



Level 3 Sport Bridging Course



Learning Aim: **B**

The Muscular System Workbook

Name: _____

B1

B2

B3

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B5

B6

B7

B8

Extras

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Introduction

There are over 640 named muscles in the human body and these make up approximately 40% of your body mass. The muscles that move your bones during activity are called **skeletal muscles**.

In this workbook you will learn about the principle skeletal muscles, their associated actions and muscle fibre types. This workbook also shows the different types of muscles and their specific functions, as well as the responses and adaptations of the muscular system to sport or exercise.



B1: Characteristics and Functions of Different Types of Muscles

There are three main types of muscle tissue in the human body:

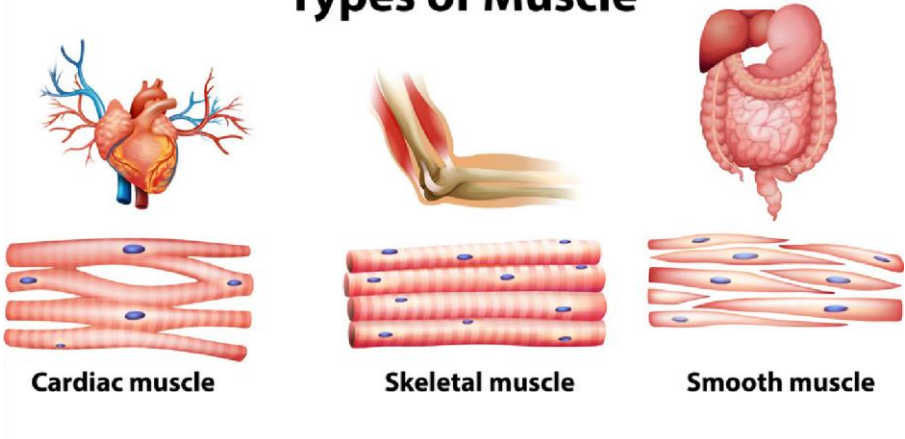
- 1.
- 2.
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Complete the table below with describing the different muscle types

