.

Les Tendons (The Ends):

- Fibrous ends formed by collagen fibers (connective tissue) [Ref: Q3].
- Attach the muscle to the bone [Ref: Q4].

(Note: Tendons are NOT contractuelle) [Ref: Q4].

Microscopic Structure & Connective Layers

The Functional Unit:

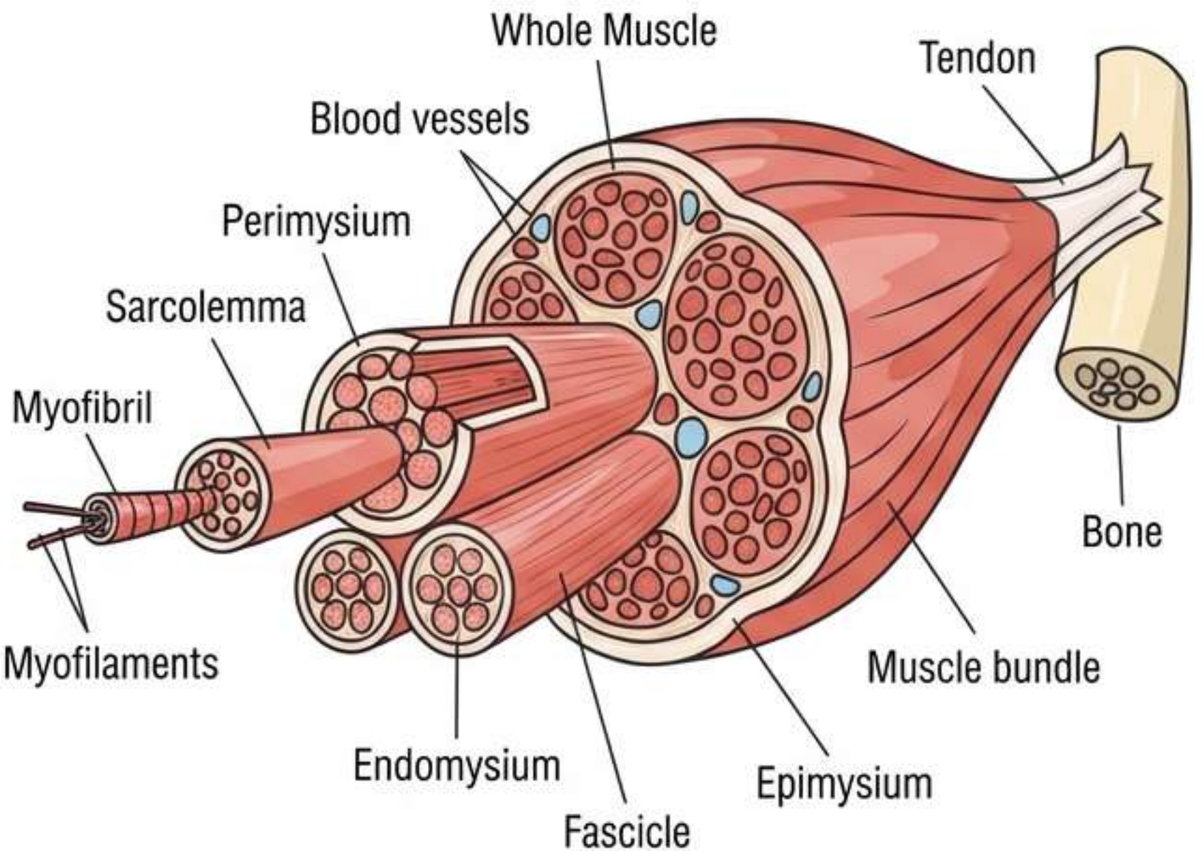
- The muscle fiber (myocyte) is the functional unit of the muscle [Ref: Q4].

Structure:

- The fiber is formed by myofibers [Ref: Q3] surrounded by a connective membrane: the **sarcolemma**.

Connective Layers (Wrapping):

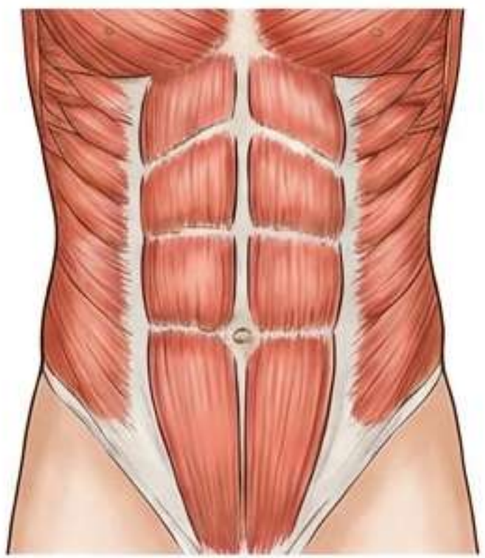
- **Perimysium**: Connective layer surrounding bundles of fibers.
- **Epimysium**: Envelops the whole muscle (continuous with muscle fascia).



