

A microscopic view of numerous water droplets, likely from a plant's surface, showing their spherical shape and intricate internal structures. The droplets are set against a light blue background, creating a soft, ethereal atmosphere. The lighting highlights the curvature and texture of the droplets, giving them a three-dimensional appearance.

CHAPTER 14

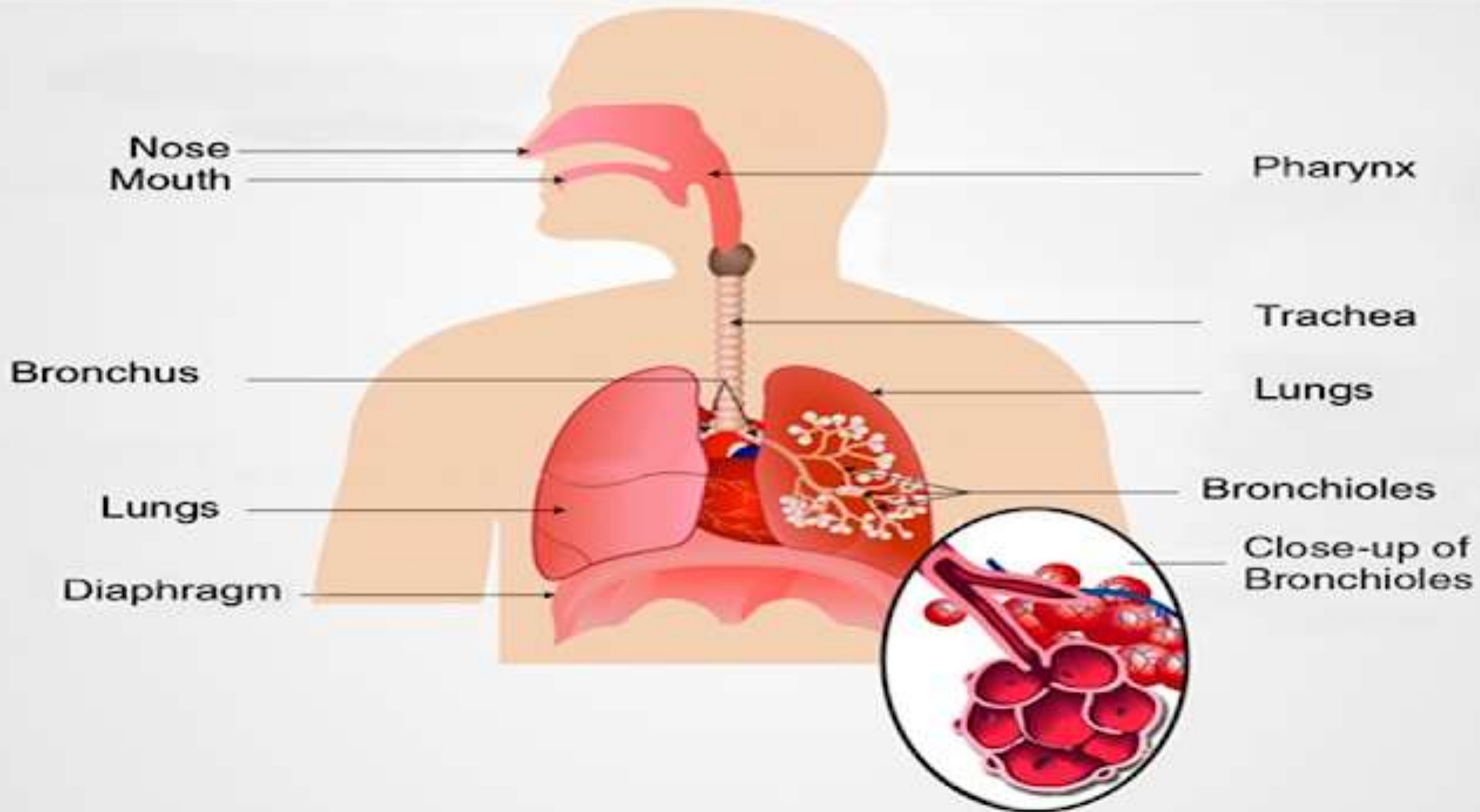
GAS

EXCHANGE

FEATURES OF GAS EXCHANGE SURFACES IN ANIMALS

- Have a large surface area relative to the volume of the organism.
- They are thin, so have a short diffusion pathway.
- They have a moist surface where gases can dissolve first before they diffuse in or out.
- They are able to maintain the diffusion gradient down which the gases can diffuse.