Muscle Type	Characteristic	Function

Types of muscle



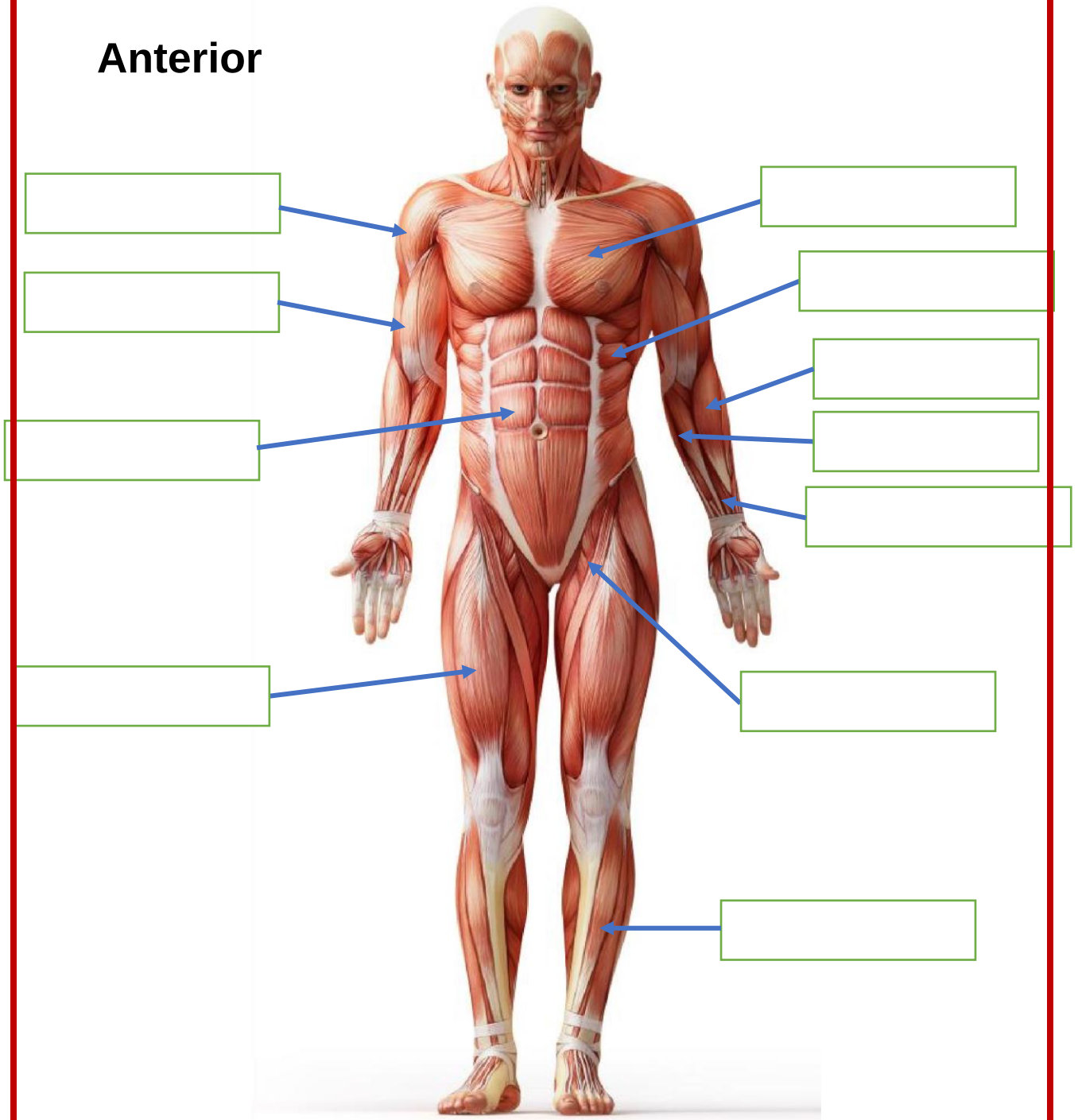
B2: Major Skeletal Muscles of the Muscular System

Skeletal muscles are **voluntary** muscles which means they are under your control. Skeletal muscles are attached to your skeleton by tendons which pull on specific bones when a muscle contracts. Skeletal muscles not only provide you with movement, strength and power but are also responsible for maintaining posture and generating heat which maintains your normal body temperature.