Muscle Types: Simple vs. Compound

Simple Striated Muscles:
Have one belly and two ends.

Compound Striated Muscles:
Have several fleshy bodies.



Digastric: With two bellies (*di* = two) and an intermediate tendon [Ref: Q3, (Example: the digastric muscle).

Polygastric: With several bellies and intermediate tendons [Ref: Q13]. (Example: rectus abdominis muscle).

Juxtaposed: Side by side with two or more heads at one end and a common tendon (Example: biceps muscle).

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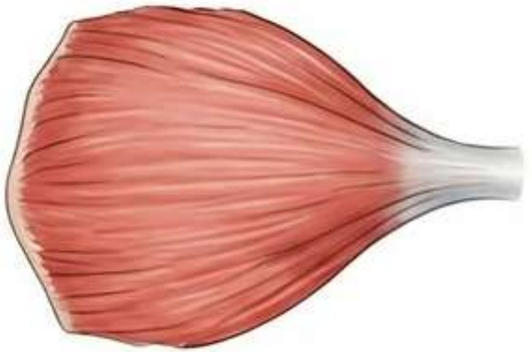
Shape Classification: Long & Flat Muscles

Muscles Longs (Long Muscles)

- **Dimensions:** Longer than they are wide or thick.
- **Shape/Location:** Superficial, spindle-shaped (fusiform), and multi-articular [Ref: Q6].
- In fusiform muscles, fibers converge toward the end of the tendon [Ref: Q2].

Muscles Plats (Flat Muscles)

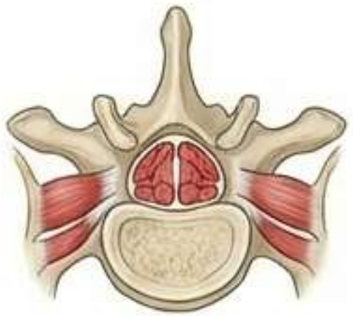


- **Dimensions:** Longer and wider than they are thick.
- **Location:** Walls of the trunk (quadrilateral, diamond-shaped) or root of limbs.
- In flat muscles, fibers are parallel [Ref: Q2].

  (Example: Grand fessier / Gluteus maximus is a flat muscle [Ref: Q9]).

Shape Classification: Short, Annular & Geometric

3. Muscles Courts (Short Muscles)

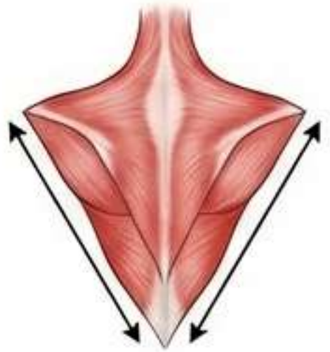


- **Dimensions:** All three dimensions are reduced.
- **Location:** Deep, located near a joint.
- **Function:** It is mono-articular [Ref: Q4]. (Example: Muscles of the hand are short muscles [Ref: Q9]).

4. Muscle Annulaire (Annular)

- Circular and surrounds orifices (Example: orbicularis oris muscle [Ref: Q9]).

