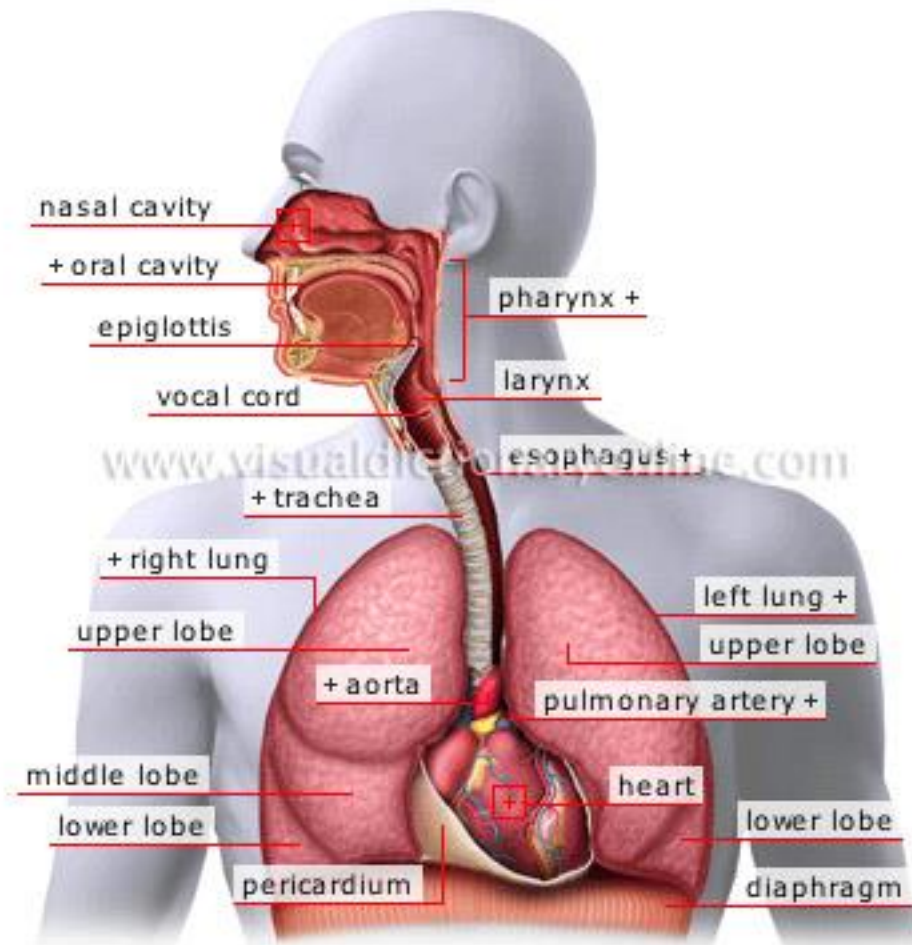
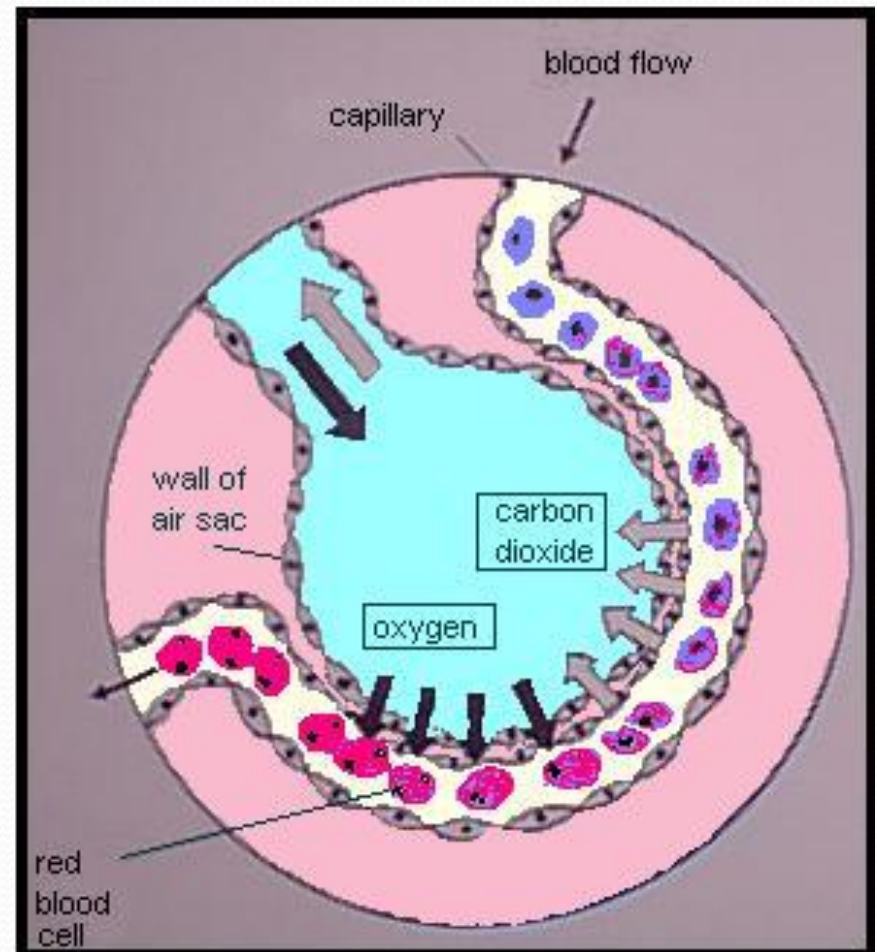


