

GCSE PE

Anatomy and Physiology Learning Booklet

Name:

Tutor:

Class/teacher(s):

School:



1.1

1.1 Applied anatomy and physiology – An Overview

Learners will develop knowledge and understanding of the basic structures and functions of body systems that are particularly important to physical activities and sports. They will also study the short and long-term effects of exercise on these systems, and how these effects can impact on physical fitness and performance. Learners will develop the ability to collect and use data, analyse movement and apply their knowledge and understanding, using examples from physical activity and sport.

The sections:

1.1.a. The structure and function of the skeletal system

Learners will be able to name and locate the major bones of the body and be able to apply examples of how the skeletal system allows the functions such as posture and protection. Learners will be able to identify major joints along with the associated articulating bones in the knee, elbow, shoulder and hip. Knowledge will be developed of the types of movement at hinge joints and ball and socket joints, as well as being able to apply these movements to examples from physical activities and sports.

Topic area Learners must:

Topic area	Learners must:
Types of movement at hinge joints and ball and socket joints 	<ul style="list-style-type: none">• know the types of movement at hinge joints and be able to apply them to examples from physical activity/sport:<ul style="list-style-type: none">○ flexion○ extension• know the types of movement at ball and socket joints and be able to apply them to examples from physical activity/sport:<ul style="list-style-type: none">○ flexion○ extension○ rotation○ abduction○ adduction○ circumduction.
Other components of joints	<ul style="list-style-type: none">• know the roles of:<ul style="list-style-type: none">○ ligament○ cartilage○ tendons.

Topic area	Learners must:
Location of major bones	<ul style="list-style-type: none"> • know the name and location of the following bones in the human body: <ul style="list-style-type: none"> ○ cranium ○ vertebrae ○ ribs ○ sternum ○ clavicle ○ scapula ○ pelvis ○ humerus ○ ulna ○ radius ○ carpals ○ metacarpals ○ phalanges ○ femur ○ patella ○ tibia ○ fibula ○ tarsals ○ metatarsals.
Functions of the skeleton 	<ul style="list-style-type: none"> • understand and be able to apply examples of how the skeleton provides or allows: <ul style="list-style-type: none"> ○ support ○ posture ○ protection ○ movement ○ blood cell production ○ storage of minerals.
Types of synovial joint	<ul style="list-style-type: none"> • know the definition of a synovial joint • know the following hinge joints: <ul style="list-style-type: none"> ○ knee – articulating bones – femur, tibia ○ elbow – articulating bones – humerus, radius, ulna • know the following ball and socket joints: <ul style="list-style-type: none"> ○ shoulder – articulating bones – humerus, scapula ○ hip – articulating bones – pelvis, femur.

Glossary of terms for 1.1 a

Articulating bones	Bones that move relative to each other at a joint.
Cartilage	A tough, elastic, fibrous connective tissue
Ligament	A short band of tough and flexible tissue connecting bones together and stabilise the joint.
Synovial Joint	An area where two or more bones meet within a joint capsule and allows a wide range of movement to occur
Tendon	A tendon is a tough yet flexible band of fibrous tissue which joins muscle to bone

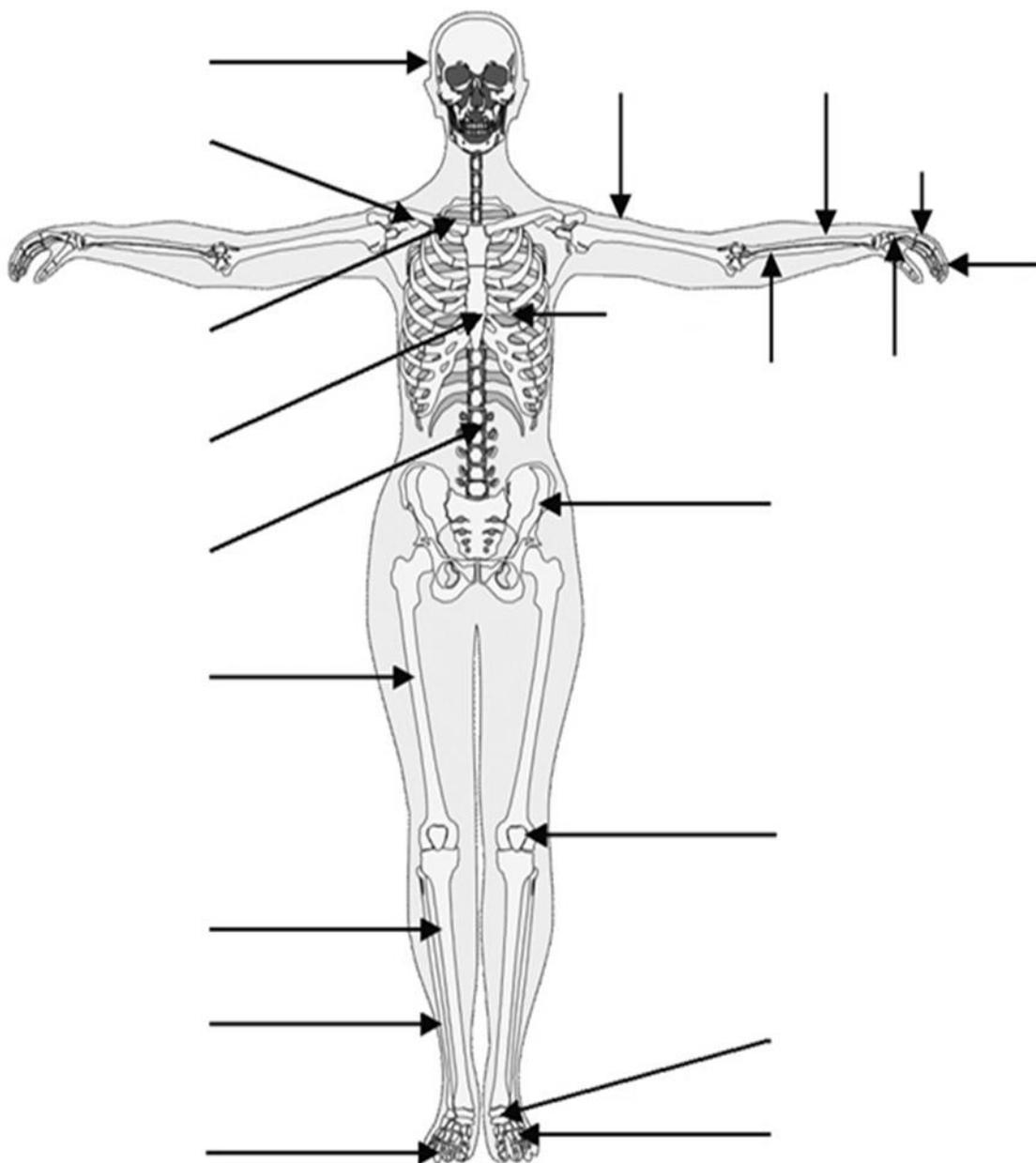
Tasks per section:

Location of major bones.

Task) Label the diagram of a skeleton with all 19 bones.

Why are there 20 arrows and not just 19?

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Functions of skeleton.