5. Geometric Shape

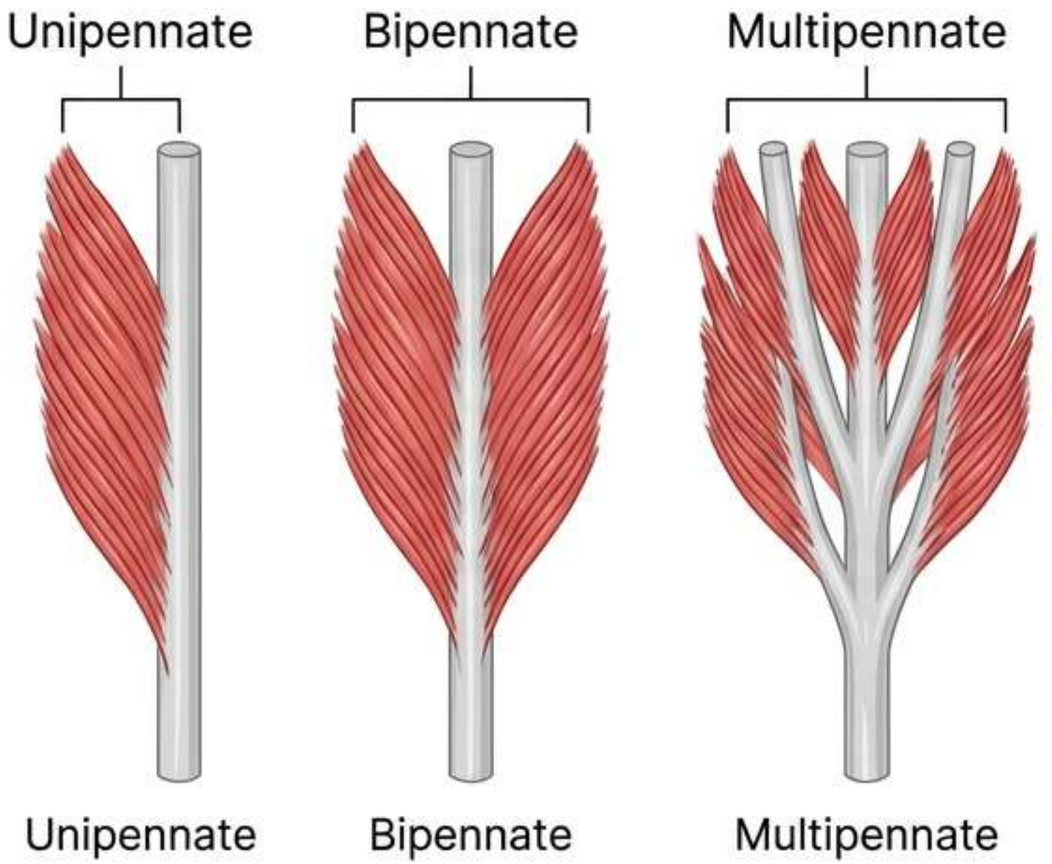


- Trapezoid, square, triangle.

Arrangement of Fascicles (Pennation)

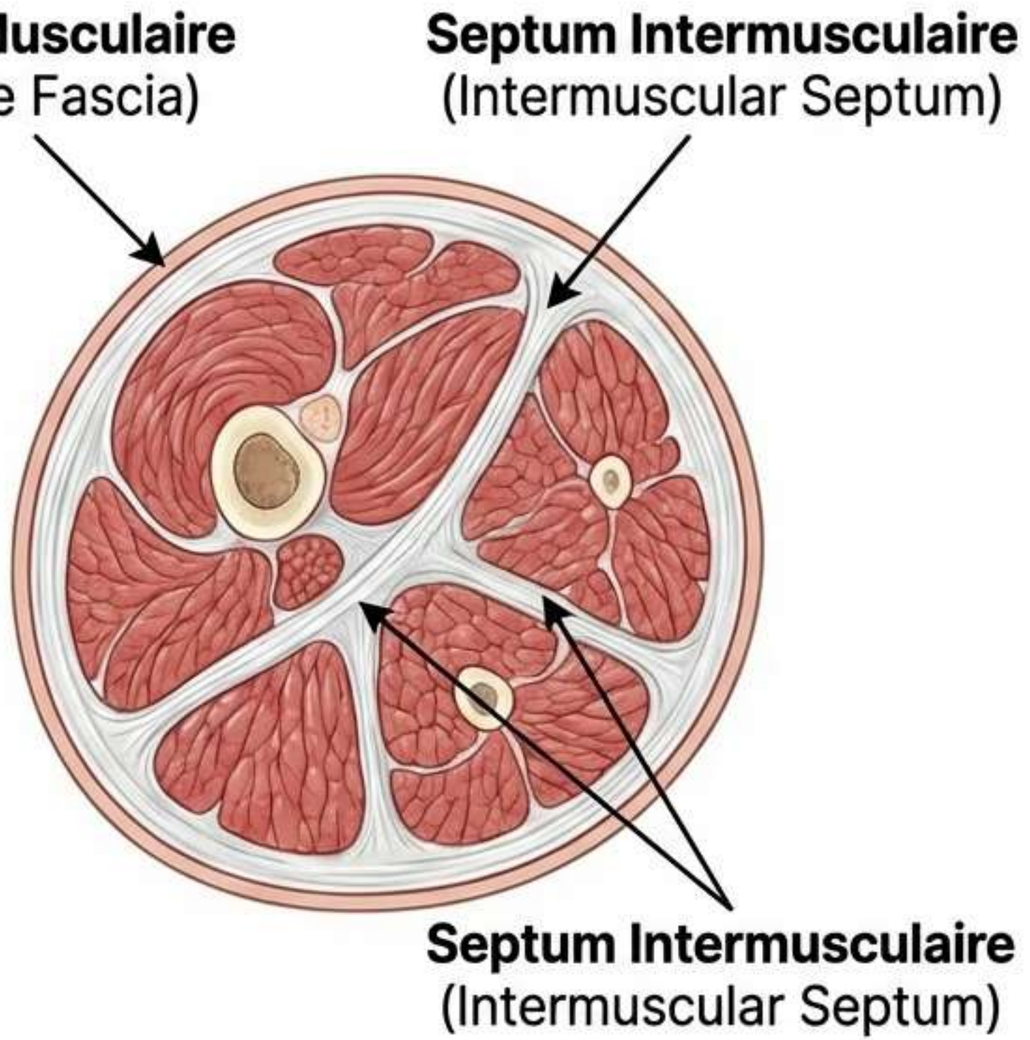
Classified by the relationship of fibers to the tendon:

