OCR A Level PE

A Level PE Revision Booklet

Applied Anatomy & Physiology

Name: _____

Contents Page

Introduction

This revision work-booklet includes topic overview sheets and exam questions.

The topic overview sheets include a range of key information, images and diagrams in order to help you revise each topic. There are lots of gaps within these sheets which you will need to fill in. Lets look at an example.

As you can see, there are gaps in the description of gross and fine skills shown below.

Gross v Fine

- **Gross - uses _____ muscle groups which don't need to be _____**
- **Fine - uses _____ muscle groups which are more intricate & must be _____ _____**

You simply need to fill in the gaps in order to complete the definition.

Gross v Fine

- **Gross - uses large muscle groups which don't need to be precise**
- **Fine - uses smaller muscle groups which are more intricate & must be more precise**

The example below shows that you need to complete the table by filling in the gaps.

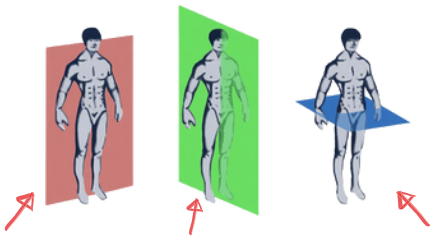
Pharmacological Aids	Advantages	Disadvantages
Anabolic _____	Increased _____ mass and strength and speed of recovery	Increased mood swings Links to _____ damage and heart failure
Peptide _____	Increased aerobic capacity	Linked to _____ thickening
_____ Growth Hormone	Decreased ____ mass, increased _____ mass	Increased risk of cancer, abnormal growth and organ enlargement

After filling in the answers, the table should look like this:

Pharmacological Aids	Advantages	Disadvantages
Anabolic Steriods	Increased muscle mass and strength and speed of recovery	Increased mood swings Links to liver damage and heart failure
Peptide Hormones	Increased aerobic capacity	Linked to blood thickening
Human Growth Hormone	Decreased fat mass, increased muscle mass	Increased risk of cancer, abnormal growth and organ enlargement

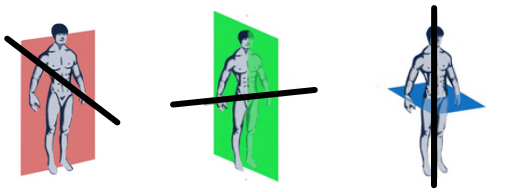
You will also be required to answer a number of exam questions throughout the booklet. Read each question carefully and pay close attention to the amount of marks available.

Planes of Movement



_____ _____ _____

Axes of Rotation



_____ _____ _____

_____ joints allow only backward and forward motion. There are 3 hinge joints

- Knee
- Elbow
- Ankle

_____ joints are when a long bone fit into a cup shaped hole allowing circumduction.

This includes shoulder and hip joints

_____ joints allow circular motion but don't fully allow circumduction
The _____ is a condyloid joint

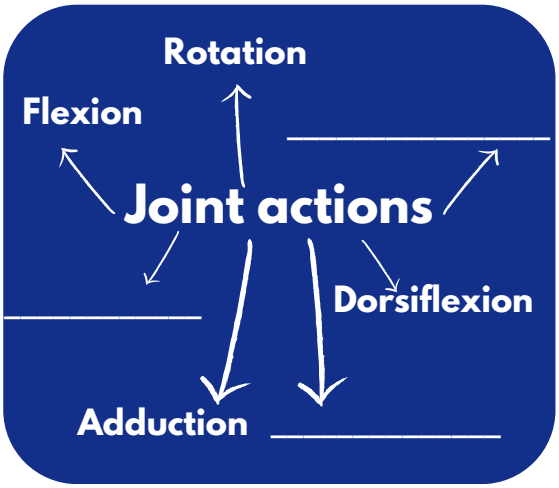
The _____ column is the central axis of the skeleton.

There are 5 groups of the vertebral column -
Cervical curve
Thoracic curve
Lumbar curve
Sacral curve
Coccyx (tailbone)

If its moving - it's a synovial joint

A _____ joint is a place where two or more bones meet.

