

PE Spring 2 Knowledge Organiser

Anaerobic and aerobic exercise	
<p>Energy production Aerobic respiration - the use of glucose and oxygen to release energy aerobically with the production of carbon dioxide and water.</p> <p>Anaerobic respiration – know the impact of insufficient or no oxygen on energy release, the by-product of anaerobic respiration (lactic acid)</p>	<p>Energy production Energy sources: fats as a fuel source for aerobic activity, carbohydrates as a fuel source for aerobic and anaerobic activity</p>
<p>Aerobic respiration</p> <ul style="list-style-type: none"> • Takes place in the presence of oxygen • Intensity of the exercise is moderate to low • Produces a lots of energy with few harmful by-products (Carbon Dioxide and water) • You can work aerobically for a long period of time (duration) • Gives time for oxygen to be delivered to the working muscles and processed during the activity. <p>Anaerobic respiration</p> <ul style="list-style-type: none"> • Take places without the presence of oxygen • Can produce energy quickly but cannot be produced for a long duration • Actions are powerful and fast • Intensity is therefore high and the duration in short • Lactic acid is the by-product causing muscles to become fatigued and rest is needed before continuing • Time - Muscular contractions are happening too rapidly for oxygen to be delivered in time to be used. 	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;">Aerobic respiration</p> <p style="text-align: center; font-size: 24px; color: blue;">O₂</p> <div style="border: 1px solid blue; padding: 5px; text-align: center; margin: 5px;"> <p>Glucose + oxygen → ENERGY + carbon dioxide + water</p> </div> <p style="text-align: center; font-size: 24px; color: blue;">O₂ O₂</p> <p>Fats</p> <div style="border: 1px solid blue; padding: 5px; text-align: center; margin: 5px;"> <p>Fatty Acids + oxygen → ENERGY + carbon dioxide + water</p> </div> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;">Anaerobic respiration</p> <p>Uses carbohydrates (only) as a fuel source</p> <p>Carbohydrates</p> <div style="border: 1px solid blue; padding: 5px; text-align: center; margin: 5px;"> <p>Glucose → ENERGY + lactic acid</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p style="font-size: 24px; color: blue;">O₂</p>  </div> <div style="text-align: center;"> <p style="font-size: 24px; color: blue;">O₂</p>  </div> </div>
<p>Application</p> <ul style="list-style-type: none"> • Describe aerobic respiration and explain why it's the primary energy system for a marathon runner? • Explain why oxygen debt is more likely to be associated with a 100m sprint than a 15 minute walk? • Many sports will require both aerobic and anaerobic respiration. Using specific sporting of your choice explain why this is the case? 	

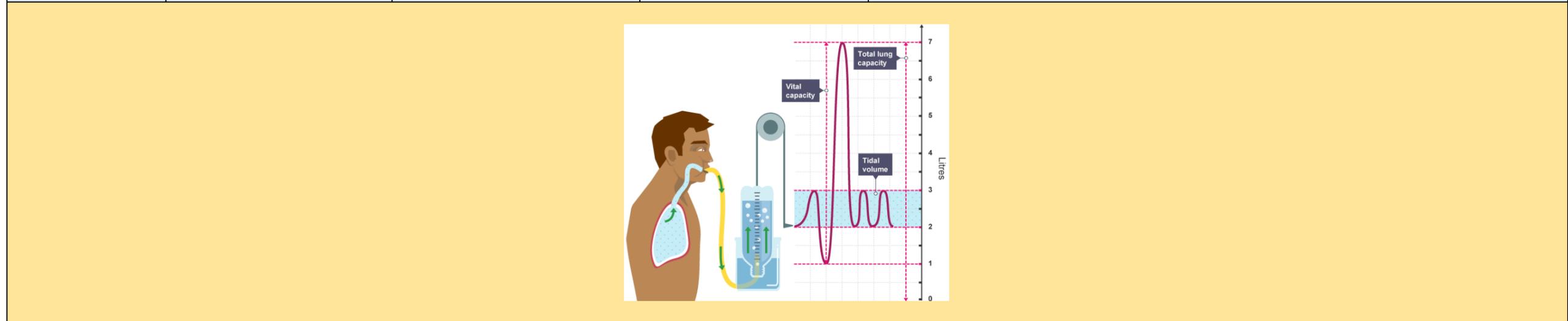
The short term effects of exercise on the body systems