PARTS OF RESPIRATORY SYSTEM



| Component | Structure | Function |
|---------------------|--|--|
| Epiglottis | <ul style="list-style-type: none"> • Small flap of cartilage | Prevents food entering the trachea |
| Trachea | <ul style="list-style-type: none"> • Tube which carries air • Covered in hairs (Cilia) • Surrounded by C-shaped cartilage rings (Protect) | Also known as the wind pipe; passage for oxygen to travel through |
| Bronchus | <ul style="list-style-type: none"> • Cartilage rings • Smooth muscle | Splits trachea into two tube to allow oxygen in right and left lungs |
| Bronchioles | <ul style="list-style-type: none"> • Further division of bronchi • Very narrow tubes • Lead to alveoli | Allows oxygen to filter into alveoli |
| Alveoli | <ul style="list-style-type: none"> • Air sacs • Thin walls | Site for exchange of gasses |
| Diaphragm | <ul style="list-style-type: none"> • Muscle that sits underneath lungs • Attached to the ribs and sternum • Base of thoracic cavity | Enables thoracic cavity to be increased and decreased |
| Intercostal muscles | <ul style="list-style-type: none"> • Muscles that sit between the ribs • Internal and external | Enables thoracic cavity to be increased and decreased |

Breath In

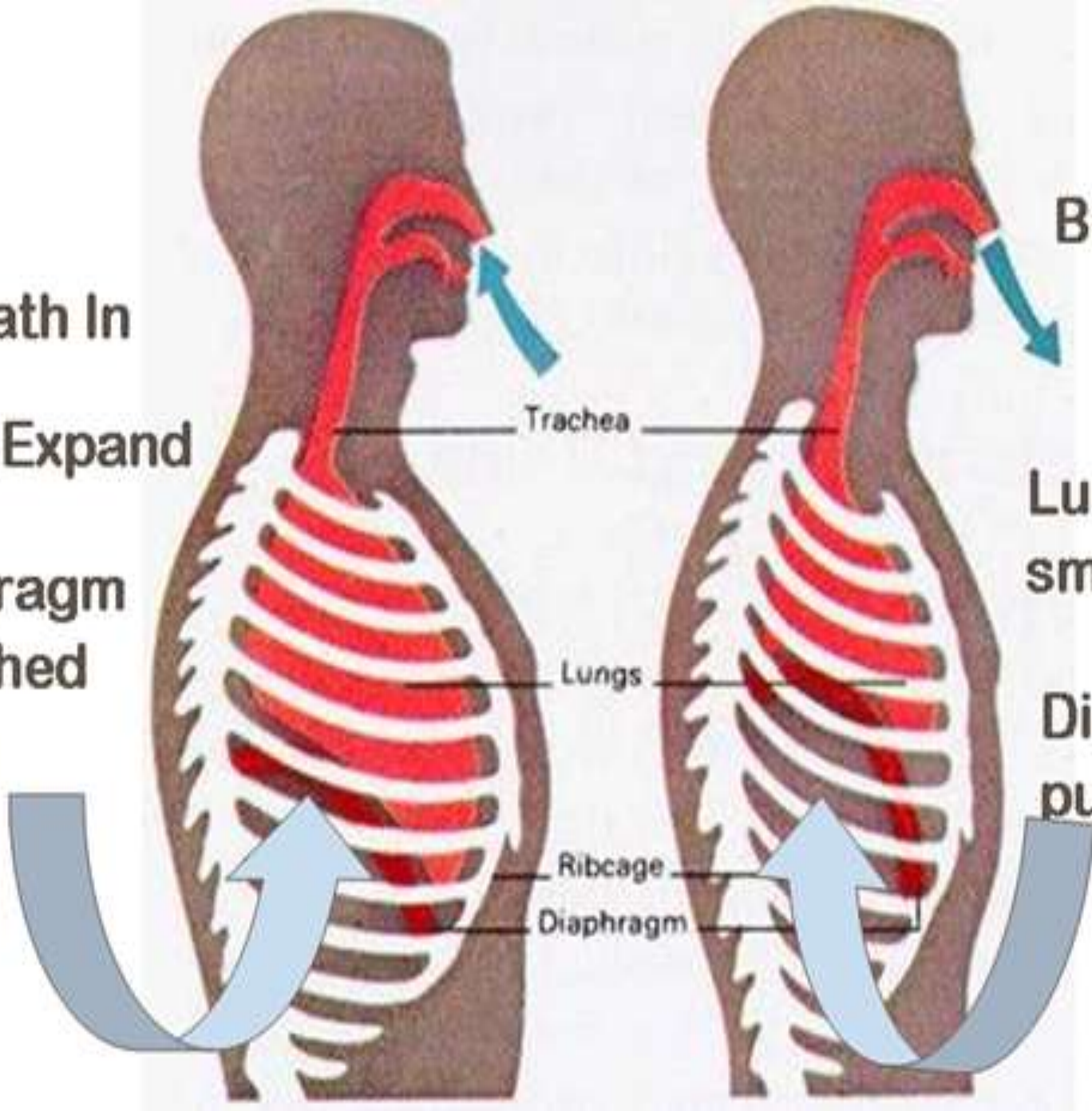
Breath out

Lungs Expand

Lungs get smaller

Diaphragm is pushed down

Diaphragm pushes up

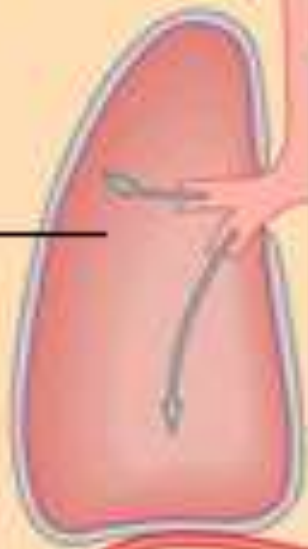


Air flow



Lung

Each lung increases in size as the ribcage expands



Diaphragm

This muscle contracts and moves down



Intercostal muscles

The muscles between the ribs contract

Ribs

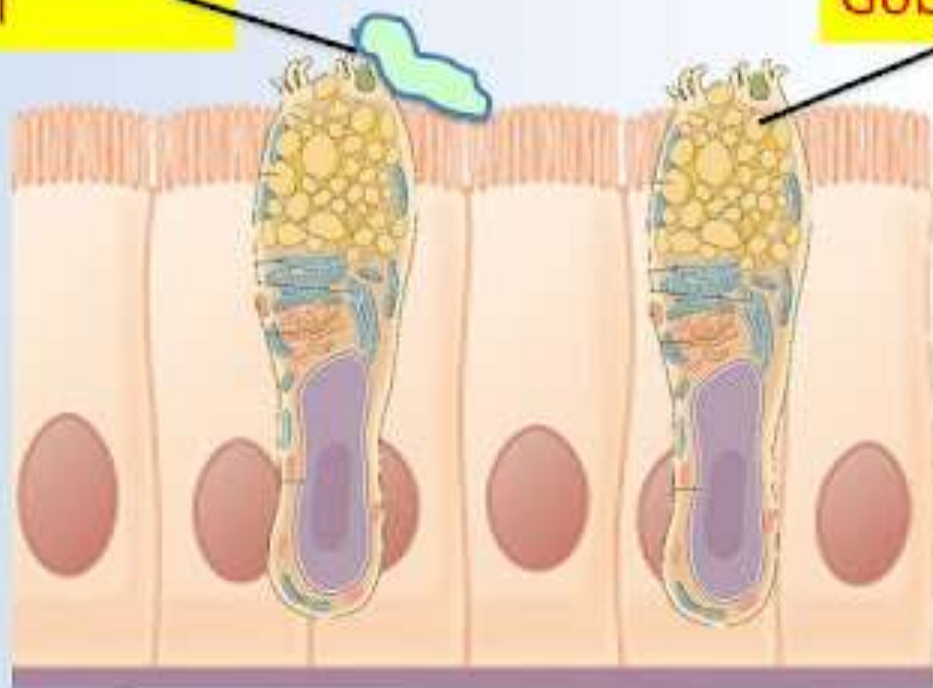
The ribs rise and swing outwards

6. SPECIALIZED CELLS INVOLVED IN RESPIRATION: GOBLET CELLS

Goblet cells are another specialized cell. They are found within the ciliated epithelial layer. Their function is to release mucus. This mucus is secreted from the cell and then released into the air passages.