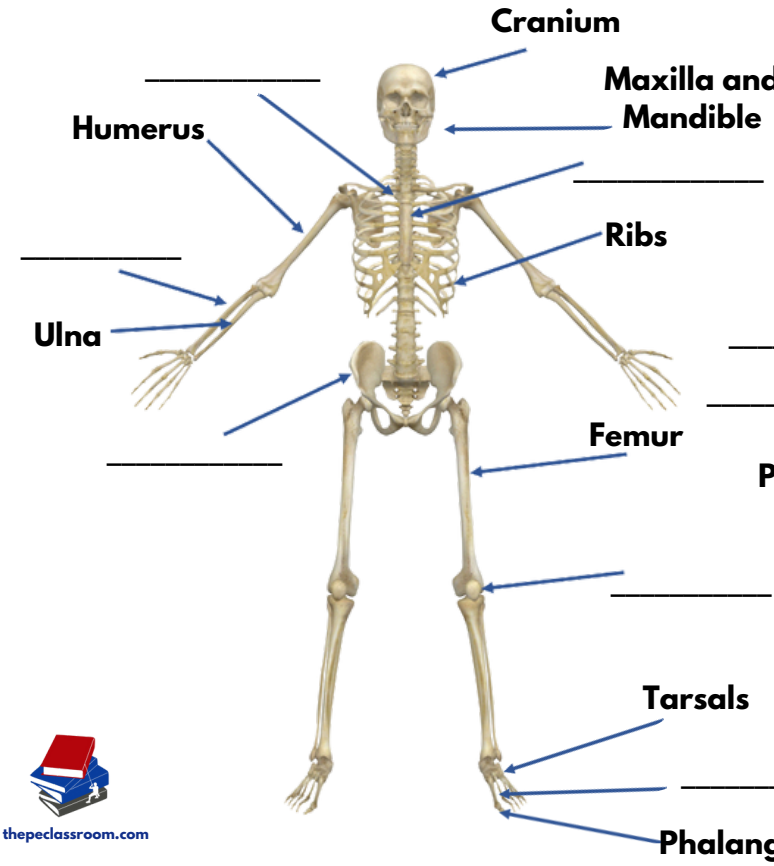

(Elbow Joint)

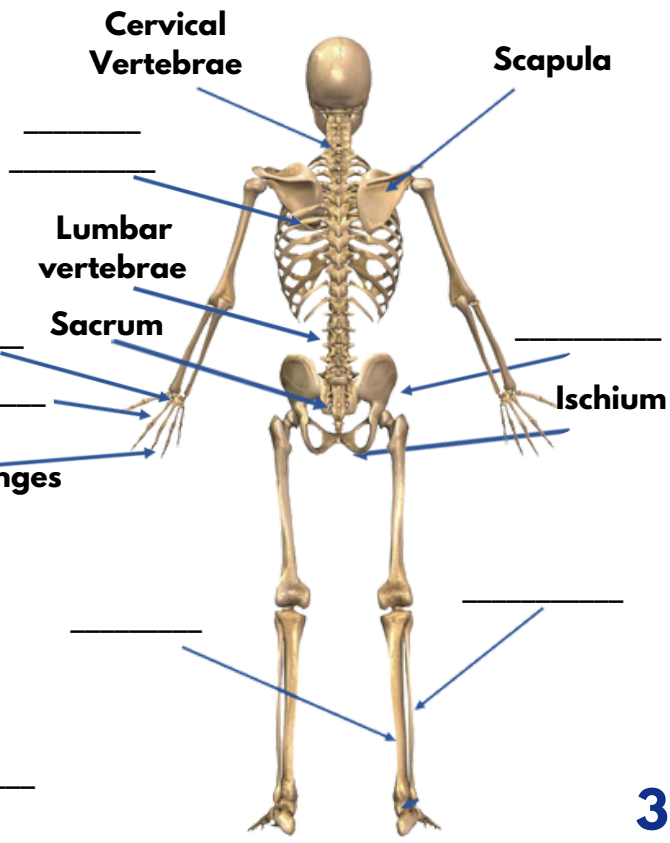


Applied Anatomy & Physiology - Skeletal System

Joints have articulating bones which connect joints to the skeletal system.

They can move within the joint, making them flexible





2 Markers

1.Explain, stating the joint type, the plane in which the knee moves to kick a football.
(2 marks)

2. Muscles contract to create movement about a joint. Which joints do the following muscles act on?

Iliopsoas. Latissimus dorsi.