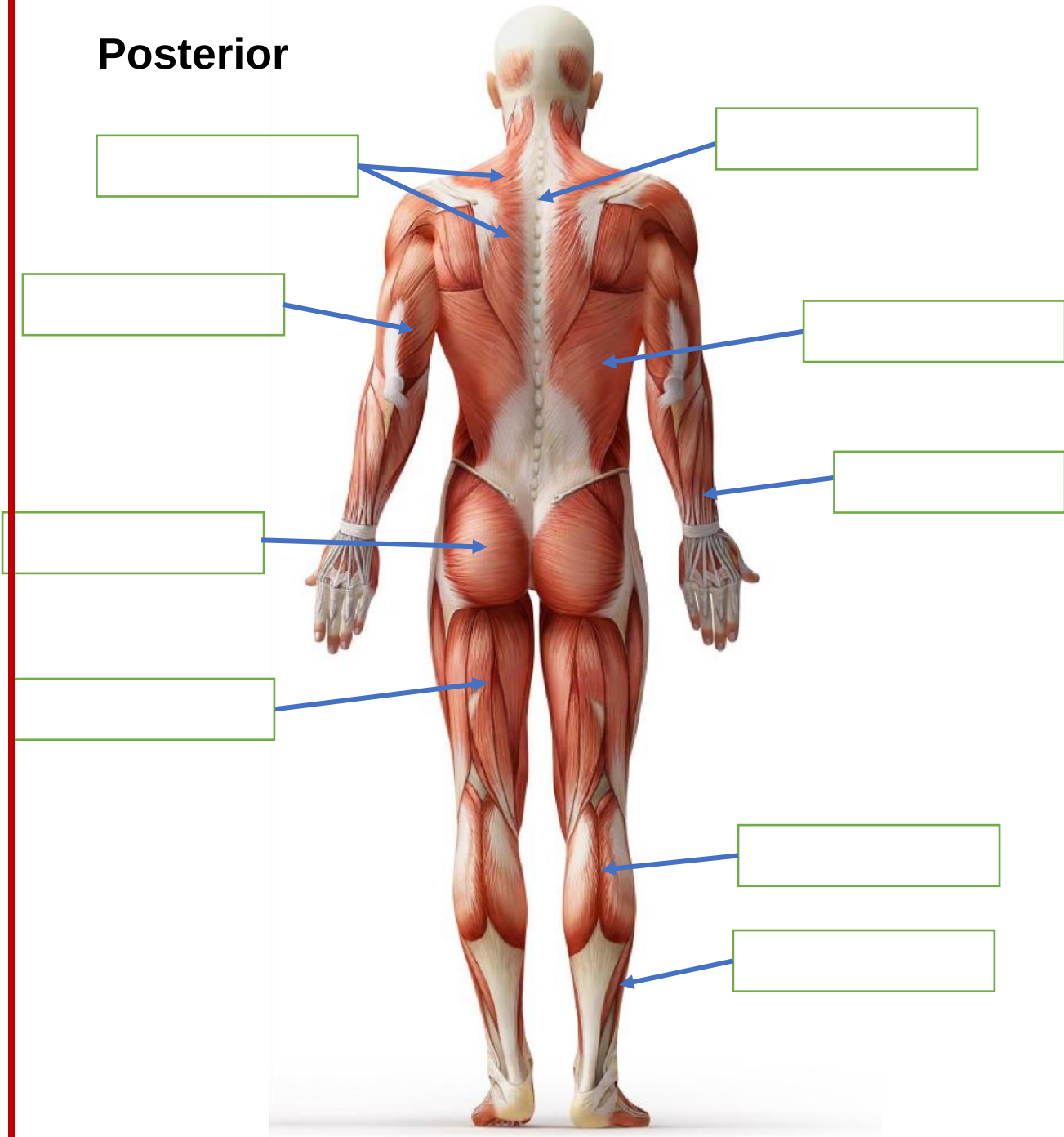
Complete the diagram below naming all the major bones of the body

Anterior



Complete the diagram below naming all the major bones of the body

Posterior



Complete the table below about each major skeletal muscle

Muscle	Function	Location	Origin	Insertion	Exercise activity
Triceps					
Deltoids					
Pectorals					
Biceps					
Wrist flexors					
Wrist extensors					
Supinators					
Pronators					
Abdominals					
Hip Flexors					
Quadriceps					



Complete the table below about each major skeletal muscle

Muscle	Function	Location	Origin	Insertion	Exercise/activity
Hamstrings					
Gastrocnemius					
Soleus					
Tibialis anterior					
Erector spinae					
Teres major					
Trapezius					
Latissimus dorsi					
Obliques					
Gluteus maximus					

B3: Antagonistic Muscle Pairs

When a muscle contracts, it exerts a pulling force on the bones to which it is attached, causing them to move together around the joint. One end normally remains stationary while the other end is drawn towards it. The end that remains stationary is known as the **origin** and the end that moves is called the