Task) Identify the functions of the skeleton

1. To provide _____ and _____, giving the body its posture
2. To allow movement by providing attachment sites for _____
3. To protect the internal _____
4. To produce _____, both red and white
5. To store _____ such as phosphorus, calcium, potassium and iron

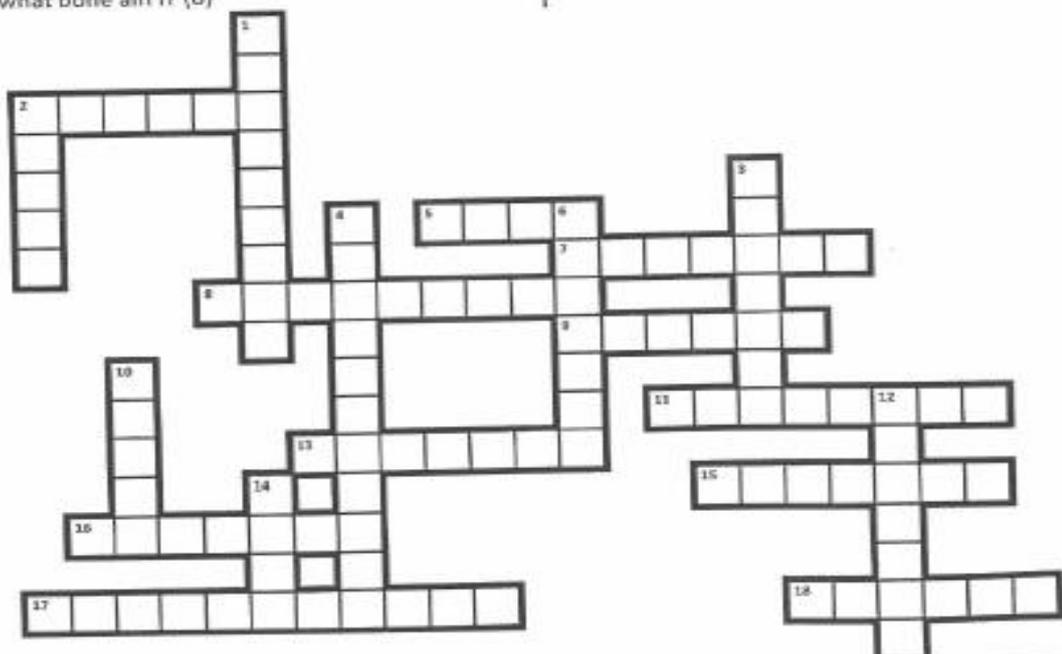
Task) Identify the bone that is being described in each clue then fit it into the crossword.

Across

- 2 I am a long bone found at the back of the lower leg; what bone am I? (6)
- 5 There are many of me and I offer protection to some of the major organs such as the heart and the lungs; what bones am I? (4)
- 7 I make up the bones found in the foot at the ankle joint; what bones am I? (7)
- 8 I am found in the cervical, thoracic, lumbar, sacrum and coccyx regions; what bones am I? (9)
- 9 I am found in the lower arm and I am located on the same side as the thumb; what bone am I? (6)
- 11 I am more commonly referred to as the collar bone; what bone am I? (8)
- 13 I am the bone that is found at the top of your head that offers protection to your brain; what bone am I? (7)
- 15 You will find me in the upper arm, my lower bone end makes up part of the elbow; what bone am I? (7)
- 16 I am more commonly referred to as the kneecap; what bone am I? (7)
- 17 I am the bones found between the phalanges and the tarsals of the foot; what bones am I? (11)
- 18 I am the large bone which forms part of your hips; what bone am I? (6)

Down

- 1 I am more commonly referred to as the fingers or toes; what bones am I? (9)
- 2 I am the largest bone in the body; what bone am I? (5)
- 3 My more common name is the shoulder blade; what bone am I? (7)
- 4 I am the bones found between the phalanges and the carpals; what bones am I? (11)
- 6 I am more commonly referred to as the breast bone; what bone am I? (7)
- 10 Some people call me the shin bone; what bone am I? (5)
- 12 I make up the bones found in the hand at the wrist joint; what bones am I? (7)
- 14 I am the thinner bone of the lower arm; what bone am I? (4)



Types of synovial joint

Task) Give the definition of a synovial joint

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Types of movements at hinge and ball and socket joints

Task) Complete the table

Joint type	Movements created	Two examples on body	Example in sport
Hinge		1. 2.	1. 2.
Ball and socket		1. 2.	1. 2.

Task) Using a sporting example describe the anatomical action at a hinge joint

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Other components of joints

Task) In the table, link the component of a joint to its role

Component of joint	Draw an arrow to link to the correct role	Roles
Tendon		a soft connective tissue. It acts as a shock absorber and reduces friction at the joint
Ligament		attach bone to bone. Function helps to stabilise joints during movement
Cartilage		attach muscles to bone. When muscles contract they pull on the tendons which pull on the bones and make them move

1.1.b. The structure and function of the muscular system

Learners will develop their knowledge of the location of the major muscle groups and be able to apply muscle use to examples from physical activities and sport. Learners will also develop their knowledge of the roles of muscles as agonists, antagonists, fixators and also how they operate as antagonistic pairs, again by applying to examples from physical activities and sports.

Topic area	Learners must:
Location of major muscle groups 	<ul style="list-style-type: none"> • know the name and location of the following muscle groups in the human body and be able to apply their use to examples from physical activity/sport: <ul style="list-style-type: none"> ○ deltoid ○ trapezius ○ latissimus dorsi ○ pectorals ○ biceps ○ triceps ○ abdominals ○ quadriceps ○ hamstrings ○ gluteals ○ gastrocnemius.
The roles of muscle in movement 	<ul style="list-style-type: none"> • know the definitions and roles of the following and be able to apply them to examples from physical activity/sport: <ul style="list-style-type: none"> ○ agonist ○ antagonist ○ fixator – antagonistic muscle action.

