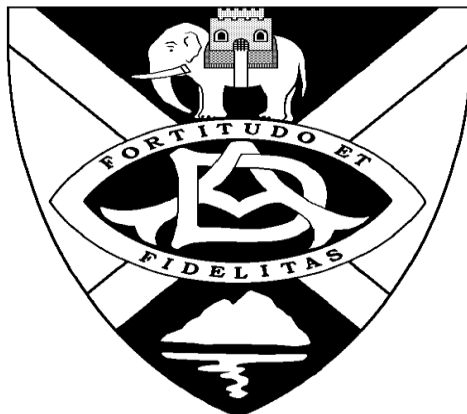


Dumbarton Academy
Physical Education
Standard Grade Course

The Body Booklet



**DUMBARTON
ACADEMY**

Name

Teacher.....

Dumbarton Academy

Physical Education Department

The Body

You must use this book to help you:

- Complete homework
- Learn at home
- Study for exams and tests

If you prefer to use your computer, you can get the same information on the BBC Bitesize Standard Grade Physical Education website:

www.bbc.co.uk/scotland/learning/bitesize/standard/pe/

Other resources:

- Bitesize DVD
- Evaluating DVD
- Powerpoint disk
- Past papers and answers disk

Remember: the best resource is your teacher! If you have any difficulties seek their help early.

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STRUCTURE AND FUNCTION

This revision bite will help you understand how our bodies move.

The skeleton

The skeleton is the framework of bones which gives **shape** and **support** to the body. It also **protects the internal organs** like the heart and lungs.

Joints

Where two or three bones meet, we have joints. These allow the skeleton to move. The body has two types of joint which allow free movement.

- **Ball and socket joints** are found at the shoulder and the hip and allow movement in three dimensions, or directions.
- **Hinge joints** are found at the elbow and at the knee and allow movement in one dimension, or direction.

Muscles

The muscles of the body allow movement to occur at joints. These muscles are known as skeletal muscles. To allow movement at a joint muscles work in **pairs**. Examples of this can be found in the elbows and knees.

Muscles controlling the elbow

The muscles which control the movement of the elbow are the triceps and the biceps. The **biceps** contracts or shortens, pulling the lower arm up, and causing the elbow to bend. At this time the **triceps** relaxes or lengthens. To straighten the elbow it is then the triceps which contracts or shortens in order to pull the lower arm down, and at this time the biceps relaxes.

Muscles controlling the knee

If we look at the knee we can see the **hamstring** and the **quadriceps** controlling the movement. The hamstring contracts, pulling the lower leg up and causing the knee to bend. At this time, the quadriceps relaxes. To straighten the knee, the quadriceps contracts, and pulls the lower leg down. At this time the hamstring is relaxed.

Connective tissue refers to other features which support the body and its movement.

- **Tendons** are strong strips which attach the muscles to bones. When a muscle contracts to move a joint, it is the tendon which pulls on the bone.
- **Ligaments** are strong bands which connect bones to bones at the joint. They're elasticated to allow the movement of that joint, but are strong enough to stop movement outside the normal range.
- **Cartilage** is a soft cushioning substance which covers the ends of the bones. It acts as a shock absorber and reduces the rubbing of the bone surfaces.

Oxygen transport system

In order to work and create movement, muscles need oxygen. The body's oxygen transport system takes oxygen to the working muscles, through the circulatory and respiratory systems working together. The main workers are the **heart, blood** and **lungs**. The whole oxygen transport system works in a cycle.

- As we breathe, oxygen enters the lungs and is absorbed into the blood stream.
- The heart pumps this oxygenated blood to the working muscles, so that the muscles can produce movement.
- As the muscles use the oxygen up, carbon dioxide is produced and absorbed into the blood.
- And this de-oxygenated blood is pumped back to the heart then on to the lungs.
- The lungs get rid of this carbon dioxide, and breathe in more oxygen.

HOW TO ANSWER

Here's an example of a question you might be expected to answer in your exam and how you might answer it.

Question

Actions in many activities require movement from either the hinge joint of the knee or elbow. Select an activity. Name a skill/technique and the main hinge joint used.

