

<b>Topic: CB9 Ecosystems and Material Cycles ( Triple)</b>		<b>Duration: 11 lessons</b>	<b>Composite:</b>
<b>Key vocabulary:</b>	<p><b>Powerful knowledge</b></p> <p><b>Which organism is a producer in a food chain?</b>  <b>What type of food does a primary consumer eat?</b></p> <p><b>What do the arrows in a food chain indicate?</b>  <b>What limits the length of a food chain.</b>  <b>Explain the use of indicator species in deriving levels of pollution.</b>  <b>Describe a belt transect sample</b>  <b>What is a quadrat used for?</b>  <b>How can you ensure quadrat sampling is as accurate as possible?</b>  <b>Name examples of abiotic and biotic factors.</b>  <b>What is meant by biodiversity?</b>  <b>What is a parasite?</b>  <b>What is a mutualist?</b>  <b>What does non-native mean?</b>  <b>Why does eutrophication lead to fish death?</b>  <b>What is food security?</b>  <b>What is desalination?</b>  <b>What is distillation?</b>  <b>Name the process that removes CO<sub>2</sub> in the carbon cycle.</b>  <b>Name 2 other process that release CO<sub>2</sub> in the carbon cycle.</b>  <b>Why do plants need nitrogen?</b>  <b>How do plants obtain nitrogen?</b>            What is an indicator species?            What is meant by food security?            Name 3 factors that can affect decay.</p>	<b>Core knowledge Components</b>	<b>Links to previous and future topics</b>
Biotic Abiotic Ecosystem Habitat Niche Community Population independent Producer Web Consumer Primary Secondary Tertiary Predator Pollutant Quadrat Transect Distribution Abundance Indigenous Eutrophication Endangered reforestation Conservation Biodiverse Potable Mutualistic Decomposers Rotation Food Security Sustainability Indicator species Decomposition		Describe different levels of organisation including organisms, populations, communities to the whole ecosystem.  Describe some relationships between organisms in a habitat. How are animals interdependent and what do they compete for in an ecosystem?  Name the parts of a food chain and the consumers at each trophic level.  Give examples of other types of relationships that are parasitic and mutualistic.  Use data from sampling to estimate the number of individuals in an area.  Link abiotic factors to distribution of organisms.  Give examples of the environmental impact of some pollution events.  Give examples of case studies where reintroductions have increased biodiversity.  Explain the impacts of human activities on diversity including fish farming, introduction of non-native species and eutrophication.  How can the impact of human activity that has reduced biodiversity be reversed?  Outline global pressures that lead to concerns over food security.  How can indicator species be used to determine / monitor levels of pollution and which species are the main aquatic and atmospheric indicators?  Describe the processes in the water cycle.  Describe the processes in the carbon cycle and how each part of the process functions.  Explain the impact of burning fossil fuels.	Year 7 Ecology  Year 8 Micro-organisms  Year 9 Environmental Studies Year 10 – Natural selection  OCR A Mod 4 Biodiversity and Conservation

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<b>Impressive reading</b>	<b>Impressive speaking</b>	<b>Impressive writing</b>	<b>Resilience</b>	<b>Employability via:</b>
Case studies of reintroductions as part of conservation efforts	Be able to articulate changes in food webs. Be able to articulate the impact of Human activity on the environment	Explain the impact of changes in feeding relationships using concisely and be able to explain sequentially the steps in eutrophication	Develop an understanding of interconnectivity using food webs. Be able to scale up with confidence and use estimates.	Sees a bigger picture, makes links and is aware of global threats. Careers: Ecologist, zoologist, conservationist, agriculturalist, researcher, journalist.

**CULTURAL CAPITAL:**

Understanding wider global issues with world population growth and conflicts with biodiversity and food security. Issues in meat production.