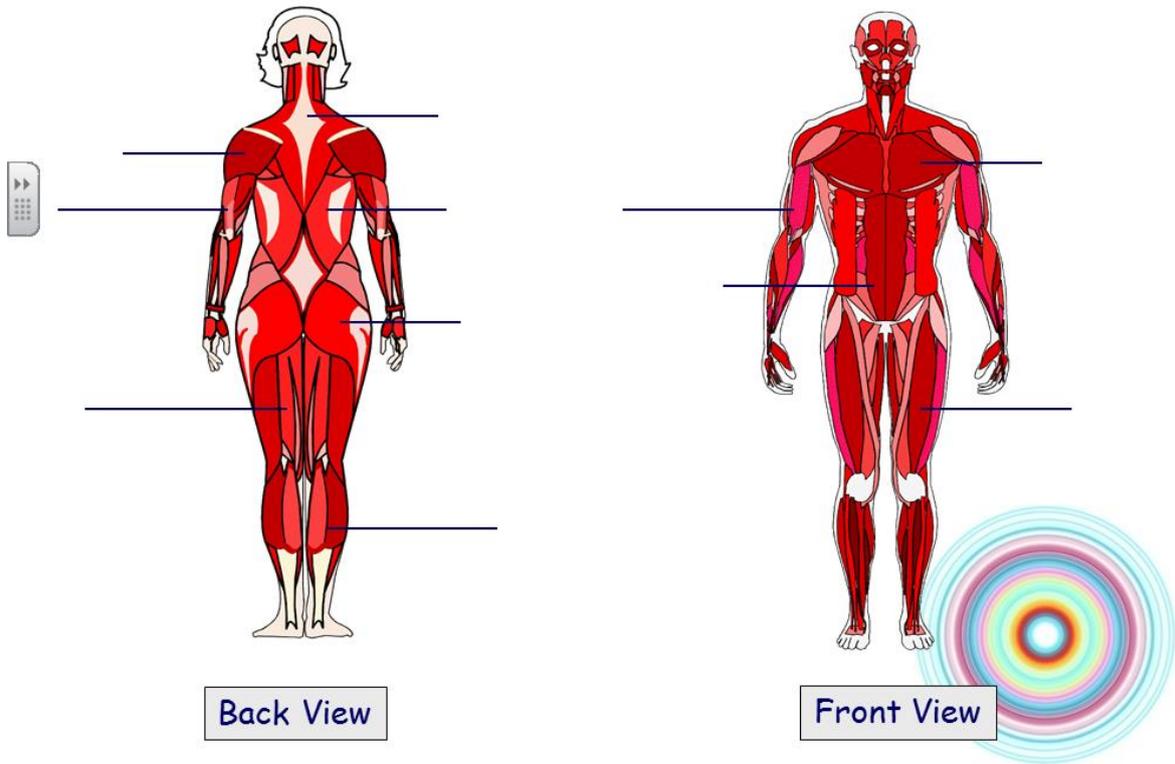
Glossary of terms for 1.1 b

Abduction	Movement away from the midline of the body
Adduction	Movement towards the midline of the body
Agonist	The muscle that works to create the movement
Antagonist	The muscle that works in the opposite way of the agonist
Antagonistic muscle action	A pair of muscles that work together to produce movement with one muscle contracting whilst the other muscle relaxes. E.g. the upper arm, as the arm flexes the bicep contracts and the triceps relaxes
Circumduction	The circular movement of a joint. It is a movement pattern that combines flexion, extension, adduction, and abduction
Fatigue	Muscle tiredness when the body has a lack of energy
Fixator	A muscle which acts as the stabilizer and helps the agonist work effectively of one part of the body during movement of another part
Flexion	A bending movement around a joint in a limb
Extension	A straightening movement around a joint.
Rotation	The turning of a body part about its long axis as if on a pivot

Tasks per section:

Location of major muscle groups

Task) Label both the front and back diagrams of the muscular system with all 11 muscles.



The roles of muscles in movement

Task) Explain the difference between origin and insertion using biceps as the example

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Task) Choose a different muscle and identify the origin and insertion points

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Task) Complete the table, identifying the agonist and antagonist muscles

Location	Action	Agonist	Antagonist
Knee joint	Flexion		
	Extension		
Elbow joint	Flexion		
	Extension		

Task) Describe the role of a fixator muscle and provide an example

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1.1.c. Movement analysis

Learners will develop their knowledge of the three classes of lever and will be able to use examples from physical activities and sport to show where these levers might operate to produce movement. Learners will become aware of the mechanical advantage provided by levers in movement. Learners will know the three planes of movement and be able to give examples of these levers from different physical activities and sports. Frontal, transverse and longitudinal axes of rotation will be recognised by learners who will be able to apply these to examples from physical activities and sports.

Topic area	Learners must:
Lever systems 	<ul style="list-style-type: none"> know the three classes of lever and their use in physical activity and sport: <ul style="list-style-type: none"> 1st class <ul style="list-style-type: none"> neck 2nd class <ul style="list-style-type: none"> ankle 3rd class <ul style="list-style-type: none"> elbow know the definition of mechanical advantage.
Planes of movement and axes of rotation 	<ul style="list-style-type: none"> know the location of the planes of movement in the body and their application to physical activity and sport: <ul style="list-style-type: none"> frontal transverse sagittal know the location of the axes of rotation in the body and their application to physical activity and sport: <ul style="list-style-type: none"> frontal transverse longitudinal.

Glossary of terms for 1.1 c

Axis of rotation	A line around which the body can turn
Frontal axis of rotation	Runs horizontally from the front to back of your body. A gymnast performing a cartwheel moves through this axis
Longitudinal axis of rotation	Passes vertically from the top to the bottom of your body. A 360 degree turn rotates through this axis.
Transverse axis of rotation	Passes horizontally from left to right. A somersault passes through this plane
Frontal plane	An imaginary line which divides the body from front to back vertically
Sagittal plane	An imaginary line which divides the body vertically into left and right sides
Transverse plane	An imaginary line which divides the body horizontally from front to back
Levers	<ul style="list-style-type: none"> ○ 1st Class: A lever in which the fulcrum is positioned between the load and the effort. ○ 2nd Class: A class 2 lever has the load and the effort on the same side of the fulcrum, with the load nearer the fulcrum. ○ 3rd Class: The effort is placed between the load and the fulcrum, and the effort must travel a shorter distance and be greater than the load.
Mechanical advantage	1st and 2nd class levers provide mechanical advantage, this means that a larger load can be moved with a smaller amount of effort.

Tasks per section:

Lever systems

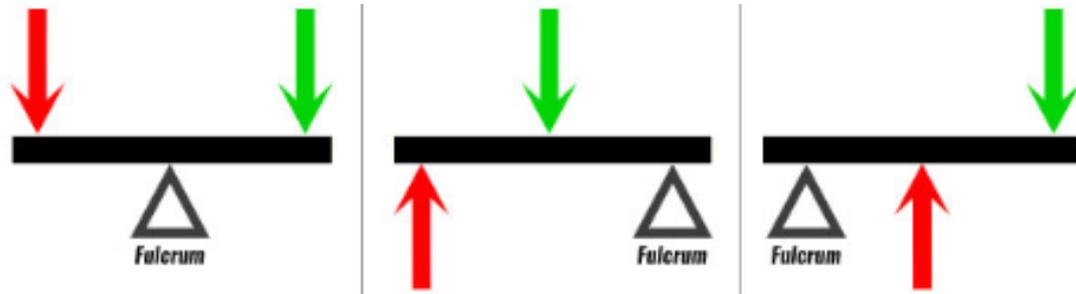
Task) Which is the most common lever in the body

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Task) Re-write the definition of mechanical advantage

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Task) In the diagrams below, identify each lever then label where the effort and load are



Planes of movement and axes of rotation

Task) Provide a sporting example for each axis

- Frontal axis

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- Longitudinal axis

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- Transverse axis

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Task) Describe the following planes of movement

- Frontal plane

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- Sagittal plane

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- Transverse plane

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1.1.d. The cardiovascular and respiratory systems

Learners will develop their knowledge and understanding of the structure and function of the cardiovascular system. Blood vessels and blood cells with their pathway through the heart will be understood along with definitions of key cardiac terms. Learners will understand the pathway of air through the respiratory system and know the role of the respiratory muscles and alveoli during breathing, along with an understanding of key definitions. Learners will also be able to define aerobic and anaerobic exercise and be able to give practical examples of aerobic and anaerobic activities.

Topic area	Learners must:
Structure and function of the cardiovascular system	<ul style="list-style-type: none"> • know the double-circulatory system (systemic and pulmonary) • know the different types of blood vessel: <ul style="list-style-type: none"> ○ arteries ○ capillaries ○ veins • understand the pathway of blood through the heart: <ul style="list-style-type: none"> ○ atria ○ ventricles ○ bicuspid, tricuspid and semilunar valves ○ septum and major blood vessels: <ul style="list-style-type: none"> – aorta – pulmonary artery – vena cava – pulmonary vein • know the definitions of: <ul style="list-style-type: none"> ○ heart rate ○ stroke volume ○ cardiac output • know the role of red blood cells.
Structure and function of the respiratory system	<ul style="list-style-type: none"> • understand the pathway of air through the respiratory system: <ul style="list-style-type: none"> ○ mouth ○ nose ○ trachea ○ bronchi ○ bronchiole ○ alveoli • know the role of respiratory muscles in breathing: <ul style="list-style-type: none"> ○ diaphragm ○ intercostals • know the definitions of: <ul style="list-style-type: none"> ○ breathing rate ○ tidal volume ○ minute ventilation • understand about alveoli as the site of gas exchange.
Aerobic and anaerobic exercise 	<ul style="list-style-type: none"> • know the definitions of: <ul style="list-style-type: none"> ○ aerobic exercise ○ anaerobic exercise • be able to apply practical examples of aerobic and anaerobic activities in relation to intensity and duration.