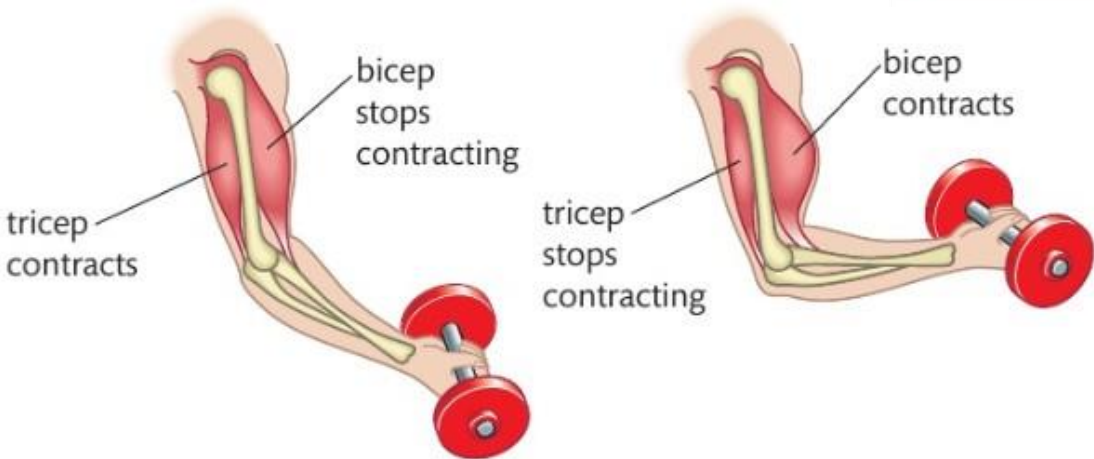
Many muscles work in antagonistic pairs to create a movement.

Key terms

Origin – the fixed end of the muscle that remains stationary.

Insertion – the end of the muscle that moves. The insertion normally crosses over a joint to allow movement when the muscle shortens.

 Identify the muscles, state which are contracting and relaxing. Which is the agonist and which is the antagonist?



 Complete the table below

insertion.