3. Give a practical example of each of the following planes of movement.
Sagittal. Transverse.

3 Marker

4. State the three articulating bones that are present at the wrist joint. (3 marks)

Muscles CANNOT push - so they work in antagonistic pairs.

Whilst one muscle pulls (the agonist). Its pair muscle will relax (the antagonist).

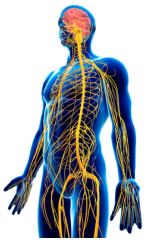
Isotonic muscle contraction - a muscle contracts and _____ is present

Concentric contraction - muscle _____ therefore generating force

Eccentric contraction - muscle_____ due to a greater opposing force

Isometric muscle contraction - when a muscle contracts but its _____ does not change.

All muscles are made up of individual fibres.
Muscle fibres can either be -
Slow _____ (type I - slow twitch)
Fast oxidative _____ (type IIa - fast twitch)
Fast _____ (type IIX - fast twitch)



Fixator Muscles - a muscle that stabilises one part of the body while another part moves.

Slow Oxidative (type I)	Fast Oxidative Glycolytic (type IIa)	Fast Glycolytic (Type IIX)
Slow Twitch	Fast Twitch	Fast Twitch
Slow Contrations	Fast Contractions	Very Fast Contractions
Aerobic Activity	Fatigue relatively quickly	Fatigue very quickly
e.g._____	e.g. _____	e.g. _____

Applied Anatomy & Physiology - Muscular System

Skeletal muscles only contract when stimulated by electrical impulses from the central _____ system (CNS)

A nerve impulse is initiated in the motor _____

The impulse is conducted down the axon of the motor neuron by a nerve action _____

A _____ (acetylcholine) is secreted into the synaptic cleft to conduct the impulse across the

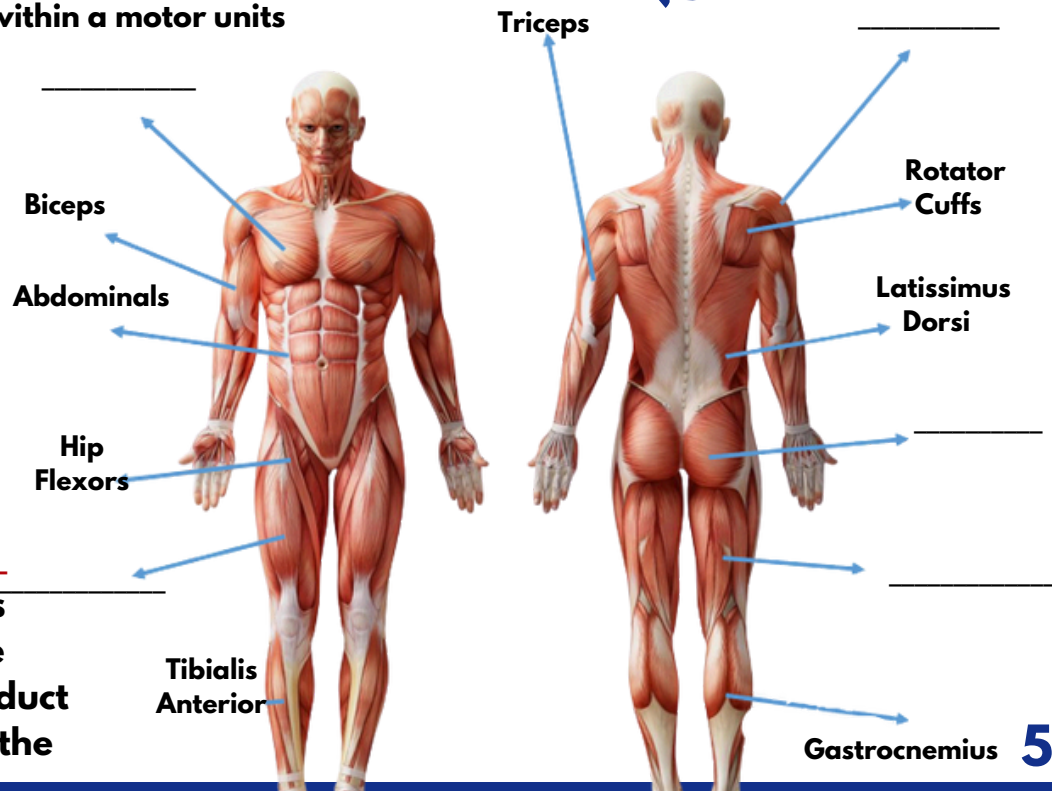
THE ALL OR NONE LAW

For a stimulus to result in a muscle contraction, the stimulus strength must be high enough to reach the threshold for ALL muscle fibres within a motor units

