

X_ Biology _Life Processes (Respiration)_Handout 3/3

MECHANISM OF BREATHING

(Slide 1)

- When we breathe in, we lift our ribs up and out and our diaphragm contracts and flattens.
- The chest cavity becomes larger and volume increases, decreasing the pressure. So, air is sucked into the lungs and fills the expanded alveoli.
- The alveoli have a rich supply of blood vessels called capillaries and the oxygen of the alveolar air diffuses into the blood.
- The oxygen is carried by the blood to all the parts of the body.
- Carbon dioxide gas, a waste product from respiration, diffuses into the blood at the tissue level.
- The blood carries the CO₂ back to the lungs and it diffuses into the alveoli, and is exhaled.
- When we breathe out air, the diaphragm relaxes, the ribs move down and make our chest cavity contract and smaller. This contraction of the chest pushes out CO₂ from the alveoli of lungs into the trachea, nostrils then out of the body into air.

During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.

The average breathing rate in an adult man at rest is about 15 to 18 times per minute. This breathing rate increases with increased physical activity.

Gas exchange

(Slide 2)

- This is the delivery of oxygen from the lungs to the bloodstream.
- It is also the elimination of carbon dioxide from the bloodstream to the lungs.
- It occurs in the lungs between the alveoli and the alveolar walls that have a network of tiny blood vessels called capillaries.

Alveoli are an important part of the respiratory system.

- Its function is to exchange oxygen and carbon dioxide molecules to and from the bloodstream.
- These tiny, balloon-shaped air sacs are found at the very end of the respiratory tract and are arranged in clusters throughout the lungs.

EXCHANGE OF GASES:

- This is important because it provides oxygen to the cells of living organisms and so they obtain energy from organic molecules.
- Gas exchange during respiration occurs primarily through diffusion.
- Diffusion is a process that is driven by a **concentration gradient**. Gas molecules move from a region of high concentration to a region of low concentration.

RESPIRATORY PIGMENT:

(slide 3,4,5)

- The respiratory pigment in humans and other vertebrates, is **haemoglobin** (Hb)
- Haemoglobin increases the oxygen-carrying capacity of the blood as its main activity is to transport oxygen to different parts of the body.
- The normal range of haemoglobin in the blood of a healthy adult person is from 12 to 18 grams per decilitre of blood.
- The deficiency of haemoglobin reduces the oxygen carrying capacity of the blood. This results in breathing problems, tiredness and lack of energy.

Haemoglobin and Oxygen:

- Oxygen binds with haemoglobin and forms oxyhaemoglobin and this is a reversible process.



Haemoglobin and carbon dioxide:



CO₂ is also transported as bicarbonates or dissolved in the plasma

Haemoglobin and carbon monoxide:

- Haemoglobin has more affinity for carbon monoxide than oxygen. If carbon monoxide gas is inhaled by a person, then this carbon monoxide binds very strongly and irreversibly with haemoglobin in the blood. This prevents it from carrying oxygen to the brain and other parts of the body.
- Carbon monoxide gas (CO) is formed whenever a fuel burns in an insufficient supply of air.
- For eg. Petrol burnt in engine of car; coal burnt in closed place etc.
- Due to lack of oxygen, the person cannot breathe properly. This is called carbon monoxide poisoning.

Source: Science text book, Google