# The Respiratory System



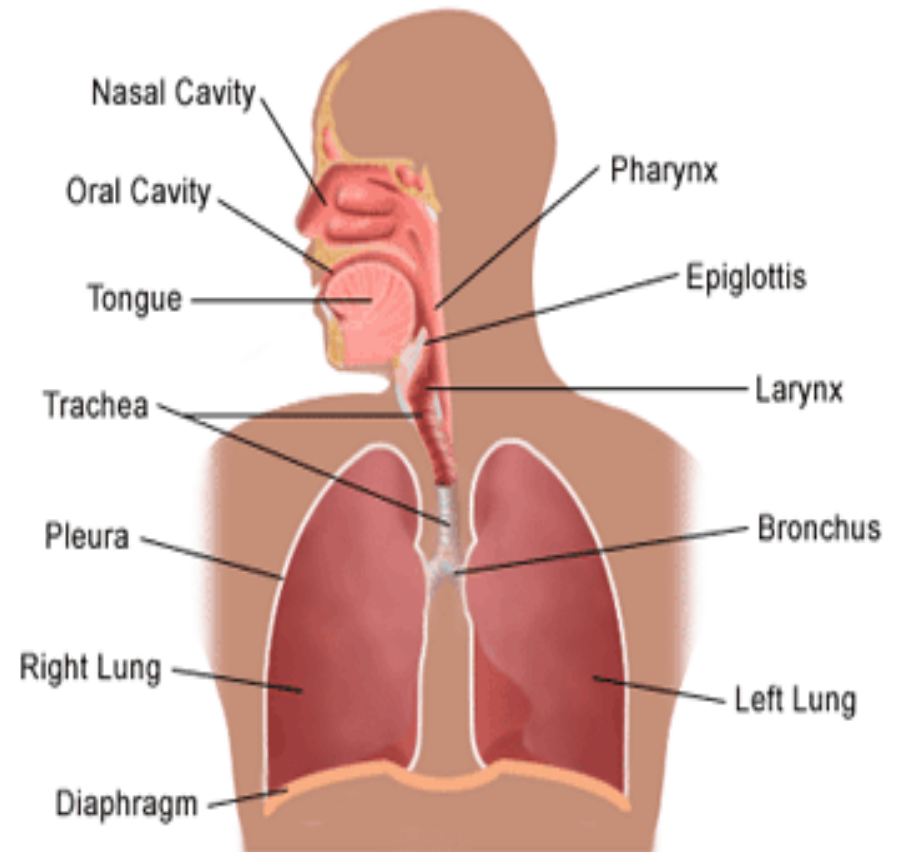
# Introduction

- The **respiratory system** is the system of the body responsible for the exchange of gases from the atmosphere with the body.
- **Oxygen** is brought into the body, whereas **carbon dioxide** is released into the environment.



