Knowledge Organiser

Physical Education

RAYNES
PARK HIGH SCHOOL

BTEC SPORT KNOWLEDGE ORGANISER

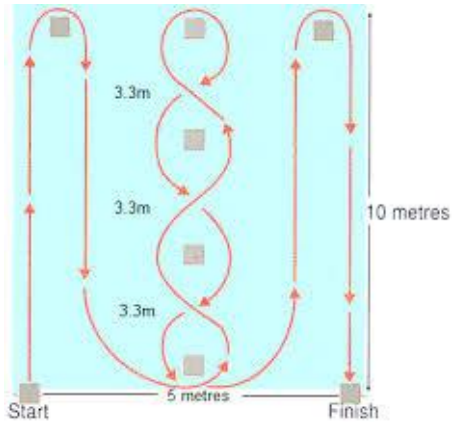
Unit 1: (Exam unit – 25%)

Learning aims

A. know about the components of fitness and the principles of training.
B. explore different fitness training methods.
C. investigate fitness testing to determine fitness levels.

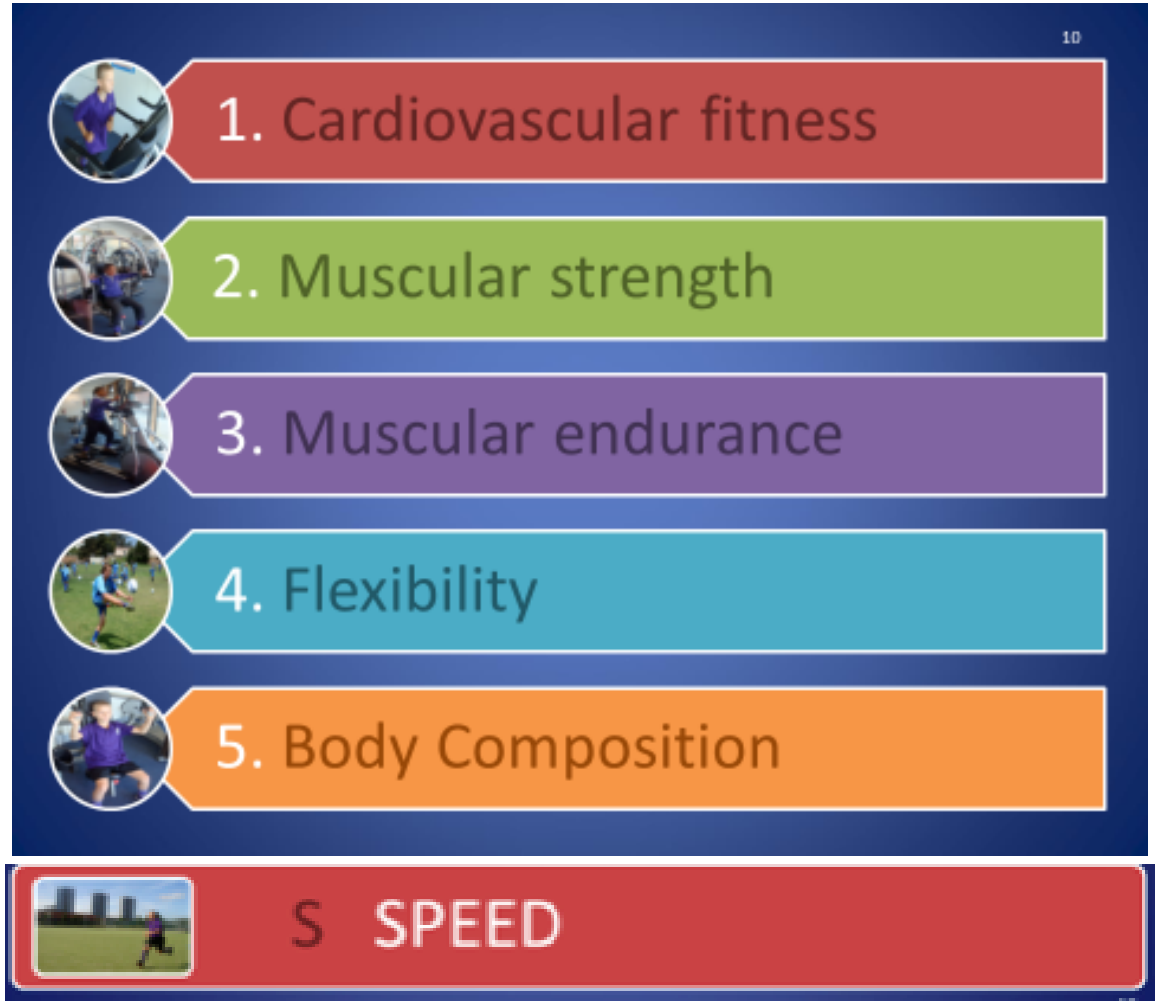
Key words/ terms:

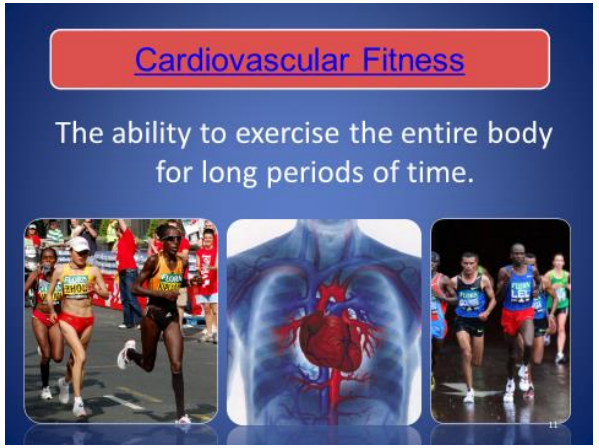
- Components of physical fitness
- Components of skill related fitness
- Exercise intensity
- Principles of training
  - FITT
  - Progressive overload
  - Adaptation
  - Reversibility
  - Individual differences/ needs
  - Variation
  - Rest and recovery
  - Rest and recovery
- Methods of training
- Protocol
- Fitness testing
- Validity
- Reliability
- Normative data

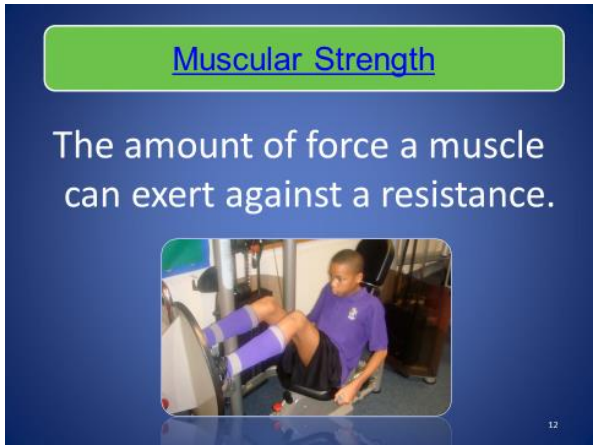


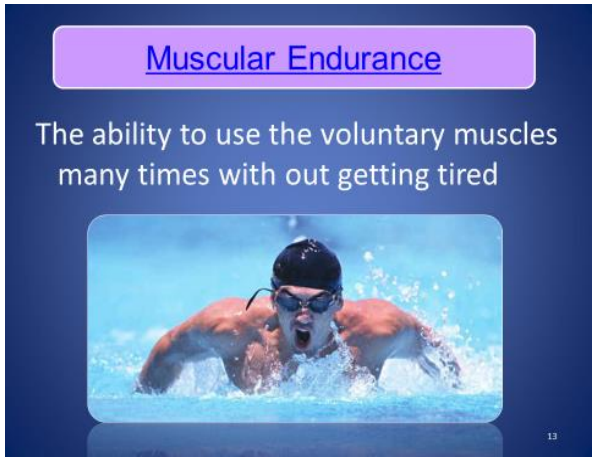
Time to run 35 meters (in seconds)		
rating	**men**	**women**
very good	< 4.80	< 5.30
good	4.80 - 5.09	5.30 - 5.59
average	5.10 - 5.29	5.60 - 5.89
fair	5.30 - 5.60	5.90 - 6.20
poor	> 5.60	> 6.20