**SEND**

Clear outline of key vocab. Misconceptions outlined, start of lesson retrieval practice, delivery chunked into associated topics and within the lesson. Dual codes where possible and demonstrations with explicit instructions, targeted discussion and questioning with empathetic seating and grouping

<b>YEAR 11 TRIPLE BIOLOGY</b> <b>Topic: Exchange &amp; Transport</b>		<b>Duration: 10 lessons</b>	<b>Composite:</b> <b>Unit test</b>
<b>Key vocabulary:</b>	<b>Core knowledge Components</b>	<b>Powerful knowledge components crucial to commit to long term memory</b>	<b>Links to previous and future topics</b>
Excretion Absorption Respiration Aerobic Anaerobic Ventilation Diffusion Osmosis Facilitated diffusion Active transport Lungs Trachea Bronchi Bronchioles Alveoli Ciliated epithelium Cilia Goblet cells Mucus Gas exchange Concentration gradient Surface area Diffusion distance Heart Chamber Atrium Ventricle Artery Vein Capillary Valve Double circulation Single circulation Plasma	<ol style="list-style-type: none"> <li>1. What substances are excreted from cells?</li> <li>2. What substance is needed to be absorbed by cells.</li> <li>3. What are the three main ways substances enter cells?</li> <li>4. What factors affect the rate of diffusion?</li> <li>5. What equation is used to determine the rate of diffusion?</li> <li>6. What adaptations are in the lungs to increase surface area for absorption and excretion of gases?</li> <li>7. What adaptations are there in alveoli?</li> <li>8. What are the three main blood vessels?</li> <li>9. Which blood vessels carry mainly oxygenated blood at high pressure?</li> <li>10. Which blood vessels carry mainly de-oxygenated blood at lower pressure?</li> <li>11. What are the adaptations in the capillary to allow exchange?</li> <li>12. What is meant by double circulation?</li> <li>13. Name the four chambers of the heart?</li> <li>14. Why is the left side more muscular?</li> <li>15. What is the purpose of the heart valves?</li> <li>16. What is a pulse?</li> <li>17. What is the equation to determine cardiac output?</li> <li>18. What is meant by stroke volume?</li> <li>19. Name 2 types of cellular respiration.</li> <li>20. Explain the difference between two types of cellular respiration?</li> <li>21. Which chemical absorbs the carbon dioxide in the respirometer?</li> <li>22. What safety precautions should you take for yourself and the organisms in the respirometer?</li> <li>23. How can a respirometer show how temperature affects the rate of respiration?</li> </ol>	<div style="border: 2px solid red; padding: 5px;"> <p><b>Powerful Knowledge</b></p> <p>Which gases are exchanged in the lungs?</p> <p>Which process is happening during gas exchange?</p> <p>State fick's law</p> <p>Where in the lungs are gases exchanged?</p> <p>Name the four components of blood</p> <p>Name the chambers of the heart</p> <p>What is the purpose of heart valves?</p> <p>State the equation for aerobic respiration</p> <p>State the equation for anaerobic respiration</p> <p>Explain why cardiac output increases with exercise.</p> <p>Which part of a respirometer indicates the rate of respiration?</p> </div>	KS3: Cells, Moving & Breathing  KS4: Key concepts

Red blood cell White blood cell Platelet Cardiac output Stroke volume Heart rate Pulse rate Muscle Spirometer Blood pressure Exercise Soda lime			
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Impressive reading	Impressive speaking	Impressive writing	Resilience	Graph/Numeracy skills:	Employability via:
Read with purpose: spot the error activity	Discuss with members of a group how medical condition affect Fick's law	To tie in with culture capital activity about lung damage/emphysema. Students write an explanation of how the damaged alveoli experienced in emphysema compromise efficient gas exchange.	<ul style="list-style-type: none"> <li>Use of transferable mathematical skills.</li> <li>Scientific investigation skills in using fiddly equipment.</li> </ul>	<ul style="list-style-type: none"> <li>Calculations involved in surface area: volume ratios</li> <li>Use of Fick's law equation to work out rate of diffusion</li> <li>Use of/rearranging of the cardiac output equation</li> <li>Calculating respiratory rate from data obtained using a spirometer, data analysis &amp; graph</li> </ul>	Doctor, nurse, physiotherapist, sports therapist, personal trainer, athlete, paramedic.
<b>Culture capital:</b> <ul style="list-style-type: none"> <li>Adolf Eugen Fick: responsible for Fick's law used to calculate rate of diffusion; and also equation for cardiac output</li> <li>EMPHYSEMA: caused by smoking, pollution etc. Damages alveoli and compromises gas exchange.</li> <li>Uses of cardiac output in diagnosis &amp; treatments</li> </ul>					