Muscles, tendons and bones work together to produce the movement for this skill/technique.

Describe the movement required for the skill/technique chosen. Describe how this movement is produced.

Answer

Activity - Basketball

Skill/Technique - Lay up

Joint - Knee

Description of movement required: My left leg bends then straightens quickly to allow me to jump in the air

Description or how movement is produced: My hamstring and quadriceps work in pairs. My hamstring contracts/shortens pulling on the tendon connected to the lower leg whilst my quadriceps relax/lengthen. This causes my knee to bend. My quadriceps then contract/shorten pulling on the tendon to straighten my leg as I jump, at the same time my hamstring relaxes/lengthens.

Once you've selected an appropriate school based activity, an appropriate skill and joint, you'd get:

- **one mark** for a clear description of how the joint moves for the skill chosen
- **three marks** if there is a detailed description of how muscles, tendons and bones work together to produce this movement

Question

Actions in many activities require movement from either the hinge joint of the knee or elbow. Select an activity. Name a skill/technique and the main hinge joint used.

Describe how good flexibility in this joint improved your performance.

Answer

Activity - Badminton

Skill - Overhead clear

Joint - Shoulder joint

Improved performance - Good range of movement at the shoulder allows my arm to go fully back and it can rotate quickly forward. This long lever action means that I can get a fast racket head speed through the shuttle so that it goes high and far to the rear of my opponents' court, making it difficult for my opponent to return.

PHYSICAL ASPECTS OF FITNESS

This revision bite will help you understand why the kind of fitness and the level of fitness you require depends on your lifestyle, the sports you do and the level at which you take part in them. Your lifestyle and participation in sport will depend on the type and amount of fitness you possess. There are different aspects of physical fitness and each contributes to your overall fitness.

Aspect of fitness	Definition	Test	Type of training
CRE/ Aerobic Endurance	The ability of the heart and lungs, to work for a long period of time without tiring.	Bleep test/ Leger run. Harvard step test. Cooper/12 minute run.	Fartlek/varied pace running. Interval training. Continuous training. Circuit training.
Muscular Endurance	Muscular Endurance is the ability of a muscle or group of muscle, to work continuously/for a long time without tiring.	Number of sit-ups I could do in 30 secs. Bent arm hang test.	Weight training Circuit training
Strength	The maximum force a muscle/group of muscles can apply against a resistance.	Grip dynamometer test. Maximum weight I could lift in one repetition/1 Rep Max.	Weight training Circuit training
Speed	Moving the whole body part of the body very quickly/in a short time.	50 metre timed sprint. 50 metre shuttle run test	Sprints/sprinting. Weight training. Plyometrics. Stretching. Shuttle runs.
Power	Combination of strength and speed.	Vertical jump. Standing broad. Sergeant jump. Measured throw.	Weight training. Plyometrics.
Flexibility	The range of movement at/across/around a joint.	Sit and reach test.	Stretching. Static/ballistic stretching. PNF.

AEROBIC ENDURANCE

To develop CRE (cardio-respiratory endurance) when training you must ensure that you are in your training zone.

TRAINING ZONE? This is the rate at which the heart should beat during training to be of benefit to the cardio-vascular system/CRE. This is between 70% and 85% of your maximum heart rate.

Short term effects of cardio-respiratory endurance exercise

- An increase in body temperature.
- Face becomes red.
- Deeper/faster breathing.
- Faster pulse rate.
- Body sweats/perspires.

Long term/Physiological effects of cardio-respiratory endurance training

- The heart gets bigger/stronger.
- The stroke volume may increase.
- Your VO₂ max increases.
- The vital capacity of lungs may increase.
- More air may be breathed in each breath.
- Your recovery rate may decrease.

Benefits of high level of CRE to performance

You can work harder for longer, before tiring; you can recover more quickly after strenuous exercise; your skill level remains high throughout performance.

Examples

- Activity-Football
- I can keep up with play throughout the game, without tiring.
- My skill level stays high, throughout the game.
- I can work harder for longer, without tiring
- I can keep a high level of concentration.
- Less likely to make mistakes.

TYPES OF TRAINING

CRE (cardio-respiratory endurance) can be developed using different types of training.

