

# GCSE Physical Education: e-Resources

## Answers to Activities



# GUIDANCE

1.

a) Why is visual guidance particularly suitable for learning a new skill?  
It helps the learner establish an overall image or framework of what has to be performed.

b) Why can verbal guidance be of limited use on its own?

*Any one of the following:*

Does the performer understand the instruction?

Can the performer remember the instruction?

Can the performer translate from spoken word to movement?

Best used with other forms of guidance.

c) What are the benefits of verbal guidance?

Effective for the advanced performer in giving information on tactics, strategies

Instructions can be repeated and varied 'for purpose'

Helps in creating an image of the task

Spontaneous and easily adapted to the needs of the learner

Can offer clarification when learner is unsure.

d) When is manual/mechanical guidance best used?

*Any one of the following:*

When learning potentially dangerous movements/skills.

To instil confidence.

One to one situations.

Complex skills.

2. Explain when each of the 3 Types of Guidance would be best used by a teacher/coach to improve performance.

**Visual** – this form of guidance is especially useful when a performer is just starting to learn a new skill – showing the learner the pattern of movement – useful for evaluation/feedback purpose.

**Verbal** – creating an image in the performers' mind and how the task needs to be done – most effective with small groups or individuals because very often meanings could be lost with a larger group. With the advanced performer, verbal guidance is effective = giving information such as tactics or positional play. (Best with visual).

**Manual** – useful for complex or dangerous skills – to reduce error and fear – gives confidence – guides a performer through a movement. Especially good for the 'first time' performance e.g. front somersault = gymnastics.

3. Explain how learning can be affected by the guidance received.

Learning is affected by many factors, including how guidance is given to performers in sport and appropriate practice situations for specific types of skill.

# PRACTICE

1. Explain why practice is important for improving performance.

Practice makes skill...

- habitual
- consistent
- reliable
- efficient
- effective
- accurate
- 

Characteristics of skilful performer/skilled performance.

2. When is WHOLE PRACTICE most suitable?

- For skills which cannot be broken down into parts e.g. cycling, golf swing.
- Promotes fluency and links between each part of the task.
- Used when skill is highly organised.
- Used to develop a 'feel' for the whole task.
- Can be used for simple skills that can easily be recalled.
- Can be used for advanced performers who are making skills habitual.

3. When is PART PRACTICE most suitable?

- Used to highlight a weakness in the performance, which is practised separately and then integrated back into the whole task.
- Best suited to skills of a more complex nature, which have several different parts – tennis serve, triple jump.
- When whole task is dangerous.

4. Using examples from sporting activities you have taken part in, describe the following methods of practice:

## **WHOLE PRACTICE:**

Repeating the whole exercise over and over again.

Best suited for activities which do not lend themselves to being split into parts.

Dribbling in football/basketball. Catching – netball

Simple skills.

Non-confusing for learner – to get a 'feel' of skill.

## **PART PRACTICE:**

Complex skill – perhaps try whole first, then break it down and practice its parts.

Tennis serve/Triple-Long Jumps.

Lay up shot in basketball, gymnastics routine.

**WHOLE-PART-WHOLE PRACTICE:**

Combination practice.

Normally complex skills.

Try first as a whole – to get a feel – then practice parts – then re-assemble.

Experienced and skilful performers – reassembly can be difficult.

Triple Jump – Long Jump.

**VARIED PRACTICE:**

Best used for open skills.

Practice skills in conditions that vary.

Netball Shooting – 1 marker – 2 markers – no markers – edge of circle – under net.

Practice matches changing situations in game.

**FIXED PRACTICE:**

Best used for CLOSED SKILLS e.g. forward roll

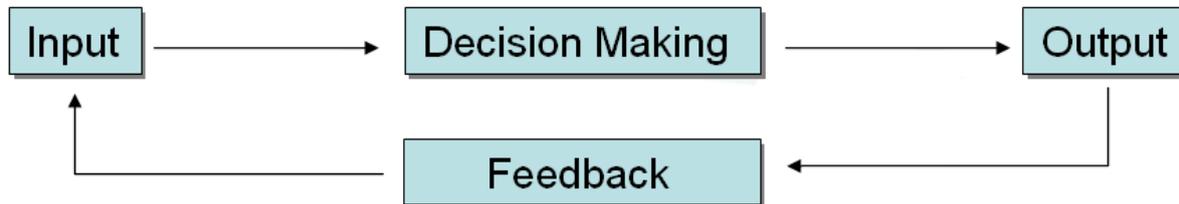
Skill is repeated over and over.

Conditions of practice always remain the same.

Not affected by environment.

# INFORMATION PROCESSING

1. Draw a diagram to show how you process information when taking part in a physical activity.



2. Give an example from a physical activity of how information is received (INPUT) e.g. BADMINGTON – what information is there from senses?

## Sight (visual):

- opposition (where he/she is – what are they doing?)
- flight of shuttlecock
- stance of opposition
- racket movement
- net
- people off court but in close proximity/crowd

## Sound (audio):

- hear the sound of the shot played by opposition
- shuttlecock on racket
- movement on court of opposition
- noise of crowd and opposition

## Feel:

- hand on racket
- grip
- 'soft hands', contact with ground on different shots

3. Name a physical activity and list the important information that you keep focused on e.g. Badminton/Receiving

- Position of opponent – 'shape' of opponent
- Shuttlecock – where struck e.g. above/below/side of opponent
- Flight/speed/direction of shuttlecock

#### 4. What is PERCEPTION? How is it linked to memory?

- Perception helps with the process of Selective Attention
- Perception is the process of INTERPRETING information and then a decision is made in response
- Skilled performers use their perception to anticipate what will happen next

e.g. what a badminton player has to interpret when receiving:

- how hard the shuttlecock was struck?
- how fast it is moving?
- where and when it will land?
- how prepared are you?

Any decisions made in response to this incoming information can only happen with the help of MEMORY. A great deal of information arrives in STM - Selective Attention filters the important information, and it is then interpreted by searching LTM for similar information from before – then a response occurs.

#### 5. Why should effective FEEDBACK include both knowledge of performance (KP) and knowledge of results (KR)?

KP – Knowledge of performance – how well or badly you perform

KR – Knowledge of results – the outcome of the performance

KR is only concerned with the statistics of the activity and although useful is really very obvious in most activities e.g. winning or losing a race

For progression in technique and improvement in performance a teacher/coach needs to tell a performer about the technical efficiency of their performance. This form of feedback is vital for the next decision and feeds into the INPUT of the Information Processing System – it is essential for LEARNING e.g. sprinting – as well as times and positions in the race, technical detail should be given:

- start position
- arm action
- transition/pick up
- stride cadence
- knee lift
- dip
- finish
- stillness of body

6. What is FEEDBACK? Give 3 reasons to explain why feedback is important in developing and improving skill.

- Feedback is the response you receive to your OUTPUT. It can be Intrinsic or Extrinsic
- Identifies strengths/weakness
- You cannot LEARN without feedback
- It is motivational
- It shapes future behaviour – refinement of technique
- It reinforces correct actions – knowing what to do the next time you try the same skill

APPLIED – linking Theory to an actual Physical Activity

8. How might information processing differ for a beginner in a physical activity and an advanced performer?

**Beginner:**

Cannot cope with too much information – selection and identification of important information weak

Little experience to rely on

Actions result in a poor performance – disjointed and slow

**Advanced:**

Can select relevant information and anticipate

Has more experience to call on – responses will often be quicker

Successful performance

9. See Question and Answer in INFORMATION/DISCUSSION

# TYPES OF SKILL

1. What is a Skill?

Learned ability to bring about pre-determined results (goals) with maximum certainty and efficiency.

2. Explain the difference between OPEN and CLOSED skills and give one example for each

Open skill – where movements vary according to the environment e.g. badminton overhead stroke / pass in basketball / netball.

Closed skill – where movements are always exactly the same and do not depend on the environment e.g. shot put, discus throw, golf swing, handstand.

3. “Skills can be classified as *closed* or *open*.”

(i) What is a *closed* skill?

Closed skill: involves performing a skill in a situation that remains the same or stable. They are unaffected by the sport environment, are habitual, require few decisions and are self-paced (the performer controls the timing of execution).

ii) What is an *open* skill?

Open skill: involves performing a skill in a situation that is constantly changing. They are affected by the sport environment, require adaptability, and require decisions to be made and are mostly externally paced (the environment controls the timing of the skill).

4. Which type of skill has more information to process?

OPEN or CLOSED

Open

5. Give reasons to explain why closed skills are usually easier to learn than open skills.

Fewer decisions to be made  
Less information to process  
Unaffected by the sport environment

6. Using sporting examples, explain the difference between BASIC and COMPLEX skills

Basic – seen as simple actions requiring some co-ordination and control of the body usually using the major muscle group e.g. catching or throwing a ball

Complex – actions require more refined and controlled movements of the body e.g. Tucked Front somersault on the Trampoline.

Age and experience – contributing factors

7. (i) What type of PRACTICE is best for learning a CLOSED skill?

FIXED Practice

(ii) what type of PRACTICE is best for learning an OPEN skill?

VARIABLE Practice

8. Using a *tennis serve*, as an example, suggest *three* factors that could cause the movement towards the open end of the continuum in the diagram. (from ×).

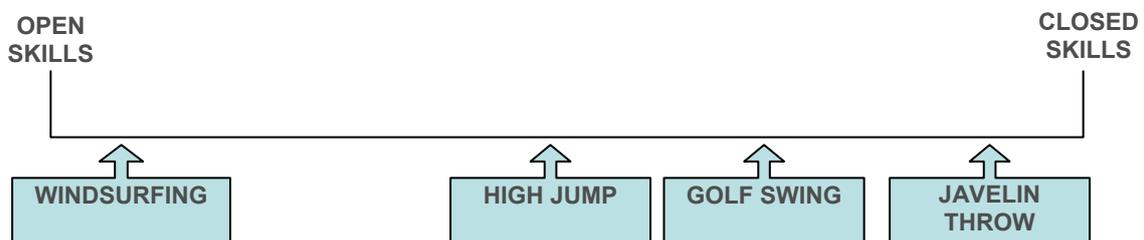


The actual technique of the serve is a circular movement pattern each time and can be practised to groom the technique for consistency. In this respect it is partly closed. However, it will need slight adaptations to take account of:-

- Position of opponent;
- Their strengths and weaknesses;
- Wind conditions;
- The point in the game/match;
- Whether you need spin or not;
- Crowd noise;
- Sense of pressure of occasion.