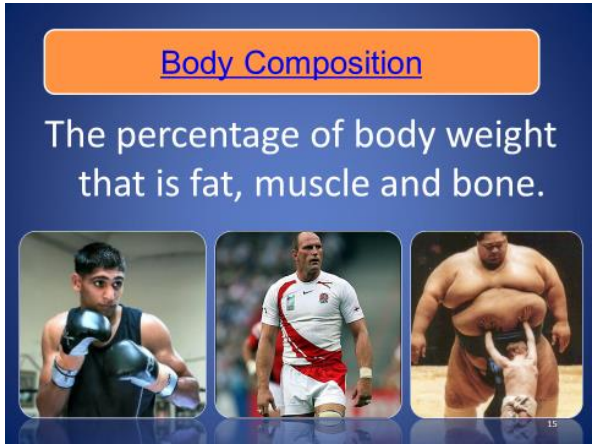
Components of Fitness

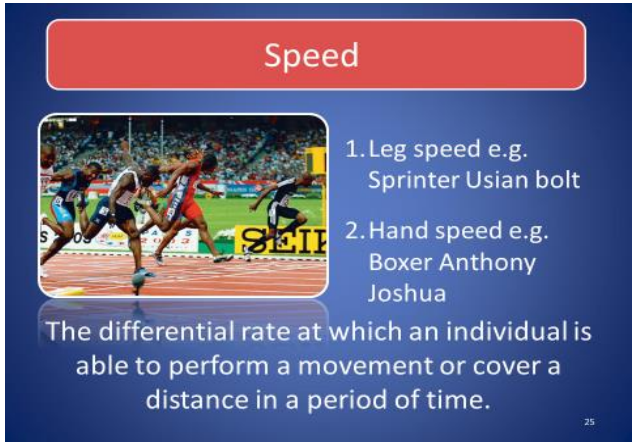












Components of Fitness

Power

The ability to undertake strength performances quickly.

Power = Strength × Speed

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Co-ordination

The ability to use two or more body parts

Can require Hand, foot, chest or head - eye coordination

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Reaction Time

The time between the presentation of a stimulus and the onset of a movement

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Agility

The ability to change the position of the body quickly and to control the movement of the whole body

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Balance

The ability to retain the centre of mass (gravity) of the body above the bass of support with reference to static (stationary), or dynamic (changing) conditions of movement, shape and orientation

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An Exercise Session

Warm Up

Main Activity

Cool Down

Warm-Up


Prevent injury


Improve performance


Practice skills before the event


Prepare psychologically for the event

3 Stages of a warm-up


1. Cardiovascular warm up - Gradually Raises heart rate to working level.


2. Stretching - Static or Dynamic (Ballistic)
Must be specific to the main activity


3. Specific skills Practice - Should be skill specific to the main activity.

Main Activity


1. Training Session E.G continuous


2. Taking Part in a competitive match.


3. Could be trying to lose weight


4. Rehabilitation after illness or injury.

Cool Down


Gradually returns the body to its normal resting heart rate and temperatures


Every training session should finish with a cool down.


Disperses lactic acid produced during exercise.


Stretches in the cool down should be held for longer (30-35)

Fitness Testing

Coopers 12-minute test

- Tests cardiovascular fitness and muscular endurance
- Run or swim as far as you can in 12 minutes
- Measure distance covered and calculate VO2 Max

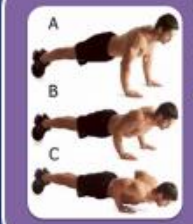
Hand grip strength test (Strength)

- Test muscular strength in the hand
- Take hand grip dynamometer and squeeze as tightly as possible.
- Take three recordings, record the best score

Sit and reach flexibility test

- Measures the the flexibility of leg muscles
- Can use a sit and reach box or sit down with legs straight with feet against a bench or a desk
- Measure how far beyond your toes you can reach

Push Up/Sit Up test (Muscular Endurance)



- Complete as any push ups or sit ups in 1 minute

Sergeant (Vertical) Jump test (Power)

- This tests leg power. Chalk your finger tips and touch the wall as high as you can.
- Measure how high above your standing reach mark you jumped and record your result

30-metre sprint test (Speed)

- Mark out a 30 metre distance.
- On signal run as fast as you can
- Can be completed over different distances.

Illinois agility run (Agility)

- Participants are required to run the course as quickly as possible.
- Participants must start lying on the floor (chest in contact with the floor

Standing stork test (Balance)

- Measures a persons balance
- Timed how long this position can be held for
- Repeat the test on the opposing foot.

Ruler drop test (Reaction time)

- Partner holds a 1 metre ruler at 0 cm.
- Place your thumb and forefinger of your preferred hand at the 50cm mark
- Partner decides when to release.
- Catch between thumb and forefinger as quickly as possible.

Alternate ball toss (Coordination)

- Using a tennis ball throw from right hand against wall and catch with left, throw with left catch with right
- How many in 30 seconds?

1. INTERVAL

2. CONTINUOUS

3. FARTLEK

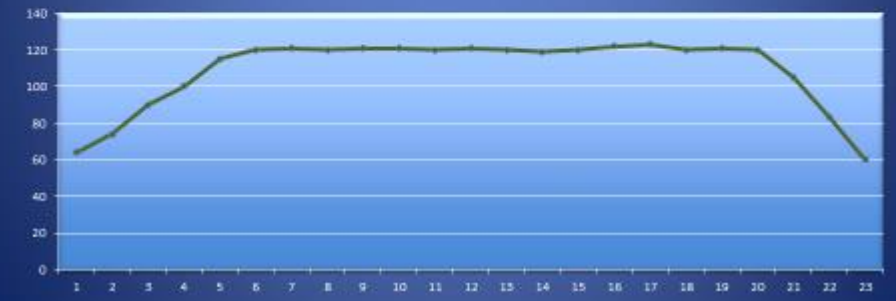
4. CIRCUIT

5. WEIGHT

6. CROSS TRIANING

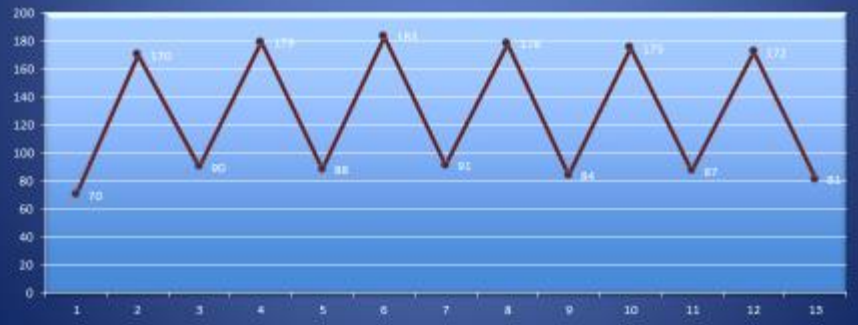
CONTINUOUS TRAINING

- Training with no rest periods.
- Sessions will last longer than 15 minutes.
- Improves cardiovascular fitness.
- Working heart rate will not be very high.
- Heart rate will remain at a steady state.