Mucus secreted by goblet cell

Goblet Cell



Components of inspired and expired air

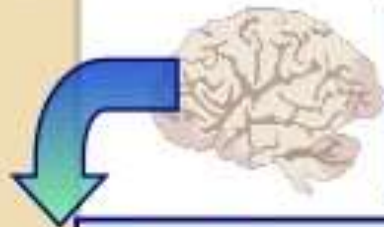
| Components (%) | Inspired air (%) | Expired air (%) |
|----------------|-------------------------|-------------------|
| Oxygen | About 21 | About 16 |
| Carbon dioxide | About 0.03 | About 4 |
| Nitrogen | About 79 | About 79 |
| Water Vapour | variable | saturated |
| Temperature | Atmospheric temperature | 37 degree celsius |

Breathing during exercise

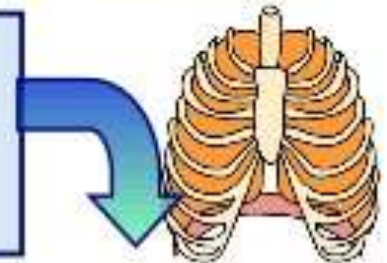
Muscle cell **respiration increases** – more oxygen is used up and levels of CO_2 rise.



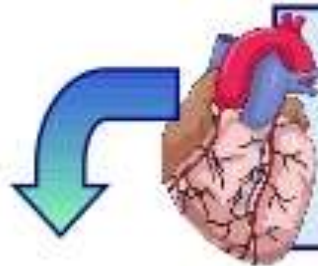
The **brain** detects increasing levels of CO_2 – a signal is sent to the lungs to increase breathing.



Breathing rate and the **volume of air** in each breath increase. This means that more **gaseous exchange** takes place.