Interval training session

Interval training involves a short/medium bout of intense exercise over a set distance or time followed by a short rest period. I then repeated a set number of times.

I did 8 repetitions of 100 metres at 90% effort. I allowed myself a 60 second recovery, between each repetition.

How interval training progressively overloaded

- I trained 4 times a week, instead of 3.
- I increased the length of my sprints, from 100 metres to 110 metres.
- I increased the length of time I trained each session, from 20 to 25 minutes.
- I increased the number of sprints, from 8 to 9.
- I increased the intensity of each repetition, from 90% to 95% effort.
- I decreased the recovery time between repetitions, from 60 to 50 seconds.

Continuous training session

Continuous training involves training (running, swimming, cycling) over a long distance at a steady pace.

I ran continuously for 20 minutes, at a steady pace/in my training zone.

How continuous training progressively overloaded -

- I trained 4 times a week, instead of 3.
- I increased the length of time I ran, in my training zone.
- I increased the pace that I ran at, from 6 minute mile pace to 6½ minute mile pace.
- I increased the length of time I ran each session, from 20 to 25 minutes.

Fartlek training session

Fartlek training (varied pace training) involved steady pace training over a long distance, during which short bouts of fast, intense training is included.

I ran at varied a pace for 20 minutes, alternating between recovery walking, jogging, mid-paced running and sprinting.

How Fartlek training progressively overloaded

- I trained 4 times a week, instead of 3.
- I lengthened the sprint sections of my Fartlek run/ran them uphill/reduced my recovery walk section.
- I increased the length of time I ran each session, from 20 to 25 minutes.

TRAINING WITHIN ACTIVITIES

Practice to improve CRE and a skill or technique at the same time

Skill/technique-lay-up

I performed 20 lay-ups continuously, moving around a cone at the top of the key each time.

ANAEROBIC ENDURANCE

Anaerobic endurance is the ability of the body to work without oxygen, for a short period of time.

After working **anaerobically** the body goes into **oxygen debt**. When this happens not enough oxygen reaches the working muscles. Oxygen then has to be repaid back to the body.

Situation where you were required to work anaerobically.

Example

Activity-Basketball

I had to sprint back into defence, to catch up with my opponent.

MUSCULAR ENDURANCE

Muscular endurance can be developed using weight training or circuit training.

Weight training

Muscular endurance weight training involves lifting a **low/small** weight/resistance, at a **high** number of repetitions.

To calculate the initial workload (intensity) for muscular endurance training, I had to first of all work out the maximum weight I could lift in one repetition for each exercise (my one rep maximum). I then worked at 50% of this weight, performing 15-25 repetitions.

Upper body example

I did 20 repetitions of a bench press, at 50% of my maximum lift/one rep maximum.

Lower body example

I did 20 repetitions of a squat, at 50% of my maximum lift/one rep maximum.

Weight training session

I worked on a circuit which included 6 exercises, each targeting different parts of the body/muscle groups. I lifted 50% of my one rep maximum 20 times for each exercise. I did 3 sets of exercises.

How Weight training session overloaded

I lifted 50% of my one rep maximum 25 times and did 4 sets of exercises.

Circuit training

Initial workload is set for Circuit training to develop muscular endurance by counting the maximum number of sit-ups/press ups/pull ups etc, I could do in one minute. I then worked at 80% of my maximum at each station.

Upper body example

I did sit- ups continuously, for 30 seconds.

Lower body example

I did bench jumps continuously, for 30 seconds.

Circuit training session

I did 6 different exercises with 1 minute at each station with 30 secs. rest in between.

How circuit training session overloaded

I did 6 different exercises with 70 seconds at each station with 20 secs. rest in between.

TRAINING WITHIN ACTIVITIES

Practice to improve muscular endurance and a skill or technique at the same time

Example

Activity - Swimming

Skill/technique - Front crawl

I placed a float between my legs and repeated the arm action for the length of the pool.

The benefits of a high level of muscular endurance to performance

The benefits are that you can repeat actions continuously for a long period of time without tiring.