These external factors taken into consideration make the skill also partly open.

9. Match the following skills to a position on the OPEN/CLOSED CONTINUUM:-



# SKILL AND STAGES OF LEARNING

1. Name and explain three stages of learning you go through when learning a skill.
  - COGNITIVE
  - ASSOCIATIVE
  - AUTONOMOUS
2. How would a teacher/coach give-guidance at each stage of learning?
3. What is the link between PRACTICE and the stages of learning?
4. Why is an understanding of the 3 stages of learning important for a teacher/coach when planning training activities?

The resource below can be developed to answer any of the above questions.

To be developed with the use of links to answer questions 1 – 4

- All guidance must be easily understood and linked to the different stages of skill learning.
- Guidance – verbal, visual, manual/mechanical
- Each form of guidance is rarely used in isolation.
- Cognitive Stage:- beginners, heavy dependence on feedback, movement is uncoordinated, trying to understand and work out what has to be done, many errors which need help in correcting, skill might have to be broken down and taught in parts. Visual Guidance especially important – physical demonstration to allow the beginners to form a mental picture. Simple instructions verbally – technique important not outcome
  - short period of practice – not too much information at any one time.
- ASSOCIATIVE STAGE:- techniques have been learnt – emphasis on practice – performances are much better – fewer errors and they can be self-corrected to some extent – more consistent – Verbal Guidance important here as the person is better able to deal with more complex information and practice sessions are longer and more intense. Visual Guidance often used alongside verbal e.g. video evidence to promote technique.
- Autonomous stage:- skills are automatic – outcome, tactics and strategies can be concentrated on. Few errors but can be identified and self-corrected easily. All forms of Guidance are useful, but Manual Guidance reduces errors and gives confidence

# CHARACTERISTICS OF A SKILLED PERFORMER/PERFORMANCE

## 1. “We can tell if a player is skilful by the way he/she performs.”

**Using one of your own sporting activities as the example, describe fully a skilful performance.**

A skilled sporting performance is a High/Very Good performance because sportspersons are better at:

- using available energy (more efficient, less waste).
- controlling their actions (smoother).
- making fewer mistakes.
- seeing what's happening around them (interpretation) – vision.
- anticipating.
- making correct decisions at the right time and quickly.
- Improvisation.
- being in the correct place at the correct time.
- Seemingly having ‘more time’.

The more skilful a sportsperson is, the more likely they are to be:

- consistent.
- accurate.
- aesthetic.
- co-ordinated.
- confident and successful.
- highly motivated.

Looking for candidates to draw on their own personal sporting experiences. The answer should be written ‘through’ their example, varied responses as far as is possible.

## 2. Describe the characteristics of an unskilled performance in sporting activity.

- Unskilled players keep the ball to themselves.
- Unskilled players are often self-conscious (not confident) on the ball and give it away easily.
- Unskilled players are not always in the right place at the right time.
- Are prone to injury.
- Need to work harder than a skilful player.
- Waste energy more easily and tire quicker.
- More likely to upset other players.
- More likely to slow down a move or movement.
- More likely to make wrong decisions.
- Less control of their actions.
- Make more mistakes.
- Less able to anticipate and improvise.
- Less able to reduce chance/luck.

Plus any reference to 'characteristics of a skilled performance/skilful player':

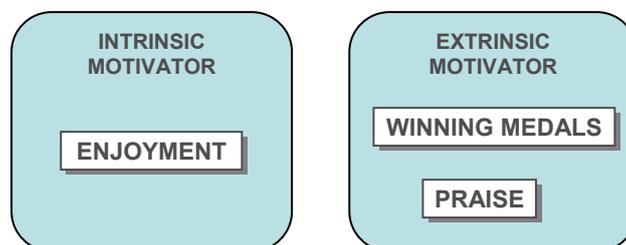
- Accuracy
- consistency
- co-ordinated
- controlled
- aesthetic
- smooth
- successful
- specific physical components
- technical model
- maximum output with minimum outlay of energy and time.

## Technological Developments

1. Give two examples of how ICT is helping sports officials make the correct decisions at important fixtures.
2. Describe technological developments in a physical activity of your choice, and explain how they could improve performance.
3. What technological developments would you like to see introduced for a physical activity of your choice?
4. How can technological developments in Performance Analysis help sportspersons improve their performance?

# MOTIVATION

1. Indicate whether the following are intrinsic or extrinsic motivators by dragging them to the correct boxes:



2. Learning will not take place if a person lacks motivation. Name **two** types of motivation.

Intrinsic, Extrinsic

3. “The desire to do well in sporting activity is based on motivation.”

(i) Name two types of motivation. [Intrinsic](#), [Extrinsic](#)

- (ii) Which type of motivation is better in the long term?  
Explain your answer.

[Intrinsic](#)- means you do something because of satisfaction/enjoyment. The drive comes from the activity itself. Sports people will remain interested in sport when extrinsic rewards have gone.

- (iii) Describe one way in which you have been motivated to help you improve your sporting performance.

[Success or winning](#)

[Praise](#)

[Gaining reward in a variety of ways](#)

[Praise support from coach, teacher, parents, and peers](#)

[Recipient of good teaching coaching](#)

[Progression](#)

[Working relationships with others](#)

[Following and setting realistic and attainable goals](#)

[Need/desire/determination to be the best](#)

[Fear of being left behind or not being as good as others](#)

[Feel good factor](#)

[Emulate role models](#)

[Fear of criticism](#)

4. "Motivation is the amount of enthusiasm and determination that a person has for a given sporting performance or activity."

(i) Explain how motivation can be *intrinsic*.

Intrinsic motivation means self motivation. The drive to participate, practice, train and compete comes from the person him/herself. Taking part for no other reason than simply to take part - enjoying a sport regardless of rewards.

(ii) Explain how motivation can be extrinsic.

Extrinsic motivation may be in the form of physical rewards such as certificates, badges, cups, awards, money.

(iii) Give *one* disadvantage of extrinsic motivation.

Not everyone feels rewards are important  
If a reward is too difficult or too easy to obtain, it may put you off.  
Competition for rewards may put you under too much pressure.  
Loss of interest if no prizes won.  
When rewards stop, so does the sportsperson.  
Win at all costs attitude - cheating, hostility.  
May lose fun and enjoyment of the activity.

5. Name three problems associated with an over-dependence on extrinsic motivation in sport.

If they are too frequent - awards, cups etc. a performer may lose interest in them.  
A player may become over reliant on this type of motivation and lose the fun and enjoyment of the activity.  
Extrinsic motivation can lead to win at all costs attitude - becomes sole focus - could lead to cheating and hostility.  
Extrinsic motivation can detract from development of skill, e.g. winning v performing well.  
If rewards are withdrawn then the player could become disinterested  
Pressure/stress of competition.

# GOAL SETTING

1. "To succeed in sport one needs to set goals."

Explain clearly the difference between short-term and long-term goals.

To achieve long-term goals, short term goals or objectives are set to help them.

Short-term goals are very often set in training programmes.

Short-term goals can act as incentives and signposts as to whether you are on target.

Short term goals:

Train hard to achieve reasonable times (qualifying) for an event.  
Winning local events  
Selection for County team.  
Selection for Inter County Champ.

Long term goals:

To run for county.  
To gain selection for Olympics.

2. Goal-setting is important to a performer.  
How can short-term goals help in achieving long term goals?

- Most performers, as part of their planning, will set achievable short-term goals that will help them achieve their long term goal.
- Short term goals can act as incentives and signposts as to whether you're on target. (motivational)
- Achieving short term goals can build confidence to carry on and achieve long term goals.
- Reduce anxiety
- Give focus

3. Explain how goal setting can help a sportsperson succeed in their sport.

One way to stay motivated is to have a goal to work towards.

A goal motivates you to work hard.

Mental preparation - since you know exactly what you are aiming for.

Give direction - signpost

Something to check your progress against.

Controls anxiety and feel more in control.

Increases confidence.

Performance goals - individuals have more control over these - confidence - success.

Adhesive - losing interest

4. "Setting SMART goals is important for development and progress in sport."

Complete the table by using the headings provided to explain why goals need to be SMART.

	Why do goals need to be SMART?
Specific	Goals need to be specific to gain focus.
Measurable	Goals need to be measurable to gauge progress and know when to set new goals.
Agreed	Goals should be agreed by all parties so that the performer has ownership of the goals and values them.
Realistic	Goals need to be realistic to motivate and give direction to the performer.
Time-phased	Goals need to be time-phased in order to focus the performer and so that short term goals can lead to longer term goals.

5. "When a sportsperson sets targets/ goals to aim for they should be SMART."

Use specific examples from one sporting activity to explain how the SMART principles can be used to set targets/ goals.

Specific - to run a 300m outdoor under 44 seconds

Measureable - timed - possible to say whether I have met it.

Agreed - my coach agreed with me on my specific goal. Motivation on agreed targets, lack of motivation would result from disagreement of a target.

Realistic - my coach agreed that 44 seconds was a realistic target as my personal best is 45.1 seconds.

Time - phased - I would plan according to my goals. Allow for time and improvement. Vary training methods: short, speed sections to improve reaction time and endurance work to ensure I could maintain speed for longer over the whole distance. I gave myself 3 weeks in which to prepare for an attempt on my PB. Training 4 times a week and earmarking a certain competition.