- **Flat Muscle:** Fibers are parallel, in extension of the tendon.
- **Fusiform Muscle:** Fibers converge toward the end of the tendon.
- **Unipennate:** Fibers attach to the lateral side of a tendon.
- **Bipennate:** Fibers attach to both sides of a tendon.
- **Multipennate:** Fibers attach to sides of subdivisions of a tendon.



💡 **Key Exam Fact**
In a **penniform muscle**, the muscle fibers are **oblique** [Ref: Q6].

Annexed Structures I: Fascia & Septa



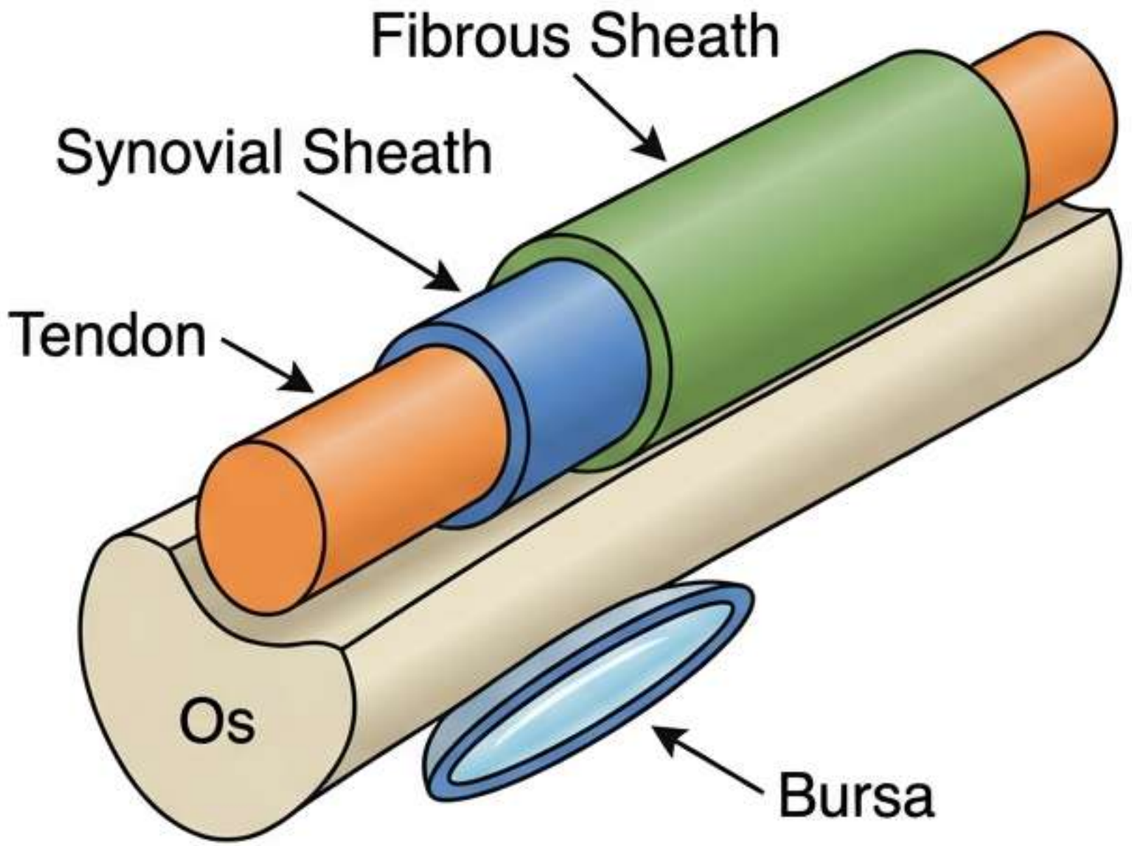
Fascia Musculaire

- Connective tissue that surrounds and inscia
  surrounds and supports muscles.