However, training can affect the composition of your muscles

Most muscles contain both slow and fast twitch muscle fibres.

The proportion of muscle fibre types in each muscle is largely _____..



1 Marker

1. Which of the following muscle fibres is most suited to weight lifters? (1 mark)

A) Slow Oxidative
B) Fast Oxidative Glycolytic
C) Fast Glycolytic
D) Slow Glycolytic

2 Markers

2. State and explain which minuscule fibre can be used in between training sessions in order to aid recovery. (2 marks)

3. Identify the joint action and the main agonist at the shoulder as the performer moves from stage 1 to stage 2. (2 marks)

4. The neuromuscular system is responsible for creating muscular contractions. Explain the 'All or None Law'. (2 marks)

3 Marker

5. Explain how a motor unit is stimulated to cause muscular contraction. (3 marks)

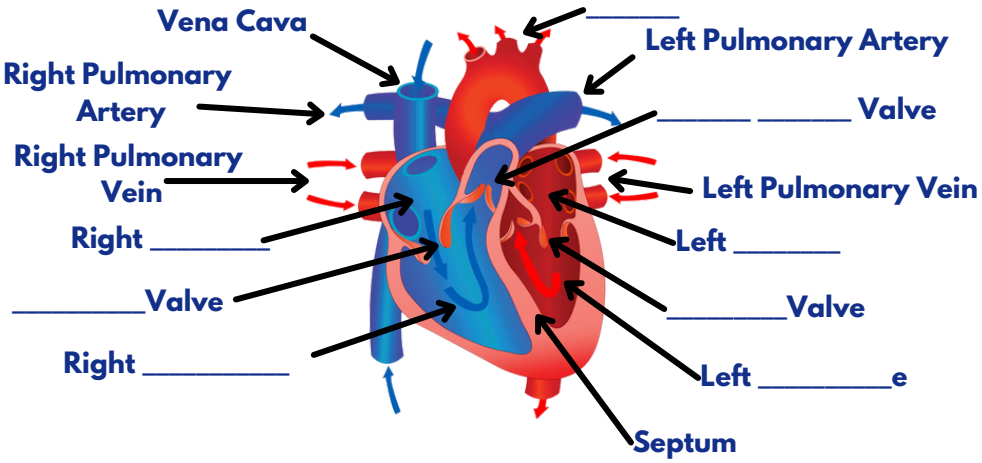
4 Marker

6. Explain the term antagonistic pair, using the knee joint as an example. (4 marks)

6 Marker

7. State which type of muscle fibres each of the athletes below would primarily use, explaining why. (6 marks)

Long distance rower. Triathlon. High Jumper.



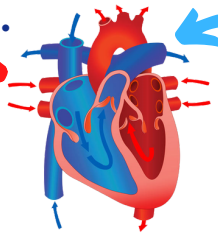
The cardiac conduction system is a group of cells found in the wall of the heart.

The heart is _____, meaning it is capable of generating its own electrical impulses

Cardiac Conduction System

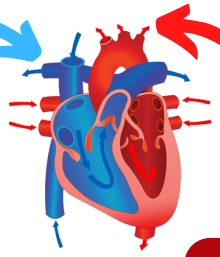
Sinoatrial Node (SAN)
↓
Atrial Contraction
↓
Atrioventricular _____(AVN)
↓
_____ of His
↓
_____ Fibres
↓
Ventricular Contraction

he Pulmonary Circuit carries...



Oxygenated blood to the heart via the pulmonary veins

Deoxygenated blood to the lungs via the pulmonary arteries



Deoxygenated blood to the heart via the vena cava

The Systemic Circuit carries...

Oxygenated blood to the body via aorta.