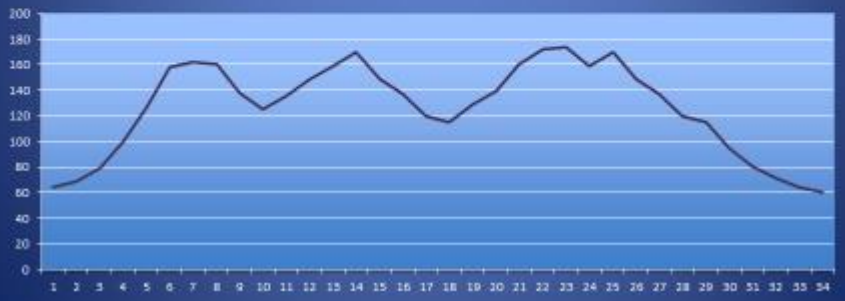
INTERVAL TRAINING

- Most suited for team games as it fits the style of many games.
- Short bursts followed by walk or jog period
- Defined as high intensity periods of work followed by defined periods of rest.



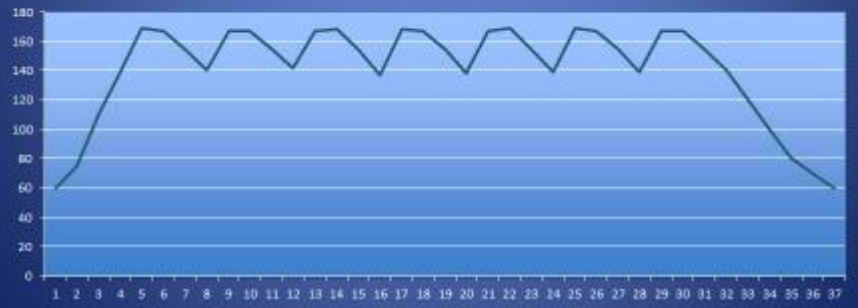
FARTLEK TRAINING

- Suited to games such as football, netball and hockey as includes short bursts.
- Combination of fast and slow running.
- FARTLEK differs from INTERVAL, sprint periods vary in distance and gradient.



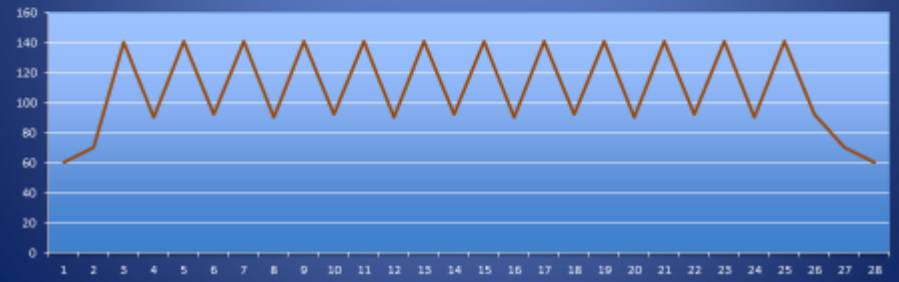
CIRCUIT TRAINING

- Improves local muscular endurance, muscular endurance, cardiovascular fitness
- Exercises arranged in a circuit, the same muscle groups are not used consecutively
- Circuit training develops general fitness



WEIGHT TRAINING

- Increase muscular Strength
- Increase muscular Endurance
- Increase Speed
- Develop Muscular Bulk (Hypertrophy)
- Rehabilitate after illness or injury



CROSS TRAINING

- Varying types of exercise to help break the monotony of using one method
- Can also relieve the stresses of the body as a result of using a single training method.
- Can be used to produce same effects as a single type of training but through different types

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Unit 2: (Coursework unit – 25%)

Learning aims

A. understand the rules, regulations and scoring systems for selected sports.
B. practically demonstrate skills, techniques and tactics in selected sports.
C. be able to review sports performance.

What you will need to know:

Learning aim A:

- Explain the rules of 2 selected sports:
  - Rules
  - Regulations
  - Scoring systems
- Explain the roles of different officials in 2 selected sports:
  - Roles/ responsibilities of each official.
  - How are the rules applied by the officials.

Learning aim B:

- Explain the technical and tactical demands of 2 selected sports:
  - What components of fitness are needed?
  - What are skills & why are these important?
  - What tactics can be used to outwit opponents?
- You will also be required to participate & demonstrate skills in 2 selected sports both in isolated drills and in full game situations.

Learning aim C:

- Create a checklist to assess your own performance in 2 selected sports (rating your own components of fitness, skills and use of tactics.)
- Create a written document reviewing your own performance in 2 selected sports:
  - Strengths
  - Areas for improvement
  - Suggested activities to improve performance

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Unit 5: (Coursework unit.)

Learning aims

A. know about the short-term responses and long-term adaptations of the body systems to exercise

B. know about the different energy systems used during sports performance.

What you will need to know & demonstrate:

Learning aim A:

- Explain how the musculoskeletal system responds to short term exercise.
- Explain how the cardiorespiratory system responds to short term exercise.
- Explain the long term adaptations of the musculoskeletal system to exercise.
- Explain the long term responses of the cardiorespiratory system to exercise.

Learning aim B:

- Understand how the body uses different energy systems to enable us to exercise.
- Explain how each of these energy systems works.
- Compare and contrast how these systems are used within different sports.

Key words:

Skeletal system
Muscular system
Cardiovascular system
Respiratory system
Aerobic
Oxygen
Anaerobic
Glycolysis
Intensity
Lactic acid
Creatine phosphate
Adenosine triphosphate
Gaseous exchange
Glucose

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Unit 3: (Coursework unit.)

Learning Aims

A. design a personal fitness training programme
B. know about the musculoskeletal system and cardiorespiratory system and the effects on the body during fitness training
C. implement a self-designed personal fitness training programme to achieve own goals and objectives .
D. D review a personal fitness training programme.

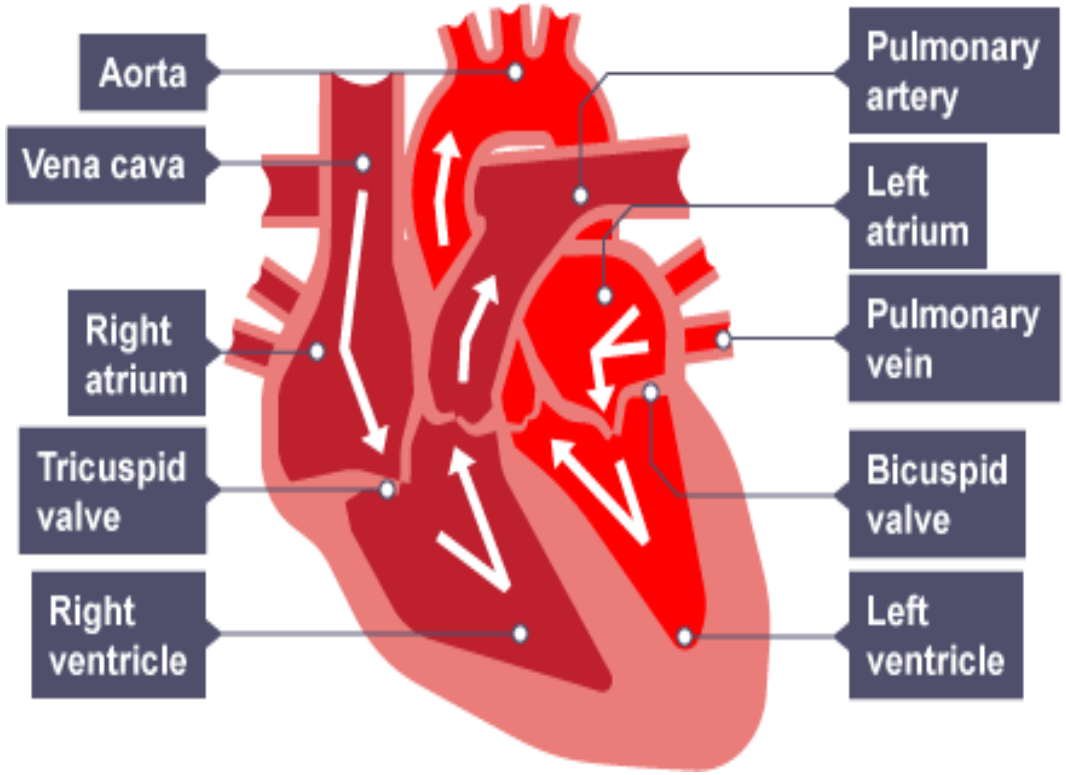
Key words/ terms:

Learning aim A:
Goal setting
SMART
PAR – Q
Components of fitness
Principles of training
Programme design
Methods of training
Training intensity/ zones

Learning aim B:
Musculoskeletal system
Skeletal muscles
Bones
Synovial joint
Cardiorespiratory system
Atria
Ventricles
Vena cava
Aorta

Learning aim C:
- Record keeping
- Training log
- Training review
- Aims and objectives
- Equipment
- Achievements

Learning aim D:
- Training review
- Strengths
- Areas for development
- Suggested activities for improvement



Circulatory System – The Heart

Stroke volume (SV) Amount of blood pumped from the heart in a single beat when resting

Cardiac output (CO) Total volume of blood pumped from the heart during one minute

Heart rate (HR)The number of times the heart beats per minute

Resting heart rate (RHR) The number of times the heart beats when inactive

The heart is a muscular pump. When it beats it pumps blood to the lungs and around the body. The amount of blood pumped can be calculated:

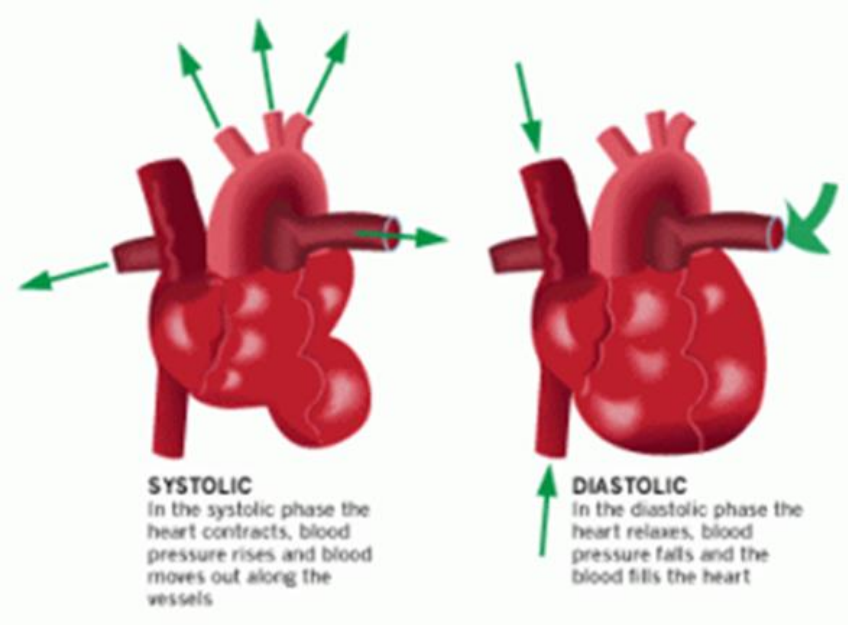
heart rate x stroke volume = cardiac output

The heart has four chambers. The two atria collect the blood. The two ventricles pump the blood out of the heart.

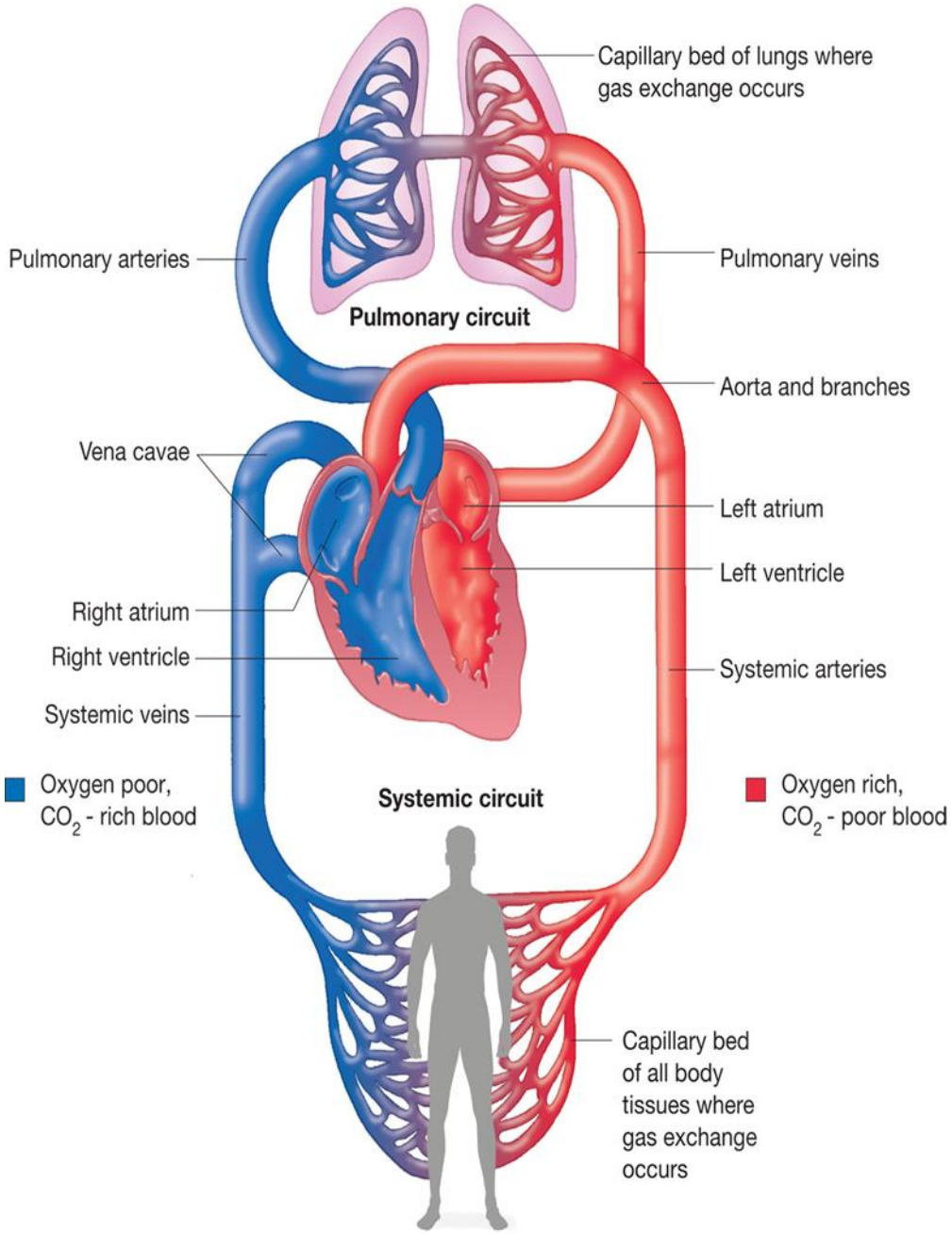
Valves prevent the blood from flowing backwards.

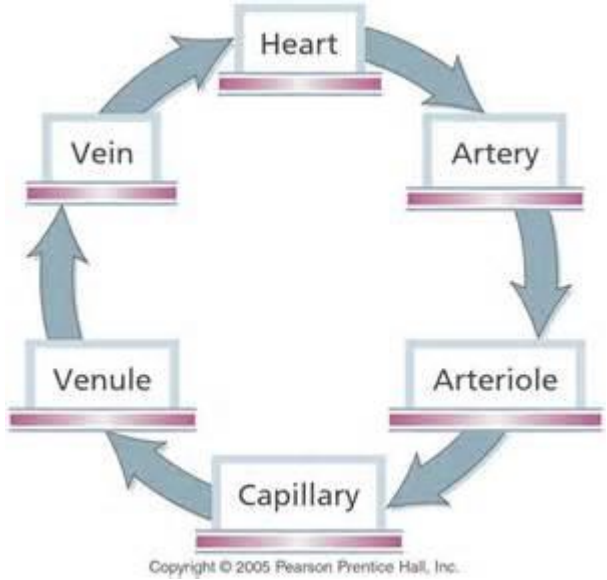
The septum separates the two sides of the heart.