# Structure of the Respiratory System

- A **respiratory system** consists of three parts:
  1. A moist respiratory surface (i.e. **alveoli**)
  2. A means of bringing air into the body (i.e. **lung and associated muscles**)
  3. A means of transporting the respiratory gases around the body. (i.e. **circulatory system**)



# Interesting Facts



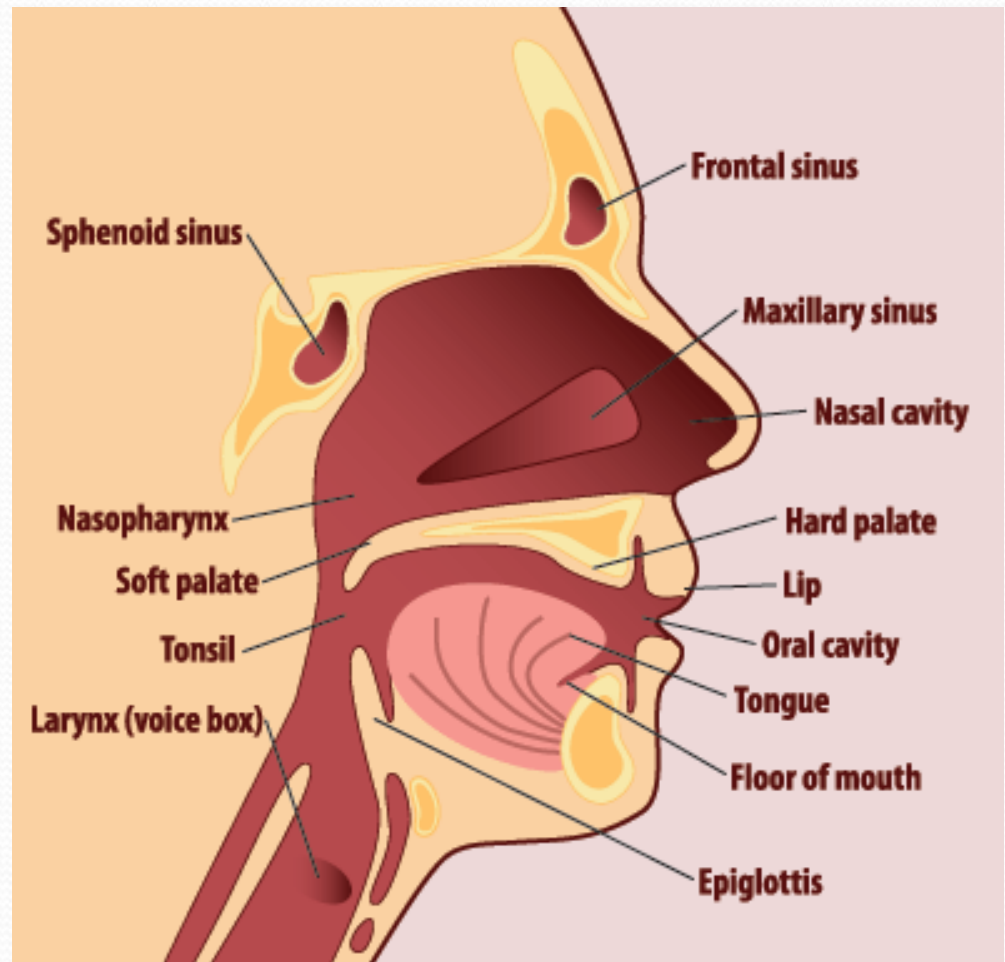
- The alveoli in your lungs are 1 cell thick so that gases can quickly diffuse across them into or out of the bloodstream.
- Frogs are able to exchange gases in three ways:
  - With their lungs
  - Across their skin
  - Through their mouth
- Some individuals can hold their breath more than 3 minutes!