Applied Anatomy & Physiology - Cardiovascular System

Stroke Volume - The _____ of blood pumped out by the heart ventricles in each _____

Cardiac Output - The volume of blood pumped out by the heart ventricles per _____
= HR x SV

During exercise, blood must be distributed to the areas of the body that require increased _____ supplies.
In order to do this, blood flow is redistributed through a mechanism called _____ shunting.

Chemoreceptors detect a change in blood _____/CO_2 levels - they are located in the wall of arteries.

The **vasomotor** is located in the **Medulla** _____ in the brain and is responsible for the regulation of heart ____, blood pressure and the _____ of blood flow.

Heart rate can be regulated by -
1. Neural controls
2. Intrinsic controls
3. Hormonal controls

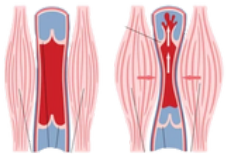
Sympathetic system increases the number of cardiac _____, increasing heart rate (e.g. during exercise).

Parasympathetic system decreases the number of cardiac _____, decreasing heart rate (e.g. at rest).

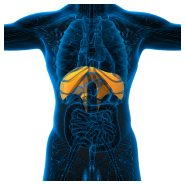
Venous Return -
The flow of blood back to the heart,via the _____ and specifically the vena _____

Venous return mechanisms -

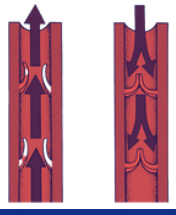
1. The Skeletal Muscle _____

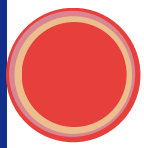


2. The _____ Pump

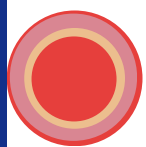


3. Pocket _____

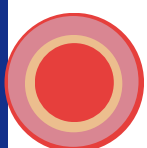




Vasodilated artery



Normal artery



Vasoconstricted artery

Starling's Law - Stroke volume increases in response to an increase in _____ return.

1 Marker

1.Which of the following shows the correct order that is followed by the conduction system of the heart? (1 mark)

A) Purkyne Fibres, Bundle of HIS, SA Node, AV Node
B) AV Node, SA Node, Bundle of HIS, Purkyne Fibres
C) AV Node, SA Node, Purkyne Fibres, Bundle of HIS
D) SA Node, AV Node, Bundle of HIS, Purkyne Fibres

2 Marker

2. Define the term 'stroke volume' and give a typical resting value for a trained individual. (2 marks)

3 Marker

3. Starling's Law outlines that during exercise there will be an increase in stroke volume? Explain the factors leading to this increase in stroke volume? (3 marks)

4 Marker

4. Describe four mechanisms of venous return that maintain blood flow back to the heart. (4 marks)

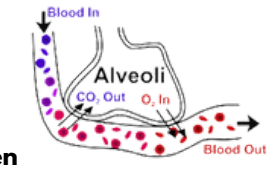
5 Marker

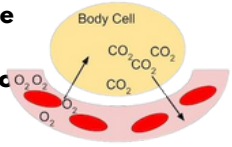
5. Describe the specific process of vascular shunting during a football match, referring to the capillaries, receptors and vasomotor. (5 marks)

The Respiratory system has two functions:

1. **Pulmonary ventilation:**
- Inspiration and _____ of air

2. **Gaseous exchange**
- **External respiration** - movement of oxygen into the _____ and carbon _____ into the lungs
- **Internal respiration** - release of _____ into respiring cells and waste into blood.





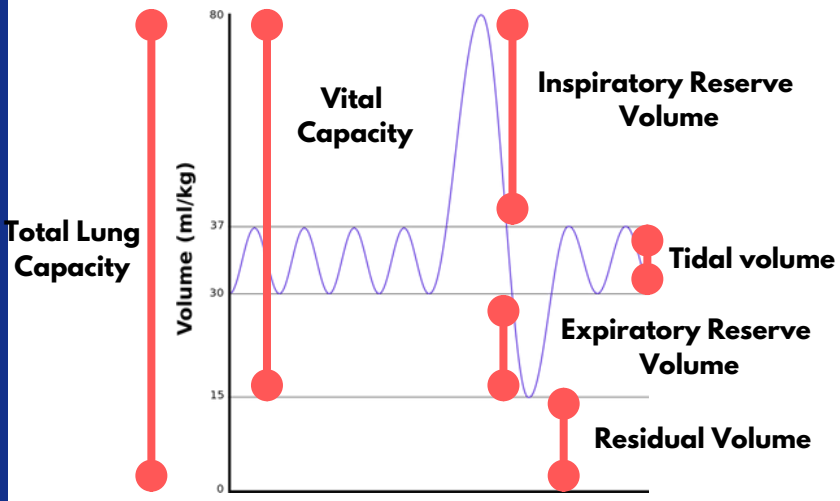
The **diaphragm** changes shape during ventilation -

