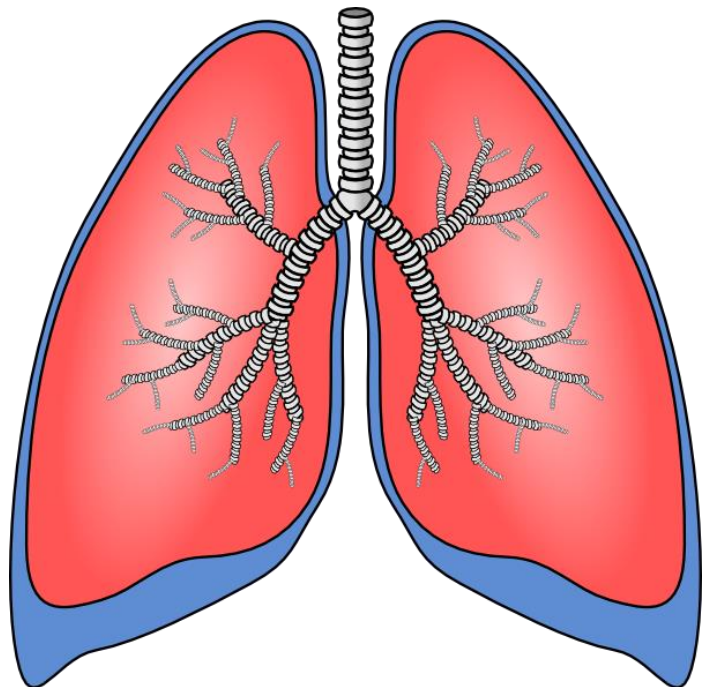


Respiratory System

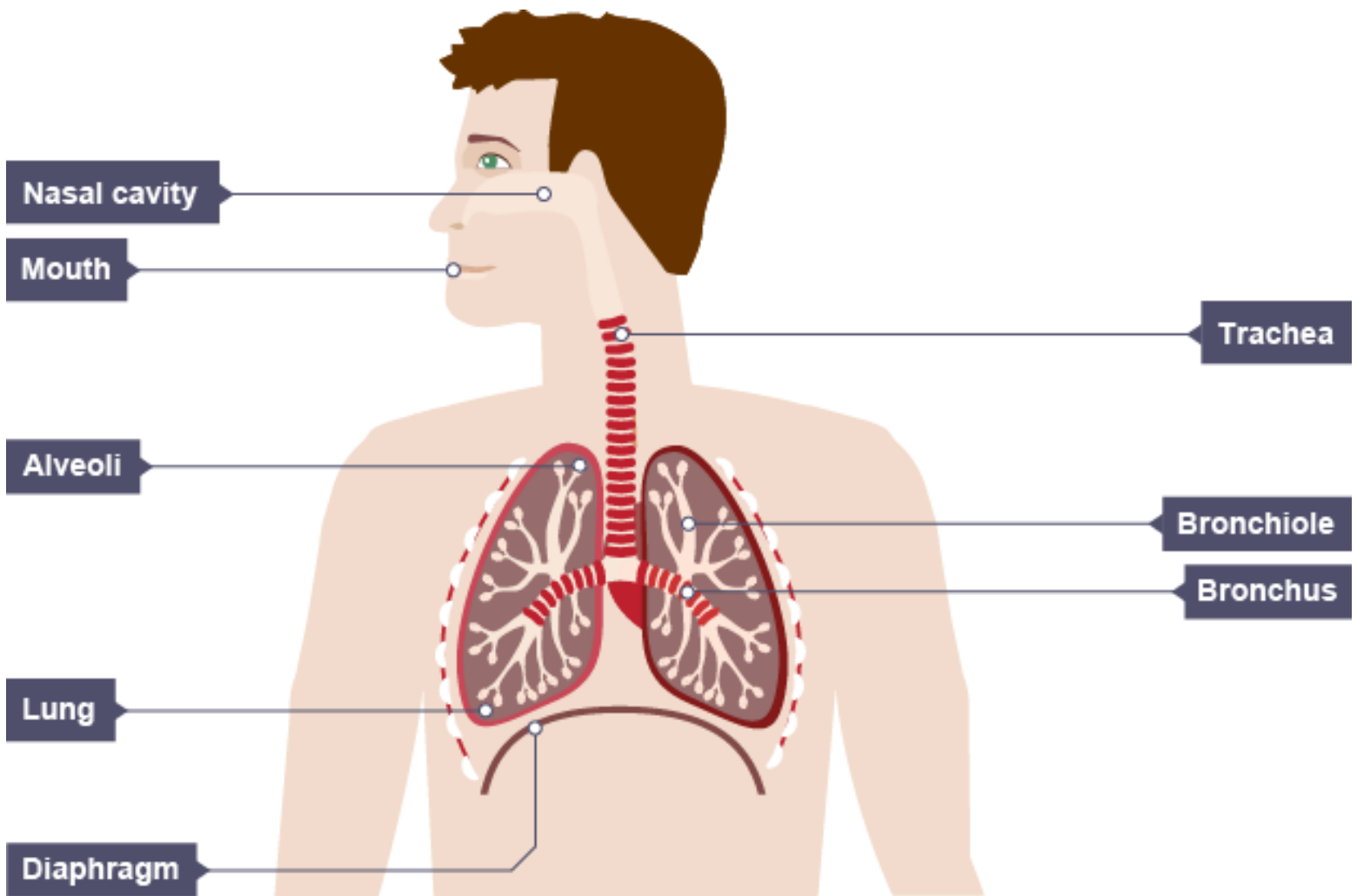
Revision Guide

St Mary's Catholic Academy

GCSE Physical Education



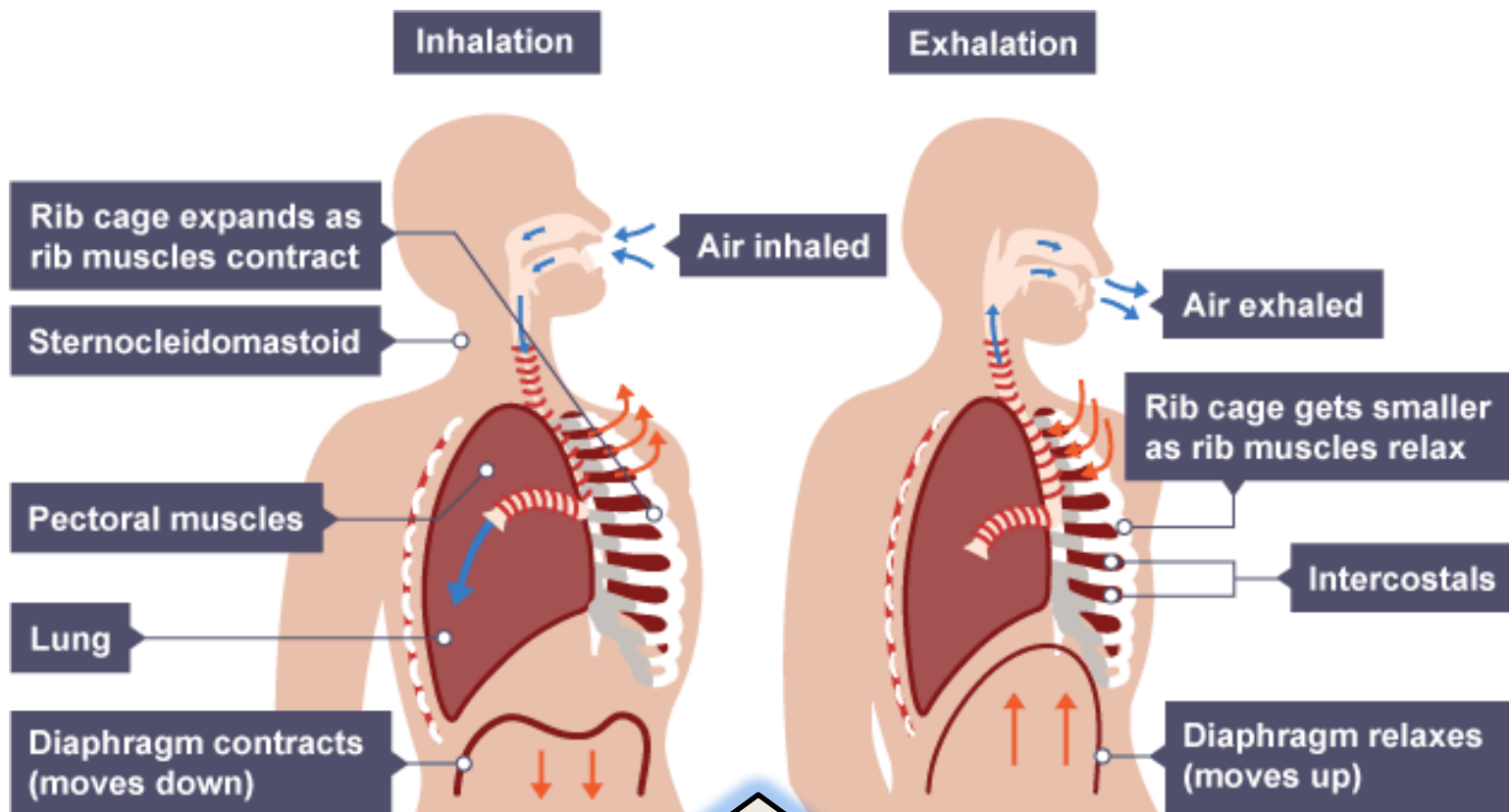
Structure of the Lungs



Passage of air into the lungs

- 1) **Air enters the body** and is warmed as it travels through the **mouth and nose**.
- 2) It then enters the **trachea**.
- 3) The **trachea divides into two bronchi**. One bronchus enters each lung.
- 4) Each **bronchus branches out into smaller tubes called bronchioles**. Air travels through these bronchioles.
- 5) At the end of the bronchioles, the air enters one of the many millions of **alveoli where gaseous exchange** takes place.

Breathing



Two important structures for breathing are the **diaphragm and intercostal muscles**.

The diaphragm is a sheet of muscle that separates the chest (or thoracic) cavity from the rest of the body.

The intercostal muscles are found between the ribs and they control rib movement.

Breathing In

- 1) Diaphragm contracts and moves downwards.
- 2) Intercostal muscles contract and move the ribs upwards and outwards.
- 3) This increases the size of the chest and decreases the air pressure inside it which sucks air into the lungs.