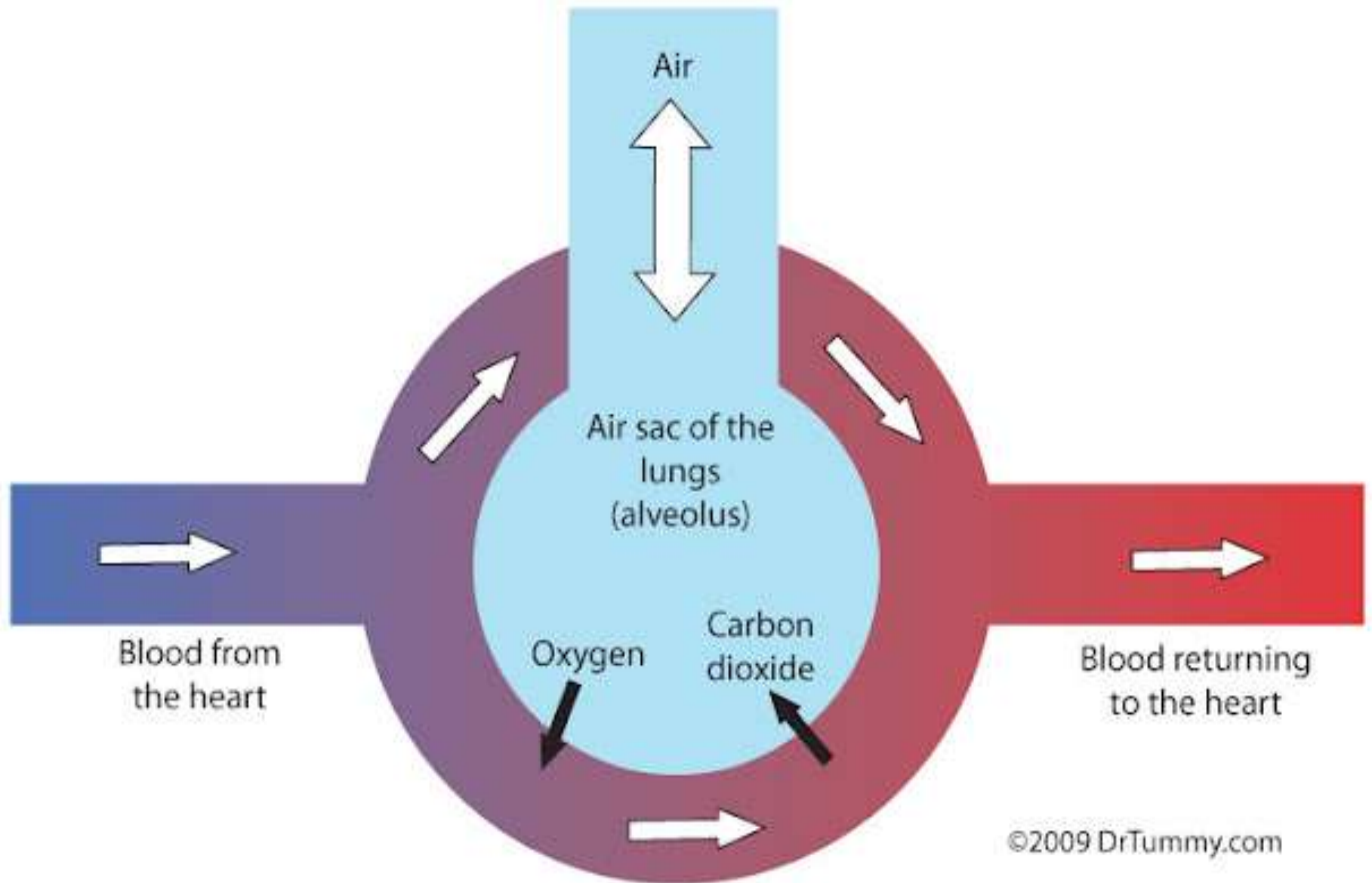


The brain also tells the **heart** to beat faster so that more **blood** is pumped to the lungs for **gaseous exchange**.



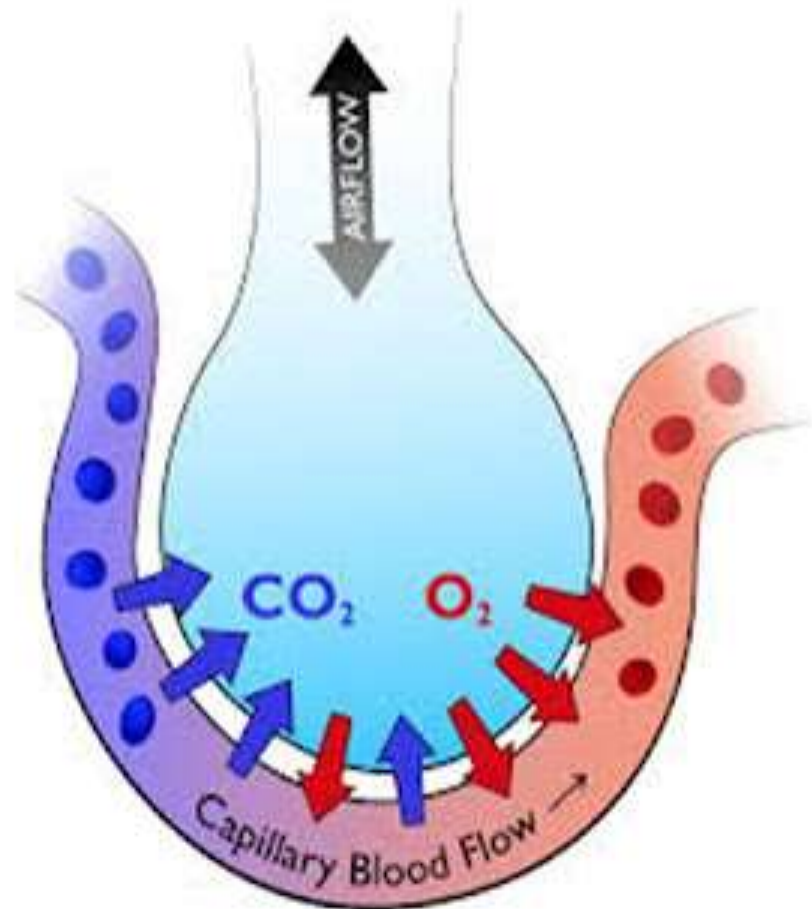
More **oxygenated blood** gets to the muscles and more CO_2 is removed.

