



## Muscular system

There are three types of muscle in the body: -

- **Cardiac:** found in the heart (involuntary)
- **Smooth:** found in the digestive and urinary systems as well as in blood vessels (involuntary)
- **Skeletal:** the rest of the muscles in the body (voluntary)

Types of muscle contractions

- **Concentric:** when a muscle shortens under tension – e.g. the bicep brachii during the upwards phase of a bicep curl
- **Eccentric:** when a muscle lengthens under tension – e.g. the bicep brachii during the downwards phase of a bicep curl
- **Isometric:** when a muscle is under tension but remains static – e.g. the abdominals during a plank
- **Isotonic:** when a muscle is under tension and moving (i.e. concentric or eccentric)

Roles of muscles

- **Prime Movers/Agonist:** the main working muscle causing the joint action
- **Antagonist:** the opposite muscle to the prime mover, relaxes allowing the agonist to work
- **Synergist:** a muscle which assists the prime mover
- **Fixator:** a muscle or group of muscles which stabilises the body or a joint whilst a movement is performed

**TASK 1: Complete the table below**

Exercise	Agonist	Antagonist	Synergists	Fixators
Press up				
Squat				
Bicep curl				

**TASK 2: When the following muscles contract concentrically what joint movement occurs?**

- Bicep brachii
- Triceps
- Quadriceps
- Glutes
- Hamstrings



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### Muscle fibre types

	Type 1 (slow twitch)	Type 2a (fast twitch)	Type 2b (fast twitch)
<b>Colour</b>	Red	Pink	White
<b>Diameter of fibres</b>	Small	Intermediate	Large
<b>Resistance to fatigue</b>	High	Moderate	Low
<b>Motor unit strength</b>	Low	High	High
<b>Myoglobin content</b>	High	Intermediate	Low
<b>Capillary density</b>	High	Intermediate	Low

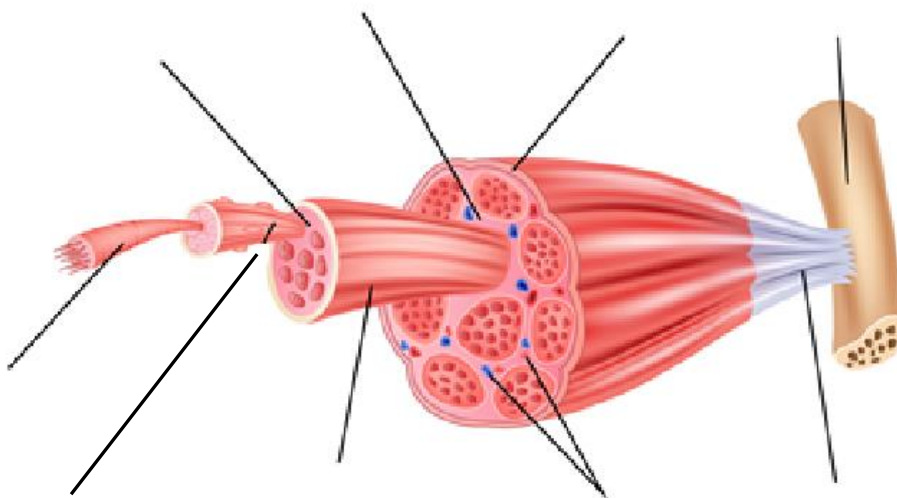
**Type 1 (slow twitch)** fibres contract slowly but can continue to contract for long periods of time. Example activity – long distance/low intensity run

**Type 2a (fast twitch)** fibres contract faster but fatigue much quicker than type 1 fibres. Example activity – heavy weight training (8 – 12 reps) or a 400m run

**Type 2b (fast twitch)** fibres contract extremely rapidly but fatigue very quickly. They are only employed during very short and explosive or maximal activities such as power lifting

### Structure of a skeletal muscle

**TASK 3: Using the following words label the diagram below. Fascicle, Muscle fibre, Bone, Epimysium, Tendon, Blood vessels, Perimysium, Endomysium, Myofibril**





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The **Sliding Filament Theory** is the theory of how a muscle contracts. Within the myofibrils in a skeletal muscle are structures called Sarcomeres which contain **actin** and **myosin**, the two contractile proteins that attach to each other allowing contractions to occur. **Actin** is the thin protein, **myosin** is the thick.



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### Answers to tasks

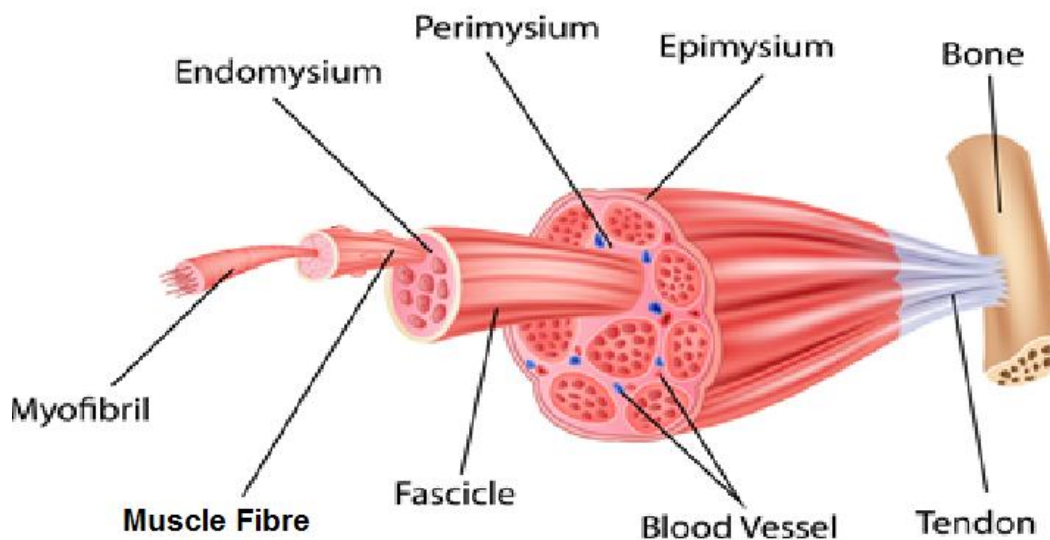
#### TASK 1: Complete the table below

Exercise	Agonist	Antagonist	Synergists	Fixators
Press up	Pectorals	Trapezius	Triceps and anterior deltoids	Abs, obliques
Squat	Quadriceps	Hamstrings	Glutes, gastrocnemius, hip flexors,	Muscles of the core
Bicep curl	Biceps	Triceps	Brachioradialis and brachialis	Anterior deltoids, abs, obliques

#### TASK 2: When the following muscles contract concentrically what joint movement occurs?

- Bicep brachii – elbow flexion
- Triceps – elbow extension
- Quadriceps – knee extension
- Glutes – hip extension
- Hamstrings – knee flexion

#### TASK 3: Label the diagram





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**\*\*TIP\*\*** When remembering the layers of the fascia/connective tissue think; the **epimysium** wraps around the whole muscle so it's the **epic** one, and the **endomysium** is round the smaller individual fibres so it's at the **end**, therefore the perimysium must be the middle one!