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# Breathing & Respiration

|   |  |
|---|--|
| 1 | I can describe the function of tissues and organs in the human gas exchange system and label a simple diagram of the human gas exchange system |
| 2 | I can state what happens to the air, ribs and diaphragm during breathing and describe changes in lung volume                                   |
| 3 | I can describe the impact of exercise, asthma and smoking on the human gas exchange system   |
| 4 | I can name and describe the two types of respiration, and I can list the reactants and products of these                                       |
| 5 | I can compare and contrast aerobic and anaerobic respiration   |

|    | Keyword      | Definition   |
|----|--------------|--|
| 1  | alveolus     | Small air sacs found at the end of each bronchiole where gas exchange takes place with the blood.                                      |
| 2  | asthma       | A lung disorder in which inflammation (swelling) causes the bronchi to swell and narrow the airways, creating breathing difficulties.  |
| 3  | bronchiole   | Small tube in the lung.  |
| 4  | bronchus     | One of two tubes which carry air into the lungs.   |
| 5  | diaphragm    | A sheet of muscle found underneath the lungs which is used in breathing.   |
| 6  | exhale       | Breathing out, to remove carbon dioxide.   |
| 7  | gas exchange | The transfer of gases between an organism and its environment.   |
| 8  | inhale       | Breathing in, to take in oxygen.   |
| 9  | respiration  | The process that transfers energy in plants and animals. In respiration, glucose reacts with oxygen to make carbon dioxide from water. |
| 10 | trachea      | Tube which carries air from the mouth and nose to the lungs.   |

Prior Knowledge From KS2:  
In KS2 you should have identified and named the main parts of the human circulatory system and respiratory system. You should also have learnt about breathing.

### Why?

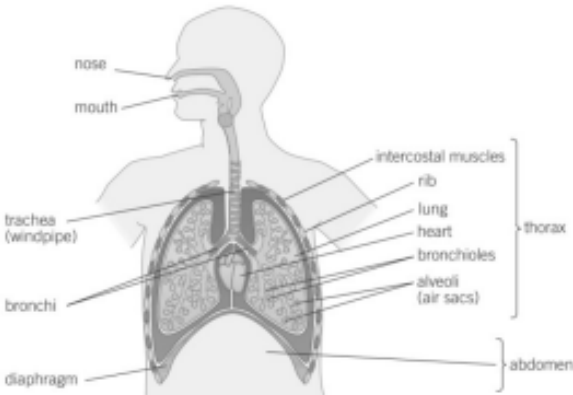
Damage to this system can be debilitating if not fatal. Although there has been huge progress in surgical techniques many interventions would not be necessary if individuals reduced their risks.

### Future Learning:

At GCSE you learn how the respiratory system is provided with oxygen and removes carbon dioxide. They provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system.

Careers::  
Doctor  
Surgeon  
Chemist  
Nurse

### Structure of the Gas Exchange System



Gas exchange is the process of taking in oxygen and giving out carbon dioxide. The gas exchange system is well adapted for this role.

### Adaptations of the Lungs

The alveoli have:

A **large surface area** for diffusion to happen quickly.

A **good blood supply** to remove the oxygen quickly and bring more carbon dioxide back to the lungs to be exhaled.

A **thin wall of cells** which gives the shortest possible diffusion distance.



### What happens when you breathe?

| Inhaling                         | Exhaling                        |
|----------------------------------|---------------------------------|
| Muscles of the ribs contract     | Muscles of the ribs relax       |
| Ribs are pulled up and out       | Ribs are pulled down and in     |
| Diaphragm contracts and flattens | Diaphragm relaxes and moves up  |
| Volume in the chest increases    | Volume in the chest decreases   |
| Pressure in the chest decreases  | Pressure in the chest increases |
| Air rushes into the lungs        | Air is forced out of the lungs  |

The process of air being drawn in and forced out of the lungs is called ventilation. Artificial ventilation can occur if a person's lungs do not function correctly.

The proportions of gases in the air we **inhale** and **exhale** changes due to using oxygen in **respiration** and producing carbon dioxide.

**Breathing and respiration** are different! Breathing allows exchange of gases in the lungs. Respiration releases energy from food in all living cells.

### Respiration

Respiration is the process in which energy is released from molecules of glucose, inside the cells of living organisms.

**Aerobic respiration** takes place in the mitochondria of cells and requires oxygen. It releases more energy as the glucose is fully broken down.

**Anaerobic respiration** takes place in the cytoplasm and does not need oxygen. Less energy is released in anaerobic respiration than in aerobic.

### Aerobic respiration

**glucose + oxygen → carbon dioxide + water**

The glucose is transported to the cells in the blood plasma, the oxygen is transported to the cells in red blood cells, by binding with haemoglobin.