6. "Sporting goals should be SMART."

Describe a SMART performance goal in one of your chosen sporting activities.

*[Candidates need to give full and logical statements for each SMART.*

*Candidates should be able to draw on their own physical activity experiences]*

e.g. specific - to run a 300m outdoor under 44 seconds.

Measureable - Training - competition - times changes to training if necessary.

Agreed - Discussion, confidence and motivation high after agreement. Feel valued.

Realistic - personal best was 45.1. Agreement that 44.0 is realistic - something to work towards - control - motivated.

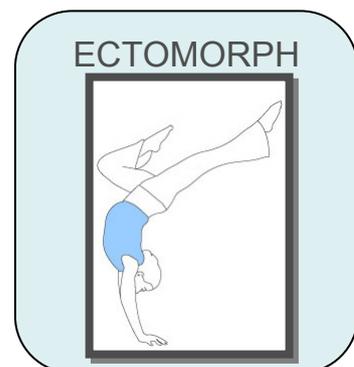
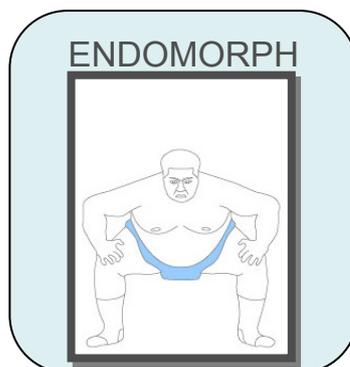
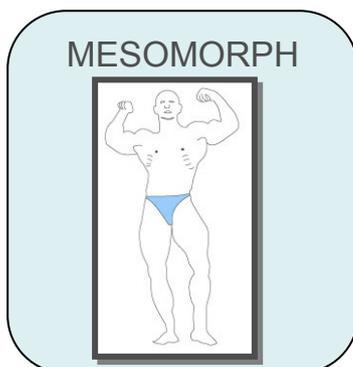
Time phased - planning to allow for improvement -vary training methods. A focus for PB attempts and competition.

7. Give an example of:-
- a) an OUTCOME GOAL - finishing 2nd in a 800m goal.
  - b) a PERFORMANCE GOAL - running the 2 laps of the race in pre-determined times. e.g. 1st lap - 70 seconds  
2nd lap - 65 seconds
8. Using the SMART principles of goal-setting, explain in detail what each term means in relation to a long-term goal you have set yourself in a named sporting activity.

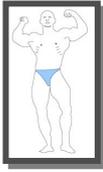
1. List 5 Adherence Strategies and explain how you have used them to maintain involvement in physical activity.
2. What role does adherence have in following an active, healthy lifestyle?
3. Discuss the main reasons for 'dropping out' of exercise programmes and physical activity.

## FUEL FOR EXERCISE

1. What are the 3 food groups and what percentage should they contribute to our diet?  
Protein 15%, fat 25% and carbohydrate 60%
2. Which components of our diet supply energy?  
Carbohydrate and fat
3. Why are carbohydrates referred to as the main energy supplier?  
They supply energy for both anaerobic and aerobic work
4. How are carbohydrates stored in the body?  
Glycogen in the muscles and liver
5. Give 3 factors which affect water loss.  
The intensity of the exercise  
The duration of the exercise  
The temperature and humidity of the environment
6. To balance the energy equation what must we do?  
Ensure energy intake = energy used
7. Give 3 ways of losing weight?  
Decrease energy intake  
Increase activity level  
Decrease energy intake and increase activity level
8. What happens to the carbohydrate and fat we take in but don't use for energy?  
They are stored in the body as glycogen and fat
9. What is the energy equation and what does it tell us?  
Energy intake – energy expenditure = energy stored  
If we intake more energy than we use then we will gain weight  
If we expend more energy than we intake then we lose weight
10. Move the images below to match them with the appropriate body type.



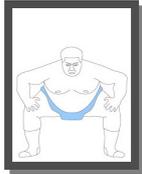
11. Describe the main characteristics of each body type



**MESOMORPH**  
Relative muscularity  
Wedge-shaped body  
Heavily muscled arms/legs  
Wide shoulders/Narrow hips



**ECTOMORPH**  
Relative Linearity  
Little muscle  
Very thin and lean  
Long arms/legs



**ENDOMORPH**  
Relative fatness  
Pear-shaped body  
Lot of fat on body, arms and thighs  
Wide shoulders and hips

12. Define the terms 'health' and 'fitness'.

**Health**

State of complete physical, mental and social well being, and not merely the absence of illness or disease or equivalent definition.

**Fitness**

The ability to meet the demands of the environment or equivalent definition

13. Explain the relationship between health and fitness.

- You cannot be healthy without being fit enough to meet the demands of the environment
- You can be fit but not healthy (as a wider concept than just 'physical')
- Exercise is the link between the two
- Fitness for sport is more specific than just being in a state of good health – at a higher level.

14. How might exercise affect your weight?

- Regular exercise increases your BMR (Basal Metabolic Rate)
- You burn up stored fat faster even when resting
- Reduces appetite
- Lose weight
- Gain weight because muscle is heavier than fat

15. How can lifestyle affect the energy needs of a person?

**LIFESTYLE** – The more active you are, the more energy you need  
The less active you are, the less energy you need

16. Why is fluid intake an important consideration for a sports person?  
Candidates should be expected to show the connection between  
Activity → Heat production → Sweating  
Prevent dehydration
17. Explain what is meant by diet.  
To be healthy, you need a balanced diet – one that matches your energy needs and gives the correct mixture of nutrients and fibre.  
Carbohydrates/Fats/Proteins/Vitamins/Minerals/Water
18. Explain why some sportspeople 'carbohydrate-load' before endurance events, such as marathons.
- Carbohydrates provide energy
  - Carbohydrates are broken down into glucose
  - Once absorbed, glucose can be used to provide energy
  - If not used, stored as glycogen in muscles
  - Vital that glycogen stores are as full as possible
  - Eating more carbohydrates and reducing physical activity in the 3 days leading up to a competition in order to build up stocks of glycogen is called carbo-loading.
  - It can delay tiredness (fatigue)
  - May improve performance in end stages of a competition
  - Work harder for longer
19. Briefly describe the meaning of the term 'energy balance'.  
Energy intake – Energy Expenditure = Energy Stored  
If we intake more energy than we use then we will gain weight. If we expend more energy than we intake then we lose weight.
20. Why is knowledge of the 'energy balance equation' important for a sports person?  
Part of an overall need to know scenario regarding 'balanced' diets, appropriate food for sport (nutrients), dangers of obesity/anorexia and how performance can be affected if the balance is incorrect.
21. What nutrient in our diet supplies energy during intense exercise?  
Carbohydrate
22. What term is used to describe the amount of energy needed to keep a person alive and healthy?  
Basal Metabolic Rate
23. Name three factors which could affect water loss taking part in sporting activity.
- Intensity of the exercise
  - Duration of the exercise
  - Temperature
  - Humidity

24. Why is it generally undesirable for sportspersons to have a high percentage of body fat?

- Strain on heart and muscles
- Interferes with flexibility
- Contributes to fatigue
- Negative affect on performance as a result

25. How can the level of body fat be controlled?

Diet and exercise

26. Explain why CARBOHYDRATE is the major energy fuel used during vigorous exercise.

- Energy from carbohydrate can be released up to 3 times as quickly as from fat. Therefore, for high intensity exercise, carbohydrate is the major fuel.
- Carbohydrate is broken down into glycogen and stored in both the muscles and liver. Therefore, carbohydrate is in exactly the right place (i.e. the muscles) to supply immediate energy to the muscles.

## MINIMISING RISK

1. Using one sporting activity, describe the range of precautions you would take in order to participate safely in that activity.

Attempting to draw from the candidates, risk assessment/safety concerns and precautions specific to ONE sporting activity:-

e.g.

- Fitness
- Techniques/Skills
- Training
- Warm up/Cool down
- Correct clothing/equipment
- Specialist equipment
- Footwear
- Rules
- Skill levels
- Physical development
- Preparation
- Environment

Answers should not be in itemised form but each point made should be specific and in detail.

2. Describe fully the reasons for WARMING UP and COOLING DOWN at the beginning and end of physical activity.

### WARM UP

- Slowly increases heart rate, breathing and blood supply to muscles
- Slowly increases body temperature to working rate
- Slowly moves muscles and joints in ways that will be used in the physical activity
- Stretches and prepares ligaments and muscles for the required intensity
- Introduces skills to be used in the activity
- Mental focus

### COOL DOWN

- Light exercise shortens recovery time by helping to remove CO<sub>2</sub>, lactic acid and other waste products
- Light exercise makes sure that the blood continues to circulate well and prevents it pooling in skeletal muscles which may lower blood pressure and cause dizziness
- Prevents muscle soreness and stiffness

3. Use one sporting activity which you have experienced and explain how each of the factors listed in column one of the table can help you to avoid injury.

RISK ASSESSMENT TABLE	
Factors	Explain how each of the factors can help you to avoid injury
Warm up	<ul style="list-style-type: none"> <li>• Specific to the sport and position (if needed)</li> <li>• General body warm up – heart raiser – repetitive exercise – stretching. The last two could be specific</li> </ul>
Correct personal equipment/clothing	<ul style="list-style-type: none"> <li>• Studs in boots – to avoid slipping – gum shields – contact – mouth injury</li> </ul>
Knowledge of rules	Rugby-scrumming laws to avoid neck injury. Hockey – lifting of the ball
Checking the environment/equipment	Frost – hard pitches. Hazards on playing area – wooden/solid touchline flags, pads on goalposts.
Skills techniques	<ul style="list-style-type: none"> <li>• Tackling in rugby – low – head behind opponents' body – shoulder contact with legs</li> <li>• Scrummaging – collapsed scrum – risk of serious injury</li> </ul>
Fitness levels	Training to cope with activity demands

4. Give one reason to explain why there are fewer injuries in gymnastics than in the other sports such as rugby, skiing and horse riding.
- Safer equipment
  - No physical contact
  - Coach/teacher supervision
  - Manual guidance – controlled environment
  - Fewer participants

5. What specific advice regarding safety/risks would you give when introducing a newcomer to a named sporting activity?

	Aspect of safety/risks	Advice given
(i)		
(ii)		
(iii)		

6. Explain three safety considerations which have to be taken into account when taking part in a named sporting activity.