Breathing Out

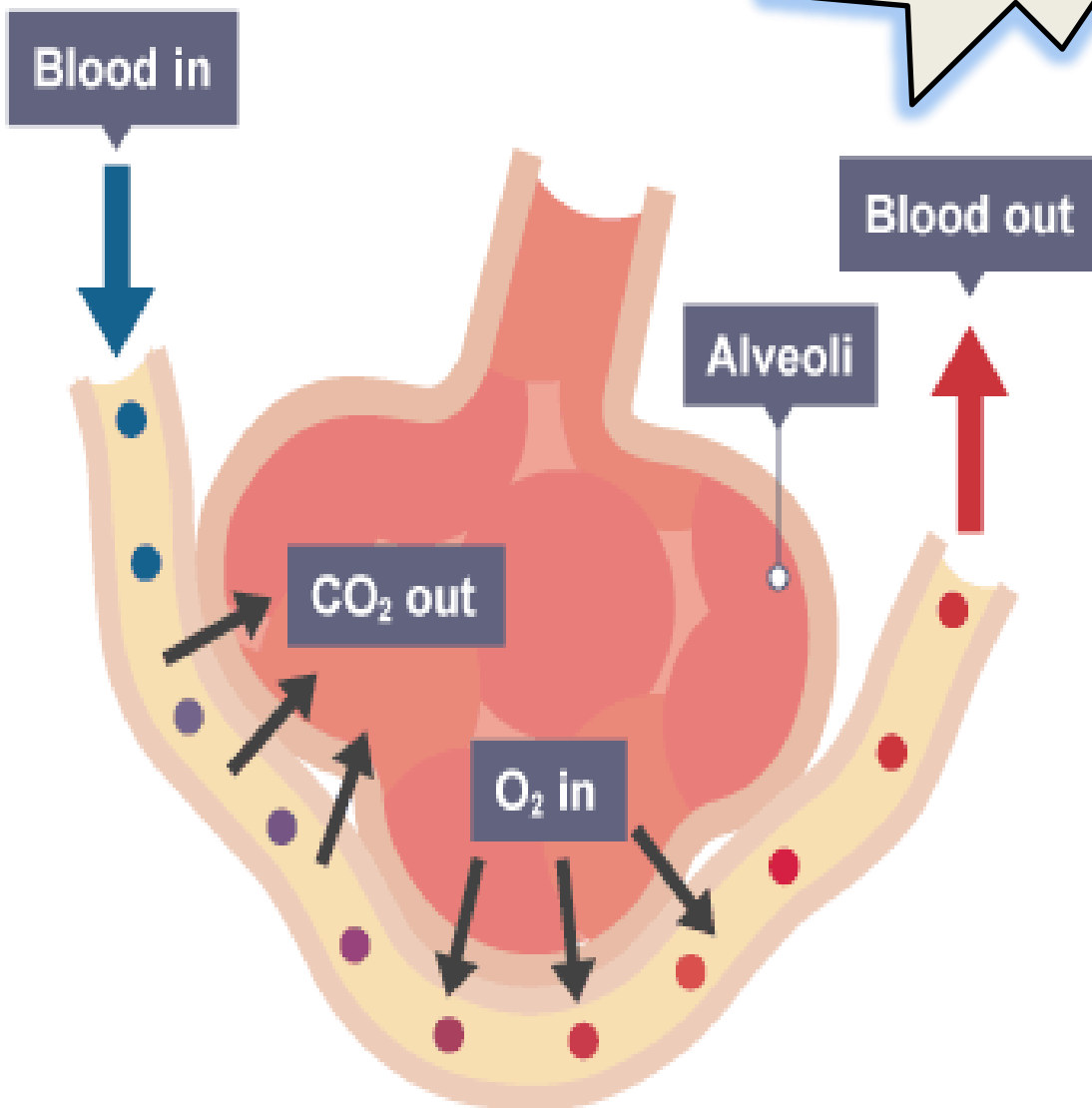
- 1) Diaphragm relaxes and moves back to its domed shape.
- 2) Intercostal muscles relax so the ribs move inwards and downwards under their own weight.
- 3) This decreases the size of the chest and increases the air pressure in the chest so air is forced out of the lungs.

Gaseous Exchange

The alveoli are surrounded by capillaries; oxygen and carbon dioxide diffuse between the air in the alveoli and the blood in the capillaries.

Red Blood cells carry the oxygen to be exchanged at the working muscle and carbon dioxide to be exchanged at the lung.

Diffusion is the **movement of gas** from an area of **high concentration** to an area of **low concentration**.



Capillaries surround the alveoli in the lungs. Both the capillaries and alveoli walls are very thin - just one cell thick. They are made of semi-permeable membranes which allow oxygen and carbon dioxide to pass through them.

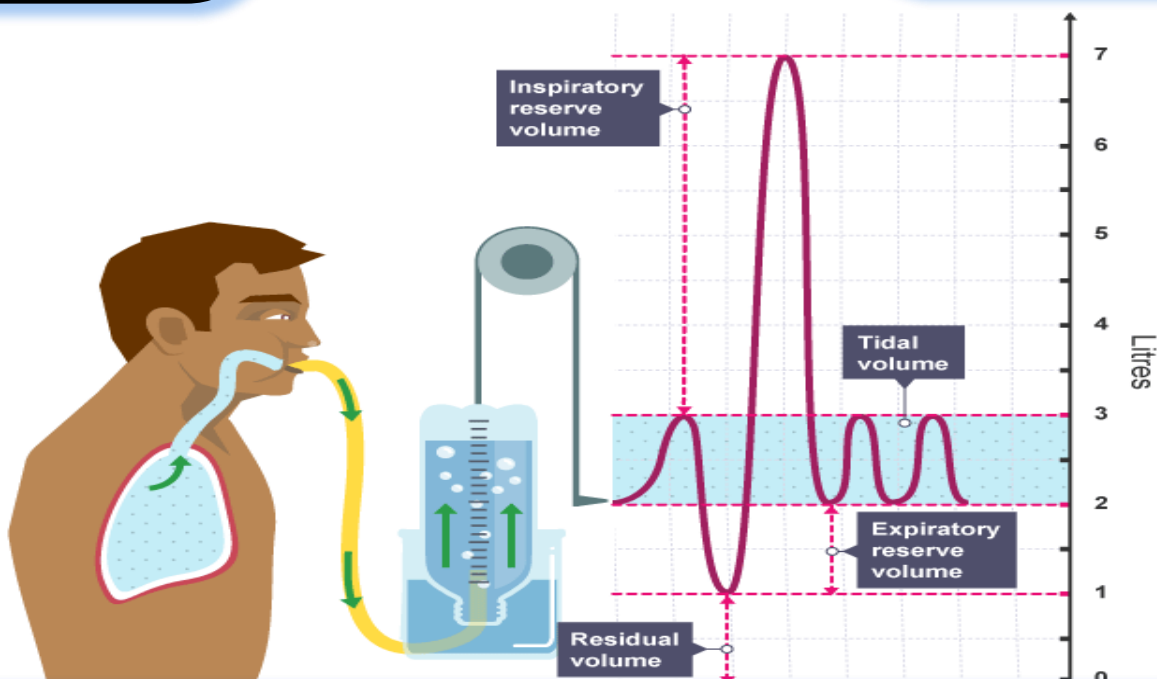
Lung Volume

Tidal volume is the amount of air breathed in with each normal breath. The average tidal volume is 0.5 litres (500 ml).