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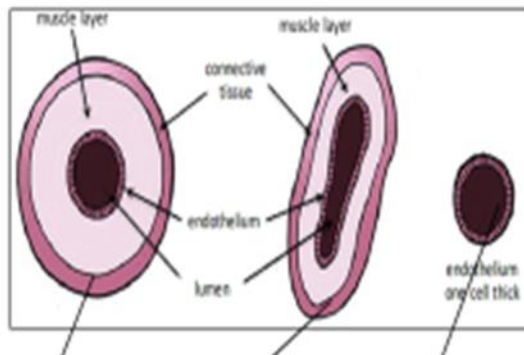
Communication & Interaction	Cognition & Learning	SEMH	Physical/Sensory
<ul style="list-style-type: none"> <li>Unambiguous terms and clear language used in presentations/handouts</li> </ul>	<ul style="list-style-type: none"> <li>Chunking of activities into manageable portions, so as not to lead to cognitive overload</li> </ul>	<ul style="list-style-type: none"> <li>Consideration to seating positions</li> <li>Awareness of specific pupil triggers</li> </ul>	<ul style="list-style-type: none"> <li>Consideration to seating positions</li> <li>Clear access for physically compromised pupils</li> </ul>

<ul style="list-style-type: none"><li>• Unambiguous terms and clear language used by teacher</li><li>• ADHD pupils are given instructions directly by use of their names</li><li>• Use of post-it plans to help pupils work through a task</li></ul>	<ul style="list-style-type: none"><li>• Use of low stakes/high gains activities for knowledge recall</li><li>• Topics are mapped out visually for pupils to see</li><li>• Links to previous learning established</li></ul>	<ul style="list-style-type: none"><li>• Communication channels kept open</li></ul>	<ul style="list-style-type: none"><li>• Opportunities for different sensory learning activities threaded into topics</li></ul>
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# YEAR 11 TRIPLE BIOLOGY EXCHANGE & TRANSPORT KNOWLEDGE ORGANISER

Cells secrete and excrete various substances E.g. waste products, CO<sub>2</sub>, urea, hormones, other chemical.

They also need to absorb certain things E.g. food molecules, hormones, oxygen, water, They do these things using several methods of cellular transport.

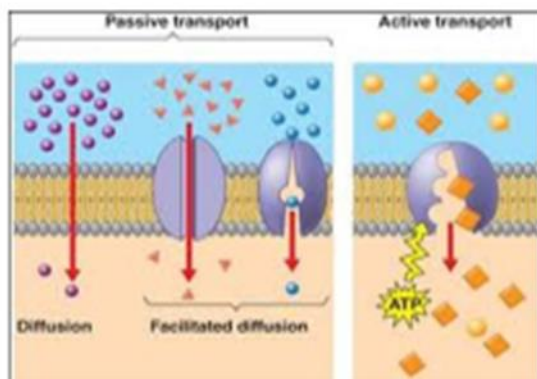


Artery	Vein	Capillary
Carry blood away from the heart	Carry blood to the heart	Connects arteries and veins
Thick muscular walls, small lumen, carry blood under high pressure, carry oxygenated blood (except for the pulmonary artery).	Thin walls, large lumen, carry blood under low pressure, have valves to stop flow in the wrong direction, carry deoxygenated blood (except for the pulmonary vein).	One cell thick to allow diffusion, Carry blood under very low pressure.

