WALT – Understand strengths and weaknesses in the muscular system unit.

WILF

- Identify and explain about functions, locations and types of muscle
- Explain long and short term effects of exercise
- Understand your strengths and areas for development and revise weaknesses.

WHY?

- To help you answer an extended exam question

What is the function of the muscular system?

What are the 3 types of muscle?

Name 2 facts about each muscle type.

There are 3 types of muscle

1. Skeletal Muscle (Voluntary muscle)
2. Smooth Muscle (Involuntary muscle)
3. Cardiac Muscle

1. Skeletal

- Functions under your **control**
- Is a **voluntary** muscle
- **A**ttached to bones under the skin (bicep brachii)
- Helps **movement**

2. Smooth

- Functions under the **control** of your **nervous system**
- Is an **involuntary** muscle
- **Located** in the walls of your **digestive system and blood vessels**
- Helps to **regulate digestion** and **blood pressure**

3. Cardiac

- **Located** only in the **wall** of your **heart**
- It is an **involuntary** muscle
- It has its **own blood supply**
- The contractions help to **circulate blood**

Locations?

Deltoid

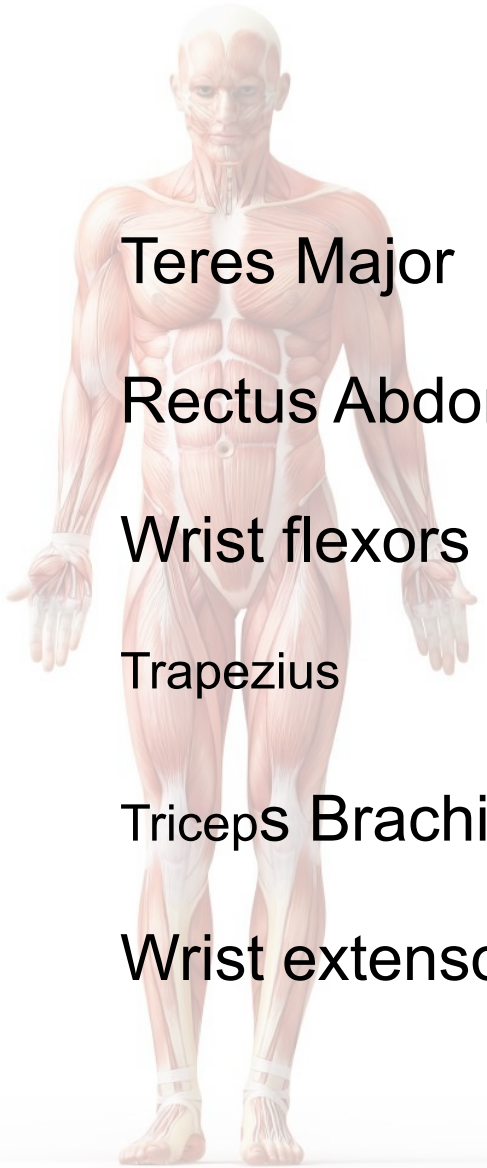
Pectoralis major

Bicep Brachii

Serratus anterior

External/internal Oblique

Latissimus dorsi



Teres Major

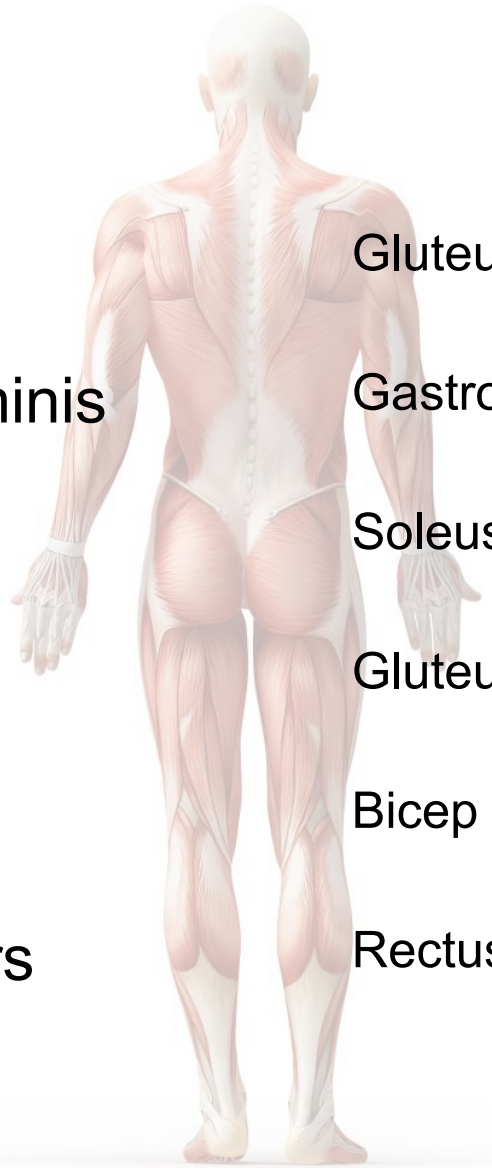
Rectus Abdominis

Wrist flexors

Trapezius

Triceps Brachii

Wrist extensors



Gluteus maximus

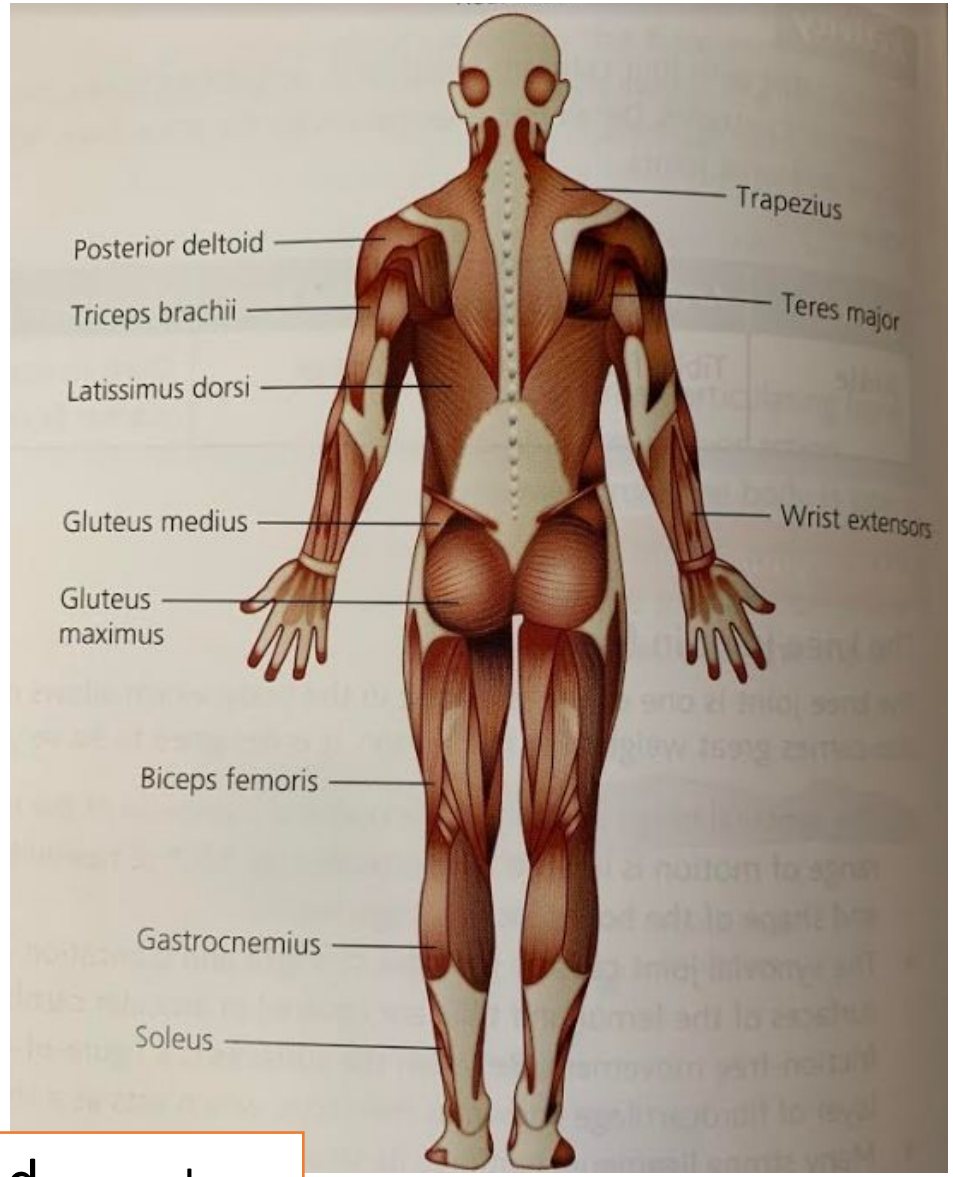
Gastrocnemius

Soleus

Gluteus medius

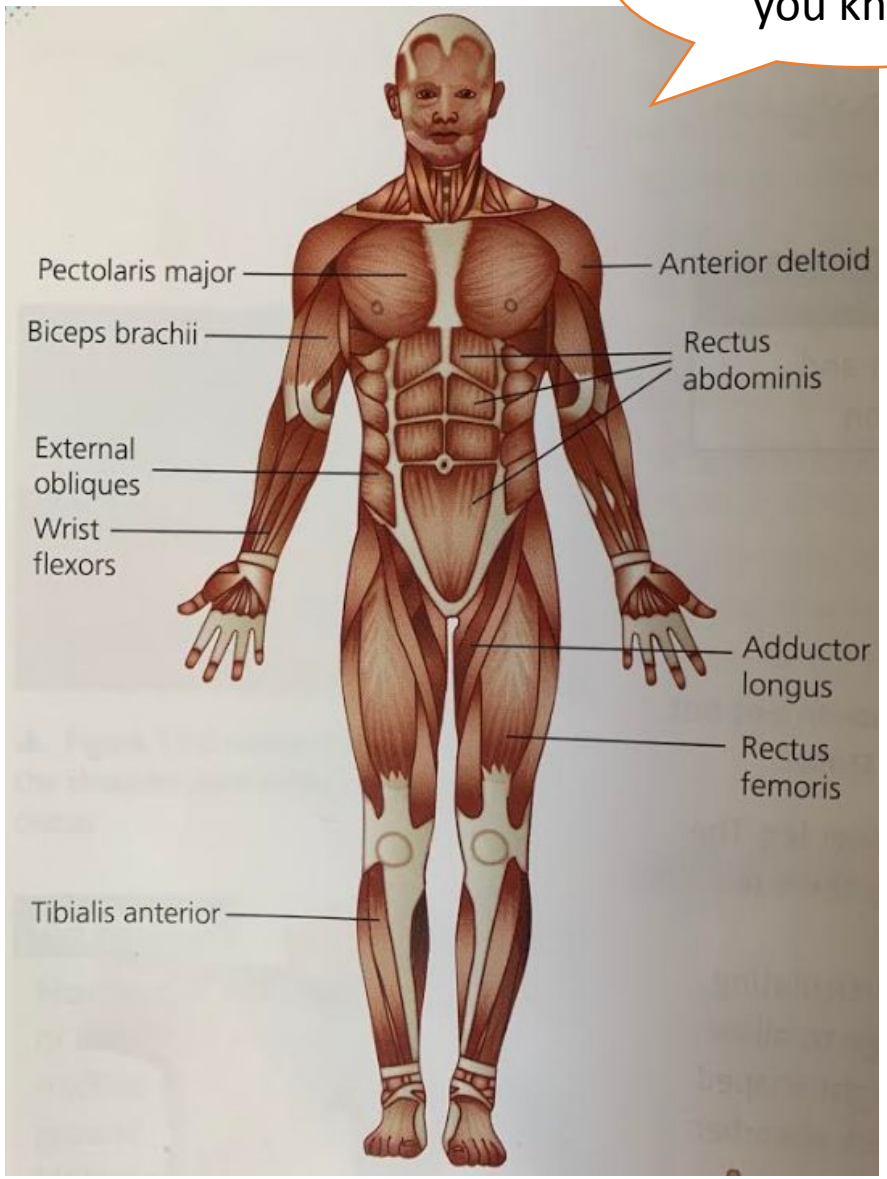
Bicep Femoris

Rectus Femoris



How do muscles attach to bones?

How many did you know?