Role	Definition	Example
Agonist		
Antagonist		
Synergist		
Fixator		

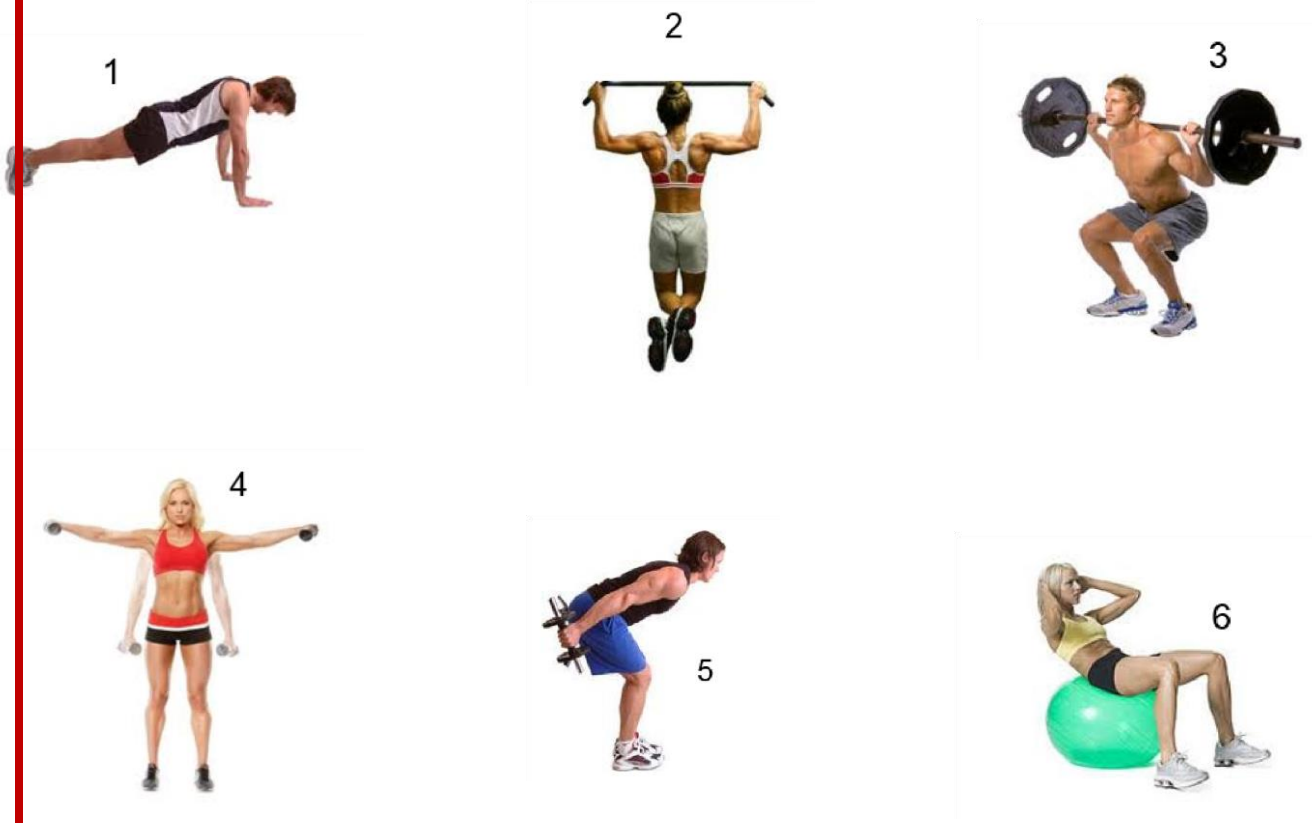


Complete the table below with the antagonistic muscle pairs

Agonist (Prime Mover)	Antagonist
Biceps	Triceps
	Latissimus Dorsi
Pectorals	
Abdominals	
Hip flexor	
	Hamstrings
	Gastrocnemius



Identify the agonist and antagonist muscles in the movements below



Complete the table below about the elbow, knee and shoulder joint

Joint	Antagonistic Pair	Movements Produced	Sporting Example
Elbow			
Knee			
Shoulder			

B4: Types of Skeletal Muscle Contraction

There are three different types of muscle contraction that will be used depending on the sporting technique or exercise action.

- 1.
- 2.
- 3.



Complete the table below describing the types of muscle contractions

Function	Description	Sporting Example
1.		
2.		
3.		

B5: Muscle Fibre Types

All skeletal muscles are made up from muscle fibres. There are 3 muscle fibre types which depend on their speed of contraction. The mix of fibres varies from individual to individual, and from muscle group to muscle group.

The majority of fibre types are **inherited**. However, **training** can influence the efficiency of the different fibre types.

- 1.
- 2.
- 3.

Key terms

Mitochondria – the organelles (parts of cells) in the body where aerobic respiration takes place.

Aerobic respiration – the process of producing energy using oxygen, where energy is released from glucose.

Anaerobic activity – activity where your body uses energy *without* oxygen; that is, activity that results in muscle cells using anaerobic respiration.

Anaerobic respiration – the process of breaking down glucose without oxygen to produce energy.



Complete the table below on each muscle fibre type

Fibre Type	Characteristics	Sporting Examples	Advantages / Disadvantages



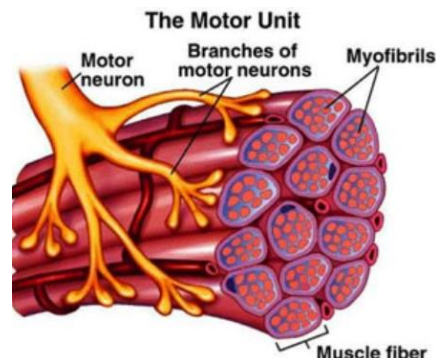
Complete the table below comparing the characteristics of muscle fibres

Characteristic	Type I (Slow Twitch)	Type IIa (Fast twitch/Fast oxidative)	Type IIx (Fast twitch/Fast glycolytic)
Contraction speed			
Force produced			
Resistance to fatigue			
Activity used for			
Intensity of activity used for			
Capillary density			
Mitochondrial density			