The right side of the heart pumps de-oxygenated blood (blood not containing oxygen) to the lungs to pick up oxygen. The left side of the heart pumps the oxygenated blood from the lungs around the rest of the body.



Circulatory System





Cardiovascular System

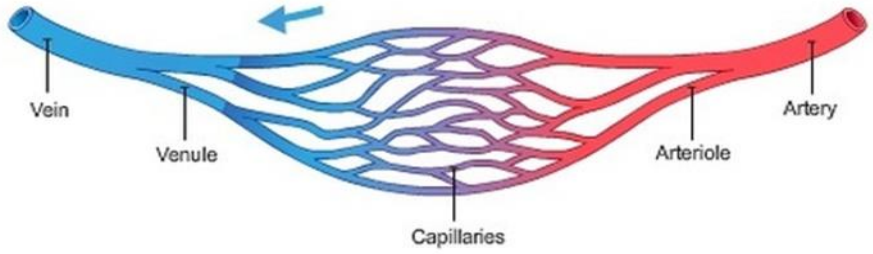
KEY TERMS
Stroke Volume
Cardiac Output

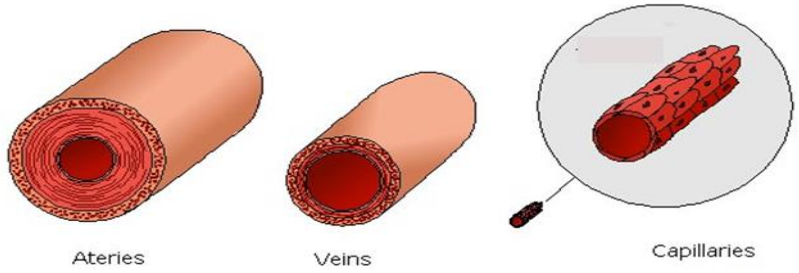
Short Term or Immediate

- Increased heart rate
- Increased of blood pressure
- Increased systolic blood pressure

Long Term effects (Adaptations)

- Cardiac hypertrophy
- Increased stroke volume
- Increased max cardiac output
- Lower resting heart rate.
- Increase in capilliarisation.
- Increase in red blood cells.

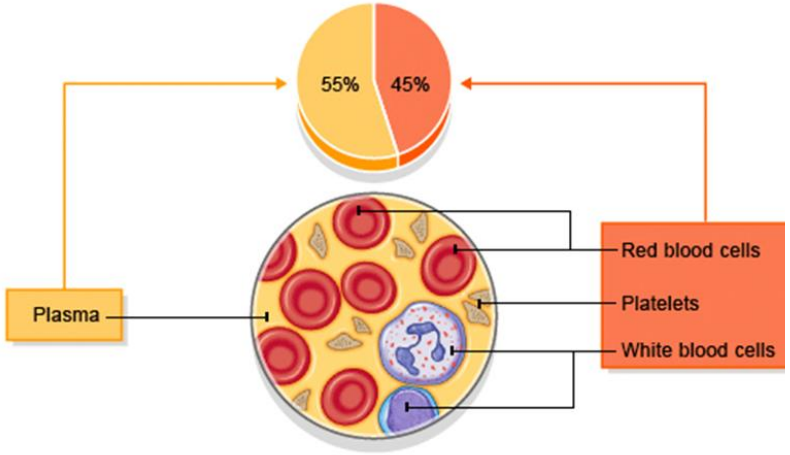


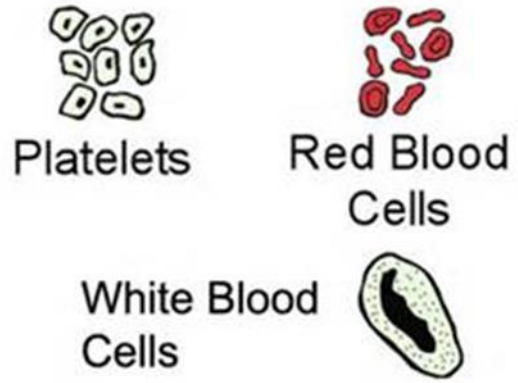


Arteries
Carry blood away from the heart (always oxygenated apart from the pulmonary artery which goes to the lungs)
Have thick muscular walls
Have small passageways for blood (internal lumen)
Contain blood under high pressure

Veins
Carry blood to the heart (always de-oxygenated apart from the pulmonary vein which goes from the lungs to the heart)
Have thin walls
Have larger internal lumen
Contain blood under low pressure
Have valves to prevent blood flowing backwards

Capillaries
Found in the muscles and lungs
Microscopic – one cell thick
Very low blood pressure
Where gas exchange takes place. Oxygen passes through the capillary wall and into the tissues, carbon dioxide passes from the tissues into the blood





Plasma
Fluid part of blood
Carries carbon dioxide, hormones and waste

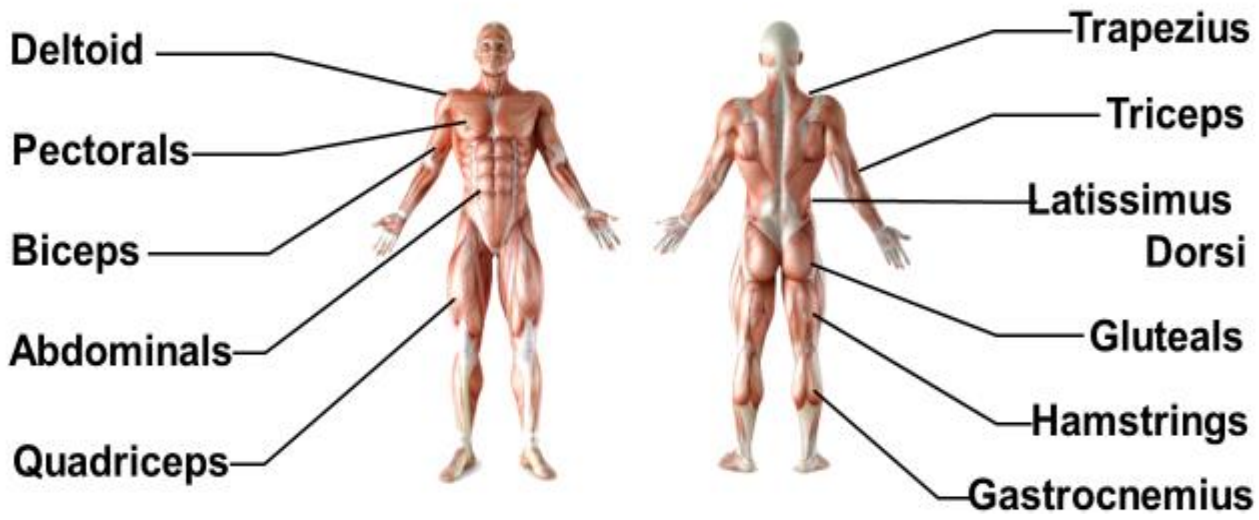
Red blood cells
Contain haemoglobin which carries oxygen
Made in the bone marrow. The more you train the more red blood cells are made.