Expiratory reserve volume is the maximum amount of additional air that can be forced out of the lungs after a normal breath.

Inspiratory reserve volume is the maximum amount of additional air that can be taken into the lungs after a normal breath.

Residual volume is the amount of air left in the lungs after a maximal out breath. This air helps to keep the lungs partially inflated to protect the microscopic structures from being damaged.



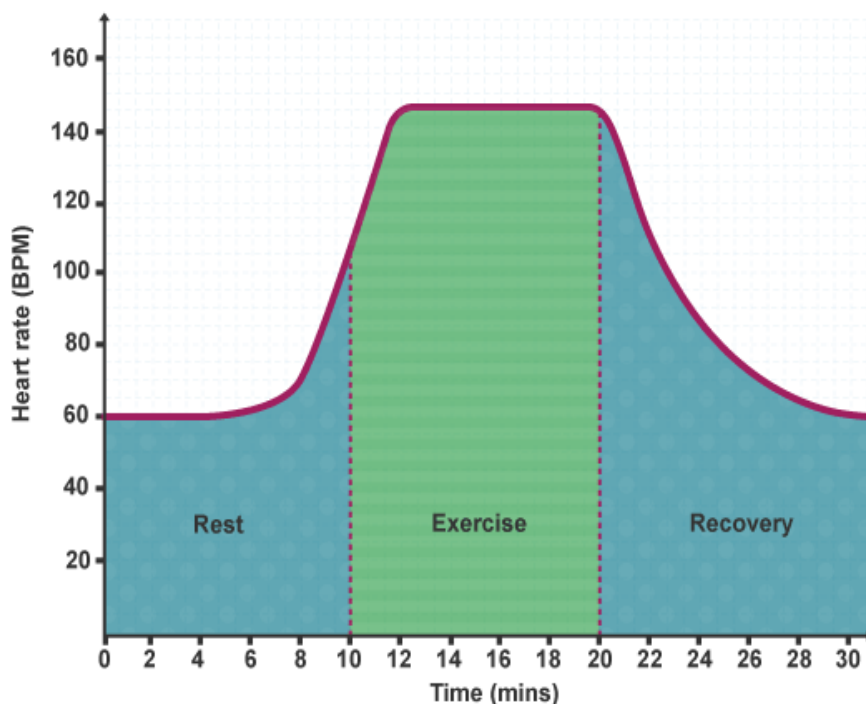
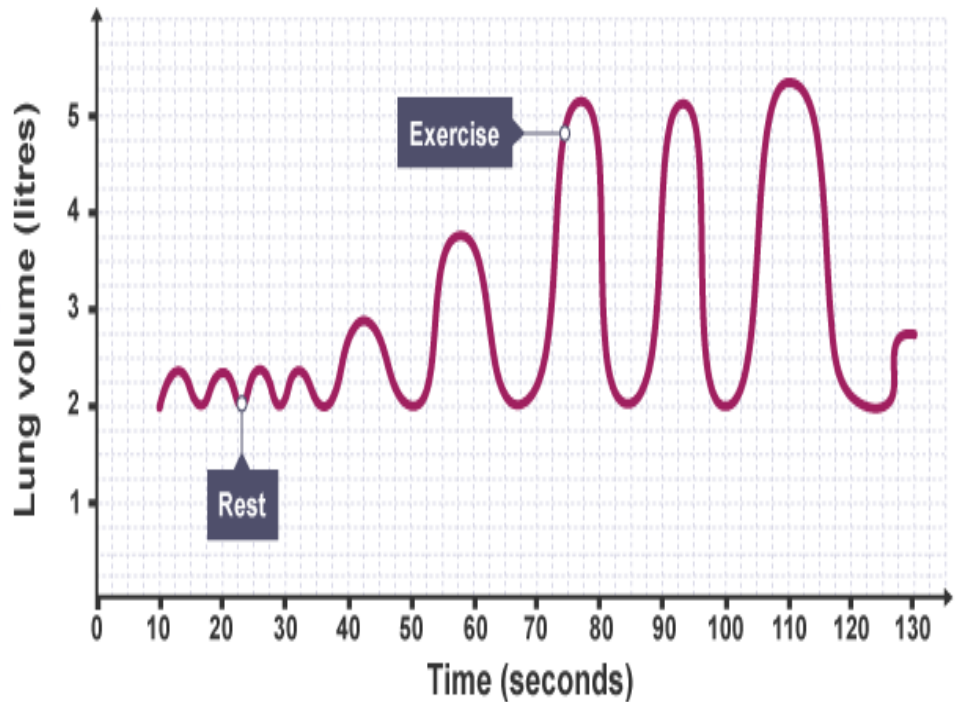
During exercise, tidal volume increases as the depth of breathing increases and the rate of breathing increases too. This has the effect of taking more oxygen into the body and removing more carbon dioxide.

Cardio-respiratory system

The cardio-respiratory system works together to get oxygen to the working muscles and remove carbon dioxide from the body.