Lower body example

Activity - Cycling

Skill/technique - Pedalling

I can keep up a higher/steadier rate of pedalling, to keep going longer without tiring.

Lower body example

Activity - Rowing

Skill/technique - Rowing/pulling the oars

I was able to keep pulling with my arms for a long time, without tiring/ slowing down.

STRENGTH

There are 3 main types of strength:

Static - you need static strength in gymnastics when holding a handstand steady for a period of time.

Explosive - when performing a spike in volleyball you need explosive strength, as you are trying to hit the ball hard and fast towards the ground using maximum energy.

Dynamic - in sprint cycling for example, you need dynamic strength to work continuously the major muscles of the legs.

You can improve/increase your strength by performing regular weight training. The workload for strength training uses **high/heavy** weights/resistance at a **low** number of repetitions.

To calculate the initial workload (intensity) for strength training, I had to first of all work out the maximum weight I could lift in one repetition for each exercise (my one rep maximum). I then worked at 80% of this weight, performing 4-6 repetitions.

Upper body example

I lifted 80% of my one rep maximum for a bench press, 5 times.

Lower body example

I lifted 80% of my one rep maximum for a squat, 6 times.

Weight training session

I worked on a circuit which included 6 exercises, each targeting different parts of the body. I lifted 80% of my one rep maximum 5 times for each exercise. I did 3 sets of exercises.

How weight training session overloaded

I lifted 85% of my one rep maximum 6 times and did 4 sets of exercises.

I increased the amount of weight, in line with my new maximum.

I increased the number of reps, from 5 to 6.

I increased the number of sets, from 3 to 4.

I decreased the rest time between sets, from 2 minutes to 90 seconds.
I increased the amount of weight I lifted, for each repetition.
I increased the weight from 80% of maximum, to 85%.
I increased the length of my training session, from 30 minutes to 40 minutes.

TRAINING WITHIN ACTIVITIES

Practice to improve strength and a skill or technique at the same time

Activity - Rugby

Skill/technique - Scrummaging/pushing in the scrum

We got two groups of players to push against each other in a scrum/for 10 seconds.

The benefits of a high level of strength to performance

The benefits are that you can apply a large force to overcome a resistance.

Upper body example

Activity - Gymnastics

Skill/technique - Handstand

I found it easy to support my body weight and could hold the handstand position steady.

Lower body example

Activity - Football

Skill/technique - Block tackle

I can put more force behind the tackle, to win the ball more easily.

SPEED

Factors in running action which limit ability to run at speed

Leg or arm speed.

The frequency or number of strides taken.

Stride length.

The range of movement or flexibility of the ankles/hips/ shoulders.

The force you can apply from the legs.

Importance of whole body speed to performance in activities

- I needed speed to beat my opponent to the ball.
- I needed speed to get free from my opponent, to receive the ball.
- I needed speed to move quickly, to get into position to play the ball.

- I needed whole body speed to dribble past my opponent, to make a pass/shoot.

Speed training session

Type of training - Interval training

I sprinted between cones 30 metres apart. I did this 10 times, taking a 1½ minutes recovery between each sprint.

Training within activities

Practice to improve speed and a skill/technique at the same time

Activity - Football

Skill/technique - Shooting

I did five 10 metre shuttle runs from the penalty box and each time I returned to the penalty box, I took a shot at goal.

Whole body speed, part of body speed and speed of reactions are important to performance in activities.

Example of situation where whole body speed was important

Activity - Football

I kicked the ball past the full back and got to the ball first before the defender to cross the ball.

Example of situation where part of body speed was important

Activity - Tennis

I could swing the racquet fast, so that my serves were fast/powerful.

Example of situation where speed of reactions was important

Activity - Hockey

When the ball rebounded off the defender I reacted quicker than the defenders to get to the ball first to score a goal.

FLEXIBILITY

Flexibility is the range of movement across a joint. Many activities require good flexibility and having good flexibility prevents injury by reducing the chance of straining or pulling a muscle.

Flexibility can be static or dynamic.

- **Static Flexibility** involves holding part of the body still, at its full range of movement. For example holding a balance in gymnastics.
- **Dynamic Flexibility** uses the full range of movement across a joint, where a fast action is used but not held. For example arching your back during a high jump.