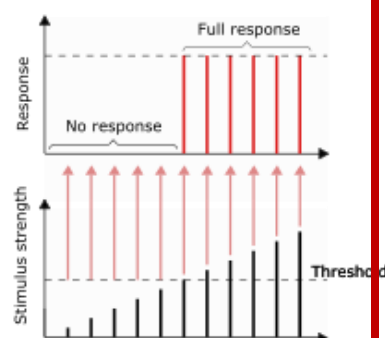
Nervous Control of Muscle Contraction

The muscular system works with the nervous system to bring about muscle contractions. For a muscle to contract it must receive a nerve impulse, this stimulus must be sufficient to activate at least one motor unit which contains the motor neuron and the attached muscle fibres.

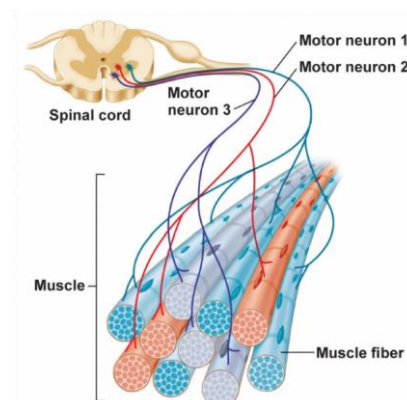
What is a motor unit?



What is meant by the activation threshold?



What is meant by the 'All or None Law'?

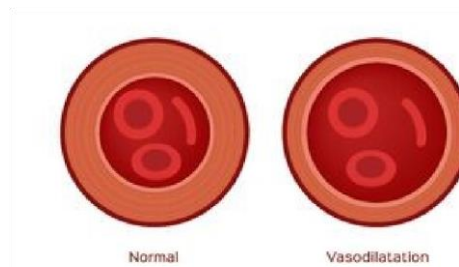


B6: Responses of the Muscular System to a Single Sport or Exercise Session

When you exercise or take part in sport your muscles will respond in a variety of ways. Some of these responses are immediate and are known as **acute** responses. Responses that take place over a longer period of time are known as **chronic** responses.



Increased Blood Supply



Increased Muscle Temperature



Increased Muscle Pliability



Use the boxes below to describe the **responses** of the muscular system

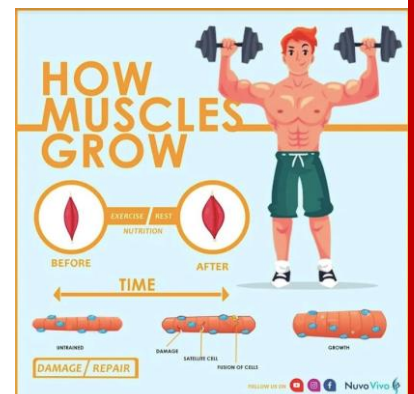


Use the boxes below to describe the **responses** of the muscular system

Lactate (high-intensity exercise)



Microtears (resistance exercise)



B7: Adaptations of the Muscular System to Exercise

Training or exercising regularly over a long period of time will allow your body's muscular system to change and adapt. For example, you will notice that your muscles change in size

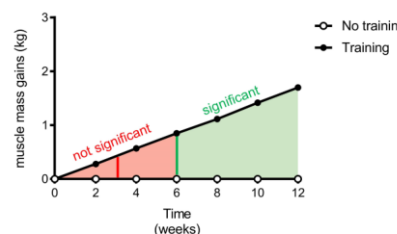
if you undertake a strength or resistance training programme. Such changes are known as **chronic** adaptations to exercise.