- Provides structure, flexibility, and facilitates movement.
- Covers the muscle and reinforces its insertion [Ref: Q2].

Septum Intermusculaire

- A partition that separates muscle groups.

Annexed Structures II: Sheaths & Bursae



Gaines (Sheaths)

- **Synovial Sheath**: A serous membrane that surrounds certain tendons [Ref: Q2]. (Note: It does NOT surround the whole muscle, only the tendon).
- **Fibrous Sheath**: A fibrous membrane that encases the tendon [Ref: Q2], forming an **osteofibrous canal** with the bone for the tendon to slide.

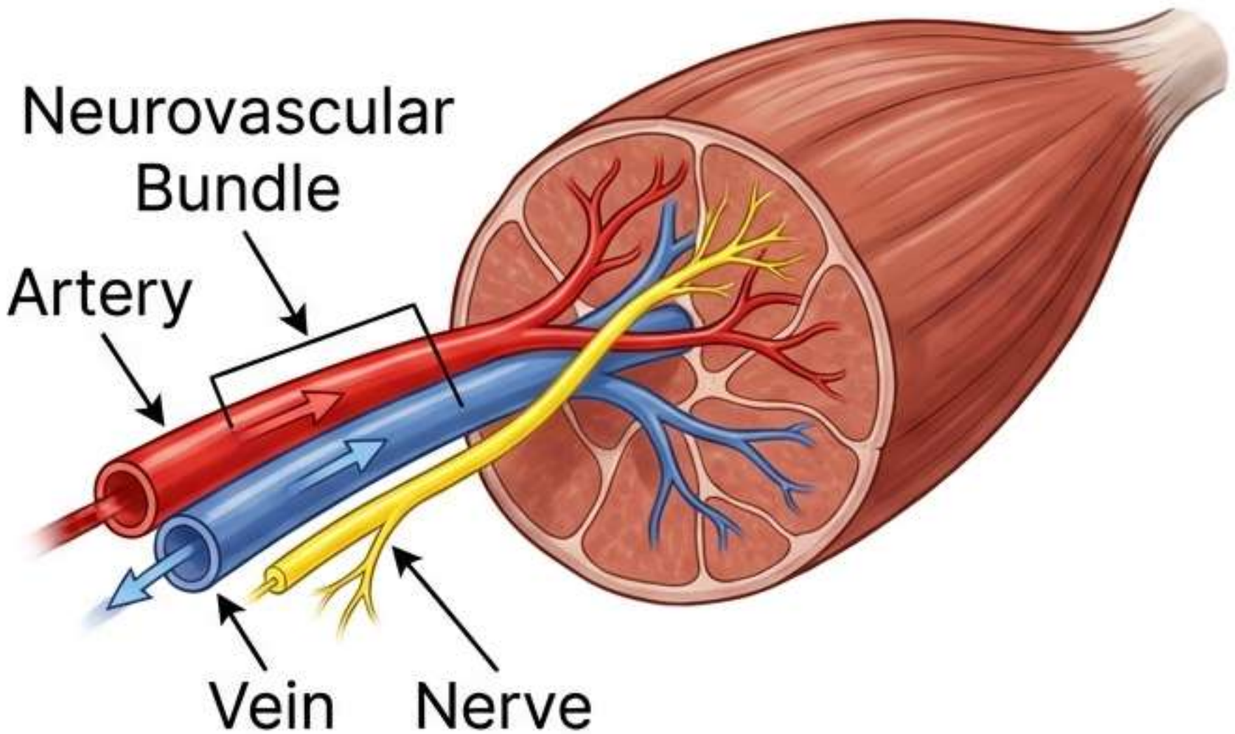
Retinaculum

- Broad fibrous membrane holding tendons in place.

