VCE Physical Education

Unit 1

Respiratory System
What's in a breath?

- Why do we have to breathe?
- How long can you stop for?
Respiratory System Main Functions

- What are the four main functions?
  - Brings air from the atmosphere into the lungs.
  - Transfers oxygen into the blood stream.
  - Removes carbon dioxide from the blood.
  - Expels heat and water vapour in the air breathed out.
  - Creates speech as air is breathed out over the voice box (larynx)
In a nut shell!

- The respiratory system can be simply put as the system that takes in $O_2$, utilises it in the body, and removes waste products.

- The respiratory system will improve dramatically with training.
Anatomy of the Respiratory System

- Nasal Cavity
- Pharynx
- Larynx
- Trachea
- Bronchus
- Bronchioles
- Alveoli
- Lung
- Pleura
- Diaphragm
- Ribs
The Conductive System

- *Nasal cavity* – warms the air by mucus and filters foreign particles with the use of cilia (hair like fibres).

- Smoking destroys cilia
Pharynx

- Channels food to the oesophagus and air to the larynx by the use of a small flap called epiglottis.

- Where the back of the mouth meets the nose.
Larynx

- Vocal cords which creates the voice as air passes through them
Trachea

- Windpipe
- Provides a safe passage for air to travel to the lungs.
- Made from rings of hyaline cartilage enclosed by other cartilage and tissue.
- Also continues to immobilise bacteria through cilia and mucus.
The Inverted Tree

- The main trunk being the Trachea which divides into main branches (Bronchi) which further divides into smaller branches (bronchus) and then into the stems of leaves (bronchioles) and lastly into leaves (Alveoli) where gases are exchanged.
Bronchi & Bronchioles

- **Bronchi** - Two branches leading into each lung.

- **Bronchioles** - Smaller branches carrying oxygen to the alveoli.
Alveoli

- Known as the leaves!
- The sacs at the end of each Bronchiole.
- Only 1 cell thick with blood vessels surrounding the surface.
- Allows transfer of oxygen, carbon dioxide & water.
Pleura

- Covers each lung and is attached to the inside of the chest cavity and the top of the diaphragm.

- Its filled with fluid which allows for minimal friction when the lungs expand and contract.
The Diaphragm

- This involuntary muscle contracts and relaxes to aid breathing whether during sleep or consciousness.
- As the diaphragm contracts the lungs expand and when it relaxes the lungs decrease in size.
Getting Winded

- A hit to the midriff area can cause the diaphragm to spasm and therefore create difficulty breathing. This is called being winded.
The Trachea, bronchi, bronchus and bronchioles.

A picture with the lungs not present. Capillaries are shown around one bronchi arm

Bronchioles with alveoli. Capillaries surround the alveoli for gas exchange.
The lungs with all the capillaries

The capillaries surrounds the alveoli for gas exchange.
Mechanics of breathing - Inspiration

- Breathing in
- The diaphragm initiates it by contracting and pulling downwards on the rib cage.
- The intercostals muscles found between two pairs of ribs also contracts and pulls the ribcage outwards.
Inspiration

- The diaphragm muscle contracts and flattens
- The intercostals raise the thorax and sternum out
- The chest cavity is enlarged and pressure reduced
- Air is drawn in

During exercise extra muscles can help to assist breathing.
Expiration (breathing out)

- Diaphragm relaxes and forms a dome shape
- The chest cavity is reduced
- The pressure is increased
- Air is forced out
Inspiration & Expiration

Breathing in:
- Ribs lift upwards and outwards
- Volume of lungs increases
- Diaphragm contracts

Breathing out:
- Volume of lungs decreases
- Diaphragm relaxes
- Ribs lower
Mechanics of breathing

- [Link](http://www.youtube.com/watch?v=d-f3RL0KiUg&feature=related)

- Using the information from what you just saw fill in the gaps for inspiration and expiration

- Also check out page 38 of your text book to help
EXCHANGES OF GASES

INSPIRATION

- Alveoli and capillaries walls are ONE cell thick. This allows for gas exchange of $O_2$ and $CO_2$ to take place. They are free to move between the cell walls of alveoli and capillaries but only when there is a HIGH pressure/concentration from one side. As we know gas flows from HIGH pressure to LOW pressure. When we breathe in air it has a HIGHER pressure of oxygen ($O_2$) than the blood in the capillaries. Therefore OXYGEN travels through the walls of the ALVEOLI and CAPILLARIES and bonds to HAEMOGLOBIN in the RED blood cells. When this attachment occurs it is called OXYHAEMOGLOBIN. The oxygenated blood is then transferred back to the heart and pumped to the muscles where it is needed for energy.
In Expiration the opposite occurs due to the reverse pressures in the systems. Carbon Dioxide (CO₂), a waste product from muscles is transferred to the LUNGS via the veins and into CAPILLARIES surrounding ALVEOLI. There is a LOW concentration of Co₂ in the ALVEOLI compared to the LUNGS. Therefore Co₂ passes through the walls of the ALVEOLI and CAPILLARIES along with heat and WATER and is sucked out of the lungs due to the pressure in the atmosphere being HIGHER than that in the LUNGS.
Gaseous Exchange

- Occurs at the alveoli and the capillaries.

- Oxygen passes through the alveoli into the red blood cells.

- Carbon dioxide and other wastes are removed from the blood and breathed out.
Respiration and exercise

What happens to the following during exercise?

- Minute ventilation ($V_E$)
- Tidal Volume (TV)
- Respiration rate (RR)
- Vital Capacity (VC)
Effects of Smoking on the Respiratory System

- **Destroys cilia** and their absence creates the beginning of serious problems for the lungs of smokers.

- **Kills alveoli** therefore now $O_2$ can’t get into the blood stream.

*Smoking causes fatal lung cancer*
Asthma is a medical condition that reduces a person’s vital capacity, sometimes to the point of breathlessness. This is caused by the constriction or narrowing of the bronchi and bronchioles. Another effect of asthma is to slow the speed at which the lungs ventilate.