Glossary of terms for 1.1 d

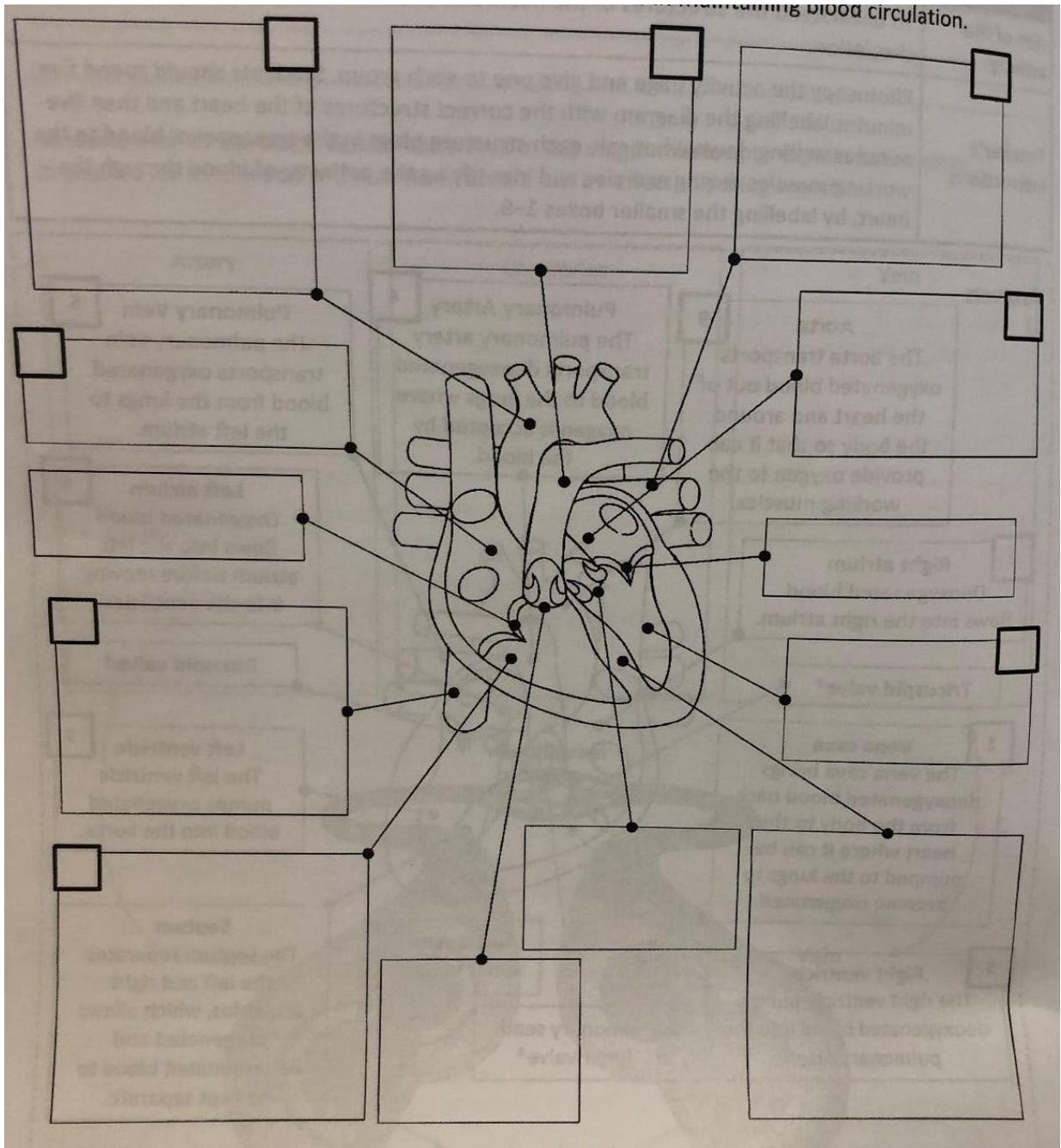
Aerobic exercise	Use of oxygen for the duration of the exercise. Usually at moderate intensity at a continuous rate e.g. long distance running
Anaerobic exercise	Exercise which does not allow for the predominant usage of oxygen. Usually high or very high intensity for a short period of time. E.g. sprinting up a hill
Blood vessels	Tubular structures that carry blood around our bodies
Breathing rate	The number of breaths taken in a minute
Capillarisation	The development of blood capillaries in the body which increases through long term effects of exercise
Cardiac output	The volume of blood pumped per minute by each ventricle of the heart. Cardiac output = stroke volume x heart rate
Double circulatory system	The human body has two circulatory loops in which blood circulates. One is oxygenated, and the other is deoxygenated. Systemic – the circulatory loop that controls blood flow from the heart to the rest of the working muscles and organs. Pulmonary - the circulatory loop that controls blood flow from the heart to the lungs
Gaseous exchange	The movement of gases taking place at the alveoli and capillaries
Heart rate	Number of heart beats per minute
Lactic acid	A waste product produced in the muscle tissues during strenuous exercise where the anaerobic energy system is in use
Minute ventilation	The volume of gas inhaled or exhaled from the lungs per minute
Red blood cells	Oxygen carrying cells containing haemoglobin
Stroke volume	The amount of blood pumped out of the heart (left ventricle - to the body) during each contraction
Tidal volume	The amount of air which enters the lungs during normal inhalation at rest

Tasks per section:

Structure of cardiovascular system

Task) Label the diagram below with the following structures:

Atria (there is a left and right), Ventricles (there is a right and left), Septum, Tricuspid valve, Bicuspid valve, Semi-lunar valves (pulmonary and aortic), Aorta, Vena cava, Pulmonary vein, Pulmonary artery.



Task) Explain what is meant by the Double Circulatory System

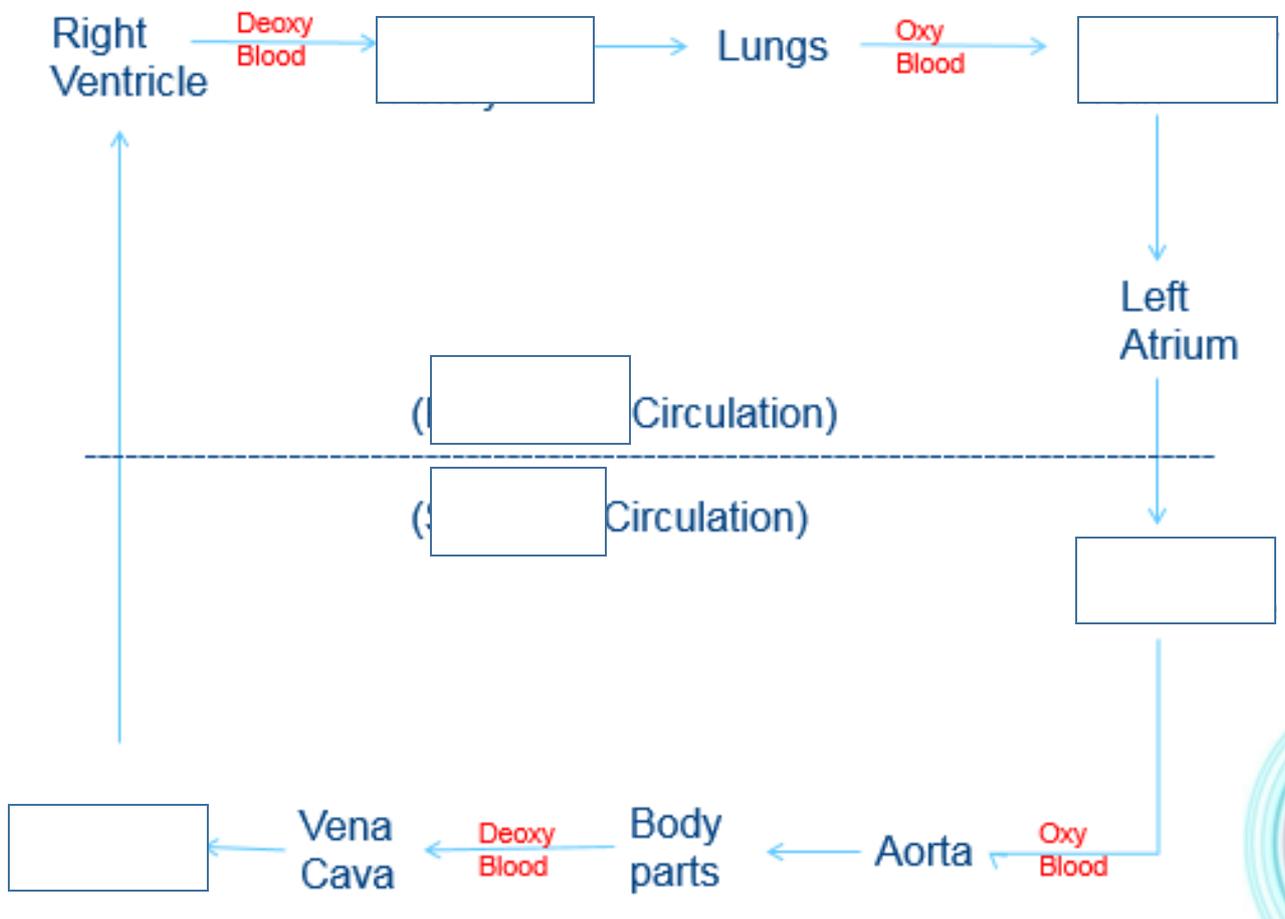
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Task) Below is the order of blood through the Pulmonary system and circulatory system. Fill in the blanks