Bourse Synoviale (Synovial Bursa)

- Connective sac filled with synovial fluid. Allows the muscle to slide.

Vascularization & Innervation



Vascularization

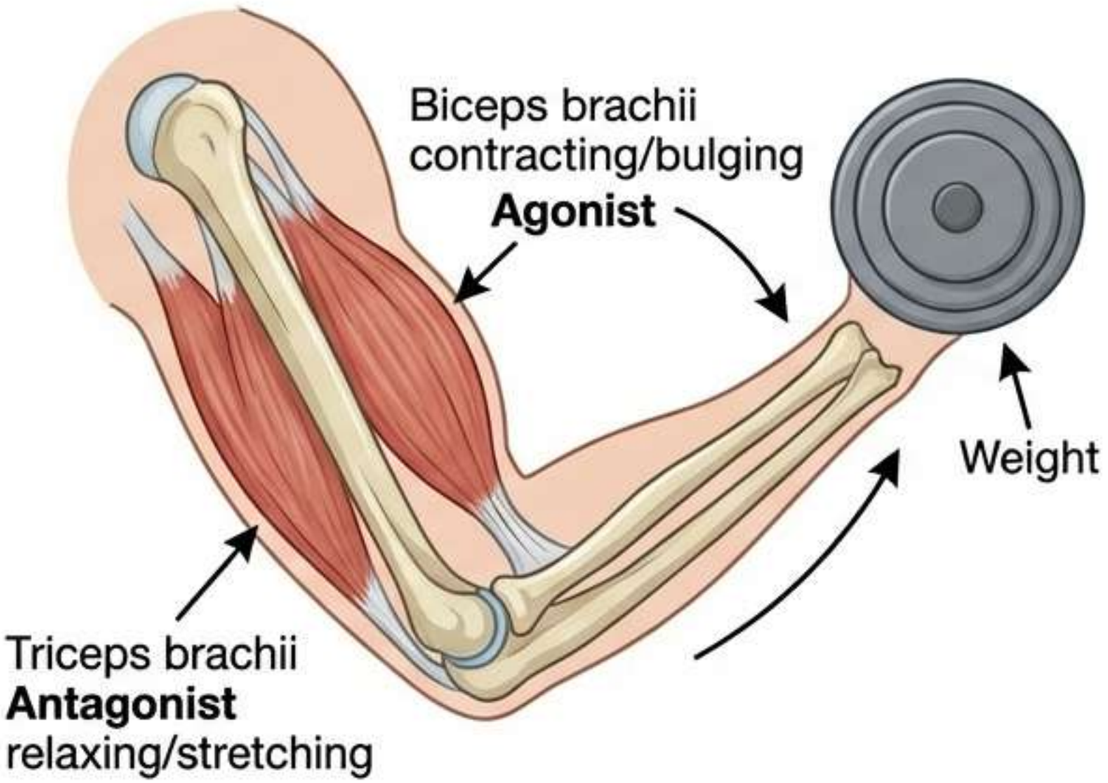
- Arteries and veins are in close proximity.

Innervation

The innervation is mixed:

- Motor
- Sensory
- Vegetative (Autonomic)

Functional Anatomy of Skeletal Muscles



Role:

Transformation of chemical energy into mechanical energy (Contraction).

Functional Classification:

- **Agonist**: The main mobilizing muscle; causes the movement.
- **Antagonist**: Opposes or provides the opposite movement (e.g., Flexion – Extension).
- **Synergistic**: Partial antagonist that neutralizes or suppresses an undesirable action.
- **Fixator**: Muscle that stabilizes a joint.

Exam Analysis: Common Traps & Key Numbers

⚠️ Top Exam Traps to Avoid

- **Cardiac Muscle**: It is **Striated** but **Involuntary**. (Do not confuse with Smooth or Skeletal) [Ref: Q7, Q8, Q12].
- **Viscera Walls**: Formed by **Smooth** muscle, NOT Striated [Ref: Q1, Q5].
- **Tendons**: Made of **Collagen** (Connective tissue), NOT muscle fibers [Ref: Q3].
- **Digastric**: Means **Two** bellies (Di = 2) [Ref: Q3, Q12].
- **Short Muscles**: Are **Mono-articular** [Ref: Q4].

📊 Key Numbers

- **600**: Approximate number of skeletal muscles [Ref: Q13].
- **40%**: Percentage of body weight [Ref: Q7].