During exercise the muscles need more oxygen in order to contract and they produce more carbon dioxide as a waste product.

Breathing depth (tidal volume) and rate (frequency) increase – this gets more oxygen into the lungs and removes more carbon dioxide out of the lungs.



Heart rate increases – this increases the rate that oxygen is transported from the blood to the working muscles and carbon dioxide is transported from the working muscles to the lungs.

The Respiratory System

Fill in the gaps as you watch the first half of the video.

This section is all about how the human body _____ and processes the _____ taken in by the _____. This vital bodily function supports life by delivering oxygen to the blood.

The pathway of air..

As we breathe in air through our _____ or _____ it enters our windpipe or _____.

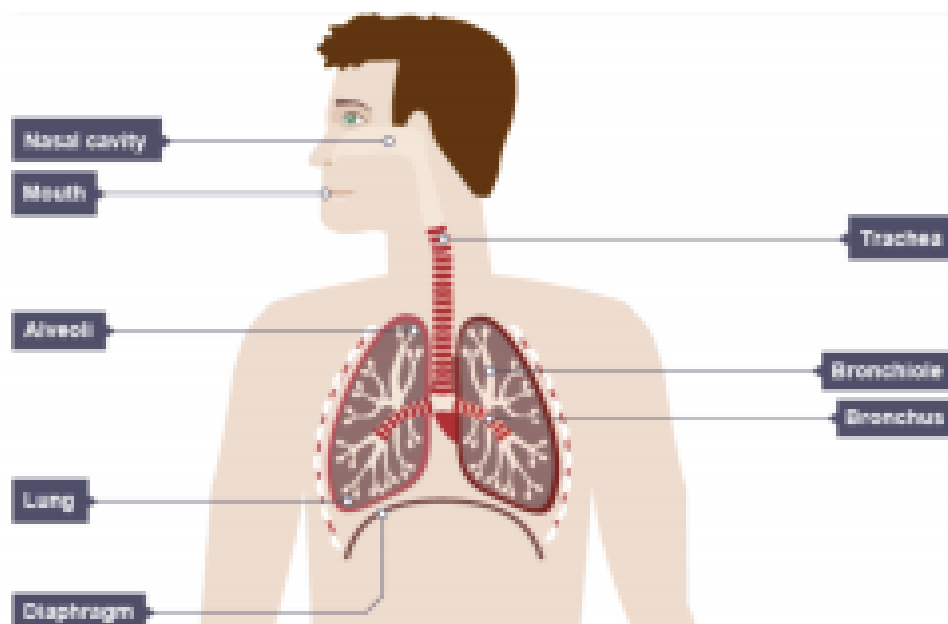
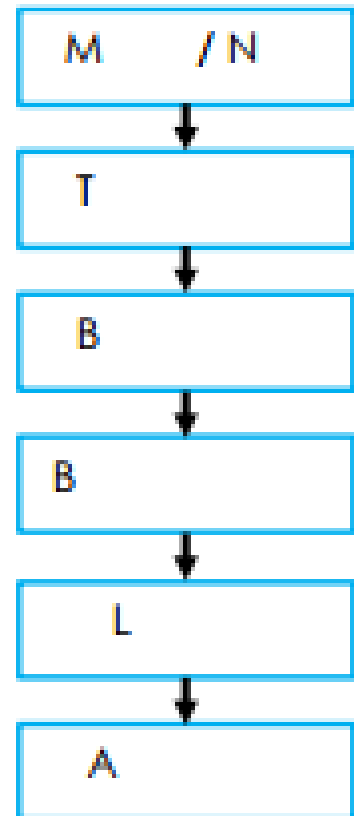
The air then splits down 2 tubes known as the _____ on its way to the lungs.

Thirdly _____ are the final stop before delivery to the _____ within the _____. These are very small _____ branching off from the _____.

Air is delivered to tiny _____ inside the lungs called _____ where the lung _____ function takes place.

Use the following words to complete the gaps;

breathes	air	lungs	nose	mouth	trachea
branchi	bronchioles		alveoli	lungs	tubes
branchi	bags	alveoli	gas exchange		



Passage of air into the lungs

1. Air enters the body and is warmed as it travels through the mouth and nose.
2. It then enters the trachea.
3. The trachea divides into two bronchi. One bronchus enters each lung.
4. Each bronchus branches out into smaller tubes called bronchioles. Air travels through these bronchioles.
5. At the end of the bronchioles, the air enters one of the many millions of alveoli where gaseous exchange takes place.