Task) Fill in the boxes with information about each blood vessels. You must include: size of lumen, valves, wall thickness, vasodilation/vasoconstriction, blood pressure

Arteries	Capillaries	Veins
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Function of cardiovascular system

Task) Match the following term to the definition

Heart rate		The amount of blood ejected from the heart in one minute
Stroke volume		The number of times the heart beats in one minute
Cardiac output		The amount of blood ejected from the heart with each beat

What is the important equation for cardiac output that uses all the terms above?

_____ X _____ = _____

Task) Describe the role of each part of the circulatory system

- Atrium

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- Ventricles

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- Septum

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- Aorta

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- Vena cava

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- Pulmonary artery

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- Pulmonary vein

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- Bicuspid valve

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- Tricuspid valve

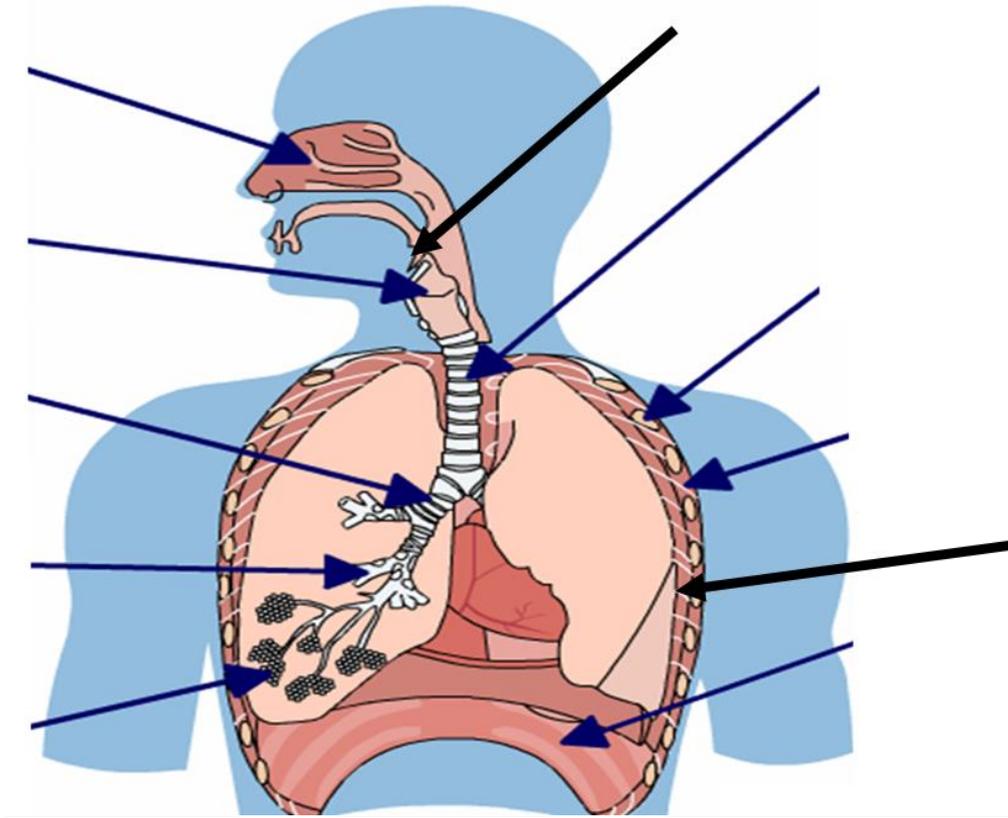
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- Semilunar valve

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Structure of respiratory system

Task) label the diagram of the respiratory system



Function of respiratory system

Task) Define the following terms:

- Breathing rate

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- Tidal volume

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- Minute ventilation

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Now use the three terms above to complete the equation

_____ = _____ X _____

Task) Circle the correct answer

- when the intercostal (respiratory muscles) contract the thoracic cavity **increases/decreases** in size
- when the intercostal (respiratory muscles) contract the rib cage moves **upwards and outwards/downwards and inwards**
- when the diaphragm contracts it flattens which **increases/decreases** the thoracic cavity, lowering/raising the air pressure and draws air **into/out** of the lungs

Task) Answer the following questions

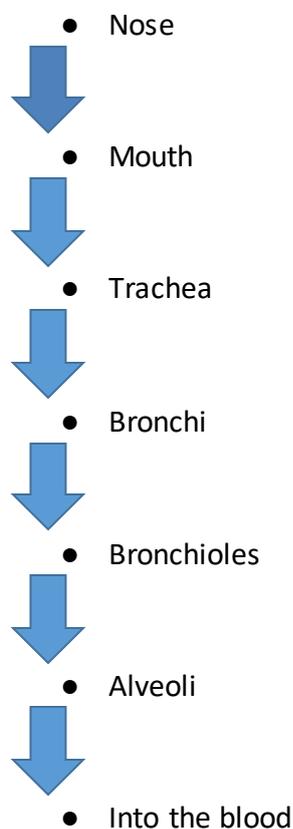
What does inspiration mean?

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What does exhalation mean?

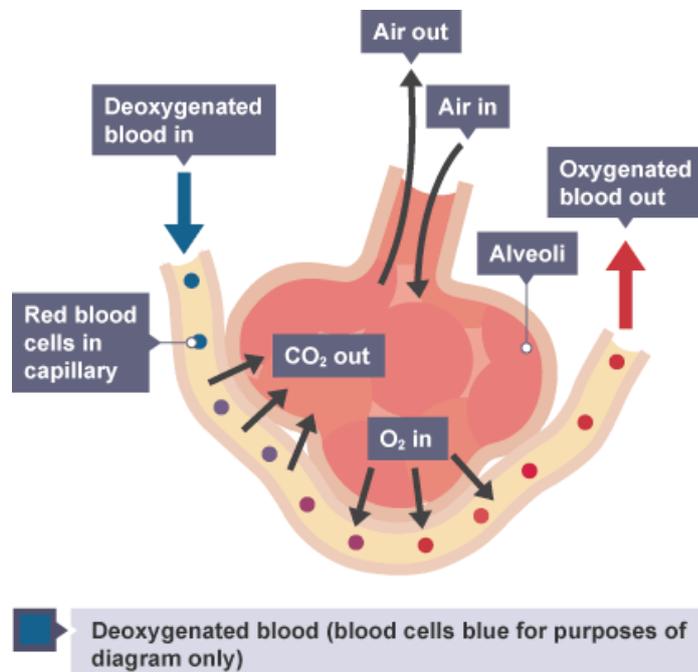
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Task) The journey of air through the respiratory system. Beside each phase explain what each section is and what happens at each section



Gaseous exchange

Task) Use this diagram to explain how oxygen enters the blood stream and also how the body gets rid of carbon dioxide.