Benefits of flexibility to performance in activities

- Able to stretch my leg/arm out to tackle/reach the ball/win the rebound.
- Able to link movements together smoothly.
- Reduce risk of injury when stretching.

Lower body stretching exercises

Hip/groin - I raised my knee up to waist height and then swivelled/rotated it fully around to the side, 10 times.

Quadriceps - Standing on my right foot, I bent my left leg behind, using both hand I gently pulled my leg up and close to my body. I made sure I kept my knees together and I held this for 10-20 seconds.

Upper body stretching exercises

Shoulders - With straight-arms I swung/rotated my arms around 360 degrees, 10 times.

Triceps - I bent my right arm over my head, reaching it down my back. I placed my left hand on my right elbow and gently pressed my right arm further down by back. Held for 10-20 seconds.

Lower body stretching exercise to improve skill or technique

Activity - Athletics

Skill/technique - hurdling

I went into a hurdling position with one leg out in front and the other bent out to the side on the ground and stretched forward for 10 seconds

Upper body stretching exercise to improve skill or technique

Activity - Basketball

Skill/technique - Javelin pass

I held/pulled my arm back fully in the javelin pass position and gently pressed back.

Training within activities

Practice to improve flexibility and a skill or technique at the same time

Activity - Badminton

Skill/technique - Overhead clear

I hit a suspended shuttle, making sure I stretched back fully for each shot.

Importance of upper body flexibility to skill performance

Activity - Badminton

Skill/technique - Net shot

I could reach further forward, to reach a shuttle played close to the net.

Example 2

Importance of lower body flexibility to skill performance

Activity - Athletics

Skill/technique - Hurdling

I could raise my lead leg high to clear the hurdle.

POWER

How the body creates power in jumping actions

Example

Activity - Athletics

Skill/technique - High jump

I bent my take-off leg, and then straightened it quickly.

I swung/drove/lifted my arm/arms upwards, as I took off.

I swung up/lifted up/drove up with my other leg, as I took off.

How more power can be created in this jumping action?

- I extended my leg more quickly and pushed harder against the floor to drive upwards.
- I bent my leg more then straightened it as fast as I could.
- I pushed down harder on the ground as I powerfully straightened my leg.
- I swung/drove/lifted my arms upwards/faster /higher, as I took off.

Effect of increased power in this jumping action on performance

- I could jump up higher to clear the bar.

How the body creates power in striking actions

Example

Activity - Badminton

Skill/technique - Smash

I swung the racquet forward using all my strength as fast as I could.

I took a long backswing, so that I could build up speed on the racquet.

How more power can be created in this striking action

I swung my arm forward faster.

I took a longer backswing, so that I could build up more speed on the racquet/before the hit.

Effect of increased power in this striking action on performance

I could get more strength behind the hit and get a faster racquet when hitting, so that the shuttle flies harder/faster/further.

How the body creates power in throwing actions

Example

Activity - Athletics

Skill/technique - Throwing the javelin

I brought my arm forward quickly.

I pulled the javelin back as far as I could, so that I could build up speed on the javelin before release.

How more power can be created in this throwing action

I swung my arm forward faster.

I took a longer backswing, so that I could build up more speed on the javelin before release.

Effect of increased power in this throwing action on performance

I could get more strength behind the javelin and get a faster arm when releasing the javelin/build up more speed on the javelin on release, so that the javelin flies harder/faster/further.

Training within activities

Practice to improve power and a skill or technique at the same time

Activity - Basketball

Skill/technique - Javelin pass

I javelin passed the ball as hard as I could 10 times across the games hall.

HOW TO ANSWER

Here are some examples of questions you might be asked in the exam and how you should answer them.

Question

(i) Select an activity. Choose a skill or technique which requires **arm** or **shoulder** strength. Explain the benefit of having strength for this skill or technique.

(ii) Select a different activity. Choose a different skill or technique which requires **leg** strength. Explain the benefit of having strength for this skill or technique.

Answer

Activity - Netball

Skill/Technique - Chest pass

Effect of strength - Strength in my arms helped my pass go to my team-mate with more speed, so it wasn't intercepted.