Retrieval

Name the muscles in hamstring and quadricep.

What type of muscle never tires?

What type of muscle is found in blood vessel walls?

What type of muscles causes movement of limbs?

Key terms/ definitions - put in correct order

Agonist	During this contraction the length of the muscle does not change
Antagonist	The muscle or muscles which stabilises the joint
Fixator	Muscle responsible for the movement
Isometric	The muscle that relaxes in response to the active muscle
Concentric	This occurs when the muscle returns to its normal length after shortening against a resistance
Eccentric	When the muscle shortens against a resistance

What are the 3 types of muscle fibres? 3 marks

Types Of Muscle Fibres

Type 1	Type 2A	Type 2B
		
Slow oxidative	Fast oxidative	Fast glycolytic

Structure and Function of muscle fibre types

Type 1- slow oxidative (SO)

- Contract slowly with less force **(slow twitch)**
- Slow to fatigue, suited for aerobic activities
- High capacity for aerobic respiration
- Lower-intensity, longer duration activities (marathon)

Structure and Function of muscle fibre types

Type 2a - Fast oxidative glycolytic (FOG)

- Also called fast-twitch/**fast oxidative fibres**
- Fast contracting
- Able to produce a great force
- Resistant to fatigue, suited to middle distance events (1500m)

Structure and Function of muscle fibre types

Type 2b - fast glycolytic (FG)

- Also called fast-twitch / **fast-glycolytic** fibres
- Contract rapidly
- Produce large amounts of force
- Fatigue more rapidly
- Suited to anaerobic activities (100m sprint)

Structure and Function of muscle fibre types

The names of the fibre types help to distinguish what type of activity they are best suited to.

Type 1 **SO** - Speed of fibres that use aerobic energy to power their movement

Type 2a **FOG** - Combine the structural properties of fast glycolytic fibres and slow oxidative fibres.

Type 2b **FG** - Use glycogen as their primary energy source, working without oxygen.

Examples…

What are 3 examples of sport for each muscle type?

Type 1	Type 2a	Type 2b
Marathon	800m	100m sprint
Triathlon	1500m	Javelin
Cross-country skiing	200m freestyle swimming	Long jump

The structure of muscle fibre types

Complete the table

Characteristic	Type 1 (SO)	Type 2a (FOG)	Type 2b (FG)
Contraction time	Slow		
Size of motor neuron		Large	
Resistance to fatigue		intermediate	
Activity used for			Short-term anaerobic
Force Production	Low		
Mitochondrial density	High	High	Low
Capillary Density		intermediate	
Oxidative capacity		High	
Glycolytic capacity	Low		
Major storage fuel		CP, glycogen	

The structure of muscle fibre types

Characteristic	Type 1 (SO)	Type 2a (FOG)	Type 2b (FG)
Contraction time	Slow	Fast	Very fast
Size of motor neuron	Small	Large	Very large
Resistance to fatigue	High	Intermediate	Low
Activity used for	Aerobic	Long-term anaerobic	Short-term anaerobic
Force Production	Low	High	Very high
Mitochondrial density	High	High	Low
Capillary Density	High	Intermediate	Low
Oxidative capacity	High	High	Low
Glycolytic capacity	Low	High	High
Major storage fuel	Triglycerides	CP, glycogen	CP, glycogen

Retrieval

What type of muscle fibre is most suited to a marathon runner and why?

What type of muscle fibre is most suited to a long jumper and why?

TASK 1

Put a tick (✓) in the box next to the one correct answer.

Which of the following muscle fibre types would be most beneficial for a shot putter?

(a) Slow oxidative ☐

(b) Fast oxidative ☐

(c) Slow glycolytic ☐

(d) Fast glycolytic ☐

[1]

TASK 2

Which one of the following is a short-term effect of exercise on the muscular system?

Put a tick (✓) in the box next to the correct answer.

- ☐ Increase in the temperature of the muscles
- ☐ Increase in stroke volume
- ☐ Increase in slow twitch muscle fibres
- ☐ Increase in muscle mass

[1]

TASK 3

Put a tick (✓) in the box next to the one correct answer.

Which of the following is not an example of an isometric contraction?