Candidates must be specific. It is not good enough to accept answers such as,

'You must know the rules'

'You must warm up'

Knowledge from their practical experiences is needed

Looking for considerations which are specific to a named sporting activity, not generic.

7. How would the warm-up for a JAVELIN thrower differ to that of a NETBALL, HOCKEY, FOOTBALL, RUGBY player?  
*(Use a position to help you answer the question)*

# THE MUSCULAR, SKELETAL, RESPIRATORY AND CARDIOVASCULAR SYSTEMS

1. "Muscles and joints work together to produce and control movement".
  - (i) In the diagram below, which muscle contracts to cause the bending of the knee? Is it:
    - a) the quadriceps or
    - b) the hamstring?
  - (ii) What type of synovial joint is the knee joint and what type of movement does it allow?  
Type of synovial joint - hinge joint  
Type of movement - flexion/ extension
  - (iii) What attaches bone to a bone to ensure stability of the joint?  
Ligament
2. The diagram below shows the action of the upper arm muscle involved in lifting a weight.  
  
Study the diagrams and then answer the questions below.
  - (i) In diagram 1, what is the movement upwards called?  
Flexion
  - (ii) Which muscle is shortening (contracting) to cause this upward movement, is it A or B?  
A
  - (iii) If the contracting muscle is the agonistic or prime mover, what is the relaxing (flexing) muscle called?  
Antagonist
  - (iv) In diagram 2, what is the downward movement called?  
Extension
  - (v) What attaches the muscle to a bone to help in movement?  
Tendon

3. “Good joint mobility is essential for efficient performance in most sporting activities.”

Complete the following table:

Description of synovial joint	Type of synovial joint	Name of synovial joint
(i) allows the widest range of movement	Ball and socket	Shoulder or hip joints
(ii) permits movement in only one plane	Hinge	Elbow, knee, joints of fingers

- iii) Describe an example of a movement in sport which involves (a) flexion/ extension and (b) adduction/ abduction.

e.g. cartwheel/ star jumps

e.g. somersault/ sit-ups / biceps curl

Looking for good examples which are clear in their understanding of the range/ type of movement allowed by synovial joints.

4. The diagram below shows the leg of a football player preparing to kick a ball.
- (i) Which PRIME MOVER (AGONIST) muscle would need to CONTRACT (FLEX) in order to LIFT the lower leg in readiness to kick the ball?  
**Hamstring**
- (ii) Which PRIME MOVER (AGONIST) muscle would need to CONTRACT (FLEX) in order to KICK the ball? **Quadriceps**
- (iii) Identify the type of joint at the KNEE (A). **A- Hinge joint**
- (iv) Which joint, A or B allows most movement? **B - Ball and socket - moves freely in all directions to allow the whole range of movements.**
- (v) What is the term used for muscles which RELAX to allow movement to take place? **Antagonistic**
- (vi) What attaches muscle to bone in order for movement at the joint to take place? **Tendon**
- (vii) What attaches bone to bone to give joints stability? **Ligament**
- (viii) The movement in the diagram is an example of which type of muscular contraction? **Isotonic/ Concentric**

5. The diagrams below shows the action of the leg muscle and joints involved in a STANDING LONG JUMP. Study the diagrams and then answer the questions below by completing the second column in the table.

Muscles act in pairs, some contract while others extend.

(i) In diagram 1 the knee is bending ready for take-off. Which muscle is contracting to cause the bending? Is it A or B?	B. Accept hamstrings
(ii) In diagram 2 the leg has straightened. Which muscle is contracting to cause this? Is it A or B?	A. Accept quadriceps
(iii) If the contracting muscle is the agonist or prime mover, what is the relaxing muscle called?	Antagonistic
(iv) What type of muscular contraction occurs in both diagrams in order to cause the movement?	Isotonic contraction
(v) What type of joint is the knee joint?	Freely movable / synovial / hinge
(vi) What type of movement does the knee joint allow?	Flexed movement / extension
(vii) What attaches a muscle to a bone to enable movement to take place?	Tendon
(viii) What attaches a bone to another bone in order to ensure stability of movement?	Ligament

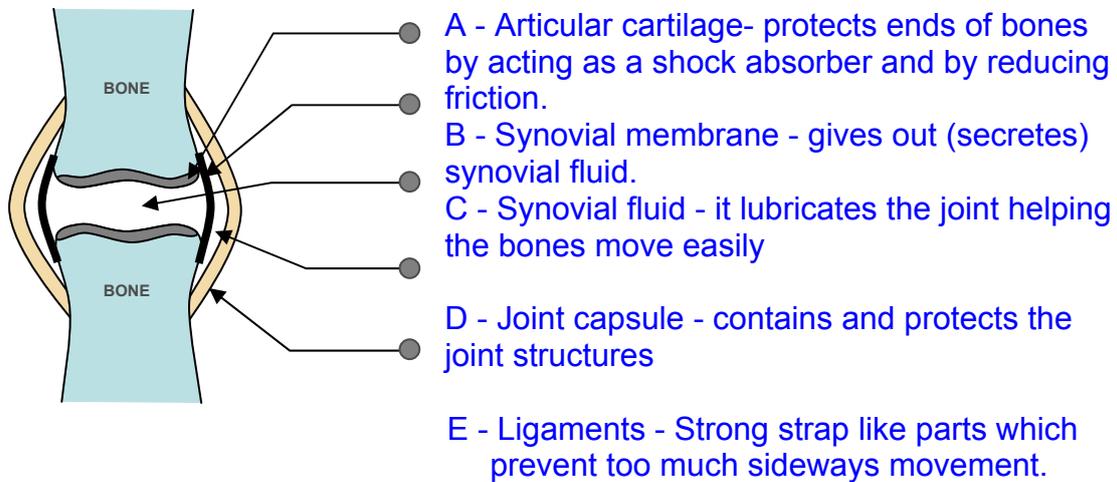
6. Describe the movement at each joint

Positions during a forward roll	Knee	Hip	Shoulder	Elbow
	Flexed	Flexed		

Using a grid like the one above, describe the type of movement at each position while:

- Running
- Diving – racing – front crawl
- Push pass (hockey)
- Any other activity of your choice

7. Label the diagram of a typical joint shown below by dragging the labels to their appropriate places



8. Explain, using examples from sport, what the different categories of joints are and why we need them.

- Immovable joints such as sutures of the skull are required when minimal movement is necessary to protect e.g. the brain inside from damage.
- Slightly moveable joints such as between the vertebrae are required when some movement is required e.g. bending forward, back, side to side but stability is still important because for example the joint has to bare weight. E.g. when the back bends in preparation for a tennis serve or javelin throw.
- Freely moveable joints are required at the limbs e.g. shoulder, knees, elbows to enable us to perform a wide range of movement for sport such as running, striking a ball, jumping.

9. Complete the following table about the main categories of joints.

Category of joint	Extent of movement	Example of such a joint
Immovable	Very little movement	Sutures of skull
Slightly moveable	Some movement	Vertebrae
Synovial (freely moveable)	Greater degree of movement	Hip, knee, shoulder, elbow

10. What factors affect the amount of movement possible at a joint?

Shape of articulating bone ends e.g. ball and socket structure allows a lot of movement.

Position of ligaments e.g. the medial and lateral ligaments of the knee stops potentially injurious sideways movement.

Position of muscles e.g. the quads can only pull the knee in one direction to extend it whereas the gluteus can move the hip joint in a number of directions.

The amount of flexibility/ mobility training undertaken. The shoulder joints of gymnast or swimmer are far more flexible than the average sports person.

Injury or illness.

11. The diagram below shows the action of the upper muscle involved in lifting a weight.

Study the diagrams and then answer the questions below.

- (i) Which muscle is involved in bending the arm? **Biceps**
- (ii) Which muscle is involved in straightening the arm? **Triceps**
- (iii) Which type of movement is taking place at the elbow joint? **Flexion**
- (iv) This movement is an example of a third order lever in action. Identify the pivot/ fulcrum and load/ resistance by dragging the labels to the appropriate points. **Pivot/fulcrum - elbow joint, Load/ resistance**
- (v) Explain why synovial joints are so important for the sports person.  
**Freely movable - allow a greater degree of movement**
- (vi) Explain why it is important to train all muscles acting on a joint.  
**Muscles work antagonistically as pairs or groups.**  
**As one muscle strengthens, so must the muscles which work with it - if not - imbalance - inefficiently and possible injury.**

- (vii) "Different synovial joints allow certain types of movement."  
Complete the table

Type of movement	Name of Synovial joint	Location of joint	Sporting Action
Flexion/ extension Increasing/ decreasing the angle between 2 bones	Ball and socket Hinge	Hip/shoulder Knee/ elbow	Running/kicking/ throwing Any action involving bending/ straightening
Rotation A circular movement - part of the body turns, while the rest remains still. A turning movement.	Pivot Ball and socket	Neck atlas- axis Hip/ shoulder	Turning head in dance, golf, swimming

## THE FUNCTION OF THE MUSCULAR SYSTEM IN FACILITATING AND IMPROVING MOVEMENT

1. What are the functions of levers in the body?  
Generate more force to move larger weights  
Produce a greater range of movement  
Increase speed at which the body moves
2. What role do the bones, joints and muscles play in the lever system of the body?  
Bones act as lever arms  
Joints act as pivots  
Muscles provide the EFFORT forces to move loads
3. Where is a lever system formed in the body?  
Wherever a muscle is attached to a bone
4. "The 3rd-class lever causes a *small contraction* of the biceps when bending your arm, which produces a large movement of the forearm."  
  