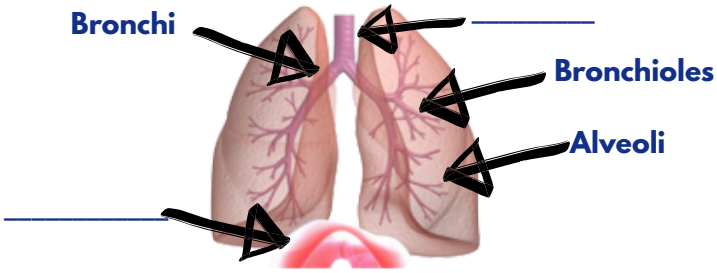
Inhalation - _____ and flattens

Exhalation - Relaxes and becomes _____ shaped

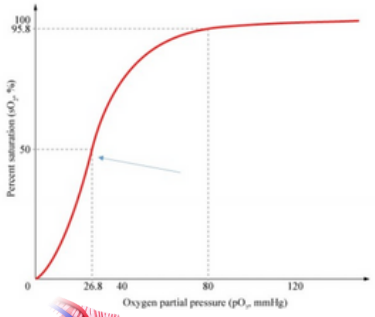
Lungs are the main organ involved in respiration.

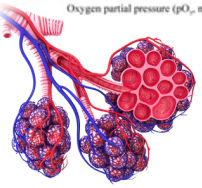
Spirometer Trace -





Oxyhaemoglobin Dissociation Curve





Applied Anatomy & Physiology - Respiratory System

MECHANICS OF BREATHING DURING EXERCISE

Inspiration

Sternocleidomastoid

Sternocleidomastoid and Pectoralis Minor cause a **greater expansion** of the rib cage and _____.

Pectoralis Minor

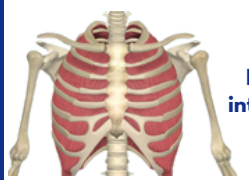
They result in the increase of lung volume, making a **larger _____ gradient than at rest**, increasing the depth of breath.

Gas Exchange -
Where the waste product **carbon dioxide** diffuses out of the blood and **oxygen** diffuses into the blood.
This takes place in the _____

This is possible because of the concepts of **diffusion, partial _____ and concentration gradients**

Each gas will diffuse down their own concentration _____

Expiration



Internal intercostals

Internal intercostals and rectus abdominis create a **greater down and inward movement** of the rib cage and sternum.

Rectus Abdominis

The volume in the lung is decreased, meaning the pressure in the thoracic cavity increases, forcing more ____ out than at rest.

The **Respiratory Control Centre (RCC)** is located in the medulla oblongata.
It receives information from sensory nerves and sends signals to motor nerves to change rate of respiratory muscle contraction.

Regulation of Breathing

1. _____ control - chemoreceptors.
2. Neural control - thermoreceptors, baroreceptors and _____.

1 Marker

1.Which one of the following describes tidal volume? (1 mark)

A) The volume of air that can be forcibly expired following a normal breath
B) The amount of air inspired and expired with each normal breath
C) The volume of air that remains in the lungs after maximum expiration
D) The volume of air breathed in or out per breath

3 Markers

Location	Partial Pressure of Oxygen (P02)	Partial Pressure of Carbon Dioxide (PC02)
Alveoli	100 mm Hg	40 mm Hg
Blood Capillary	40 mm Hg	46 mm hg

2. The table above shows the partial pressure of oxygen at the site of the lungs. Using the data from the table, explain how diffusion occurs at the site of the lungs. (3 marks)

3. Explain why the minute ventilation of a trained individual will be lowerlower at rest than that of an untrained individual. (3 marks)

4 Markers

4. Explain the term 'excess post-exercise oxygen consumption' (EPOC) (4 marks)

5. Tidal volume changes during exercise and recovery. Describe the role of proprioceptors in the control of these changes both during exercise and recovery (4 marks)

Applied Anatomy & Physiology - Energy Systems

Aerobic Respiration

The usual process for releasing energy for your muscles - occurs WITH _____.