(a) 'Set' position in sprinting ☐

(b) Handstand in gymnastics ☐

(c) 'Take the strain' in tug-of-war ☐

(d) Smash in badminton ☐

[1]

TASK 4

Fig. 12.1 shows some major muscles in the body.

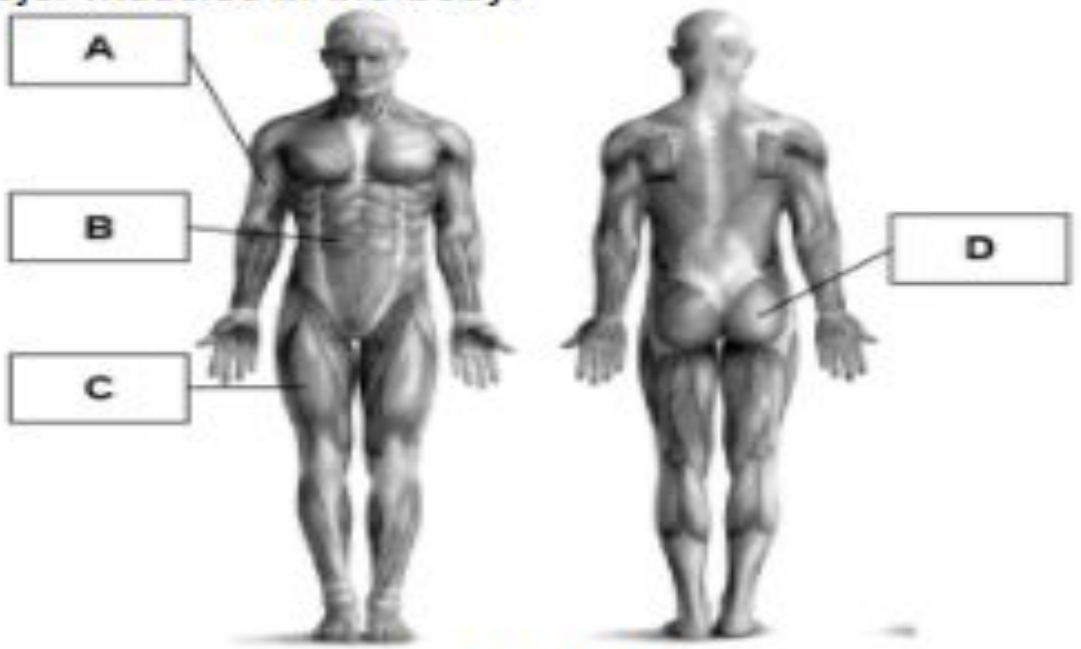


Fig. 12.1

Identify the muscles labelled A, B, C and D.

A ----------

B ----------

C ----------

D ----------

[4]

TASK 5

Fig. 14 shows the performance of a press up.