White blood cells
An important part of the immune system, they produce antibodies and destroy harmful microorganisms
Made in the bone marrow

Platelets
Clump together to form clots
Protect the body by stopping bleeding

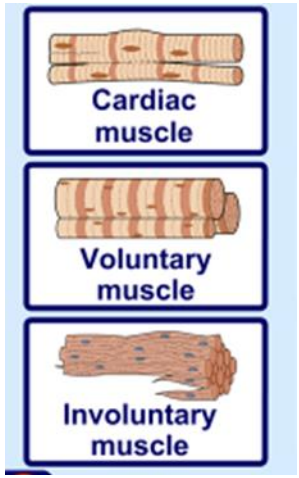
When exercising blood does the following things:
Transports nutrients and waste
Delivers oxygen to the working muscles
Removes heat (temperature regulation)
Dilutes/carries away lactic acid (acidic balance)

Muscular System



Muscle Movement

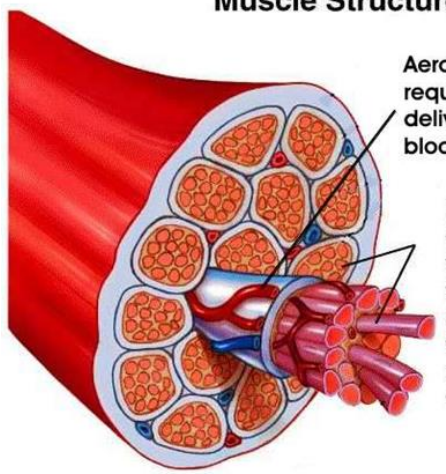
Name of muscle	Function	Example in sport
Triceps	Extend the arm at the elbow	Press-up, throwing a javelin
Biceps	Flex the arm at the elbow	Pull-up, drawing a bow in archery
Deltoids	Move the arm in all directions at the shoulder	Bowling a cricket ball
Pectorals	Adduct the arm at the shoulder	Forehand drive in tennis
Trapezius	Hold the shoulders in place, move head back and sideways	Holding head up in rugby scrum
Gluteals	Adduct and extend leg at the hips	Pulling back leg before kicking a ball
Quadriceps	Extend the leg at the knee	Kicking a ball jumping upwards
Hamstrings	Flex the leg at the knee	Bending knee before kicking a ball
Gastrocnemius	Pointing the toes, help to flex the knee	Running
Latissimus dorsi	Adduct and extend the arm at the shoulder	Butterfly stroke in swimming
Abdominals	Flex the trunk across the stomach	Pulling the body down when hurdling



Voluntary Muscle - Works under **conscience** control.

- **Skeletal muscle** attaches to bones by tendons called the origin and insertion.
- They **create movement** but they can only pull bones so they need to work in pairs.
- Voluntary muscles **tire** so they can only work for a limited amount of time.

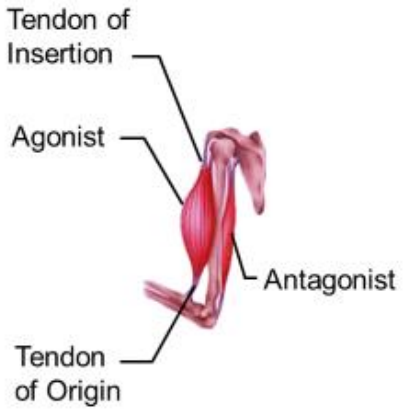
Muscle Structure



Slow Twitch	Fast Twitch
Contracts **slowly**	Contracts **quick**
Improved through **continuous training**	Improved through **interval training**
Uses **aerobic** energy	Uses **anaerobic** energy
Fatigues **slowly**	Fatigues **quickly**
Produces little **Lactic Acid**	Produces lots of **Lactic acid**
Suited to endurance sports	Suited to strength/ power sports

Antagonistic Pairs

Muscles can **only pull** so they have to work in pairs to create movement.



- When the muscle contracts it **pulls on the moveable bone** attached by the **tendon of insertion**.
- It pulls **towards the tendon of origin** on the **fixed bone**.
- The **contracting muscle** is called the **prime mover** or **agonist**.
- The other muscle in the pair **relaxes** and this is called the **antagonist**.
- During movement other muscles called **synergists** contract to **support the contraction**.
- During **muscle action** the **prime mover contracts** while the **antagonist relaxes**.

Types of Muscle Contractions

1. **Isotonic Contraction** - Muscle contraction that results in **limb movement**.
   - This is the most frequent muscle contraction during **sports play**.
   - When the **muscle contracts** it causes a **concentric movement**.
   - When the **muscle relaxes** it causes an **eccentric movement**.
   - **Training** your muscles **isotonically** improves dynamic (moving) strength, power and endurance.

2. **Isometric Contraction** - Muscle contraction with **no limb movement**.
   - Despite contracting the muscle length stays the same.
   - One muscle may contract isometrically to **stabilise a movement** so others can contract isotonically.
   - Less sports require this muscle contraction but examples are a **gymnastic handstand** or **rugby scrum**.
   - Training isometrically provides **little improvements**.

Immediate Effects of Physical Activity

1. Increased **energy demands**.
   - During increased muscle contraction more energy is required.
2. More **blood shunted** to the working muscles.
   - Blood is redirected from the digestive system to the muscles.
3. **Heart beat increases**.
   - Increased energy demand also results in an increased oxygen demand.

4. **Muscles fatigue**.
   - Insufficient oxygen and glucose delivery.
5. Build up of **lactic acid**.
   - Due to working **anaerobically**.
6. **Muscle soreness**.
   - Small **muscle tears** develop during contractions.
7. Muscles produce **heat.**

Trained Muscles and Performance

1. Increased Physical Performance
   - Increase in **muscle size** and **bulk**.
   - Increase in **strength**.
   - Increase in **muscular endurance**.
2. Decreased Risk of Injury
   - Muscles act as **shock absorbers** so well conditioned muscles reduce the landing forces.
   - More muscle around the joint helps **reduce joint injuries**.
3. Increased number of **capillaries surrounding** the **muscle**.
   - **More capillaries** surround the muscle.
   - The muscle tissue can therefore receive more **O2 and glucose**.
4. Increase in **metabolic efficiency**.
   - By increasing muscle size you **increase the body's engine** so you burn more calories.
   - Your fuel burning engine is called your **Basal Metabolic Rate**.

Rest

Rest allows the body to recover in a number of ways and can take up to 48 hours.

- Allows the body to **recover** from **minor injuries**.
- **Muscles** can **recover** from **stiffness** and **soreness**.
- Allows the muscles to **adapt** and improve.
- Allows for any lost **fluids** to be **replaced**.
- Gives time to **consume lost energy** and refill glycogen stores in the muscle and liver.

Muscle Tone

1. **Muscle Tone**
   - Voluntary muscles **readiness to contract** or respond.
   - Muscles have **slight tension** ready to be used.
   - When muscles are **trained their tone increases**.
   - The abdominal muscles tone helps with our **posture**.
   - **Posture** is important in **judged sports** such as Trampoline and Gymnastics as well as **preventing back problems** later in life.

Diet

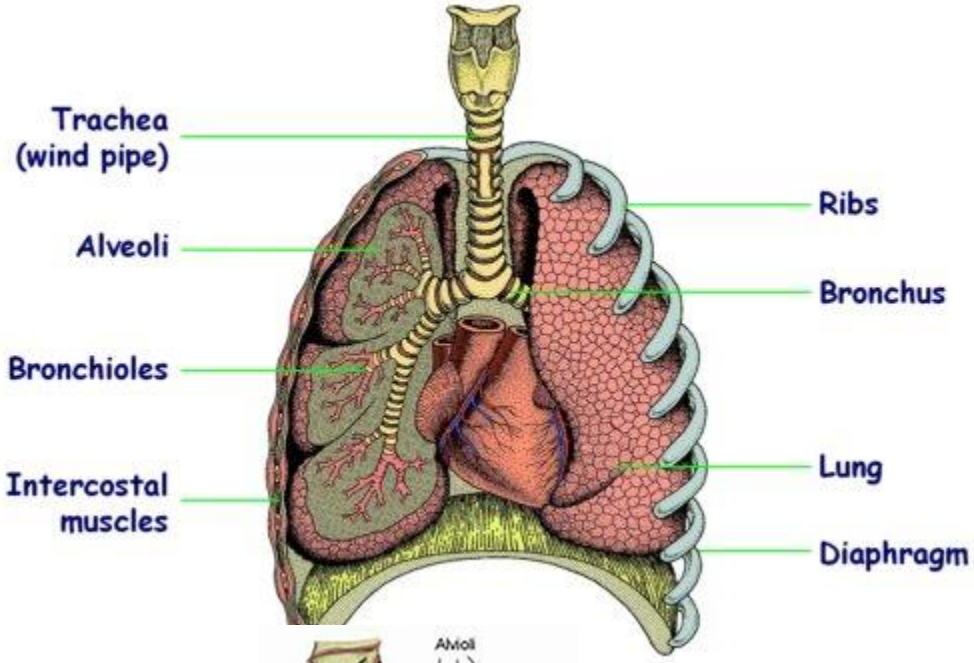
Protein is the most important nutrient for muscle tissue.