Activity - Rugby

Skill/Technique - Scrummaging

Effect of strength - Strength in my legs helped me drive the other team back off the ball, so we won possession.

Actions such as batting in soft ball need only one part of the body to move at speed. This is known as **speed of limbs**.

Question

Select an individual activity and a skill or technique from this selected activity. Name the body part that needs to move at speed. Explain in detail how the speed of limb improved your performance.

Answer

Individual activity - Badminton

Skill/Technique - Smash

Body part - Arm

Explanation - By bringing my arm forward at speed, I was able to play a powerful smash. This meant the shuttle flew faster, making it more difficult to return

Question

Whole body speed can help you carry out your role or position in a team activity successfully. Select a team activity and describe your role or position in the team. Explain in detail how speed was an advantage to your performance.

Answer

Team activity - Football

Role/Position - Sweeper

Explanation - By sprinting across the box at full speed, I could tackle an opponent before they could shoot.

Once you've chosen two appropriate school based activities and an appropriate skill for each of these activities you'd get:

Two marks for each example, if there are clear descriptions of how speed allowed the skill or the role to be performed effectively and improve the overall performance.

SKILLS RELATED ASPECTS OF FITNESS

Aspect of fitness	Definition	Test
Coordination	Linking actions smoothly in the correct order	Alternate hand tennis ball throw
Agility	The ability to change direction or position of the body quickly, while under control	Illinois agility test
Balance	Holding a position still/steady	Flamingo balance Balance bar One legged balance
Reaction Time	The time between receiving a stimulus and initiating a response	Ruler drop test

Examples of skill related fitness

COORDINATION

Problems with coordination of a skill can be improved through practice

Example

Activity - Basketball

Skill - Lay up

Problem with coordination - I was taking too many steps and I was mis-timing the jump

Practice to improve coordination - I bounced the ball and took two steps before jumping to shoot

AGILITY

Agility can help skill performance

Example

Activity - Basketball

Skill - Rebounding

I was able to quickly adjust my body position to change direction, to stretch out and grab the ball.

BALANCE

Balance can help skill performance

Example

Activity - Hockey

Skill - Dribbling

When I was dribbling past/dodging the defender, I was able to change direction quickly, to get away from the defender.

REACTION TIME

Reaction time can help skill performance

Example

Activity - Volleyball

Skill - Digging

The ball was deflected off our block and I had to react quickly, to dive to reach it to dig it up.

MENTAL ASPECTS OF FITNESS

Mental Preparation is when a performer thinks about and visualises a successful performance, before they carry it out. For example, in a basketball free throw I visualized the timing of the action I would be using and imagined the flight of the ball and the ball going into the basket.

Concentration is the ability to stay focused on and be fully aware of, what is going on around you. For example, in performing a drop shot in badminton, I had to judge the flight of the shuttle, the positioning of my body and the movement of my opponent.

Confidence is having a positive frame of mind, in which you feel that you can perform successfully. For example in football, I was confident I could control the ball with one touch, dribble past defender and strike the ball at goal on target.

Motivation is the internal feelings and/or external encouragement by coach/spectators, which make you want to do well. For example, despite being very tired during a marathon, I wanted to succeed; I knew I had trained hard for the event, so I kept going.

Examples in practice

Practices or situations involving motivation

Example

Activity - Basketball

Practice with high levels of motivation - I raced my classmates up and down while dribbling as the teacher timed us.

Why practice motivating - Because I was competing and I was determined to get to the finish line first to score the fastest time.

Practices or situations involving concentration

Example

Activity - Basketball

Practice with high levels of concentration - I repeatedly practised my lay ups by receiving a pass, before dribbling the ball in to shoot.

Why concentration needed in practice - I had to concentrate, to co-ordinate my dribble with my take off.

Practices or situations involving confidence

Example

Activity - Badminton

Situation where confidence helped performance - I saw that my opponent was moving to the back of the court, and I had the confidence to change my overhead shot from a clear to a drop shot.

Practices or situations involving a lack of confidence

Example

Activity - Football

Situation where a lack of confidence hindered performance - When I went to header the ball at goal, I was not confident that I could do it and I missed the ball.