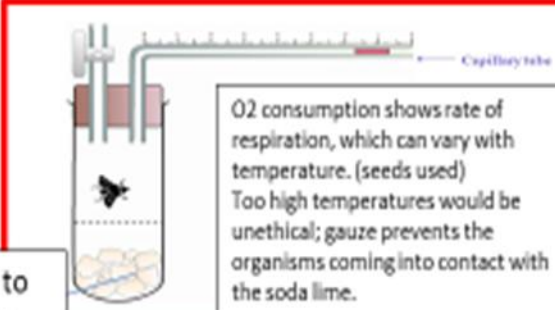
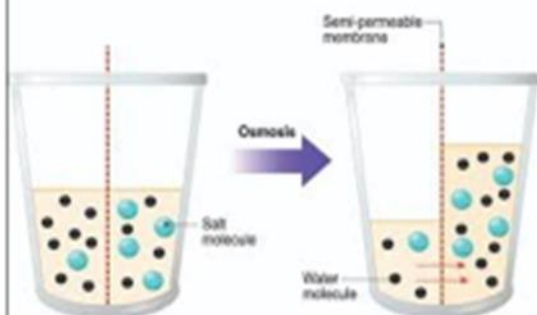
Soda lime to absorb CO<sub>2</sub>

## Exchange surfaces in the body

Efficient exchange surfaces have a large surface area, a short diffusion distance and a steep concentration gradient.



## OSMOSIS



O<sub>2</sub> consumption shows rate of respiration, which can vary with temperature. (seeds used)  
Too high temperatures would be unethical; gauze prevents the organisms coming into contact with the soda lime.

## Fick's Law

Rate of diffusion = surface area x difference in concentration / thickness of the gas exchange surface

Small intestine	Villi – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.
Lungs	Alveoli – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.
Gills in fish	Gill filaments and lamella – increase surface area, Good blood supply – to maintain concentration gradient, Thin membranes – short diffusion distance.
Roots	Root hair cells – increase surface area.
Leaves	Large surface area, thin leaves for short diffusion path, stomata on the lower surface to let O <sub>2</sub> and CO <sub>2</sub> in and out.



glucose + oxygen

carbon dioxide + water

Glucose is oxidised by oxygen to transfer the energy the organism needs to perform its functions.

Respiration with oxygen. Occurs inside the mitochondria continuously.

Aerobic respiration

## Anaerobic respiration

Respiration when oxygen is in short supply. Occurs during intensive exercise

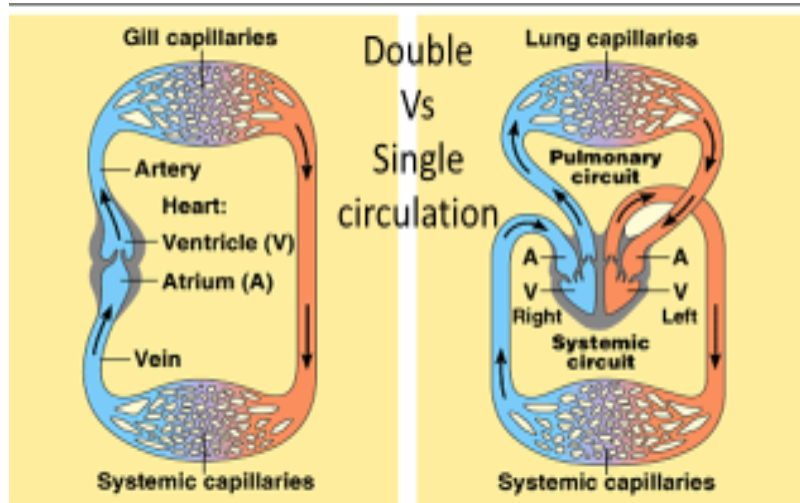
During hard exercise, muscle cells are respiring so fast that blood cannot transport enough oxygen to meet their needs.

Glucose is partially oxidised to produce lactic acid which builds up in muscle tissue causing them to become painful and fatigued.



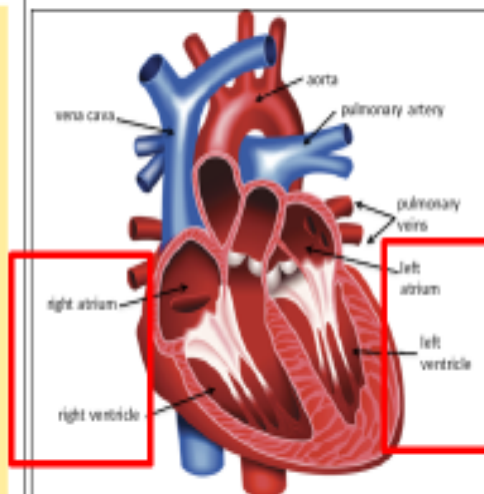
Anaerobic respiration releases a much smaller amount of energy than aerobic respiration.