Gas Exchange in the Lungs



Gas Exchange

- Oxygen passes through the alveoli walls to the capillaries
- The red blood cells take up the oxygen (hemoglobin) and carry it throughout the body (organs and muscles)
- Simultaneously, carbon dioxide (waste product) is collected from organs and muscles
- Blood carries the carbon dioxide to the lungs where it passes into the alveoli to be breathed out
- **What would happen if the body did not get rid of carbon dioxide?**



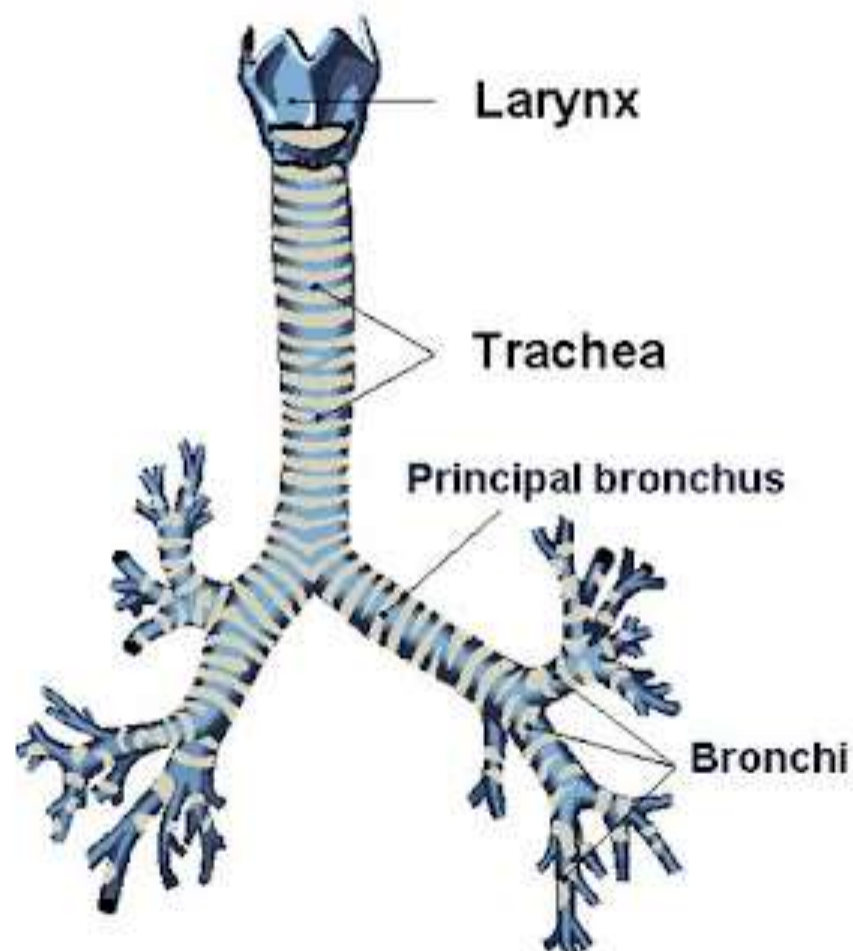
QUIZ

- Q1. List the features of gas exchange surfaces in animals.**
- Q2. Identify the parts of the respiratory system.**
- Q3. Differentiate between inspired and expired air.**

