

Topic	Respiration	Level	Key Stage 4 (or any course for students aged 11-16)
Outcomes	<p>To know how respiration differs to digestion, gas exchange, photosynthesis and breathing.</p> <ul style="list-style-type: none"> - Transfer of energy from glucose - Chemical and not a physical process - Occurs all the time - Occurs inside cells 		
Information for teachers	<p>This activity is a great way to correct erroneous ideas that students may have about photosynthesis and respiration. It is probably best used at the end of a teaching sequence on photosynthesis and respiration to check that students have arrived at the scientific way of thinking! The questions could provide a good stimulus for paired discussion or be used for an individual task.</p> <p>Once the correct answers and feedback have been shared, provide time for students to complete the reflection summary at the end to consider how their ideas may have changed.</p> <p>Answers are provided on page 3. The ideas in the table were taken from a paper by M. Sanders 1993. Reference below.</p>		
Other resources	<p>Sanders, M. (1993). Erroneous ideas about respiration: The teacher factor. <i>Journal of Research in Science Teaching</i>, 30(8), 919-934.</p> <p>Misconceptions and errors when learning science: http://thescienceteacher.co.uk/misconceptions-in-science-education/</p>		

Respiration – why wrong is wrong!

The table contains some **wrong** ideas about respiration. Read the **incorrect** statements below and then explain why the idea is wrong in the third column.

	Wrong scientific idea	Why is this wrong?
<i>e.g.</i>	<i>Blood leaves the heart through veins under low pressure.</i>	<i>Blood leaves the heart through arteries under high pressure.</i>
1	The purpose of respiration is to provide organisms with oxygen and carbon dioxide.	
2	Respiration is a gas exchange process when oxygen is taken in and carbon dioxide is given off.	
3	Animals respire through their lungs.	
4	Plants respire through stomata (small holes) on their leaves.	
5	Respiration in plants only takes place at night.	
6	Photosynthesis is the process that provides plants with the energy they need for life processes.	
7	Digestion is the process that provides animals with energy for growth and movement.	
8	Oxygen is essential for the life processes of all living organisms.	
9	The equation for respiration is: $O_2 + \text{glucose} = CO_2 + H_2O$	

Complete this reflection after you have gone through the answers:

Before I thought that...

I now know that...

	Wrong scientific idea	Why is this wrong?
1	The purpose of respiration is to provide organisms with oxygen and carbon dioxide.	The purpose of respiration is to transfer energy from food so that it can be used by cells to do work.
2	Respiration is a gas exchange process when oxygen is taken in and carbon dioxide is given off.	Respiration is a chemical process that happens inside cells whereas gas exchange is a physical process.
3	Animals respire through their lungs.	Respiration takes place inside all cells. Animals breath through their lungs.
4	Plants respire through stomata (small holes) on their leaves.	Respiration takes place inside all cells. Gas exchange takes place through the stomata.
5	Respiration in plants only takes place at night.	Respiration takes place all the time.
6	Photosynthesis is the process that provides plants with the energy they need for life processes.	Photosynthesis uses energy from the sun to produce glucose from carbon dioxide and water.
7	Digestion is the process that provides animals with energy for growth and movement.	Digestion breaks down food into simpler molecules so they can be absorbed by the body.
8	Oxygen is essential for the life processes of all living organisms.	Some organisms can respire anaerobically, without oxygen.
9	The equation for respiration is: $O_2 + \text{glucose} = CO_2 + H_2O$	Energy is missing and we should replace the = sign with an arrow, use the formula for glucose and balance the equation.

Progress: further resources on bioenergetics are available here:
<http://thescienceteacher.co.uk/biochemistry/>