TRAINING AND ITS EFFECTS

In this revision bite you'll find out how to improve fitness and performance by training.

WARM UP AND WARM DOWN

The aim of a warm up is to gradually get your whole body prepared for work. An effective warm up will:

- Prevent injury to muscles, tendons, and ligaments.
- Prepare the body for specific exercises.
- Increase blood flow and temperature of muscles so they will react quicker.
- Allow a greater range of movement of joints.

THERE ARE 4 STAGES OF A WARM UP:

Stage 1	Light running/jogging	Increases heart rate. Increases blood flow to muscles Raises the body temperature.
Stage 2	Stretching	Allows easier movement. Increases joint flexibility. Stretches the muscles.
Stage 3	Practice actions from the activity	Warms up specific parts of the body that will be used in the activity
Stage 4	Mental preparation	Visualise a successful performance.

Example of warm up

A warm-up for basketball may be as follows -

Stage 1 - jogging. We jogged around the court 5 times (5minutes)

Stage 2 - stretching. I focussed on leg and groin stretches, because of all the running/jumping/ turning I would perform. I held each stretch for 10-20 seconds and repeated. (5minutes)

Stage 3 - skills of the activity. I passed the ball backwards and forwards with a partner for 3 minutes.

Stage 4 - mental preparation I focussed on the game ahead. Performing successful lay ups and successfully man marking the opposition.

I passed the ball backwards and forwards with a partner for 2 minutes.

WARM DOWN

Gentle exercise slowly reduces heart rate and body temperature to allow the body to return to normal gradually. It also helps to rid the muscles of lactic acid. Progressive stretching gently stretches muscles that may have tightened. It can also help reduce stiffness, soreness, nausea and cramp.

Example of warm down

A warm down for basketball may be as follows -

I jogged 2 or 3 times around the court and then gently stretched my leg muscles.

FITNESS TRAINING: FITNESS TESTING

We train to improve our fitness. Before training you may need to test your level of fitness to -

- **know your starting level** so that your workload can be set specific to you and you can make the appropriate choice of exercise or type of training
- **measure any improvements** in fitness by re-testing at a later time
- **set targets** as a motivating factor

PRINCIPLES OF TRAINING

To improve your starting level of fitness, you have to train correctly and progressively, following the principles of training.

OVERLOAD

Overload means making systems of the body work harder than normal. This can be done in different ways -

- **Frequency** - increase how often we train in any given week.
- **Intensity** - increase how hard we train in any fitness session.
- **Duration** - increase how long we train in any given fitness session.

After training for several weeks, our fitness should improve as our bodies adapt to the training workload. At this point, we have to make it more difficult. We have to overload our body again to ensure we continue to improve our fitness.

PROGRESSION

Progression must be done slowly and gradually over a period of time to avoid injury or stress. It's done by altering a mixture of frequency, intensity and duration of training.

SPECIFICITY

Specificity makes sure that the programme of work (training) is going to improve the appropriate aspect of fitness for the activity and/or works the correct muscle groups.

For example -

A basketball player needs power in his legs and could exercise with squat jumps. But a rebounding drill would be a more efficient training method. It would improve power in the legs. It would also improve the specific jumping action of the player and the handling skills needed to catch the rebound successfully.

For training to be effective your workload must be set specific to your level of fitness. If your workload is too low, you will not stress the body and your level of fitness will not increase. If your workload is set too high you may overstress the body causing injury

REVERSIBILITY

If you stop training your level of fitness will quickly begin to deteriorate. This is known as reversibility.

IMPROVING FITNESS

STAMINA (CARDIO-RESPIRATORY)

To improve cardio-respiratory endurance we must -

- Exercise the heart and lungs over a long time. Done regularly, this type of exercise will increase the size of the heart and the capacity of the lungs. This will allow them to work more effectively and be able to cope with exercise.
- To develop CRE we must get our pulse into our **training zone**. This is **between seventy to eighty five percent of our maximum heart rate**. The training zone for a fifteen year old is, therefore, a pulse rate of between 144 and 174 beats a minute. Below this we'll get no benefit. Above this, we'll tire too quickly to get any benefit.
- You can also improve on aspects of fitness by training within an activity. This is done by using practices/stations which work on a specific skills and stress specific aspects of fitness at the same time. For example, continual lay-ups for 2 minutes while dribbling around a marker at the head of the key each time would develop the aspects of fitness Cardio-respiratory Endurance and Muscular Endurance and the skills of lay-up and dribbling.