Trachea

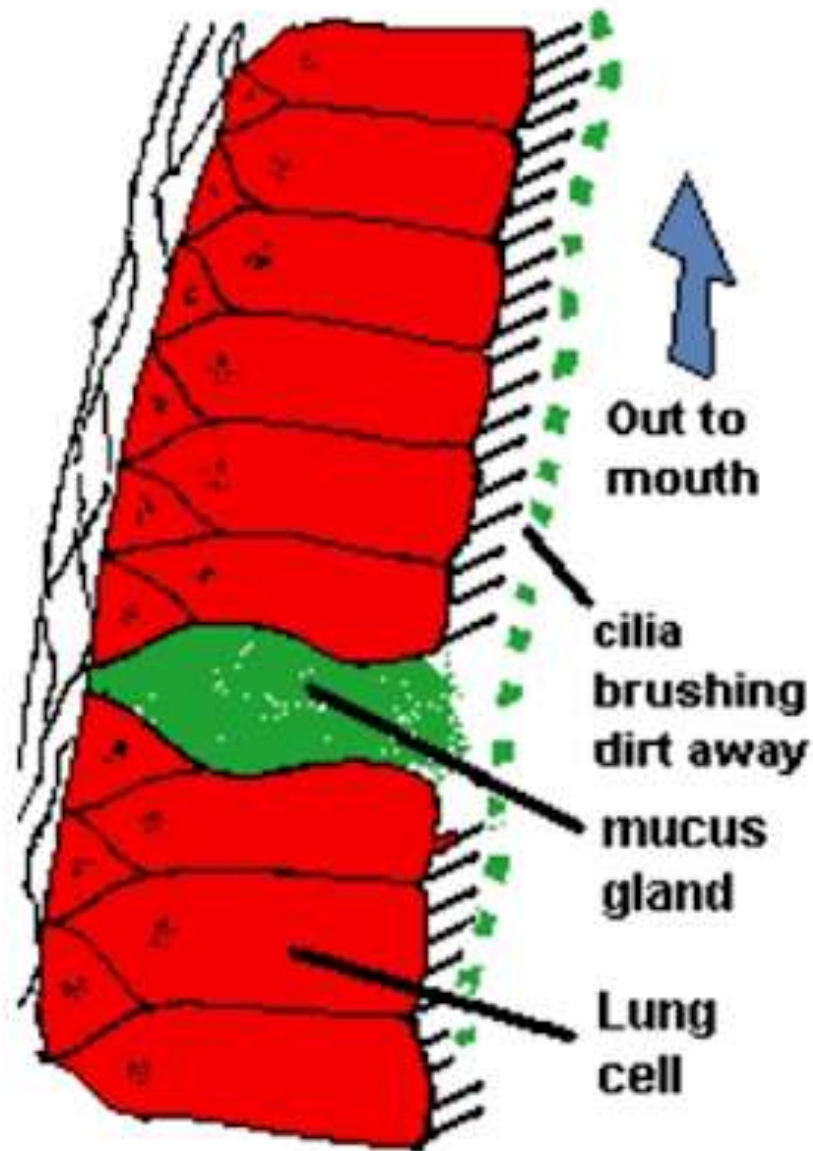
Mucus produced in the trachea continues to trap inhaled particles.

Cilia lining the trachea sweep both mucus and trapped particles away from the lungs toward the pharynx, where they can be swallowed or spit out.



Trachea are cleaned by cilia which beat a layer of mucus up out of the trachea.

The mucus is sticky so it traps dust, dirt and pathogens.

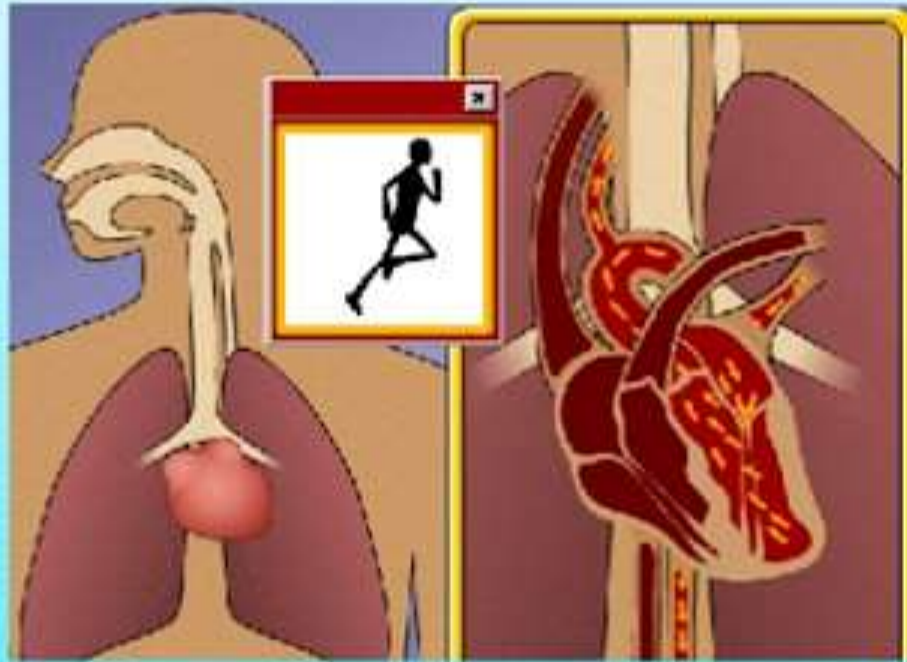


QUIZ

Q1. Investigate the differences in composition between inspired and expired air using lime water test.

Q2. How are alveoli adapted for gas exchange?

Why do the breathing rate and pulse rate need to increase with exercise?