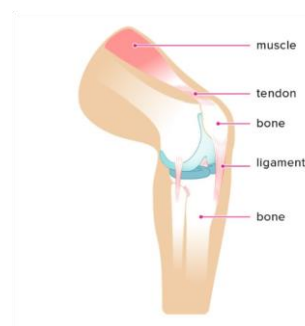
Use the boxes below to describe the **adaptions** to the muscular system

Hypertrophy

Muscle hypertrophy takes time

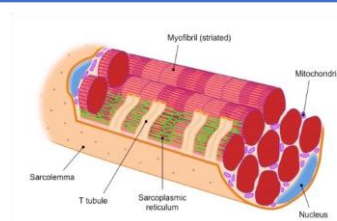


Increased Tendon Strength



Increased in Myoglobin Stores

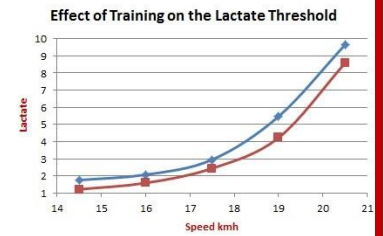
Increase in Number and Size of Mitochondria



Increase in Storage of Glycogen

Increased in Storage of Fat

Increased Tolerance to Lactate



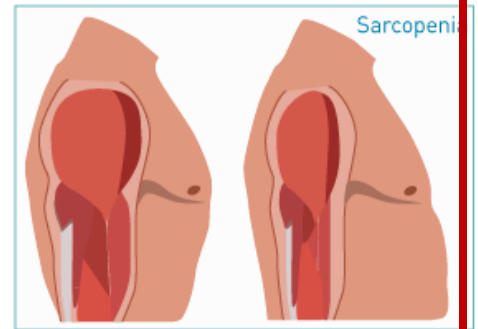
B8: Additional Factors Affecting the Muscular System

There are two primary additional factors that will affect your muscular system and in turn affect exercise and sports performance.



muscular system

Age



Use the boxes below to describe the two additional factors affecting the

Cramp



Example Exam Questions

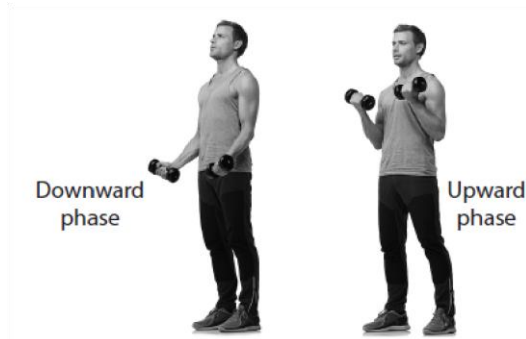
1. Tristan is a footballer player, he plays in midfield.

Explain how type IIx muscle fibre types would be beneficial for Tristan when playing football.
(3 marks)

2. The nervous system controls the force Tristan applies when kicking the ball.
Describe the law associated with nervous control of muscle contraction. (3 marks)

3. As part of Tristan's pre-season training he has undertaken lactate threshold training.
Explain how increasing Tristan's tolerance to lactate would be beneficial to his football performance. (5 marks)

4. A fundamental part of Tristian's training is using weights to develop his upper body



strength.

Analyse how the antagonistic muscle pairs, synergists and fixators at the elbow and shoulder allow Tristan to complete the bicep curl. (6 marks)

5. Stephanie is a high jumper. She uses weighted lunges as part of her training as shown.



Explain how the use of weighted lunges would improve Stephanie’s high jump performance.
(3 marks)

6. Two days after Stephanie’s training session, she experiences delayed onset of muscle soreness (DOMS).

a. State why Stephanie’s training may cause DOMS. (1 mark)

b. Explain how muscle adaptation occurs as a result of Stephanie’s training. (2 marks)

7. The table shows data of muscle fibre types for three different athletes.

	Type I	Type IIa	Type IIx
Michael	10%	20%	70%
Earle	40%	20%	40%
David	70%	20%	10%

Using the data, explain which athlete would be best suited to complete in a 10,000 metre run.
(4 marks)