The equation for aerobic respiration -

_____ + Oxygen
=
Energy + CO2 +Water

Anaerobic Respiration

This is when your muscles have to work at a very _____ level - occurs WITHOUT oxygen.

The equation for anaerobic respiration -

Glucose = Energy + _____ acid

Exothermic reaction - gives off heat/energy.
Endothermic reaction - requires heat/energy

The **ATP** molecule is how your energy is stored and used in the body.
Up to ____ **ATP** are produced across the 3 stages.

The continual breakdown and resynthesis of **ATP** is known as a **coupled reaction.**

There are two anaerobic energy systems -

1. ATP-PC System
2. Anaerobic Glycolytic System (Lactic Acid System)

Aerobic energy systems involved **three** stages -

1. Glycolysis
2. The Krebs Cycle
3. The Electron Transport Chain

AT ANY ONE TIME ALL ENERGY SYSTEMS WILL BE IN USE BUT ONE WILL BE PREDOMINANT

Lactate Accumulation - the increase of lactate as a result of _____ activity.

Lactate threshold - the point during _____ at which lactic acid quickly accumulates in the _____.

OBLA (onset of blood lactate accumulation) - the point at which blood lactate levels go above 4 millimoles per litre.

Buffering Capacity - the ability of _____ carbonate ions to neutralise these effects of lactic acid.

VO2 max is the maximum volume of _____ that can be consumed by the working muscles per _____.

After exercise, **post exercise oxygen consumption (EPOC)** will take place - it is the volume of oxygen consumed in recovery ABOVE the resting rate.

Repays the _____ debt and begins to break down lactic acid

To resaturate _____ with oxygen

Resynthesis ATP levels

The intensity of training requires different **work-rest ratios** to insure the training targets the correct energy system.

Altitude's effect on body systems

At higher altitudes, **barometric pressure decreases**, so there is _____ oxygen in the air.
Therefore partial _____ of oxygen is less than at sea level, meaning that oxygen delivery is slower as the **diffusion rate** _____.

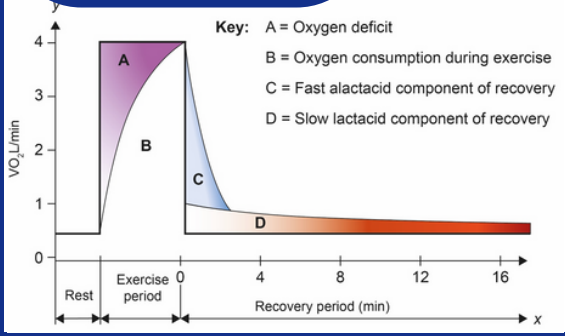
Benefits of altitude training -

1. Low oxygen increases erythropoietin production
2. This increases _____ blood cell production.
3. Oxygen extraction becomes more _____.

Thermoregulation

Muscular contractions and chemical reactions produce _____ **heat**, which may not be removed from the body quickly enough, causing further body _____ rises.

This can cause **cardiovascular** _____ - an upward drift in heart rate.



1 Marker

1.Which of the following can be best classified as the ATP-PC/glycolytic threshold? (1 mark)

A) Jogging back to the centre after a goal is scored in football
B) Running a 100m race
C) Speeding up to push away from the crowd in a marathon
D) Starting to jog at the start of a marathon

3 Marker

2. Describe what the term 'acclimatisation' means, and give two benefits of it on the cardiorespiratory system. (3 marks)

4 Marker

3. Explain what is meant by the term 'cardiovascular drift'. (4 marks)

20 Marker

4. John is an elite marathon runner whereas Mariam is a sprint hurdler.

Describe when the different fibre types may be recruited during these events. Describe and evaluate the factors that affect strength, applying your knowledge to the marathon runner and the hurdler. (20 marks)

UNIT CHECKLIST
Skeletal and Muscular Systems

Joints, movements and muscles ☐

- Shoulder
- Elbow
- Wrist
- Hip
- Knee
- Ankle
- Planes and movement

Functional roles of muscles and types of contraction ☐

- Role of muscles
  - Agonist, antagonist, fixator
- Types of contraction
  - Isotonic, concentric, eccentric, isometric

Analysis of movement, with reference to: ☐

- Joint type
- Movement produced
- Agonist and Antagonist muscles involved
- Type of muscle contraction taking place.

