**Bio summary unit 1 respiratory system**

**Section 1. Respiration what is it?**

A car needs fuel to move. During the burning process of the fuel energy is released in the form of warmth and movement. During this burning process the fuel disappears and new products replace tem. The products that are formed during this process are called combustion products. During the burning in a car engine the petrol disappears and exhaust gases are formed. Exhaust gases contain water and carbon dioxide as combustion products.

A substance that is used to demonstrate the presence of another substance is called an indicator.

**Section 2. Inhaled and exhaled air.**

Air is a mixture of several different gases. Although the gases re invisible it is possible to feel air. The main gases in the air are nitrogen and oxygen.

Air also contains varying amounts of water vapour. This is the reason that the composition of dry air is usually shown.

**Section 3. Respiration in organisms.**

When you inhale, you take in oxygen from the air.

When you exhale, you release carbon dioxide. You also release water and warmth.

In your body a burning process takes place. We call this burning process respiration.

Respiration takes place in every single cell in you body. Without this process the cells will die. For respiration you need fuel. Often glucose is the fuel that is used for respiration.

When you exercise, your muscle cells are working hard. These cells need a lot of energy.

This energy is released during respiration in your body cells. To be able to release more energy, the cells need more fuel. As they need more fuel they need more oxygen as well. Combustion products are formed as well. Your organs work hard to get rid of these.

Cold-blooded animals have a temperature that changes with the outside temperature.

Warm-blooded animals have a constant temperature.

Respiration in cells depends on the temperature. When the body temperature is low, slow respiration takes place. But when the temperature increases more respiration takes place.

During winter the temperature is low, so the body temperature will be low as well. When respiration is low little heat is generated.

Many cold-blooded animals find shelters and hibernate during the winter.

**Section 4. The respiratory system.**

You inhale air through your nasal cavity or the oral cavity. Through the pharynx and the larynx air enters the windpipe. The windpipe branches itself into 2 bronchi:

1. One towards the left lung.
2. One towards the right lung.

The bronchi divide many times into tiny tubes called bronchioles. Each bronchiole ends up in tiny air sacs known as alveoli.

Most people usually inhale through their nostrils. The cells lining the nose and trachea make slimy mucus. This mucus moistened the inhaled air.

Air you breathe in might not be that clean. Nasal hair is hair in the frontal part of the nose. Larger dust particles are trapped in these hairs.

Ciliated cells are found further back in your nose, between mucus producing cells. These cells have tiny hairs or cilia on them. Smaller dust particles and germs get trapped in the slime. The movements of the cilia sweep those trapped particles sway down to the pharynx, where they are swallowed.

In the roof of the nasal cavity is the olfactory system. This system checks the inhaled air.

Some people are not able to inhale through their nose. They breathe in through their nose.

But the oral cavity has no hairs or olfactory system and so air inhaled through the mouth is not moistened and warmed as much when inhaled through nose.

After entering the nasal and oral cavity the air reaches the pharynx. It then passes into the larynx, which is at the top of the windpipe. Your larynx contains your vocal cords that you use to produce speech.

When you swallow food, a flap of cartilage known as the epiglottis drops over the opening to your larynx. This prevents food from going down your trachea.

The uvula closes the opening of the nasal cavity.

The windpipe or trachea is like a hollow tube that connects the nose and lungs. The windpipe has horse-shoe-shaped rings of cartilage that prevent the pipe from collapsing.

The windpipe divides into 2 bronchi which enter the lungs and divide into smaller branches, the bronchioles. These bronchioles end in masses of little air sacs called alveoli.

At the end of the bronchioles are air sacs called alveoli. The alveoli have thin walls. Each air sac is surrounded by a network of blood vessels, called lung capillaries.

The alveoli contain air and the capillaries contain blood. Between the alveoli and the lung capillaries gas exchange takes place.

When inhaled air reaches the alveoli, it contains a lot of oxygen. The oxygen passes into the capillaries from the alveoli. blood carries the oxygen away from the lungs to every cell in the body where it is used for respiration.