Mouth/ Nose

Trachea

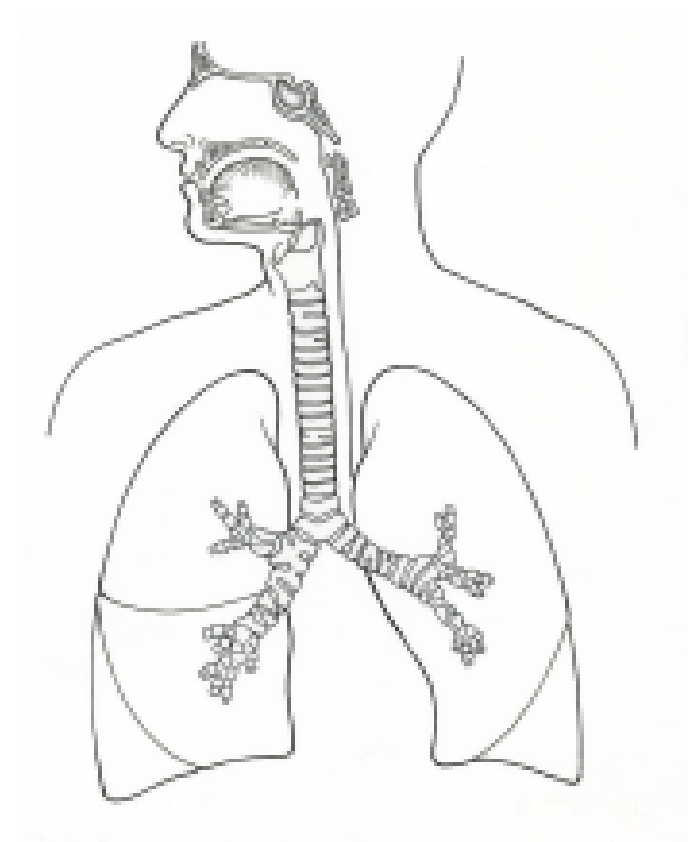
Bronchi

Bronchioles

Lungs

Alveoli

1. Add your own notes to each section relating to what occurs at each phase
2. Cut out each box and the diagram.
3. Stick the diagram into the middle of a page in your books
4. Label the diagram using the boxes/information you have created



Gaseous Exchange

Fill in the gaps as we go through the power point slides.

Gaseous Exchange

Gaseous _____ occurs at the _____ in the lungs and takes place by _____. The alveoli are surrounded by _____ so oxygen and _____ diffuse between the air in the alveoli and the _____ in the capillaries.

Diffusion is the movement of gas from an area of _____ to an area of _____.

There is a high concentration of _____ in the _____ and a low concentration of _____ in the _____, so oxygen diffuses from the alveoli into the blood.

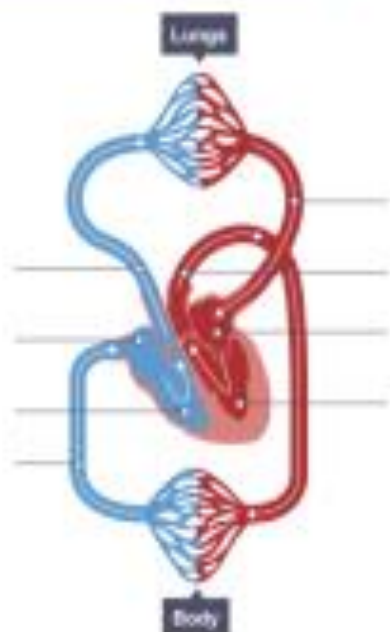
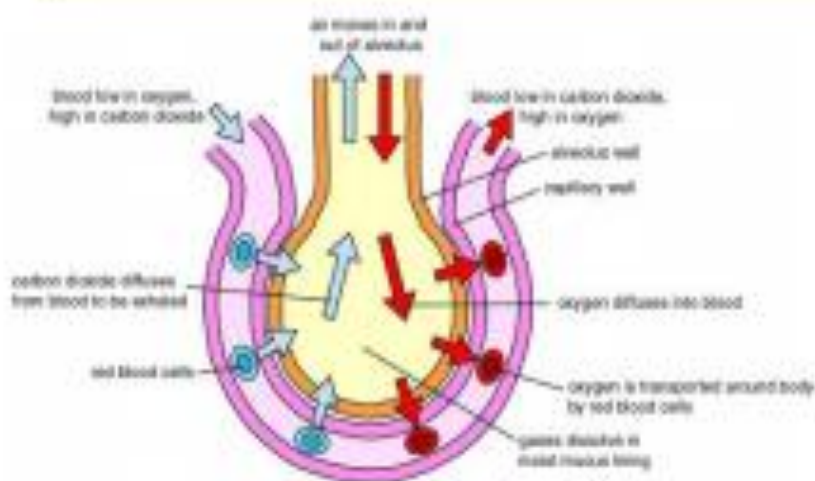
There is a _____ concentration of carbon dioxide in the blood and a _____ concentration in the alveoli, so carbon dioxide diffuses from the blood into the _____.

Both _____ and carbon dioxide are capable of _____ with an iron-rich protein in the blood called _____.

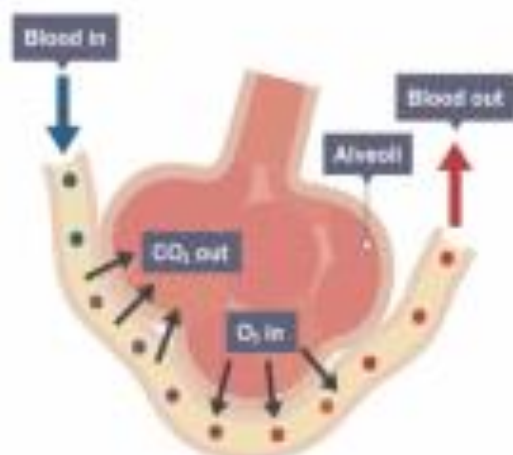
Haemoglobin carries oxygen to be _____ at the working _____ and carbon dioxide to be exchanged at the _____.

As the blood moves through the _____ in the alveoli, oxygen diffuses _____ it and carbon dioxide diffuses _____ of it.

Capillaries _____ the alveoli in the lungs. Both the capillaries and alveoli walls are very _____ - just one cell thick. They are made of semi-permeable membranes which allow oxygen and carbon dioxide to _____ through them.



Red = oxygenated blood
Blue = deoxygenated blood



Respiratory System- Mechanics of breathing

Inspiration- Breathing in air!

Fill in the gaps as we watch the video using the words below..

Consciously take a _____ and think about the fact that there are several different muscle groups working together to make this happen.

These muscle groups include the _____ and _____ muscles.

The main _____ used for breathing is the diaphragm.

The _____ is a dome shaped structure consisting of several large muscles, which is sandwiched between the _____ cavity containing the _____ and the _____, and the abdomen containing the digestive systems including the stomach.