# Breathing In

- As we breathe in, the following things occur that allow air to enter our lungs:
  - 1) Our **diaphragm**, the smooth muscle separating our thoracic cavity from our abdominal cavity, contracts and flattens out.
  - 2) Our **intercostal muscles**, the muscles between the ribs contract.
  - 3) Both these movements allow the **lungs** to expand and **increase their volume**. An increase in volume **decreases the pressure** of the air in the lungs and essentially creates a vacuum which sucks air in from the outside environment.

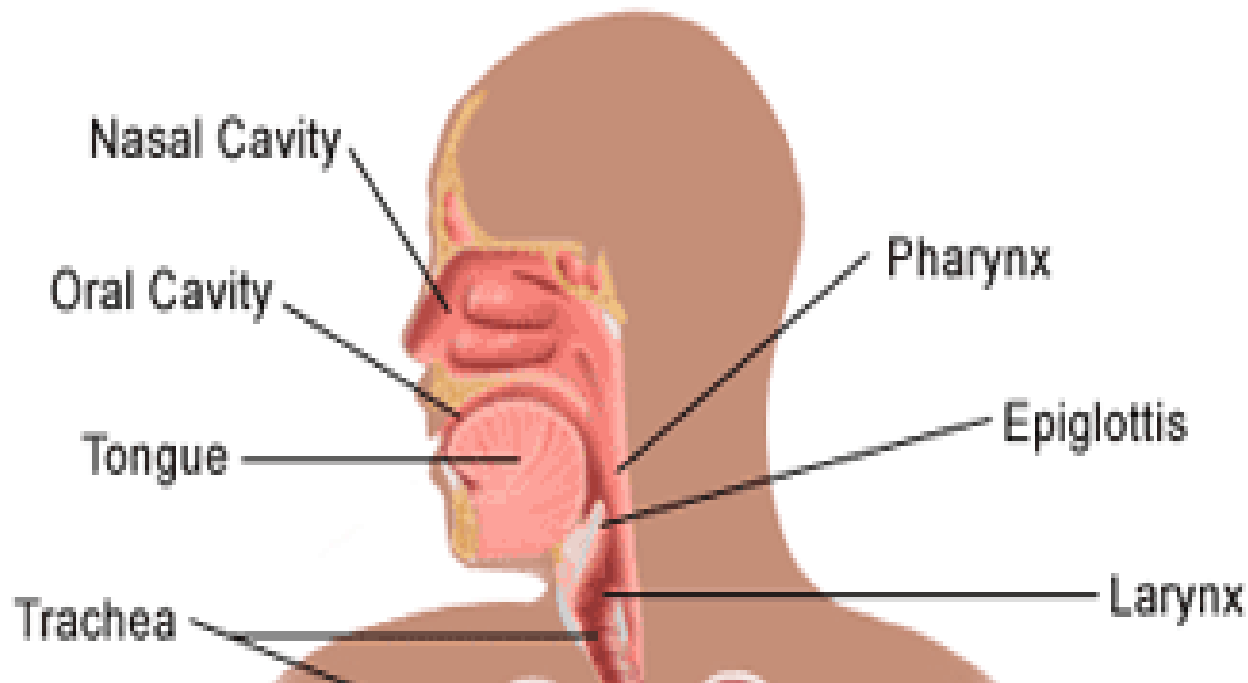
# Air Traveling to the Lungs

- Air that we breathe enters the body either through our **mouth** or our **nasal passages**.
- Here air is moistened and warmed.
- Hair and mucus in our nose also filters the air.