Aerobic and anaerobic exercise

Task) Sort the words below to create definitions of aerobic and anaerobic exercise using all of the words provided and your own words.

OXYGEN	ENERGY	RESPIRATION	ENDURANCE	HIGH
LACTIC	FAT	SPRINTING	INTENSITY	JOGGING
CARBOHYDRATE		GLYCOGEN	MODERATE	SPRINTING

Aerobic:

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Anaerobic:

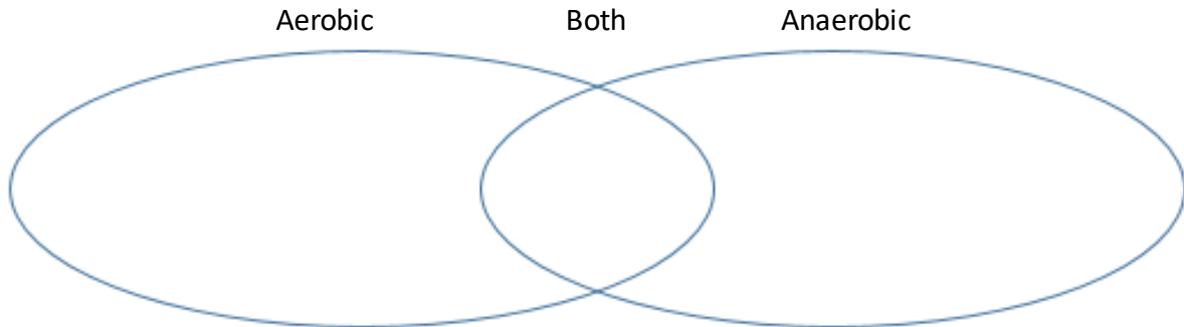
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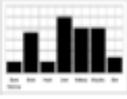
Task) Discuss with a partner and note down as many different sports as you can and place them into either aerobic, both, or anaerobic circles.



1.1.e. Effects of exercise on body systems

Learners will develop their knowledge and understanding of the short and long-term effects of exercise on muscles and bones, the heart and the respiratory system. They will be able to apply understanding of these effects to examples from a range of physical activities and sports. Learners

will be able to collect and use data in this section related to both short-term and long-term effects of exercise.

Topic area	Learners must:
<p>Short-term effects of exercise</p>  	<ul style="list-style-type: none"> • understand the short-term effects of exercise on: <ul style="list-style-type: none"> ○ muscle temperature ○ heart rate, stroke volume, cardiac output ○ redistribution of blood flow during exercise ○ respiratory rate, tidal volume, minute ventilation ○ oxygen to the working muscles ○ lactic acid production • be able to apply the effects to examples from physical activity/sport • be able to collect and use data relating to short-term effects of exercise.
<p>Long-term (training) effects of exercise</p>  	<ul style="list-style-type: none"> • understand the long-term effects of exercise on: <ul style="list-style-type: none"> ○ bone density ○ hypertrophy of muscle ○ muscular strength ○ muscular endurance ○ resistance to fatigue ○ hypertrophy of the heart ○ resting heart rate and resting stroke volume ○ cardiac output ○ rate of recovery ○ aerobic capacity ○ respiratory muscles ○ tidal volume and minute volume during exercise ○ capillarisation • be able to apply the effects to examples from physical activity/sport • be able to collect and use data relating to long-term effects of exercise.

Glossary of terms for 1.1 e

Exercise	Activity that requires physical effort. Usually carried out to sustain or bring about improvements to health or fitness
Physical activity	Movement of the body by the skeletal muscles that requires energy expenditure.
Short term	
Fatigue	Muscle tiredness when the body has a lack of energy
Lactic acid	A waste product produced in the muscle tissues during strenuous exercise where the anaerobic energy system is in use
Rate of recovery	The speed at which the body returns back to normal after exercise
Redistribution of blood (aka vascular shunt)	When you exercise the blood is diverted from inactive areas to the muscles that are being used. This action is completed through vasodilation and vasoconstriction Also known as the vascular shunt mechanism.
Long term	

Hypertrophy	The increase in size of skeletal or cardiac muscle, often as a result of training or exercise

Should I add more short and long term effects?

Tasks per section:

Short term effects of exercise

Task) Think of all the short term effects that can occur when exercising. Draw a picture of the effect in the box and see if a partner can identify the short term effect.

Then categorise them into respiratory, cardiovascular and muscular effects.

Pic1)

Name the effect:

Pic2)

Name the effect:

Pic3)

Name the effect:

Pic4)

Name the effect:

Pic5)

Name the effect:

Pic6)

Name the effect:

Pic7)

Name the effect:

Task) Define vascular shunt mechanism

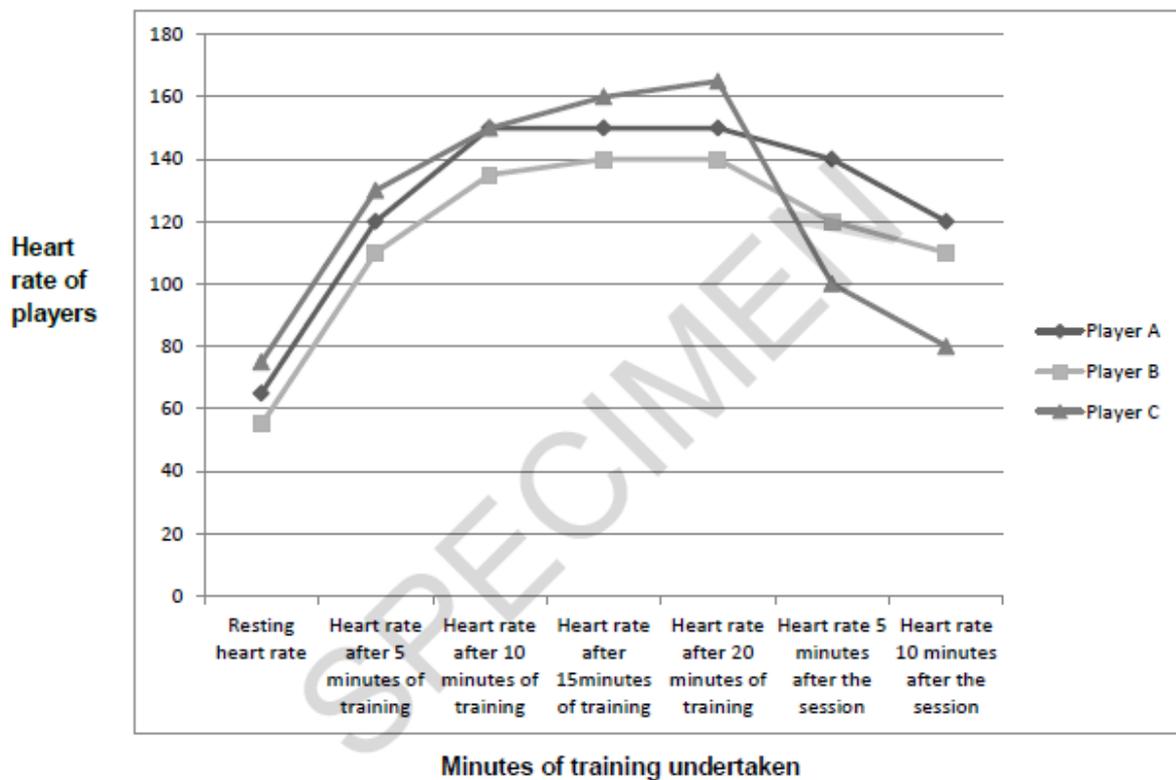
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Task) Using the information provided below analyse the players; physical fitness, performance and recovery. (3 marks)

- 21 As part of their 8 week pre-season football training programme, players are monitored in terms of the changes in heart rate that occur during and after a training session.