The muscles that move the _____ itself are the _____ and external _____ muscles.

They are each _____ to the _____ and run between them.

To _____ air the diaphragm contracts and moves _____, while the external intercostal muscles _____, forcing the ribcage _____ and _____.

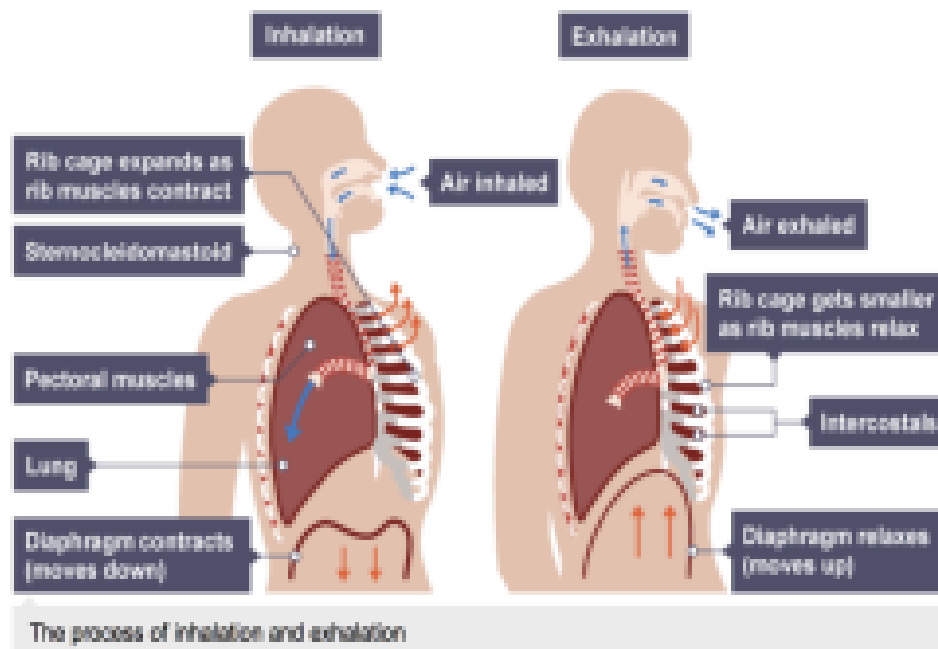
The combined effect of the _____ and the intercostal _____ increases the _____ of the chest cavity and _____ the lungs.

This expansion of the lungs increases their volume, reducing the _____ within them, causing _____ to be drawn _____.

In normal breathing we use around 25% of our lung _____, which is called our _____ volume.

As you _____ deeply the diaphragm moves further _____ into the abdomen, pushing your belly out, giving more room for the lungs to _____ and draw in more _____.

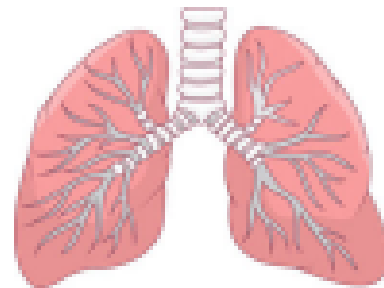
diaphragm	intercostal	lungs	contract	volume	capacity	expand	muscles	air
intercostal	muscles	contract	expands	tidal	air	in	down	
muscles	air	contract	expands	tidal	air	in	down	
intercostal	muscles	contract	expands	tidal	air	in	down	
muscles	air	contract	expands	tidal	air	in	down	



Respiratory System- Mechanics of breathing

Breathing is a two-stage process involving:

-
-



Fill in the gaps using the words below as we go through the slides..

Inspiration is the _____ of air into the _____. This is brought about by _____ the volume of the chest _____.

_____ is the expulsion of _____ from the lungs. This is brought about by reducing the _____ of the chest cavity.

Both _____ and _____ involve the use of muscles, the _____ and intercostal _____. When these muscles contract they cause the chest cavity to _____ in _____ and therefore increase its volume.

During inspiration, the breathing muscles _____. Contraction of the dome-shaped diaphragm causes it to _____, therefore enlarging the chest cavity. At the same time, contraction of the intercostal muscles causes the _____ to rise, therefore also increasing the _____ of the chest cavity.

When the chest cavity _____, its volume increases. This _____ the pressure in the chest cavity and air is passively drawn _____ the lungs. Air passes from the _____ pressure outside the lungs, to the lower pressure _____ the lungs.

During _____, the breathing muscles relax. The diaphragm curves and _____ to its dome shape. The weight of the _____ causes them to descend and the chest volume _____. The reduction in the size of the chest cavity increases the _____ of the air in the lungs and causes it to be expelled. Expiration is passive; the breathing muscles simply _____. Air passes from the high pressure in the lungs to the low pressure in the _____ and trachea.

During exercise the _____ process of inspiration is assisted by the additional contraction of the _____ and _____ muscles, which further increase the size of the chest cavity and so allow more air to enter the _____.

Also during exercise, the normally passive process of expiration is assisted by contraction of the _____ muscles, which help force air out of the lungs and to _____ up expiration.

Intake	lungs	air	pressure	pectoral	increasing	cavity
expiration		volume	increase	inspiration	expiration	size
	diaphragm		muscles	contract	flatten	
sternocleidomastoid		ribs	expands	branchi	reduces	into
inside	expiration		returns	ribs	decreases	relax
	active		lungs	abdominal	speed	

Lung Volumes

A spirometer is...

How does it work?

Breathing in...

Breathing out...

The lung volumes are..