TRAINING ZONE

There are two types of exercise you can use to push your heart beat into your training zone.

AEROBIC EXERCISE

Aerobic exercise is done at a steady and manageable pace.

For example -

- Long continuous running, where the body is working with oxygen.
- You could exercise with a frequency of three times a week, for a duration of twenty minutes. The intensity of the exercise would be moderate to ensure your pulse remains in your training zone.

ANAEROBIC EXERCISE

Anaerobic exercise is done in short, very intense bursts.

For example -

- **Fartlek**, or interval training, where the body is working without oxygen and it produces a product called **lactic acid**.
- Again, you could also exercise with a frequency of three times a week, for a duration of twenty minutes. This time the intensity of the exercise would be high. At times, your pulse rate will go above your training zone. During a twenty-minute training session, where periods of rest allow your pulse rate to fall, your pulse will, on average, be within your training zone.

IMPROVING FITNESS

MUSCULAR ENDURANCE

To improve muscular endurance you must repeatedly work and contract the muscle groups you aim to develop.

- **Circuit training** involves body weight exercise such as sit-ups, press-ups, and squat thrusts. Circuit training can be adapted to a specific activity; for example, badminton lunges and basketball chest passes.
- **Weight room training** involves loading the muscles with exercises like bench presses and leg extensions. These could be part of a weight room circuit. Use low weights around 50% of your maximum lift. The lifts should be repeated many times, at moderate speed.

STRENGTH

To improve strength you must overload specific muscle groups with heavy weights - around eighty percent of your maximum lift. Low repetitions at a slow speed are required.

SPEED

You can improve speed in two ways -

- **Sprint training** trains muscles to act quickly and powerfully. But long periods of rest are required so that the muscles can recover before working hard again. For example, you might do three sets of ten sprints. You could sprint for five seconds and rest for thirty seconds. This is known as a work to rest ratio of one to six. You may also have a five-minute break between sets.
- **Increasing the strength of the muscle group.** As we know, more strength can help produce more power. More power will produce more body speed. For example, more power in the legs will produce more whole body speed. More power in the arm muscles leads to more limb speed for striking actions.

POWER

To improve power you must overload specific muscle groups, again with heavy weights and low repetitions. However, to improve the explosive force of power, the repetitions should be done at a fast speed.

FLEXIBILITY

To improve flexibility the muscles and their connective tissue must be held in or moved through a fully extended position for between ten to fifteen seconds. Each stretch should be repeated several times, and it's best to train every day at a time when the body temperature is raised.

EFFECTS OF TRAINING AND EXERCISE

After exercise, you'll find your body experiences immediate and more gradual effects.

The minute you start training, you'll notice more frequent muscle contraction, raised body temperature and pulse, and deeper breathing known as tidal volume. Longer-term effects occur as the body adapts to regular exercise, including your heart getting larger, bones becoming denser and the vital capacity of your breath deepening.

HOW TO ANSWER

Here's an example of a question you might be expected to answer in your exam and how you might answer it.

Question

Muscular endurance is the ability of muscles to perform for long periods of time without tiring. Circuit training is a method of improving this.

(i) Name a circuit training exercise used to develop muscular endurance in these three muscle groups.

- legs
- arms
- stomach

(ii) Select an activity then select a muscle group. Describe how your performance improved as a result of endurance training for this muscle group.

Answer

(i) **Legs** - Squat thrusts

Arms - Press-ups

Stomach - Sit-ups

(ii) **Activity** - Volleyball

Muscle group - Legs

Description - I was able to keep jumping high to block for the whole game

You'd get:

- **three marks** for a circuit training exercise relevant to each of the muscle groups
- **two marks** for a clear description of how endurance training allowed effective aspects of performance to be sustained for the whole match