Unit 1 – LAC Respiratory System

Structures of the respiratory system

Nasal cavity – warms and filters the air (cilia and mucus) before entering the body

Pharynx – Part of the upper respiratory tract that warms & humidifies air before it reaches lungs.

Epiglottitis – A flap of tissue that sits beneath the tongue at the back of the throat. Its main function is cover the trachea to prevent food from entering the airways whilst eating.

Larynx – Houses the vocal cords that open to allow breathing and closing to protect the trachea when swallowing and vibrate to give voice

Trachea – The main airway to the lungs, divides into the right and left bronchi (left/right lung)

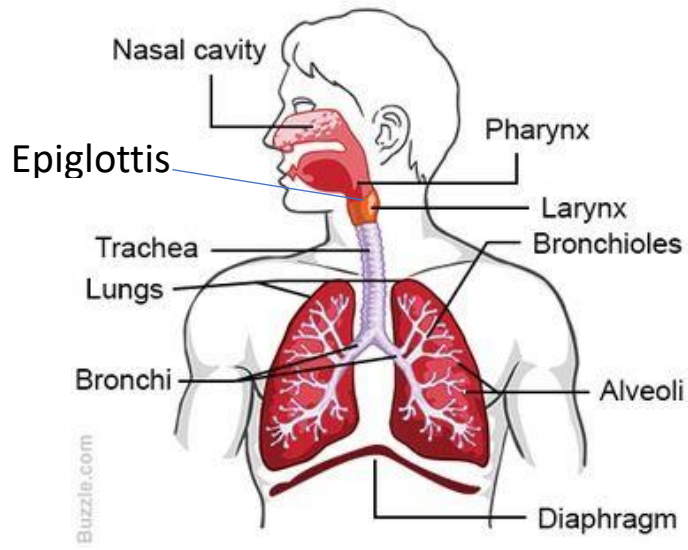
Bronchi – Main passageway into the lungs, which carries air to the left and right bronchus.

Bronchioles – smaller branches of the Bronchi which end in Alveoli

Alveoli – Tiny air sacs at the end of the bronchioles, this is where the lungs and the blood exchange oxygen and carbon dioxide (alveoli have very thin walls to allow gaseous exchange)

Diaphragm – A large dome shaped muscle that contracts and flattens to change the chest cavity size during respiration, located below the lungs.

Intercostals – located between the ribs and these contract to increase chest cavity for inspiration (external intercostals) and internal intercostal contract to force air out during



Pulmonary ventilation – The process of air flowing into the lungs during via inspiration and expiration

External respiration – The process of exchanging oxygen and carbon dioxide with the alveoli/capillaries

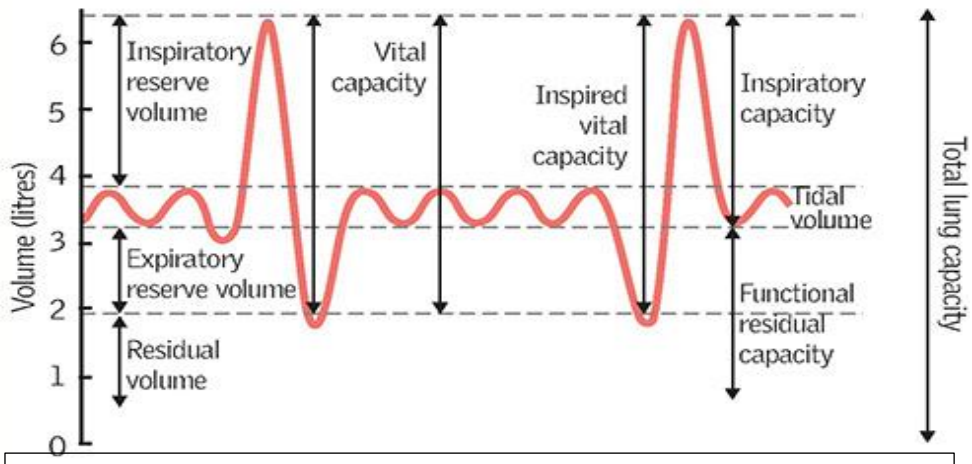
Internal respiration – Gaseous exchange from the blood supply to the body tissue. Myoglobin picks up the oxygen from the oxyhaemoglobin. Carbon dioxide returns back to the lungs via: Carbonic acid, Carbaminohaemoglobin and in the plasma

Gaseous exchange – The diffusion of gases from an area of higher concentration to an area of lower concentration **HIGH TO LOW**

Mechanics of breathing

Breathing in – When you breathe in, or inhale, your diaphragm contracts and moves downward. This increases the space in your chest cavity which increases the lung pressure. The muscles between your ribs also help enlarge the chest cavity. They contract to pull your rib cage both upward and outward to cause a pressure change resulting in air coming into the lungs.

Breathing out – When you breathe out, or exhale, your diaphragm and rib muscles (external intercostals) relax, reducing the space in the chest cavity, this increases the pressure in the lungs and pushes out carbon dioxide. During exercise the internal intercostals will also contract to more rapidly reduce the chest cavity space.



Vital capacity – The maximum amount of air a person can exhale form the lungs after a maximal inhalation. Around 4800ml

Tidal volume – The amount of air that moves in or out the lungs with each respiratory cycle. This is around 500ml in an average healthy.

Residual volume – Amount of air that remains in a person's lungs after fully exhaling, around 1l – 1.2l

Total lung capacity – The volume of air in the lungs upon the maximum effort of inspiration, this is around 6l amongst healthy adults.

Additional factors

Altitude – At higher altitudes the oxygen particles are spaced further apart resulting in the availability of these particles becomes harder meaning an increase in rapid and deep breathes in order to get the particles, this means when an athlete returns to normal altitude it becomes easier for them to breathe due to the increase in red blood cells in the body.

Asthma – inflammation/swelling of airways (bronchioles) means restricted air/oxygen into lungs. Makes athlete increase breathing rate – impacts performance. Exercise can help strengthen system, moist environment helps.

Inspiration and expiration centres

The **medulla oblongata** is where the **Respiratory Control Centre** is located, its main function = send signals to the respiratory muscles that control breathing. **Chemoreceptors** detect **changes in PH levels** (due to carbon dioxide), which send signals to increase or decrease breathing rate. Impulses are sent along the **Phrenic nerve/intercostal nerve/Vagus nerve**.

Long term adaptations

Vital capacity increases because the **respiratory muscles** get stronger so can contract more powerfully increasing the volume of the thoracic cavity so more air can be breathed in (diaphragm & intercostals).

Your body enhances its ability to exchange oxygen and carbon dioxide due to **increased alveoli & capillaries** (gaseous exchange improves due to increased surface area).

Acute responses to exercise

The body responds to exercise by increasing the **breathing rate** via the Respiratory Control Centre and increasing the **tidal volume**. They increase the amount of air (oxygen) coming into the body and the amount of carbon dioxide that can leave the body). Anticipatory rise: occurs before exercise