The cells release the carbon dioxide into the blood. Blood containing this carbon dioxide flows back to the lungs.

Blood flowing to the alveoli is oxygen-poor and carbon dioxide-rich.

Blood that flows from the alveoli is oxygen-rich and carbon dioxide-poor.

**Section 5. Inhaling and exhaling**

The air inside your lungs needs to be refreshed continuously. This is what happens when you breathe in and out. There are 2 ways of breathing in and out:

1. **Thoracic breathing (chest breathing)**

When you inhale, the chest widens as the ribcage and breastbone move upwards. This increase in volume causes a decrease in pressure in the lungs, so air from the outside pushes its way into the lungs to equalise the pressure: you breathe in.

When you exhale, the chest and the lungs return to their original volume as the ribcage and the breastbone move downwards.

Now there is less space inside your chest so air is pushed out: you breathe out.

1. **Abdominal breathing (diaphragmatic breathing)**

When you inhale the diaphragm moves down and becomes flatter.

This downward movement causes the lungs to expand and to suck in air. The volume of the thoracic cavity increases but the volume of the abdominal cavity decreases. The increased volume of the thoracic cavity expands the lungs and air flows in: you breathe in.

On exhaling, the diaphragm moves up. The chest and lungs return to their original volume. As there is less space inside, the air is pushed out: you breathe out.

**Section 6. Healthy lungs and bronchi.**

When the lungs and airways do not function properly there can be several reasons. The cause could be a disorder of the respiratory system, such as asthma. It could also be caused by inhaling harmful materials without your knowledge.

This sometimes causes an allergic reaction, like in hay fever. But there are also people who consciously breathe in harmful materials, for example people who smoke cigarettes.

The air you breathe in is full of many different tiny dust particles. These dust particles are usually kept out by nose hairs, or they stick in the mucus in the airways.

Yet there are a lot of people who are bothered by dust particles in the air. The air you breathe in may also be full of pollen grains. You breathe in these pollen grains. The pollen grains stick to the mucus in the airways. Pollen grains are the most important cause of hay fever.

Hay fever is the most common form of allergy. Having an allergy means you are sensitive to certain substances. When you come in contact with these substances by breathing them in or via your food, you suffer an allergic reaction.

Other examples of an allergic reaction are a burning sensation, itchiness or inflammation.

**Section 7. Smoking**

Tobacco smoke is a mixture of gases and droplets of tar. The tar in the tobacco smoke sticks to the linings of the lungs. After a while this tar forms a layer on the inside of the airways. The tar stops the cilia from doing their job. The mucus and inhaled dust particles can no longer be carried up to the throat.

Nicotine is the chemical which makes people addicted to smoking.

Carbon monoxide is a gas that is found in smoke. When you breathe in carbon monoxide, your blood is less able to transport oxygen.

When you breathe in the smoke which has been blown out by others is called passive smoking.

**Section 8. Vocal cords.**

At the front you can the thyroid cartilage. You can feel this in your neck.

Behind the thyroid cartilage you can find the vocal cords. They consist of 2 flaps of skin which can be caused to vibrate. At the top of the larynx you can find the tongue bone.

The larynx contains 2 small pieces of cartilage called the corniculate cartilage. The vocal cords are found between the corniculate cartilage and the thyroid cartilage.

The pieces of corniculate cartilage are able to twist slightly. They make it possible for the vocal cords to move towards each other or away from each other.

The glottis becomes narrower or wider. When you want to make a sound, you bring your vocal cords close together. The air passing through while you breathe makes the vocal cords vibrate.

**Section 9. Vital capacity.**

The lungs volume is smaller in children than in adults. Also the amount of air you inhale differs. The amount of air is called the tidal volume. The maximum amount you can breathe in or out is called the vital capacity. The vital capacity is not the same as the lung capacity because about 1.5 litres of air can never be expelled. This residual volume of air prevents the lungs from collapsing.