What other advantage does this type of lever system give?  
Greater speed of movement

# The Function of the Cardiovascular System in Facilitating and Improving Movement

1. Match the parts of the heart and connecting blood vessels to their function.

Function	Name of Part
Transports deoxygenated blood from the heart to the lungs	Pulmonary Artery
Brings back oxygenated blood from lungs to left atrium	Pulmonary vein
Receives oxygenated blood from the pulmonary vein	Left atrium
A two-flapped valve separating the left atrium from the left ventricle	Bicuspid valve
The biggest chamber of the heart, which pumps oxygenated blood around the body	Left ventricle
Main artery which takes oxygenated blood from heart to the rest of the body	Aorta
The main vein which brings deoxygenated blood back to heart from lower body	Inferior vena cava
The main vein which brings deoxygenated blood back to heart from upper body	Superior vena cava
The chamber where deoxygenated blood enters the heart	Right atrium
The three-flapped valve separating the right atrium from the right ventricle	Tricuspid valve
The chamber which pumps deoxygenated blood from the heart to the lungs	Right ventricle

2. Explain the relationship between cardiac output (Q) and exercise intensity.

- As exercise intensity increases so does CO<sub>2</sub>.
- This is to supply the body with sufficient blood carrying O<sub>2</sub> and nutrients for the increased energy demands.
- There is also a need to remove excess heat, dispel CO<sub>2</sub> and transport hormones.
- CO<sub>2</sub> can increase from around 5000cm<sup>3</sup> per minute at rest to about 30000cm<sup>3</sup> per minute for an untrained person to 38000 cm<sup>3</sup> per minute for endurance athletes.
- When exercise stops or becomes less intense their CO<sub>2</sub> will slowly adjust back down accordingly.

3. Explain how the heart's structure is adapted to its function.

The heart has 2 chambers at the top (atria) for receiving blood and 2 bigger chambers at the bottom (ventricles) for forcefully pumping blood out.

The left ventricle has the thickest, strongest muscle wall so it can pump blood around the body. The atrium chambers have thinner walls.

The heart muscle is involuntary so we don't have to think about making it beat.

The heart muscle is very hard to fatigue.

The heart has valves between the chambers and at the two main exits (pulmonary artery and aorta) which ensure blood flows in one direction only so deoxygenated and oxygenated blood don't get mixed up.

The heart has its own blood supply via the coronary artery which enables it to work continuously.

4. What is blood pressure?

A measurement of how much pressure the flowing blood puts on the artery walls.

5. What is systolic pressure?

The pressure of blood flow on the arteries when the left ventricle contracts.

6. What is diastolic pressure?

The pressure of blood flow on the arteries when the left ventricle relaxes.

7. What is the normal blood pressure reading for a young person?

About 120/80

8. Give five factors that can affect blood pressure.

Age, sex, exercise intensity, stress tension, fitness of your circulatory system.

9. Why can narrowing or blocking of blood vessels be dangerous?

The heart will not be receiving sufficient blood and oxygen causing it to work harder than it should.

10. Give five ways blood pressure can be reduced.

Regular exercise, sensible diet, reduce smoking, avoid stress, medication

11. Define the following terms:

a) Heart rate (HR)

the amount of times the heart beats in one minute

b) Stroke volume (SV)

the amount of blood forced out of the left ventricle per beat

c) Cardiac output (Q)

the amount of blood pumped out of the left ventricle in one minute.

12. What simple equation relates these three values?

$$Co = HR \times SV$$

13. Give two differences between cardiac and skeletal muscle.

Cardiac muscle is involuntary

Cardiac muscle is hard to fatigue

14. Complete the following description of the blood's journey from the heart around the body and back to the heart by dragging the correct word from the list below:

Blood is transported from the heart around the body and back to the heart in blood vessels. There are 3 types of blood vessel. When blood leaves the heart it passes into arteries. These branch off into arterioles. These are smaller but are more numerous. When it gets to the muscles, blood passes into the capillaries. These are even smaller, but there are millions of them. At the capillaries, the blood gives up its oxygen and takes in carbon dioxide. The blood starts its journey back to the heart in small veins called venules. The blood then passes into larger vein before returning to the heart.

15. Explain four ways in which blood helps the body during exercise.

Transports oxygen around the body  
 Transports CO<sub>2</sub> from the working muscles to the lungs.  
 Transports fuel to enable us to do activity.  
 Removes heat

16. Complete the table to show how the constituents (parts) of blood help us when doing sport.

CONSTITUENT	HELPS US WHEN DOING SPORT BY...
Red blood cells	Transports oxygen to muscles cells (fibres) to allow respiration, energy release and movement.
Plasma	Carrying fuel, in the form of food, to the working muscles and takes away waste such as CO <sub>2</sub>
White blood cells	Helps protect the body if injury occurs by fighting disease and infection.
Platelets	Clots the blood when we are cut to prevent too much blood loss.

17. The path that the blood takes can be described as a double loop. What is each loop called?

Systemic system - takes oxygenated blood from the heart around the body (including working muscles) and deoxygenated blood back to the heart.

Pulmonary system - takes deoxygenated blood from the heart to the lungs to exchange CO<sub>2</sub> for O<sub>2</sub> then comes back to the heart.

18. How would a 1500m runner benefit from higher levels of red blood cells?

They would be able to take in and transport more oxygen.  
 Their working muscles would be supplied with more oxygen

They could cope with higher levels of work without going over the anaerobic threshold.  
 They could cope with any given level of sub-maximal work easier.  
 They would recover more quickly.

19. Complete the following table:

Types of blood vessel	Description and function
1. <b>Arteries</b>	Carry oxygenated blood at high pressure from heart to the body. These are the thickest blood vessels. They swell as the blood is forced through then recoil back to normal. You can feel your pulse in them.
2. <b>Capillaries</b>	The smallest blood vessels only one cell thick. These are semi permeable to allow exchange of gases. Are found in clusters to feed all body tissues including muscles.
3. <b>Veins</b>	Carry deoxygenated blood at low pressure back to the heart. Are thinner than arteries. They have pocket valves to help prevent back flow of blood. When muscles surrounding them contract it helps squeeze the blood back to the heart. This is called the "skeletal muscle pump".

20. X on the graph shows how a sports person's heart rate responds to a 10 minute run at 12kmph and how it recovers.

Y shows the heart rate response to the same run after a period of regular endurance training.

Explain the reasons for the changed heart rate pattern.

- The lower resting heart rate is possible because of higher SV.
- During exercise the heart again does not have to work as fast because the larger SV allows the same cardiac output at lower bpm.
- After exercise recovery will be quicker because her fitter cardiovascular and respiratory systems can pay off any oxygen debt more quickly and return the body back to homeostasis (balance).

21. Answer the following:

a) How does regular aerobic training affect stroke volume?

b) How does this affect a person's heart rate and cardiac output when running at a medium pace for 5 minutes?

- Regular training will increase stroke volume.
- This means that for any given workload the HR can be lower whilst still delivering the same CO.
- At rest HR will therefore be lower.
- She will cope with the run more easily with a lower HR.
- She will recover more quickly after the run.

# HEALTH – FITNESS – EXERCISE CONTINUUM

1. Define the terms 'health' and 'fitness'.

## **Health**

State of complete physical, mental and social well-being, and not merely the absence of illness or disease or equivalent definition

## **Fitness**

The ability to meet the demands of the environment or equivalent definition

2. Explain the relationship between health and fitness

- You cannot be healthy without being fit enough to meet the demands of the environment
- You can be fit but not healthy (as it is a wider concept than just the 'physical').
- Exercise is the link between the two
- Fitness for sport is more specific than just being in a state of good health – at a higher level

3. 'Good health can be described as a state of complete physical, mental and social well-being.'

Explain fully how exercising and taking part in sporting activity can help a person's physical, mental and social well-being.

## **PHYSICAL**

- Looking good/feeling good – body shape improvement – burning up stored body fat
- Muscle tone – posture improvement
- Bone strengthening
- More efficient movement because of better flexibility
- CV efficiency – less prone to injury and disease
- Life expectancy implications

## **SOCIAL**

- Increases confidence in stressful situations
- Teamwork and co-operation development
- Fulfilment – challenge – worth
- Friendships, meeting people

## **MENTAL**

- Stimulation, enjoyment – 'feel good' factor
- Tension/stress reliever
- Aggression – emotion control
- Emotions not experienced elsewhere – success, exhilaration, importance, 'part of something', self esteem.

- Problems can be forgotten
- Process and the outcome can be important

4. 'Health is the state of complete physical, mental, and social well-being.'

Give three reasons to explain why taking part in a sporting activity can help a person's mental-being.

- Stimulation, enjoyment
- Positiveness – 'feel good'
- Tension/stress reliever
- Fulfilment – challenge – worth
- Aggression/emotion control
- Excitement – success, exhilaration, thrill
- Problems can be forgotten
- Process and outcome can be important – new interest/knowledge
- Sense of well-being – better efficiency of body system and body shape
- Challenge – setting goals – development of confidence and courage – personal development

5.

Health is...	Fitness is...	Exercise is...	Wellbeing is...

6. (i) Can you be fit but not healthy?

(ii) Can you be healthy without being fit?

7. Fitness is composed of health related components and skill related components.

8. Identify components of health and skill related fitness.

9. Does exercise have to be strenuous to produce health benefits – the 'no pain, no gain' principle?

10. Examine the relationship between Health, Physical Fitness and exercise.

Examine the consequences for your Health of a Sedentary Lifestyle.

## ENERGY SYSTEMS

1. During the course of a team game, players would use all three energy systems.

Name a team and describe specific situations in which each of the energy systems would be used.

ATP-PC system- high intensity short duration activities of up to 10 seconds, e.g. sprinting, bursting through a gap in rugby.