Skeletal muscle contraction ☐

- Structure and role of motor units in skeletal muscle contraction
- Nervous stimulation of the motor unit
  - Motor neuron, action potential, neurotransmitter, ‘all or non‘ law

Muscle contraction during exercise of differing intensities and during recovery ☐

- Muscle fibre types (slow oxidative, fast oxidative glycolytic, fast glycolytic)
- Recruitment during exercise of differing intensities and during recovery

UNIT CHECKLIST
Cardiovascular & Respiratory Systems

Cardiovascular system at rest

- Relationship between and resting values for heart rate, stroke volume, cardiac output and methods for calculating each.
- Cardiac cycle: diastole and systole
- Conduction system of the heart linked to the cardiac cycle

Cardiovascular system during exercise of differing intensities and during recovery

- Effects of different exercise intensities and recovery on heart rate, stroke volume, cardiac output and methods for calculating each.
- Redistribution of cardiac output. Includes:
  - Vascular shunt mechanism
  - Role of the vasomotor centre, arterioles and pre-capillary sphincters
- Mechanisms of venous return
- Regulation of heart rate
  - Neural, hormonal and intrinsic factors

Respiratory System at rest

- Relationship between and resting values for breathing frequency, tidal volume, minute ventilation and methods for calculating each.
- Mechanisms of breathing at rest and muscles involved
  - Diaphragm, external intercostals, at the alveoli and muscles

Respiratory system during exercise of differing intensities and during recovery

- Effects of different exercise intensities and recovery for breathing frequency, tidal volume, minute ventilation and methods for calculating each.
- Mechanics of breathing, including additional muscles involved
- Regulatoin of breathing during exercise
  - Neural and chemical control
- Effect of different intensities of exercise and recovery on gas exchange at the alveoli and muscles
  - Pressure gradient and dissociation of oxyhaemoglobin.

UNIT CHECKLIST
Energy for Exercise

Adenosine Triphosphate (ATP) and energy transfer ☐

- ATP as 'energy currency'
- Principle of energetically coupled reactions
  - Breakdown of ATP to ADP + P
  - Resynthesis of ATP from ADP + P

Energy Systems and ATP resynthesis ☐

- Energy Systems:
  - ATP-PC (Phosphocreatine) system
  - Glycolytic system
  - Aerobic system
- For each system:
  - Type of reaction, chemical or food fuel used
  - Specific site of reaction, controlling enzyme, ATP yield
  - Specific stages within the system
  - By-products

ATP resynthesis during exercise of differing intensities and durations ☐

- The energy continuum
- Predominant energy system used during exercise
  - How intensity and duration influences with energy system is predominately used
  - Interpretation of figures relating to the contribution of the three energy systems

The recovery process ☐

- How the body returns to its pre-exercise state
  - Excess Post exercise Oxygen Consumption (EPOC)
- Fast components of EPOC, the processes that occur and the duration
  - Replenishment of blood and muscle oxygen stores & re-synthesis of ATP and PC
- Slow components of EPOC, the processes that occur and the duration
  - Elevated circulation, ventilation, body temperature, lactate removal and conversion to glycogen
- Effect of exercise intensity on EPOC and implications of the recovery process for planning exercise or training sessions.

UNIT CHECKLIST
Environmental Effects on Body Systems

Exercise at altitude ☐

- Effects of altitude on the cardiovascular and respiratory systems
  - Reduced arterial PO2 leading to impaired muscle O2 delivery
  - Elevated heart rate and ventilation
- Acclimatisation, including importance of timing arrival, at altitude (2400m)

Exercise in the heat ☐

- Effect of heat on the cardiovascular and respiratory system
  - Temperature regulation and cardiovascular drift

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