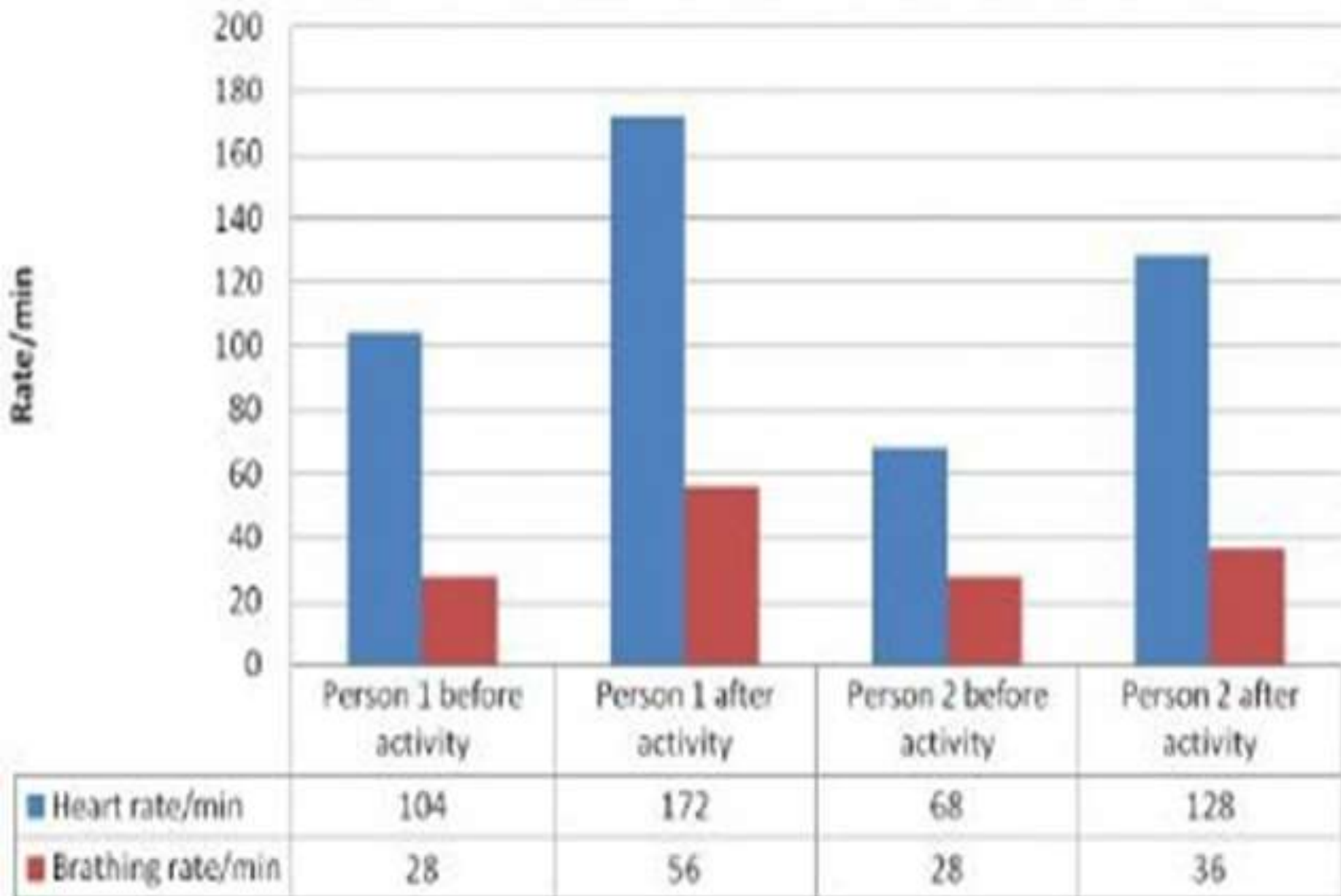
To supply more **oxygen**

Oxygen is needed for **aerobic respiration**

Respiration releases **energy**

Aerobic respiration is respiration using oxygen

Heart and breathing rate diagram



The word "QUIZ" is written in large, white, 3D block letters on a blue background. Each letter is contained within a separate blue cube with a metallic silver band around its middle. The cubes are arranged in a slightly staggered line.

QUIZ

- Q1. Describe the effect of physical activity on breathing rate.**
- Q2. Why do the breathing rate and pulse rate need to increase with exercise?**