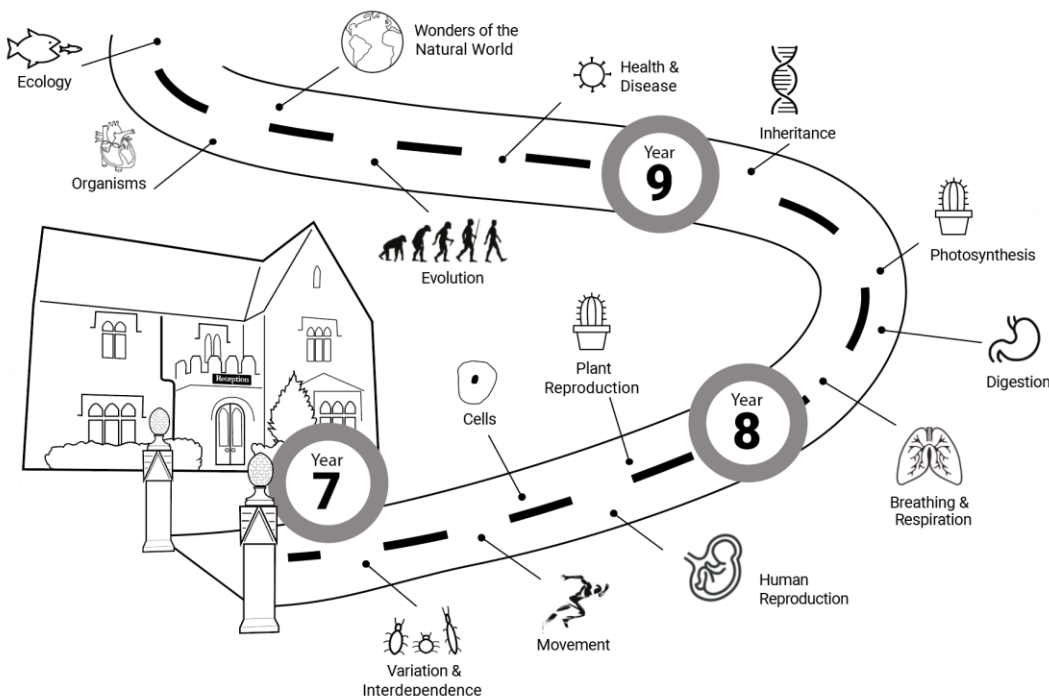
Carbon dioxide is a waste product and is transported from the cells to the lungs to be exhaled.





### Anaerobic Respiration

**glucose → lactic acid**

When an organism cannot supply enough oxygen for aerobic respiration, anaerobic respiration takes place.

Lactic acid builds up and is toxic to the organism, so must be broken down using oxygen. This is why large organisms such as humans cannot respire anaerobically for long periods of time.



| Lesson  | 1 point   | 2 points  | 4 points   | 6 points   | 10 points  |
|---|---|---|--|--|--|
| <b>The lungs</b><br>             | List as many structures in the lungs as you can.                                  | Pick three parts of the lungs and describe their functions.                               | Draw, label and colour a diagram of the lungs.   | Research a method for a lung dissection, what animals' lungs are the best for performing a dissection? | Create a model of the lungs, why have you chosen the materials you have? What do they represent?   |
| <b>Gas exchange</b><br>          | What is inhalation?<br>What is exhalation?<br>What gases are inhaled and exhaled? | Name and describe the process by which gases move into and out of the alveoli.            | Describe how the alveoli is well adapted for gas exchange. You could include a labelled diagram in your answer     | Write a 6-mark exam question and mark scheme on gas exchange.  | Write a scientific method for investigating the effect of exercise on a person's breathing rate. Include the equipment you would use. Identify the dependent, independent and control variables. |
| <b>Aerobic respiration</b><br>   | Define the word 'aerobic'   | Write out the word equation for aerobic respiration.                                      | Using information about aerobic respiration, describe why blood flow to muscles must be increased during exercise. | Summarise what you have learnt about aerobic respiration on one flashcard.                             | Research why plants are crucial for humans to respire aerobically. Write a 300 word paragraph describing why life without plants would be impossible.  |
| <b>Anaerobic respiration</b><br> | Define the word 'anaerobic'   | Write out the word equation(s) for anaerobic respiration in:<br>Animals<br>Plants & yeast | COMPARE aerobic and anaerobic respiration. You must include at least two similarities and differences.             | Create a scientific magazine article on how anaerobic respiration is used to produce bread and beer.   | Write a report on how you could investigate the effect of temperature on respiration in yeast.   |