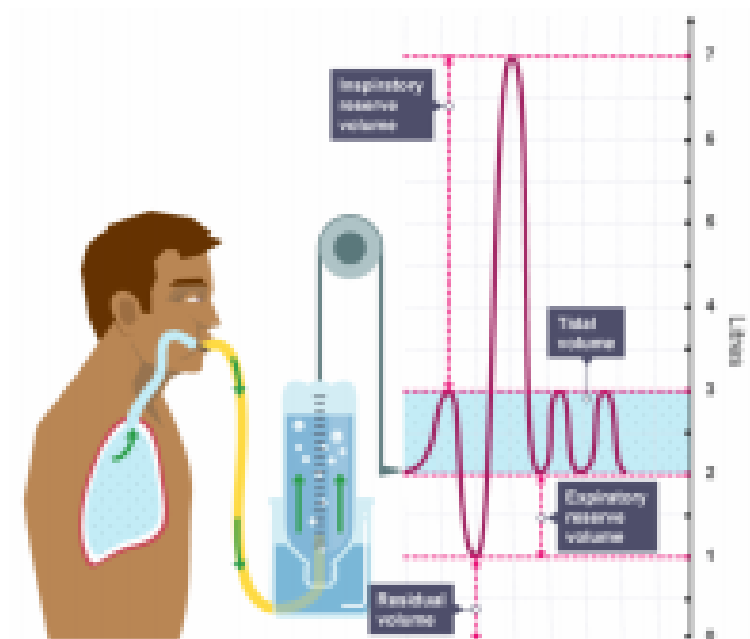
Tidal Volume=

Inspiratory Reserve Volume=

Expiratory Reserve Volume=

Residual Volume=

During exercise..



Inspiration and Expiration

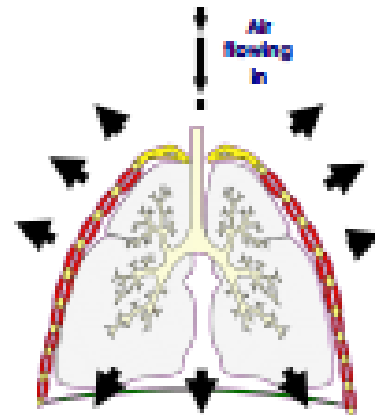
Inspiration: Breathing _____

When inhaling, the intercostal muscles _____ and pull the rib cage _____ and _____.

The _____ contracts causing it to flatten.

The chest cavity gets larger causing pressure in the lungs to _____.

Air moves _____ the lungs from the higher outside pressure.



Fill in the blanks using the words:

Diaphragm

Smaller

Up

Out

Out

Decreases

Contract

Into

Fall

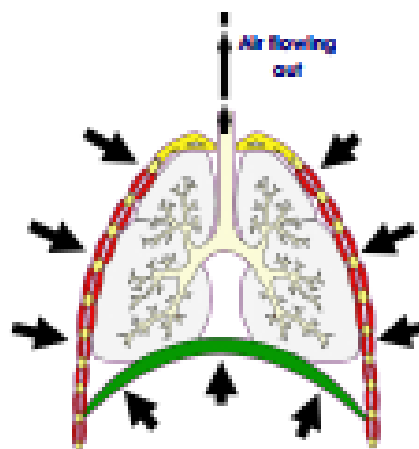
In

Out

Active

Relax

Diaphragm



Expiration: Breathing _____

The intercostal muscles _____ and so the rib cage returns to normal.

The _____ relaxes pushing it up.

The rib cage moves back in and down.

The chest cavity gets _____ and so pressure in the lungs _____.

Air flows _____ of the lungs.

During periods of exercise, expiration becomes an _____ process, involving the forced expulsion of air.

Answer the following questions in your book;

1. Zack is a 16-year-old GCSE PE student. He is just about to play a game of basketball for his school team.
 - (a) Zack's respiratory system will experience a number of changes before and during the game of basketball.
Define the terms tidal volume and residual volume. (2)
 - (b) Outline what will happen to Zack's tidal volume and residual volume once exercise starts. (2)
2. The effective working of the breathing and respiratory system is important for all performers.
 - i. Describe how respiration takes place.

Quick Questions

Where in the respiratory system does gaseous exchange take place?

- 1) Alveoli
- 2) Trachea
- 3) Bronchioles

Which of the following contracts to cause inhalation of breath?

- 1) Lung
- 2) Diaphragm
- 3) Bronchus

Where would you find the intercostal muscles?

- 1) In the lung
- 2) Below the diaphragm
- 3) Between the ribs

Which of the following muscles is recruited to increase the depth of inspiration during exercise?

- 1) Trapezius
- 2) Deltoids
- 3) Sternocleidomastoid

Which of these gases can the protein haemoglobin carry?

- 1) Ammonia and methane
- 2) Nitrogen and hydrogen sulphide
- 3) Oxygen and carbon dioxide

Which term is used to describe the movement of gases from an area of high concentration to an area of low concentration?

- 1) Contraction**
- 2) Diffusion**
- 3) Evaporation**

Which lung volume can be defined as "the amount of air breathed in with each normal breath"?

- 1) Vital Capacity**
- 2) Total Lung Capacity**
- 3) Tidal Volume**

Which gas is produced by the muscles during exercise as a waste product that needs to be transported and removed?

- 1) Oxygen**
- 2) Carbon dioxide**
- 3) Lactic acid**

For the average adult, what measurement would we expect for Tidal volume?

- 1) 2 litres**
- 2) 0.5 litres**
- 3) 6 litres**

During the first ten minutes of a hockey match, what would you expect the tidal volume of a midfielder to do?

- 1) Remain constant**
- 2) Decrease**
- 3) Increase**

Answers

- 1) Alveoli
- 2) Diaphragm
- 3) Between the ribs
- 4) Sternocleidomastoid
- 5) Oxygen and carbon dioxide
- 6) Diffusion
- 7) Tidal volume
- 8) Carbon dioxide
- 9) 0.5 litres
- 10) Increases