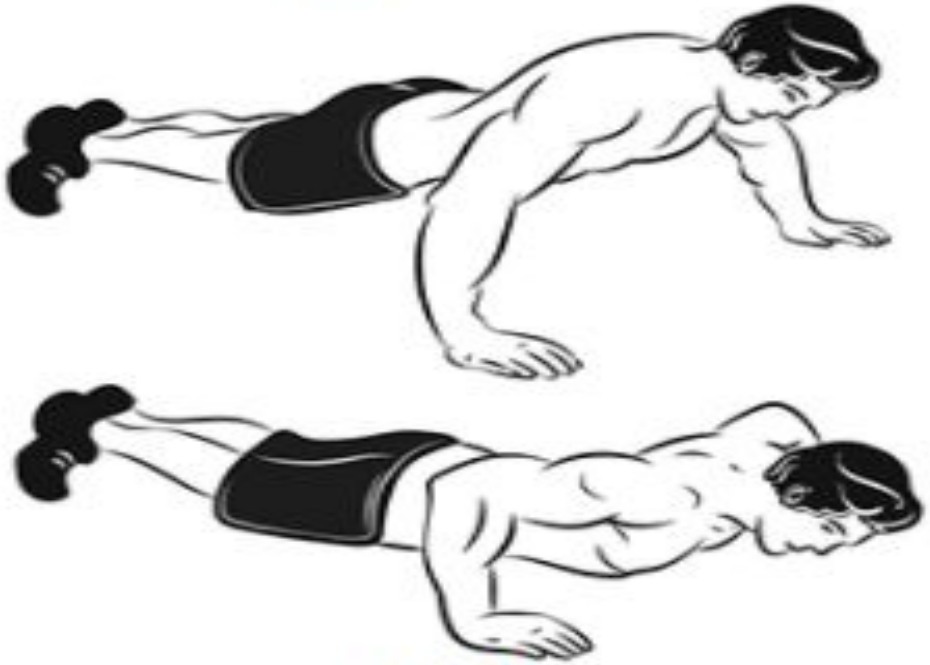


Fig. 14

Explain how the biceps brachii and triceps brachii work together as an antagonistic pair during one complete press up.

---

[4]

What are the short term effects of exercise on the muscular system?

SHORT TERM

POSITIVE

- Increased blood flow to muscles.
- Muscles are very inefficient and much of the energy we use to contract them is lost as heat.
- Physical activity in the short term can increase your alertness as hormones are released

NEGATIVE

- Increased chance of muscle soreness after participating in physical activity.
- High-intensity physical activity can leave you fatigued and affect other sessions if not appropriately moderated. Lactic acid build up.
- Energy stores and myoglobin levels within the muscle can become depleted.

What are the long term effects of exercise on the muscular system?

LONG TERM

POSITIVE

- Increased thickness of each muscle fibre (hypertrophy), improving strength and contractile speed.
- Increased number of muscle fibres (fibre hyperplasia), increased strength of contraction (and potentially increased neuron size).
- Increased availability of fuel source required.
- SO and FOG fibres develop bigger and more efficient capillary beds, increasing mitochondrial density.

NEGATIVE

- Repeated bouts of physical activity without suitable rest periods can cause overuse injuries in muscles.
- Possible injuries such as fasciitis (inflammation of the sheath around the muscle) can occur, particularly in the tibialis anterior muscle.

What are the benefits of a warm up and cooldown?

WARM UP & COOL DOWN

Intended to highlight the positive and negative impacts of physical activity

WARM UP

- Increases the blood flow to muscles
- Low-intensity exercise increases the temperature of the muscles
- Reduces risk of injury in muscles

COOL DOWN

- Maintains blood flow to muscles after physical activity.
- Provide muscles with the opportunity to replenish levels of glycogen and creatine phosphate.
- Refresh the levels of oxygen stored within the myoglobin.

Benefits of a cool down

- More oxygen to the muscles
- Maintains blood flow to the muscles
- Prevents blood pooling in muscles
- Reduces muscle soreness
- Quicker removal of lactic acid

TASK 1

15 Outline **three** structural characteristics of fast glycolytic muscle fibres.

.....

.....

.....

.....

.....

.....**[3]**

15 **(a)** Outline **three** long term benefits of regular physical activity on the muscular system.

.....

.....

.....

.....

.....

.....

.....**[3]**

(b) Describe how a warm up improves the efficiency of the muscles.

.....

.....

.....

.....

.....

.....

.....**[2]**

ANSWERS

Question			Answer	Marks
15			1. Large (size) 2. Few capillaries 3. High phosphocreatine stores 4. Few mitochondria 5. Low myoglobin 6. Low triglyceride stores 7. Few oxidative enzymes 8. Many fibres per neuron/motor unit	3

15	(a)		1. (Muscle) hypertrophy/increase in size/strength/force/endurance 2. (Muscle) hyperplasia or more (muscle) fibres 3. Increase in size/density of mitochondria 4. Increase in myoglobin (stores) 5. Increase in glycogen (stores) 6. Increase in metabolism of triglycerides/fats or increase in fat stores 7. Increase in tendon strength 8. Increased capillarisation	3
	(b)		1. Increased flexibility/range of movement (at joint) 2. Increased speed of oxygen delivery to muscles **or** more oxygen to muscles 3. Increase in muscle temperature 4. Increased elasticity/extensibility of muscle or can stretch **further** 5. Increased speed/force of contraction or muscles work faster 6. Increased speed of nerve impulses	2

5

Unit 1 **Mark Scheme**

Question			Answer	Mark
			7. Increased enzyme activity 8. Reduced muscle soreness/DOMS/lactic acid build up	