Lactic Acid System - high intensity exercise of between 10 seconds and 3 minutes duration, e.g. 400 metre sprint, counter attacking immediately after sprinting back 60 metres to defend.

Aerobic system - prolongs low intensity exercise - rhythmical/ continuous, e.g. jogging, back to position after an attack.

2. Below is a table showing some characteristics of three energy systems used in sporting activity.

Tick (✓) the energy system which is appropriate for each characteristic

Characteristics of energy systems	ATP-PC	Lactic Acid	Aerobic
Used mainly in very high intensity, short duration activities of up to 10 seconds and in the very early stages of exercise.	✓		
Used mainly in very high intensity exercise of between 10 seconds and 3 minutes in duration.		✓	
Used mainly during prolonged, low intensity of exercise.			✓

3. Identify one factor which can determine the main energy system used in any sporting activity.

Intensity or duration of the sporting activity.

4. Complete the table summarising the energy systems below:

Energy system	Aerobic or Anaerobic	Write the chemical equation summarising this process	Any by-products	How long can we use it for?
Creatine Phosphate (CP)	Anaerobic	$CP + ADP \rightarrow ATP + C$	C	Up to 10 seconds
Lactic Acid	Anaerobic	$ADP + \text{Glycogen} \rightarrow ATP + \text{Pyruvic acid}$	Pyruvic acid which turns into Lactic acid	10 - 60 seconds.
Aerobic	Aerobic	$ADP + \text{Glycogen} + O_2 \rightarrow ATP + H_2O + CO_2$	Water and CO <sub>2</sub>	Indefinitely until glucose stores run out.

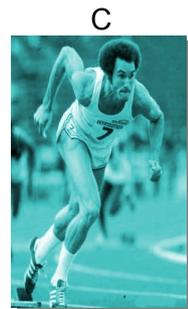
5. Study the images below. Suggest which energy system each athlete would predominantly use during performance and why.



Long jumper



Marathon runner



400m Sprinter

Diagram	Energy system	Reason
A		
B		
C		

6. Select one energy system and explain how ATP is recreated using this system. You may choose to use a diagram to assist your explanation

7. The table below shows a number of activities that are common to many games. For each activity identify the main energy system that would be used.

8.

ACTIVITY	MAIN ENERGY SYSTEM
Jogging	Aerobic
Kicking	CP
Sprinting	CP
Counter attacking	Lactic Acid

9. The energy system used for any sporting activity depends on which two factors?

- Intensity and
- Duration of the activity

10. How could an understanding of the energy systems help a teacher/ coach of a sports team train his/ her players?

The teacher/ coach would be able to work out which energy systems are used in the sport.

They would be able to work out different energy requirements of different positions.

The teacher/ coach could then make fitness training more specific to the game and to each player's identified needs.

10. "During maximum effort, such as sprinting, muscles need a lot of energy quickly but oxygen (O<sub>2</sub>) cannot reach the muscles fast enough". Which energy system is best used to provide the necessary fuel for such an activity?

Lactic acid system ATP/CP. Anaerobic

11. Explain the term oxygen debt?

Muscles need extra O<sub>2</sub> to get rid of Lactic acid. This extra O<sub>2</sub> is called O<sub>2</sub> debt and it is paid off by gulping air into our lungs. The lactic acid gets turned into carbon dioxide, water and a lactic component.

12. The following table lists a number of activities that a hockey player may perform in a game. Decide which energy system would be used to provide energy for them.

Activity	Energy System used
Taking on a defender over 10 metres.	CP
Aerobic	Aerobic
Counter attacking immediately after sprinting back 60m to defend.	Lactic acid
A keeper diving for the ball then returning to their feet.	CP
An attacker waiting on the half way line while his team defends a short corner.	Aerobic
A defender holding a defensive position when his team are attacking.	Aerobic
Closing down an attacker and tackling.	CP
Losing a defender with a change of pace.	CP

13. "During maximum effort, such as sprinting, muscles need a lot of energy quickly but oxygen (O<sub>2</sub>) cannot reach the muscles fast enough". Which energy system is best used to provide the necessary fuel for such an activity?

Activity	Aerobic / Anaerobic
Long distance running	Aerobic
Marathon running	Aerobic
Long jump	Anaerobic
A gymnastics vault	Anaerobic
A 50m sprint swim	Anaerobic
Javelin throw	Anaerobic

14. Explain why many sporting activities can be described as both Aerobic and Anaerobic.

Different phases of the activity - different demands - usually time/ intensity - call for a mix of systems to be used to provide fuel e.g. most team games.

15. What is the advantage to a team game player of having a high  $VO_2$  Max?

- Having a high  $VO_2$  Max means being able to deliver  $O_2$  to the heart and heart and working muscles more efficiently.
- This will enable the player to work aerobically for longer.
- They will not tire as quickly and will not build up lactic acid as quickly as a player with a lower  $VO_2$  Max.
- This should mean that they are more able to keep playing at higher levels without loss in performance, particularly important for a midfield player, netball centre who must attack and defend over a large area.

16. Explain what is meant by anaerobic threshold.

Anaerobic threshold is the point where aerobic mechanisms become overloaded and anaerobic metabolism begins to play a major part. The anaerobic threshold has been reached in all of us by about 80% - 90% of maximal heart rate.

17. Which energy systems would be the main provider of energy in a:

smash in Tennis, ATP - PC

60 second rally in Tennis Lactic acid

18. (i) Explain the meaning of the term  $VO_2$  Max.

$VO_2$  max is the maximum amount of oxygen we can take in, transport and use in one minute.

(ii) Give two benefits for a sportsperson of having a high  $VO_2$  max.

- Able to deliver  $O_2$  to the heart and muscles more efficiently
- This will enable the sportsperson to work aerobically for longer.
- They will not tire as quickly and will not build up lactic acid as quickly as a player with lower  $VO_2$  max.
- Performance is not impeded.

19. (i) Give a sporting example of anaerobic activity.

100 metre sprint

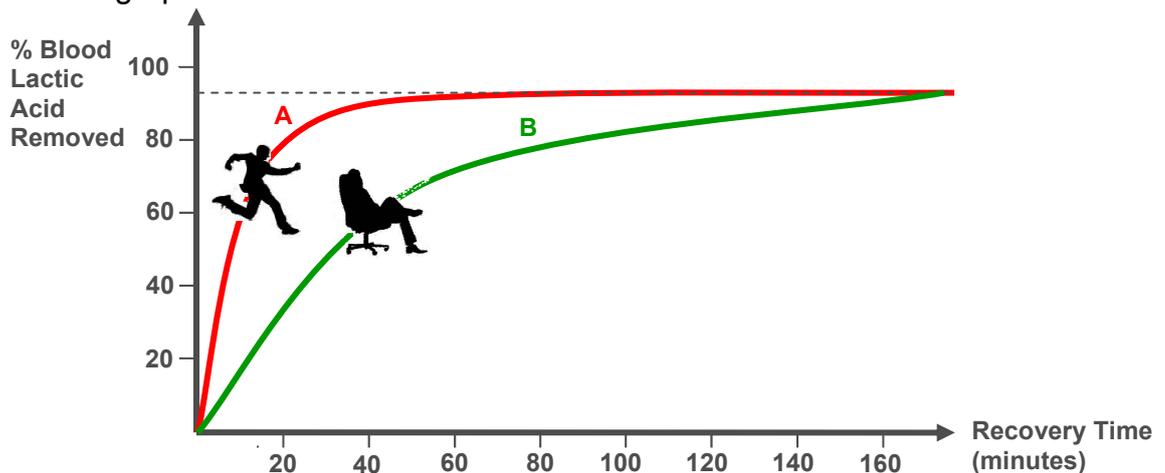
(ii) Why is lactic acid produced during anaerobic activity?

Anaerobic respiration knowledge needed here: the release of a little energy very quickly from the incomplete breakdown of glucose in the absence of  $O_2$ . This happens when muscles need to work so hard that the body can't deliver enough  $O_2$  to respire the available glucose aerobically. Because the glucose can only be partly broken down in the absence of  $O_2$  - lactic acid is produced.

20. What happens to an athlete's performance as lactic acid builds up?

Build up of lactic acid causes fatigue and results in oxygen debt. Performances suffer -muscles unable to function normally.

21. The graph shows the rate of lactic acid removal after exercise.



(i) Which athlete recovered first? A

(ii) How long did it take the other athlete to remove all lactic acid from his body? 160 minutes

(iii) How much lactic acid had been removed by A after 1 hour's recovery? 98%

(iv) How much lactic acid had been removed by B after 1 hour's recovery? 80%

(v) What is the difference in full recovery time between the two athletes? 80 minutes

(vi) There is evidence on the graph to suggest why one athlete recovered quicker than the other during recovery time. Explain the evidence.