The Cardiac System	<p>↑ Increased Stroke Volume</p> <p>Is the amount blood pumped out of the heart per heart beat. Average 70 ml/beat</p>	<p>↑ Increased Heart Rate</p> <p>Is the number of beat per minute. Average 75 BPM</p>	<p>↑ Increased Cardiac Output</p> <p>Is the volume of blood pumped out of the heart per minute. Average 5 (L/min)</p>	<p>Cardiac Equation</p> <p>Stroke Volume(SV) x Heart Rate (HR) = Cardiac Output (Q)</p>
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Application

- **Why does stroke volume increase as exercise begins?**
- **Why happens to heart rate during exercise? What is the anticipatory rise? Why does HR plateau when exercise intensity allows or when it reaches its maximum?**
- **What happens to Cardiac Output during exercise? Why?**

The Respiratory System	<p>↑ Tidal Volume (Depth of breathing)</p> <p>Amount of air inhaled and exhaled per breath. Resting TV = 500ml.</p>	<p>↑ Frequency (Rate of breathing)</p> <p>Number of breaths per minute. Resting frequency is between 12-20 breaths</p>	<p>↑ Minute Ventilation</p> <p>Amount of air inhaled and exhaled per minute</p>	<p>Tidal Volume(TV) x Frequency (f) = Minute Ventilation (VE)</p> <p>TV x f = VE</p>
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Application

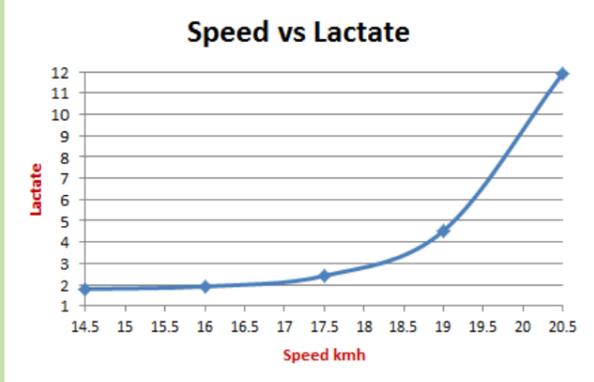
- **What happens to Tidal volume and Frequency as exercise begins and how does this help a Badminton player to perform at his maximum? (4)**

<p>The Vascular System</p>	<p>The redistribution of blood flow:</p> <p>When exercise begins the body alters its priorities.</p> <p>At rest a high proportion of blood goes towards organs.</p> <p>During exercise blood is directed to the working muscles e.g. During running blood is directed to Hamstring and Quadriceps.</p>	<div style="text-align: center;"> </div> <p>The process of redistributing blood when exercising is known as VASCULAR SHUNTING</p> <p>Vascular Shunting is achieved by:</p> <p>Vasodilation – Widening of the lumen of blood vessel to increase blood flow.</p> <p>Vasoconstriction – Narrowing of the blood vessel to restrict blood flow.</p>
<div style="border: 1px solid black; padding: 10px; margin: 0 auto; width: 60%;"> <h3 style="text-align: center;">Vasoconstriction and Vasodilation</h3> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> Dilated Artery Normal Artery Constricted Artery </div> </div>		
<p>Application</p> <ul style="list-style-type: none"> • Why is it important to avoid eating a large meal immediately before exercising? • Explain why vascular shunting is important for a Footballer to maintain their performance? 		

<p>Muscular System</p>	<p>Lactate Accumulation</p> <p>If muscles are working anaerobically then Lactic acid accumulation will occur rapidly.</p> <p>Lactic acid is a by-product of high intensity anaerobic exercise</p>	<p>This ultimately leads to Muscle fatigue – Reduction in ability of the muscle to produce force</p> <p>It can also lead to cramp at the end of the game</p>		<p>Oxygen debt is created when muscles work anaerobically. This means that you are in the recovery phase after exercise. The cardiovascular and respiratory systems work hard to replenish your muscles with oxygen.</p>
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Application

- How does the cardio-respiratory system work together to help a middle distance runner recover from oxygen debt? (9)
- What is a by-product of anaerobic exercise?
- Interpret the data plotted on the graph? This shows lactate accumulation.



Speed (kmh)	Lactate
14.5	2
16	2
17.5	3
19	5
20.5	12

Topic 9 Marker

- Evaluate how the short term effects of exercise can both benefit and limit performance in a Rugby game? (9)