Fig. 3 shows a graph of heart rate results for three players during the first training session of the programme.

Fig. 3



Long term effects of exercise

Task) Identify a long term effect of exercise for each system:

- Cardiovascular system

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- Muscular system

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- Respiratory system

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Task) Complete the sentences below about the long term effects of exercise on the body by filling in the gaps:

Regular exercise increases the amount of energy that you are expending and, therefore, can reduce the amount of _____ that is stored within the body, and it can also lead to _____ (increase in muscle size), and increased muscle mass. Both of these changes will result in the exerciser's body shape being changed. It is also good for bone health as regular _____ can lead to bone remodelling which increases the _____.

A range of _____s can be improved through exercise. For example, an increase in muscle mass which is associated with regular exercise, particularly resistance exercise, can lead to increased _____ and _____ which will increase the muscles' resistance to _____.

Exercise can also increase the size of the heart over time. This is called cardiac _____. This increased size and strength of the heart causes more blood to be effectively pumped from the heart, with less effort. Hypertrophy of the heart therefore leads to bradycardia (a lower resting _____) and an increased resting _____ as more blood can be pumped out with each beat. The potential _____ during exercise is greatly increased due to the increased strength of the heart, which greatly improves an athlete's _____ for exercise as it can ensure an adequate supply of _____ is maintained for longer.

- The ability of the respiratory system to take in oxygen and transport it around the body is improved by the increased contractile strength of the _____ which allows for an increased _____ (the amount of oxygen taken in with each breath) and _____ (the amount of oxygen breathed in and out each minute). The increased density of capillaries, known as _____, also increases the body's ability to transport oxygen to the working muscles.

1.2 Physical training

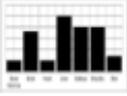
Learners will develop their knowledge and understanding of the components of fitness required for physical activities and sports and how each can be measured. Learners will also be able to apply their knowledge of training principles to personal exercise/training programmes to improve fitness, along with the knowledge of how to optimise training and helping to prevent injury.

The sections:

1.2.a. Components of fitness

Learners will develop their knowledge and understanding of the components of fitness, including cardiovascular endurance, muscular endurance, speed, strength, flexibility and agility. Learners will be able to define each component and be able to apply using a range of practical examples from physical activities and sports. Learners will also develop their knowledge of suitable tests for each component. Learners will be able to collect and use data related to the identified components of fitness.

Topic area	Learners must
<p>Components of fitness</p>  	<p>Know the following components of fitness:</p> <ul style="list-style-type: none">• cardiovascular endurance/stamina<ul style="list-style-type: none">○ know the definition of cardiovascular endurance/stamina○ be able to apply practical examples where this component is particularly important in physical activity and sport○ know suitable tests for this component, including:<ul style="list-style-type: none">– Cooper 12 minute run/walk test– multi-stage fitness test• muscular endurance<ul style="list-style-type: none">○ know the definition of muscular endurance○ be able to apply practical examples where this component is particularly important in physical activity and sport○ know suitable tests for this component, including:<ul style="list-style-type: none">– press-up test– sit-up test• speed<ul style="list-style-type: none">○ know the definition of speed○ be able to apply practical examples where this component is particularly important in physical activity and sport○ know suitable tests for this component, including:<ul style="list-style-type: none">– 30m sprint test• strength<ul style="list-style-type: none">○ know the definition of strength○ be able to apply practical examples of where this component is particularly important in physical activity and sport○ know suitable tests for this component, including:<ul style="list-style-type: none">– grip strength dynamometer test– 1 Repetition Maximum (RM)

Topic area	Learners must
Components of fitness cont.  	<ul style="list-style-type: none"> • power <ul style="list-style-type: none"> ○ know the definition of power ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – ‘standing jump’ or ‘vertical jump’ tests • flexibility <ul style="list-style-type: none"> ○ know the definition of flexibility ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – ‘sit and reach’ test • agility <ul style="list-style-type: none"> ○ know the definition of agility ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – Illinois agility test • balance <ul style="list-style-type: none"> ○ know the definition of balance ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – ‘stork stand’ test • co-ordination <ul style="list-style-type: none"> ○ know the definition of co-ordination ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – ‘wall throw’ test • reaction time <ul style="list-style-type: none"> ○ know the definition of reaction time ○ be able to apply practical examples of where this component is particularly important in physical activity and sport ○ know suitable tests for this component, including: <ul style="list-style-type: none"> – reaction time ruler test • be able to collect and use data relating to the components of fitness.

Glossary of terms for 1.2 a

Agility	The ability to change direction at speed; nimbleness
Balance	The ability to stay upright or stay in control of body movement
Cardiovascular endurance	The ability to continue exertion while getting energy from the aerobic system used to supply the body with energy. Also referred to as stamina
Co-ordination	The ability to move two or more body parts under control, smoothly and efficiently
Flexibility	Range of movement available around a joint
Muscular endurance	The ability to move your body and muscles repeatedly without fatiguing
Power	The ability to exert a maximal force in as short a time as possible
Reaction time	The ability to respond quickly to a stimulus

Speed	The ability to move quickly across the ground or move limbs rapidly through movements.
Strength	The maximum force a muscle/group of muscles can apply against a resistance.

Tasks per section:

Components of fitness

Task) Create a glossary for the components of fitness (without looking at the glossary!) then include examples of activities in sports which require each component.

Agility is:	Sports that require it and why:
Balance is:	Sports that require it and why:
Cardiovascular endurance is:	Sports that require it and why:
Coordination is:	Sports that require it and why:
Flexibility is:	Sports that require it and why:
Muscular endurance is:	Sports that require it and why:
Power is:	Sports that require it and why:
Reaction time is:	Sports that require it and why:
Strength is:	Sports that require it and why:
Speed is:	Sports that require it and why:

Task) Draw the route for the Illinois agility test. Then explain how it allows a person to test for agility and not just speed.

Picture:

Explanation:

.....
.....

Task) The test procedures have been provided for you. Fill in the rest of the table by identifying the equipment needed, the name of the test, the component of fitness it tests, and the unit of measurement.

Procedure	Equipment	Test	Component of fitness	Measured in
Measure a set distance (e.g. 50 m) and place a cone at each end. Start the stopwatch and see how far the participant can run/swim in 12 minutes.				
Sit on the floor and place your legs out in front of you and try to reach forward as far as possible.				
Perform as many press-ups as possible in one minute.				
Perform as many sit-ups as possible in one minute.				
Reach as high as possible while standing and then try to reach as high as possible while performing a standing jump.				
Run between two cones in the shortest time possible.				

Procedure	Equipment	Test	Component of fitness	Measured in
Squeeze a dynamometer with your hand with maximum isometric contraction for around five seconds.				
Perform one repetition of a bench press with as much weight as possible.				
Run around the multi-directional course as quickly as possible.				
Balance on one leg with the other leg raised with the foot placed against the standing leg's knee for as long as possible.				
Throw a ball against a wall and catch it in the opposite hand as many times as possible in 30 seconds.				
Place your fingers either side of the bottom of a ruler as an assistant holds it. Grab the ruler as quickly as possible when they drop it.				
Run the length of a straight course in time to a track being played. Keep up with the track by making it to the other end in time with the signal. The signals will become quicker and if you cannot keep up, you must stop.				