The incomplete oxidation of glucose causes a build up of lactic acid and creates an oxygen debt



(a) Fish

(c) Mammal



Different structure in the heart have different functions

<b>Right ventricle</b>	Pumps blood to the lungs where gas exchange takes place.
<b>Left ventricle</b>	Pumps blood around the rest of the body. Thicker cardiac muscle in the wall.
<b>Pacemaker (in the right atrium)</b>	Controls the natural resting heart rate. Artificial electrical pacemakers can be fitted to correct irregularities.
<b>Coronary arteries</b>	Carry oxygenated blood to the cardiac muscle.
<b>Heart valves</b>	Prevent blood in the heart from flowing in the wrong direction.

## What Is a Pulse?

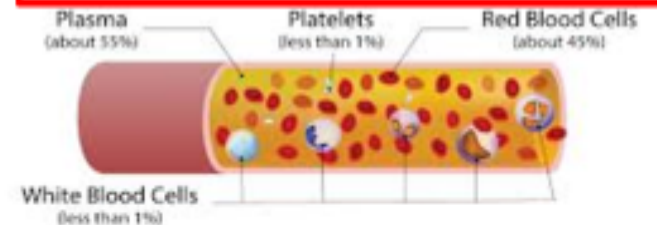
- When the heart beats, it sends a wave, or pulse, of blood through the arteries



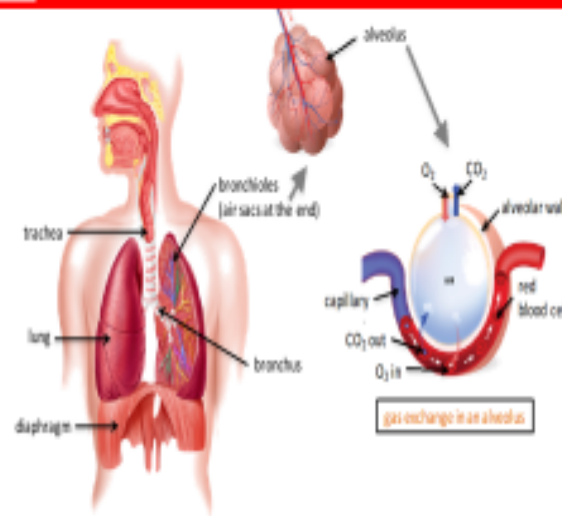
## Cardiac Output, Stroke Volume, and Heart Rate

- Cardiac Output – amount of blood leaving the heart per minute (L/min)
- Stroke Volume – amount of blood heart pumps with each beat
- Heart rate – number of beats per minute
- $CO = SV \times HR$

## COMPOSITION OF BLOOD



<b>Trachea</b>	<i>Carries air to/from the lungs</i>	Rings of cartilage protect the airway.
<b>Bronchioles</b>	<i>Carries air to/from the air sacs (alveoli)</i>	Splits into multiple pathways to reach all the air sacs.
<b>Alveoli</b>	<i>Site of gas exchange in the lungs</i>	Maximises surface area for efficient gas exchange.
<b>Capillaries</b>	<i>Allows gas exchange between into/out of blood</i>	Oxygen diffuses into the blood and carbon dioxide diffuses out.



<b>Plasma (55%)</b>	<i>Pale yellow fluid</i>	Transports CO <sub>2</sub> , hormones and waste.
<b>Red blood cells (erythrocytes)(45%)</b>	<i>Carries oxygen</i>	Large surface area, no nucleus, full of haemoglobin.
<b>White blood cells (phagocytes and lymphocytes)(&lt;1%)</b>	<i>Part of the immune system</i>	Some produce antibodies, others surround and engulf pathogens.
<b>Platelets (&lt;1%)</b>	<i>Fragments of cells</i>	Clump together to form blood clots.