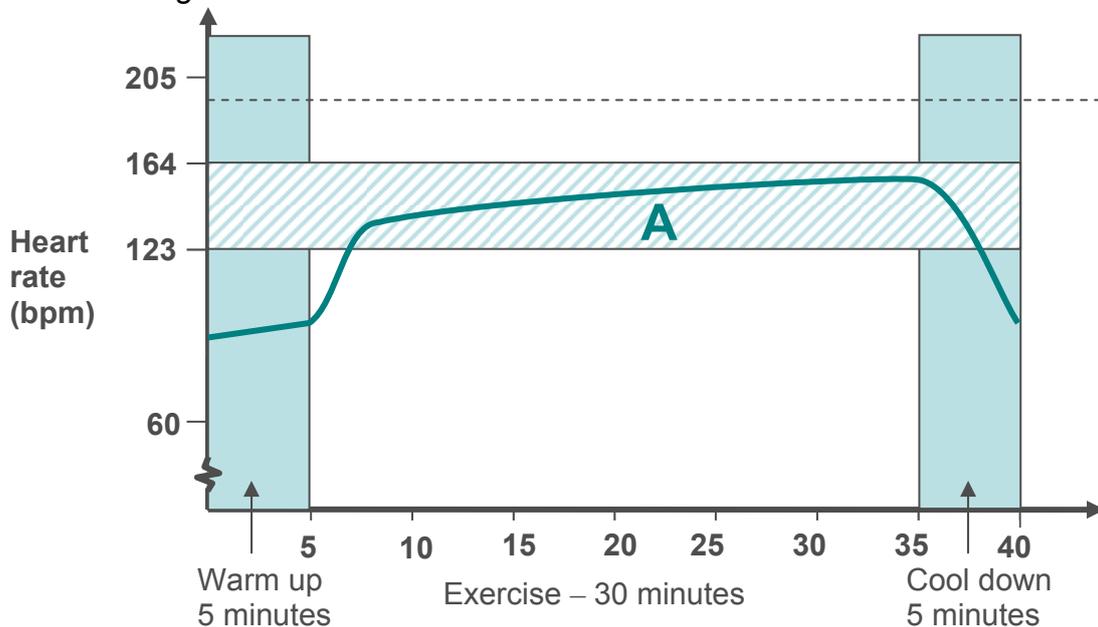
Runner A - exercising during recovery

Runner B - Not exercising during recovery

Blood lactate levels will decrease more quickly with exercise rather than rest.

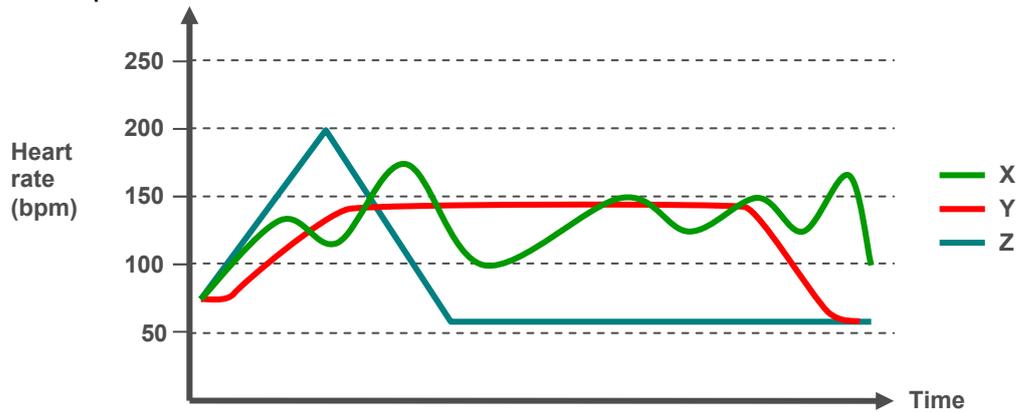
Importance of warm down / exercise recovery

22. The graph below shows the heart rate of a 15 year old athlete during a training session.



- i. What heart rate is indicated at 205 bpm?  
Maximum Heart rate  $220 - 15 = 205$
- ii. What threshold is identified at Z?  
Aerobic threshold
- iii. What is the name given to training zone A?  
A- Aerobic training Zone
- iv. What type of sporting activity could the athlete be training for?  
If you are trying to improve your endurance (aerobic) you need to work for longer periods at lower percentages of maximum heart rate. No recovery evident which would signify anaerobic work.
- v. What physical fitness component is being developed in this session?  
Cardiovascular endurance or Aerobic capacity

23. The graph below shows the heart rates (X, Y and Z) for three different performers.



Which heart rate would be appropriate for

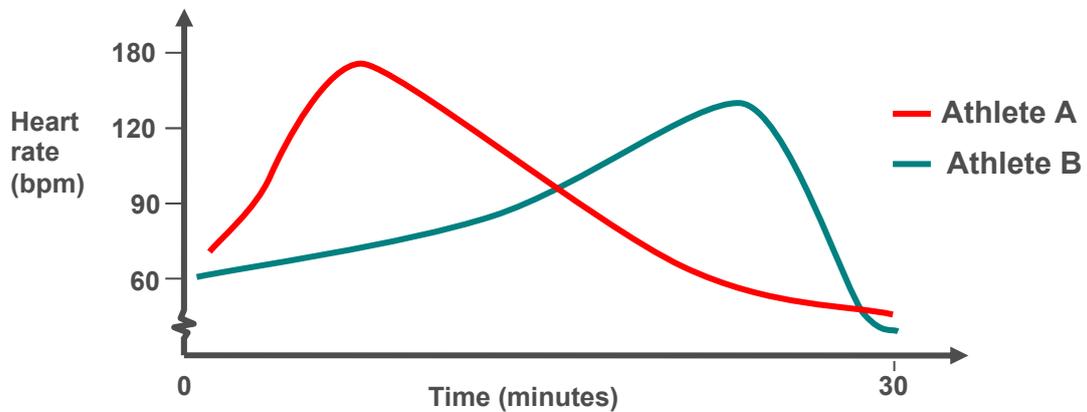
- a 100 metre sprinter and
- a games player?

Give reasons for your answers.

(i) Z - the heart rate indicates a dramatic rise - into anaerobic for a brief time only and then sharply drops and evens out to resting heart rate. Maximum effort.

(ii) X - Peaks and troughs at aerobic level - indicating work/recovery - similar to any Team Game Scenario. Peaks - indicate dynamic movement close to anaerobic threshold.

24. The graph below shows the heart rate of two 16 year old athletes when training at the same intensity.



- Which athlete is the fitter, A or B? **B**
- Using information from the graph to help you, give two reasons for your answer.

When unfit people exercise they will arrive at their MHR quickly and take a great deal of time to recover.

Fit people exercising will take time to reach their MHR but will recover quickly to their normal resting heart rate.

Resting heart rate is normally lower for a fit athlete.

MHR is usually lower for a fit athlete.

25. The graph below shows the heart rate of a sportsperson recorded during a training session.



- What happens to the sportsperson's heart rate during the training session?

Varies - increases then decreases

- ii. What causes the heart rate to change in this way?

Varying intensity of physical work - recovery/rest/interval training

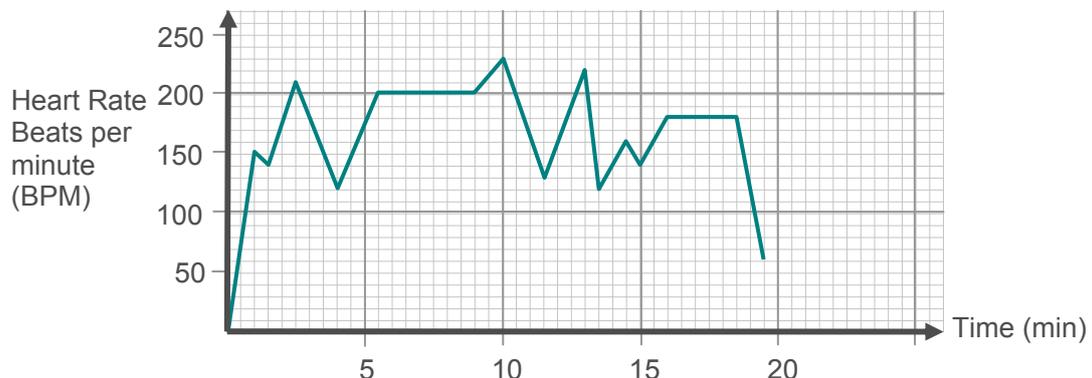
- ii. What type of sporting activity do you think the sportsperson is training for?  
Explain your answer.

100 metres

The sportsperson at times is working close to MHR.  
The graph indicates that there is high intensity work being performed this is because of the recovery periods which should not allow fatigue to set in.

The MHR is 200. Anaerobic Training Zone is approx, 80% of 200- which is 160. - training at this level improves anaerobic fitness.

26. The graph below shows the heart rate of an eighteen-year-old badminton player during a game.



- i. Give two pieces of evidence to suggest that this player is a fit competitor.

Lower resting Heart Rate

Quick Recovery rate

Working comfortably toward Anaerobic end of Training Zone

- ii. Calculate the player's maximum heart rate (MHR)

$$220 - 18 = 202$$

- iii. What evidence is there to suggest that this player worked both aerobically and anaerobically during the game?

Knowledge needed of thresholds and training zones/ working zones

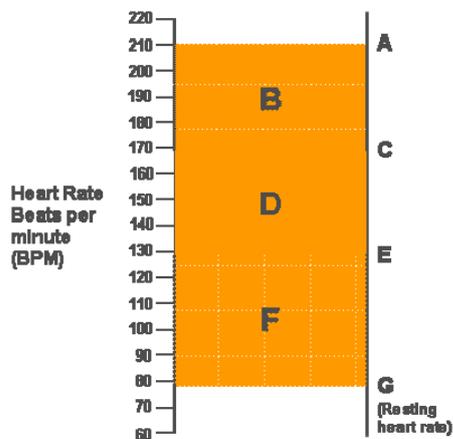
MHR =202

Aerobic Threshold  $60\%$  of  $202 = 121$

Anaerobic Threshold  $80\%$  of  $202 = 161$

Player is working aerobically within the 121 - 161 zone and also occasionally works above 202, anaerobically.

27. The graph below shows how a sixteen-year-old sportsperson can use heart rate to work out how hard to train.



Heart rate and training of a sixteen-year-old sportsperson:

- i. What heart rate is indicated at 204 bpm (A)?  
Maximum heart rate
- ii. What threshold is indicated at 163 bpm (C)?  
Anaerobic training threshold
- iii. What threshold is indicated at 122 bpm (E)?  
Aerobic training threshold
- iv. In which training zone does lactic acid build up quickly? Is it B, D or F?  
B
- v. How does lactic acid build up affect training time and recovery time?  
Training time - shorter  
Recovery time - longer
- vi. Which training zone is important for improving aerobic fitness? Is it B, D or F?  
D
- vii. Explain why training zone F has little effect on aerobic fitness?  
Exercising is too easy. No stress. No adaptation. Burning fat zone.