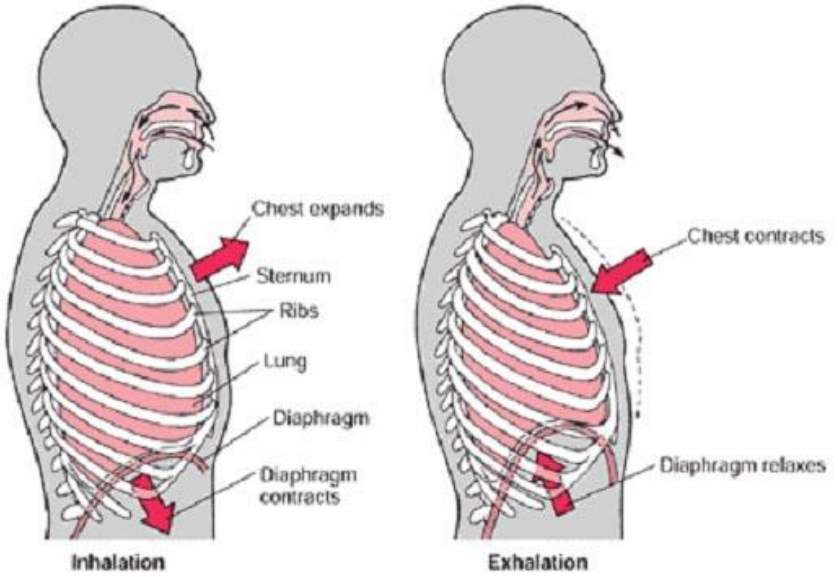
Why is it important?

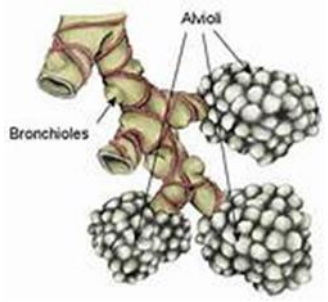
- They **build muscle tissues** to make the body **stronger**.
- They **repair muscle tissue**.

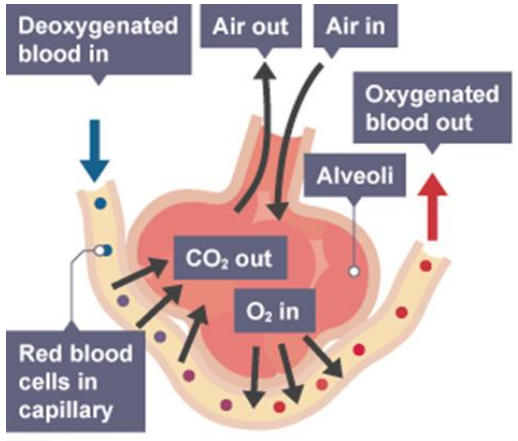
Sources of food

- **Meat, eggs and nuts.**









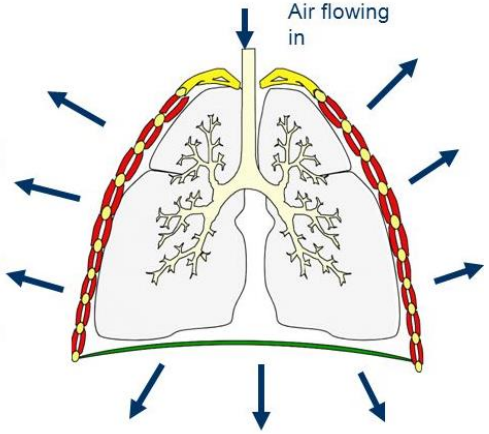
Breathing in

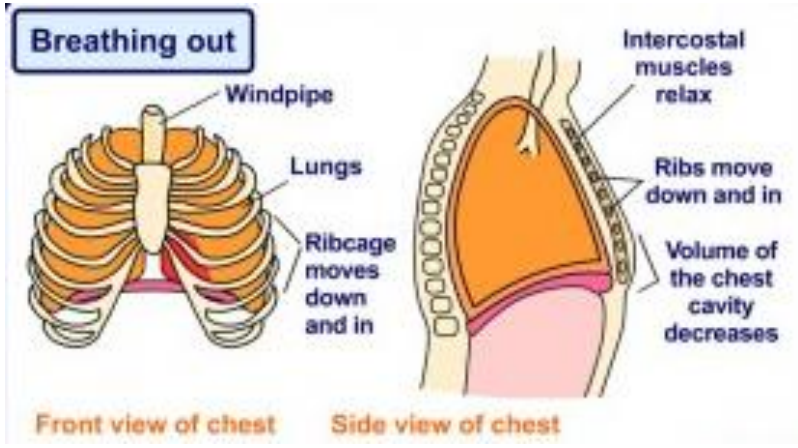
The intercostal muscles contract pulling the rib cage up and out

Diaphragm contracts causing it to flatten

Chest cavity gets larger causing pressure in the lungs to fall

Air moves into the lungs from the higher outside pressure

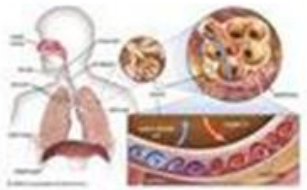




Respiratory System

Respiratory System

KEY TERMS
Vital Capacity
Tidal Volume
Oxygen Debt



Short Term or Immediate

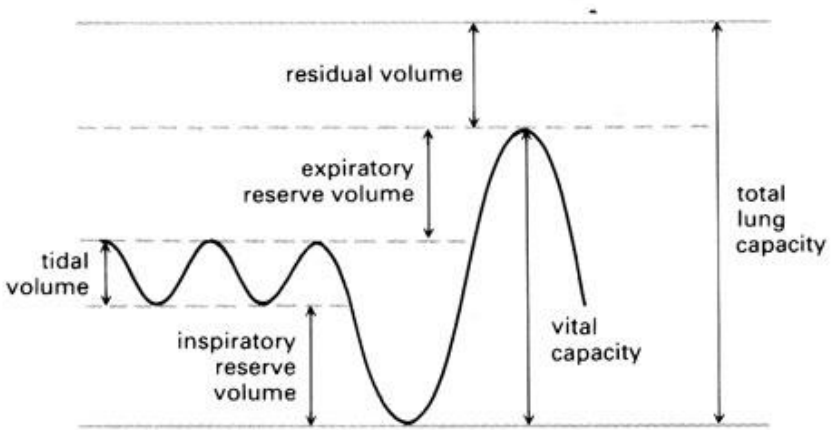
- Increased breathing rate.
- Increased depth of breathing.