1.2.b. Applying the principles of training

Learners will develop their knowledge and understanding of the principles of training. They will be able to define each principle and be able to apply each to personal exercise/ training programmes. Learners will develop their knowledge and understanding of how to optimise training using the FITT principle and different types of training. Learners will develop their knowledge and understanding of the key components and physical benefits of the warm up and cool down applied to physical activities and sports.

Topic area	Learners must:
<p>Principles of training</p> 	<ul style="list-style-type: none"> • know the following definitions of principles of training and be able to apply them to personal exercise/training programmes: <ul style="list-style-type: none"> ○ specificity ○ overload ○ progression ○ reversibility.
<p>Optimising training</p> 	<ul style="list-style-type: none"> • know the definition of the elements of FITT (Frequency, Intensity, Time, Type) and be able to apply these elements to personal exercise/training programmes • know different types of training, definitions and examples of: <ul style="list-style-type: none"> ○ continuous ○ fartlek ○ interval <ul style="list-style-type: none"> – circuit training – weight training – plyometrics – HIIT (High Intensity Interval Training). • understand the key components of a warm up and be able to apply examples: <ul style="list-style-type: none"> ○ pulse raising ○ mobility ○ stretching ○ dynamic movements ○ skill rehearsal • know the physical benefits of a warm up, including effects on: <ul style="list-style-type: none"> ○ warming up muscles/preparing the body for physical activity ○ body temperature ○ heart rate ○ flexibility of muscles and joints ○ pliability of ligaments and tendons ○ blood flow and oxygen to muscles ○ the speed of muscle contraction • understand the key components of a cool down and be able to

apply examples:

- low intensity exercise
- stretching
- know the physical benefits of a cool down, including:
 - helps the body's transition back to a resting state
 - gradually lowers heart rate
 - gradually lowers temperature
 - circulates blood and oxygen
 - gradually reduces breathing rate
 - increases removal of waste products such as lactic acid
 - reduces the risk of muscle soreness and stiffness
 - aids recovery by stretching muscles.

Glossary of terms for 1.2 b

Specificity	The training must be matched to the needs of the sporting activity and individual
Overload	A greater than normal stress that is applied on the body for training adaptations to take place.
Progression	Gradual increases in exercise in order for the body to adapt through overload
Reversibility	Any adaptation that takes place as a result of training will be lost if you stop training
FIIT: Frequency, Intensity, Time, Type	FITT outlines the key components of an effective exercise program: Frequency – the number of times exercise takes place Intensity – how hard and intense the exercise is Time – how long you exercise for Type - the kind of exercise that takes place.
Circuit training	Series of alternate exercises performed at stations that focus on different muscle groups
Continuous training	Training that involves activity without rest intervals. It can be performed at any intensity
Cooldown	The act of allowing physiological activity to return to normal gradually after strenuous exercise by engaging in less strenuous exercise. Aims to slowly decrease breathing, heart rate and muscle temperature
Fartlek	Training which varies in intensity and duration and consists of bursts of intense effort alternating with less strenuous activity
HIIT	Exercise that alternates between high intensity and periods of recovery
Interval training	Training that incorporates periods of exercise and rest
Plyometrics	Involves jumping, bounding, hopping exercise
Warm-up	Preparatory exercises to prepare the body and mind for physical activity. Aims to increase breathing heart rate and muscle temperature

Tasks per section:

Principles of training

Task) Guess the method. Read the caption then choose which method you believe it to be and place the corresponding number in the box.

1	2	3	4	5	6	7
Circuit training	Continuous training	Weight training	Fartlek training	Interval training	Plyometric training	High intensity interval training

This exercise is interspersed with periods of rest or low-intensity exercise.




This requires the athlete to perform a number of different exercises at each station that they move to.

The athlete performs this exercise at a steady pace for a prolonged period of time.




This can be performed on a range of terrains at different speeds.

This requires the athlete to continually lift large loads, and will result in strength gains.




This involves bounding or jumping in order to increase power through eccentric contractions followed by larger concentric contractions.

This involves the athlete performing maximal work for short periods of time before taking a short break and then repeating the exercise again.



Task) Using examples, define the following terms:

- Frequency

.....
.....

- Intensity

.....
.....

- Time

.....
.....

- Type

.....
.....

Optimising training

Task) Design a warm-up for your favourite sport using examples.

1. Pulse raiser:

.....
.....

2. Mobility exercises:

.....
.....

3. Stretching:

.....
.....

4. Dynamic movements:

.....
.....

5. Skills practice:

.....
.....

1.3.c. Preventing injury in physical activity and training

Learners will develop their knowledge and understanding of how to prevent injury when participating in physical activities and sport. The potential hazards will be known in a range of physical activities and sports settings. Learners will know how risks can be minimised by using appropriate equipment, clothing, correct lifting techniques, using the warm up and cool down and an appropriate level of competition.

Topic area	Learners must:
Prevention of injury 	<ul style="list-style-type: none"> • understand how the risk of injury in physical activity and sport can be minimised and be able to apply examples, including: <ul style="list-style-type: none"> ○ personal protective equipment ○ correct clothing/footwear ○ appropriate level of competition ○ lifting and carrying equipment safely ○ use of warm up and cool down • know potential hazards in a range of physical activity and sport settings and be able to apply examples, including: <ul style="list-style-type: none"> ○ sports hall ○ fitness centre ○ playing field ○ artificial outdoor areas ○ swimming pool.

Glossary of terms for 1.3 c

Hazard	A hazard is an object or situation that could potentially cause harm to an individual
Hydration	Having the appropriate level of water in the body for it to function optimally. When this level of water falls below optimal levels it is referred to as dehydration.
PPE	Personal Protective Equipment. Items that are worn to protect the wearer from harm.

Tasks per section:

Prevention of injury

Task) Identify and highlight all the precautions which have been taken by the following sports team in order to limit the risk of injuries.



The team undertakes training sessions on every day of the week in order to prepare for their matches which occur every weekend. As a result, the coaches constantly stress the importance of reducing the risk of injury. Before each training session, the coaches perform a risk assessment of the area to ensure that it is safe to play in and they ensure that all equipment is working properly. They also ensure that all athletes and members of staff are trained in lifting equipment safely in order to reduce the risk of developing back and neck injuries.

The team has a sports-science department which monitors the amount of training that is being completed and whether the players are becoming tired and need a rest day or a low-intensity day to give them time to recover. As well as having appropriate rest, it is also important that the players have the appropriate level of competition and are not training too hard, and that they are not competing against athletes who are much bigger or stronger than them. The coaches, therefore, monitor each individual's training programme to ensure that they are working at an appropriate level. For example, each player knows how much weight they should be lifting for each exercise and this weight is only increased when the coaches think it is appropriate. They also ensure that before and after every session, a warm-up and a cool-down are performed.

Before training sessions and matches the coaches ensure that all players wear the appropriate protective equipment, such as shin pads, and that any players who have problem areas (e.g. weak ankles) have taping or bracing applied. The coaches also ensure that the correct clothing and footwear is worn. The appropriate clothing and footwear will depend upon the location of the training session and the weather conditions at the time.

Task) Look at the photographs of various sporting facilities. Identify five potential hazards which you would need to be aware of if you were to use the facility.

Sports Hall Hazards



- 1.
- 2.
- 3.
- 4.
- 5.

Fitness Centre Hazards



- 1.
- 2.
- 3.
- 4.
- 5.

Playing Field Hazards



- 1.
- 2.
- 3.
- 4.
- 5.

Artificial Pitch Hazards



- 1.
- 2.
- 3.
- 4.
- 5.

Swimming Pool Hazards



- 1.
- 2.
- 3.
- 4.
- 5.