# SHORT AND LONG TERM EFFECTS OF EXERCISE

1. During vigorous exercise the following change can take place in the body:

- The heart beats faster
- Breathing becomes heavier
- Sweating occurs
- Skin reddens

Explain why these changes help the body to cope with the demands of vigorous exercise.

The lungs and heart work together to get  $O_2$  round the body and clear carbon dioxide away. When exercising the heart and lungs have to work harder.

More blood gets pumped to the working muscles each minute bringing  $O_2$  for energy and carrying carbon dioxide away. (The amount of carbon dioxide increases when exercising.) Carbon dioxide reduces the ability to carry  $O_2$  in the blood. It has to be removed as quickly as possible.

Heavier breathing means more  $O_2$  is taken in with each breath to provide energy for working muscles.

Cooling mechanism. Working muscles produce heat. To prevent the body temperature rising blood vessels at the surface of the skin open (dilate) and heat is transported away from the body (salt and water): (evaporation).

More waste products are made during exercise and can interfere with the effective running of the body, e.g. heat exhaustion

Blood is moved or shunted close to the skin surface to cool down, this makes the skin redder.

2. **“During strenuous sporting activity *visible* and *immediate* changes to the body can take place.”**

Breathing becomes heavier/quicker. More  $O_2$  is being taken in with each breath to provide fuel/energy for working muscles. Extra demand.

Sweating - keeps the body cool by the process of evaporation.

Skin colour deepens - blood is shunted close to the skins surface to cool down.

**3. Describe 3 visible and immediate changes that can take place to the body during strenuous sporting activity.**

**Identify four-long term effects of training.**

### **Cardio Vascular**

Heart/ circulation system - increase in strength and size

Lower resting heart rate

Stroke volume increases.

Recovery rate improves.

Arteries larger and more elastic - blood pressure is reduced.

Quantity and quality of blood increases.

Can cope with more lactic acid during exercise.

### **Cardio respiratory**

Volume of air taken in as each breath increases.

Breathing becomes more efficient.

Increase  $VO_2$  max.

More  $O_2$  in and more carbon dioxide out.

Continue breathing deeply for longer.

### **Tendons/Ligaments/Bones**

Tendons become stronger.

Ligaments more flexible through stretching.

Bones become stronger.

### **Muscles**

Muscles hypertrophy.

Muscle fibre increase in size.

Strength increase.

**Explain how long-term training can help to improve performance in a named sporting activity.**

**Name of sporting activity ....**

**Named sporting activity is important:-  
Aerobic/ Anaerobic/ strength training variables**

**Links with performance:**

- Recovery rates
- Heart copes with stress/ stroke volume
- Lactic acid tolerance
- Increased amount of O<sub>2</sub> going to working muscles helps reduce the effects of fatigue.
- Muscle hypertrophy.
- Muscle strength
- VO<sub>2</sub> max implications - high VO<sub>2</sub> max means people can work at a higher rate for longer - suffer less fatigue.
- Anaerobic threshold increases - work harder and longer before tiring.
- Ligaments - flexibility links
- CO<sub>2</sub> removal from strenuous work - because it reduces ability to carry O<sub>2</sub> in the blood.

5. "Taking part in sporting activity makes the body respond by changing both immediately and adapting over time to the level of activity."

a) Outline four short-term effects of exercise on the body.

- Skin reddens
- Body becomes hot
- Body become sweaty
- May get a stitch
- May get aching muscles/joints
- Heart-rate increases
- Breathing increases
- May become tired
- May pick up an injury
- May become stressed

b) Describe four long-term benefits for health and physical fitness of long-term training.

- Increased CV endurance through efficient respiration/circulation.
- Increased  $VO_2$  max.
- Increased vital capacity/cardiac output/larger- stronger heart.
- Improvements in physical fitness overall or for specific parts of the body.
- Increased effectiveness/efficiency of components of fitness.
- Improve performance in sport.
- Lower resting heart rate. Recovery rate improves.
- Reduce risk of injury.
- Arteries larger and more elastic - blood pressure reduced.
- Can cope with more lactic acid during exercise.
- Body uses more fat and less carbohydrate as a fuel for exercise weight implications.
- Tendons become stronger. Bones become stronger. Ligaments more flexible.
- Capillaration increase.

6. Give two long-term effects of aerobic exercise on the body and explain how each can help to improve performance.

Answer the question by completing the table below.

Long term effect of aerobic exercise	Explain how each can help to improve performance:
<ul style="list-style-type: none"> <li>• Heart/circulatory system - increase in strength and size</li> <li>• Lower resting hearth rate</li> <li>• Increase in stroke volume.</li> <li>• Red blood cells increase</li> <li>• Recovery rate improves</li> <li>• Arteries larger and more elastic blood • pressure is reduced</li> <li>• Can cope with more lactic acid during exercise.</li> <li>• Quantity and quality of blood increases.</li> <li>• Breath in more air and continue to do so for a longer time</li> <li>• Able to work closer to <math>VO_2</math> max.</li> <li>• More <math>O_2</math> in more carbon dioxide out.</li> <li>• Body uses more fat and less carbohydrate as a fuel for exercise.</li> <li>• Tendons become stronger - as do bones - ligaments more flexible.</li> </ul>	<ul style="list-style-type: none"> <li>• Application is vital improving performance.</li> </ul>

# The Function of the Cardio-Respiratory System in Facilitating and Improving Movement

1. Complete the following by filling in the blanks:

Every cell in the body needs to RESPIRE or it will die. Respiration means it needs to take in OXYGEN and get rid of CARBON DIOXIDE. The cells need the OXYGEN to produce ENERGY. The oxygen is breathed in as part of the air. The AIR enters through the NOSE & MOUTH, passes down the TRACHEA into the BRONCHI through the BRONCHIOLES and finally ends up at the tiny air sacs called ALVEOLI. Each ALVEOLUS has thin walls and is surrounded by a thin blood vessel called a CAPILLARY. This helps the process of GASEOUS EXCHANGE. This means that OXYGEN diffuses into the BLOOD and travels in the blood to the working MUSCLES. At the same time CARBON DIOXIDE diffuses into the alveoli and is BREATHED OUT.

2. Define the following terms:

3.

**Respiratory Rate:** How many times we breathe in a minute

**Tidal Volume:** The amount of air breathed in with each breath

**Minute Ventilation:** The amount of air breathed in per minute

3. Make up a simple equation that links the three terms above.

Minute ventilation = Tidal volume × Respiratory rate

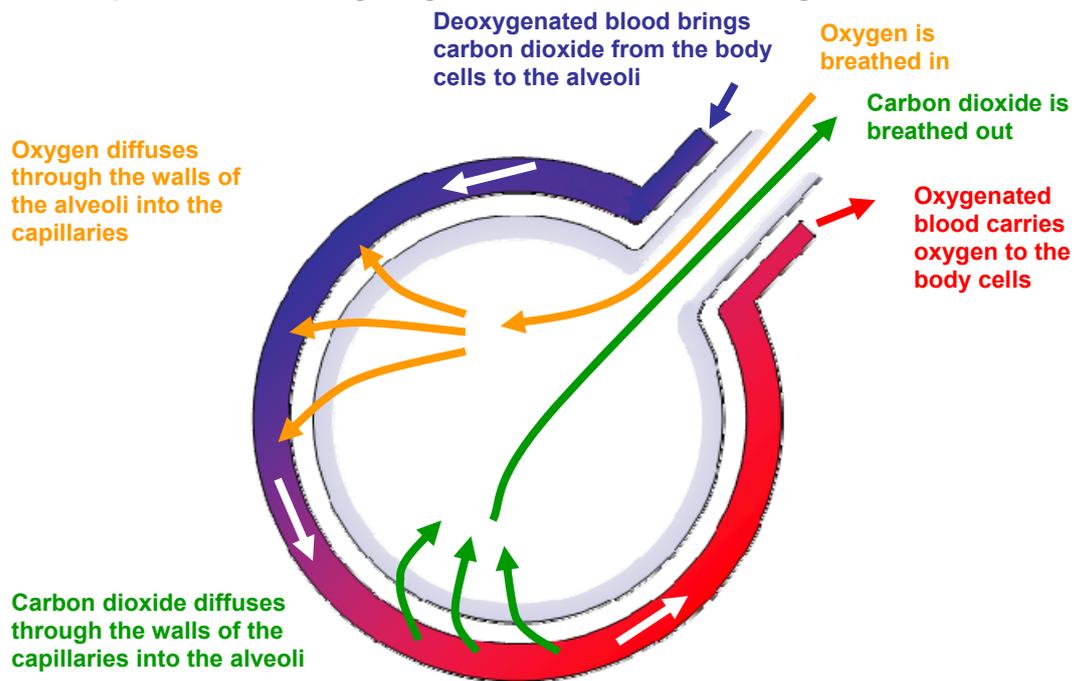
4. What is VO<sub>2</sub> Max?

VO<sub>2</sub> Max is the maximum amount of oxygen we can take in, transport and use in one minute. It is measured in ml/kg/minute

5. What is the advantage to a football or hockey midfield player of having a high VO<sub>2</sub> Max?

- Having a high VO<sub>2</sub> Max means being able to deliver oxygen to the heart and working muscles more efficiently.
- This will enable the player to work aerobically for longer.
- They will not tire as quickly, and will not build up lactic acid as quickly as a player with lower VO<sub>2</sub> Max.
- This should mean that they are more able to keep playing at higher levels without loss in performance particularly important for a midfield player who must attack and defend over a large area.

6. Complete the following diagram for Gaseous Exchange.



7. Name TWO functions of the Respiratory System.

- Provides  $O_2$
- Expels  $CO_2$

8. How does the body provide the extra  $O_2$  needed for exercise?

- Deeper breaths
- Faster Rate of Breathing
- Both