Long Term effects (Adaptations)

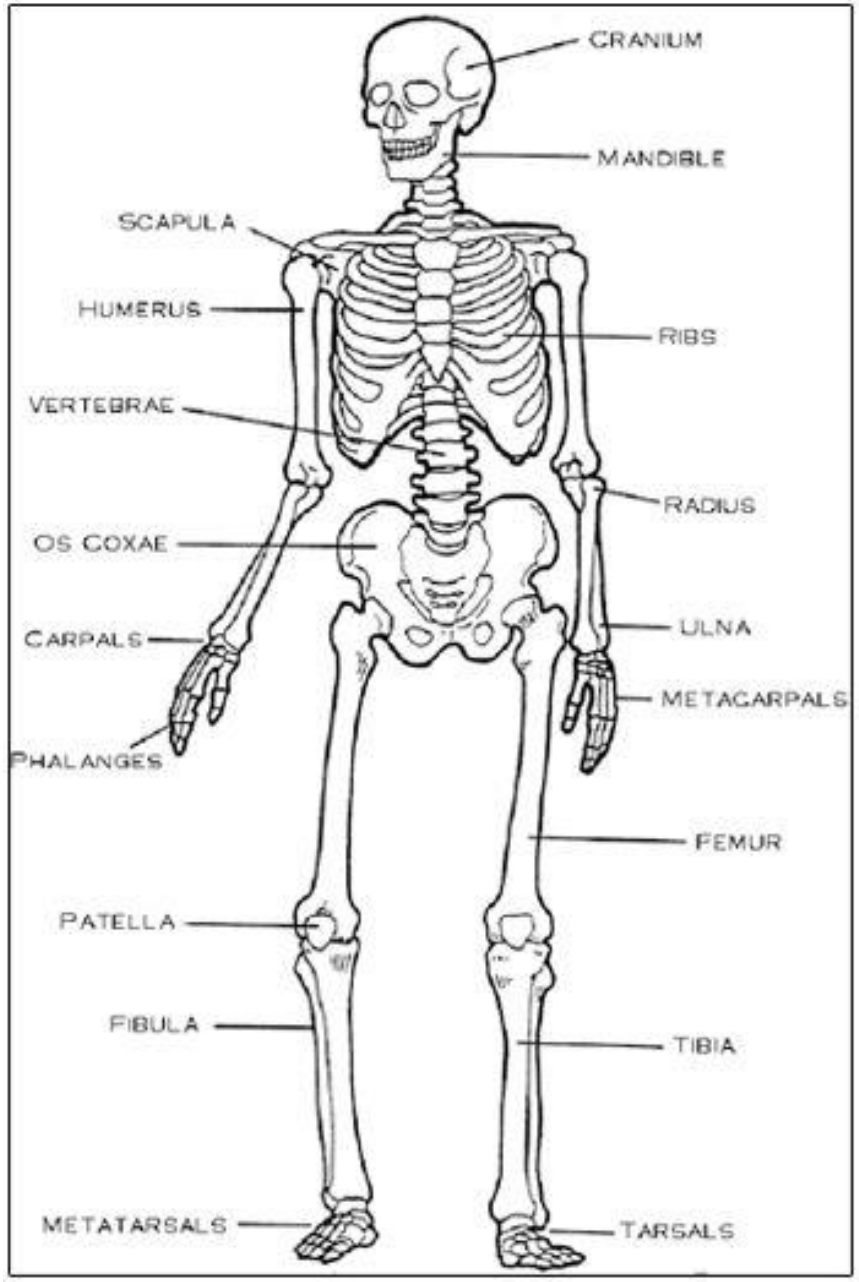
- Increased number of alveoli.
- Increased strength of intercostal muscles.
- Increased vital capacity
- Increased strength of diaphragm

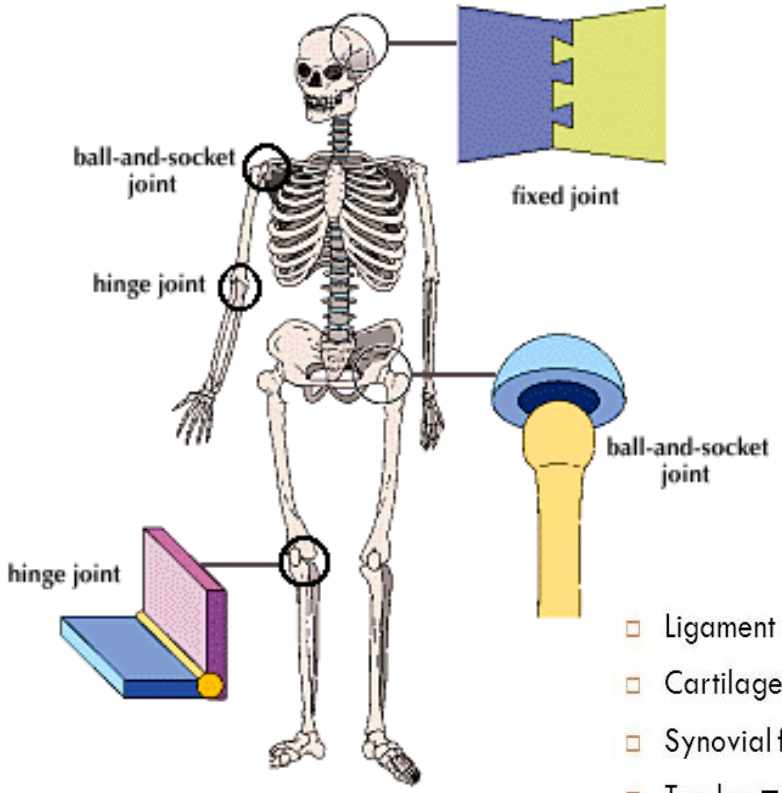
Oxygen debt is the amount of oxygen consumed during recovery above that which would normally be consumed during rest. This results from a shortfall of available oxygen during exercise.

Lung volume or capacity	Definition	Changes during exercise
tidal volume	Volume of air inspired or expired per breath	Increase
inspiratory reserve volume	extra air that can be forcibly inspired	Decrease
expiratory reserve volume	extra air that can be forcibly expired	Slight decrease
residual volume	Volume remaining at end of maximum expiration	Slight increase
total lung capacity	Volume in lung at end of maximum inspiration	Slight decrease
vital capacity	Maximum volume forcibly expired after maximum inspiration	Slight decrease

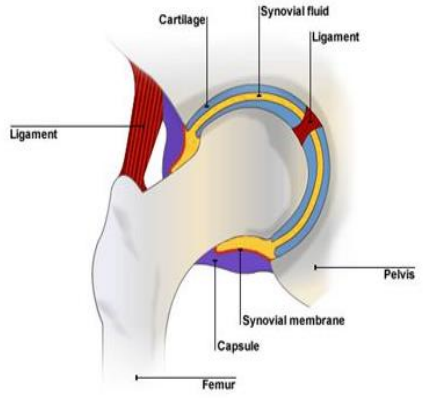


Skeletal System





- Ligament = Connects bone to bone
- Cartilage = Spongy tissue which protects
- Synovial fluid = Lubricant to allow smooth movement
- Tendon = Connects muscle to bone



TYPE OF JOINT	BODY LOCATION	TYPES OF MOVEMENT
Ball and socket	Hip, shoulder	Flexion/ extension, rotation, abduction, adduction
Hinge	Knee, elbow	Flexion/ extension
Pivot	Neck	Rotation
Condyloid	Wrist, ankle	Flexion/ extension, abduction, adduction
Saddle	Base of thumbs	Flexion/ extension, abduction, adduction
Gliding	Carpals (hands), tarsals (feet)	Gliding movements – where 2 bones with flat surfaces slide on each other – forward and back with slight sideways movement

FLEXION

'The **BENDING** of a joint'

EXTENSION

'The **STRAIGHTENING** of a joint'

ABDUCTION

'A movement **AWAY** from the body'

ADDUCTION

'A movement **TOWARDS** the body'

ROTATION

'A joint in a **CIRCULAR** motion'