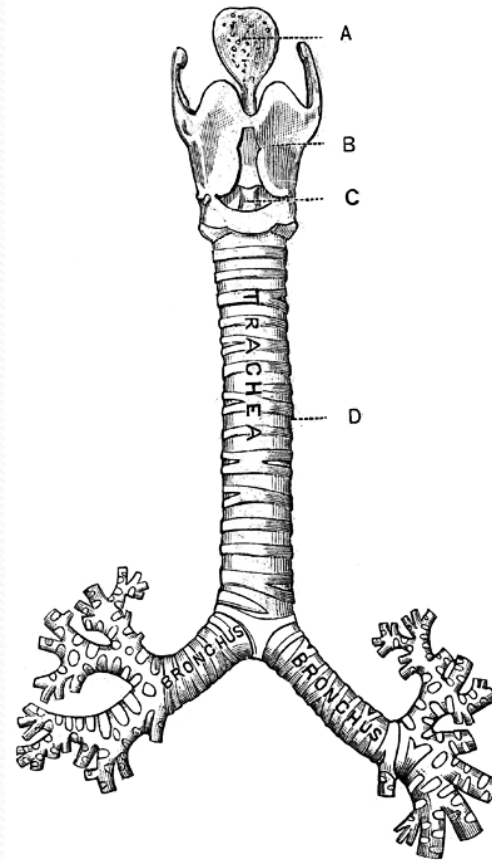
# Air Traveling to the Lungs

- The air reaches a connection between the two entry points, known as the **pharynx** (or throat).
- Here air is guided down past our **larynx** (or voice box) and into our **trachea** (or windpipe).



# Air Traveling to the Lungs

- Our **trachea** is a hollow tube made from cartilage rings.
- These rings prevent our trachea from collapsing (i.e. when we sleep).

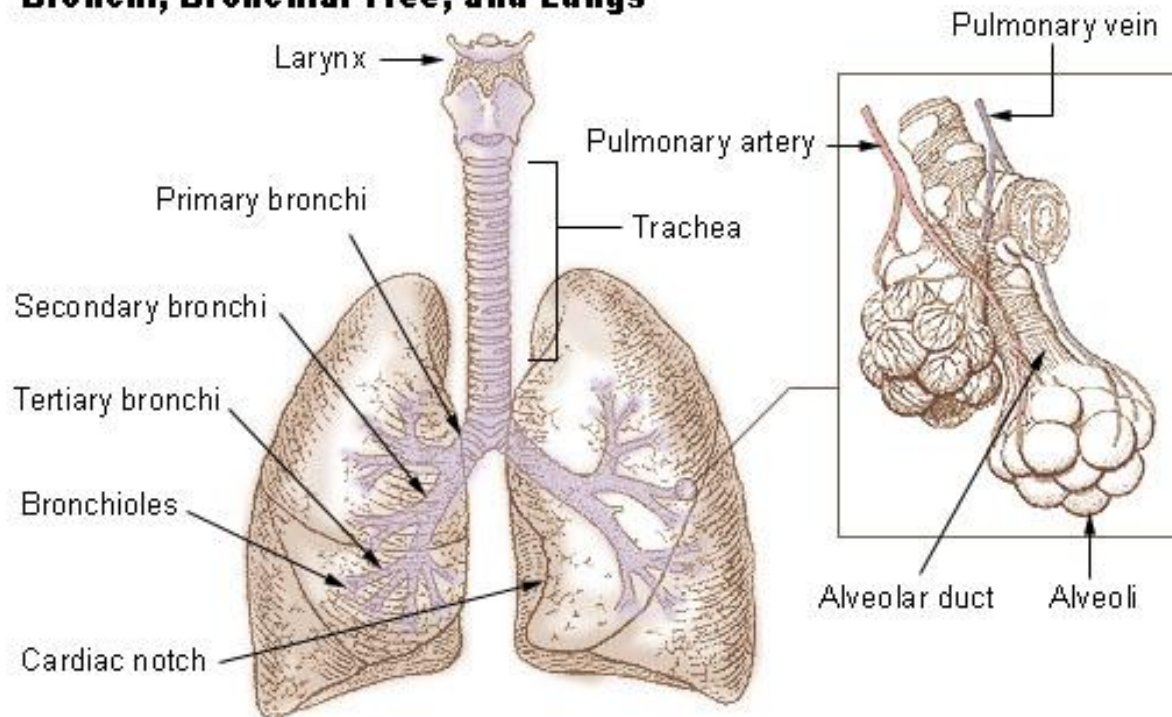




# Air Traveling to the Lungs

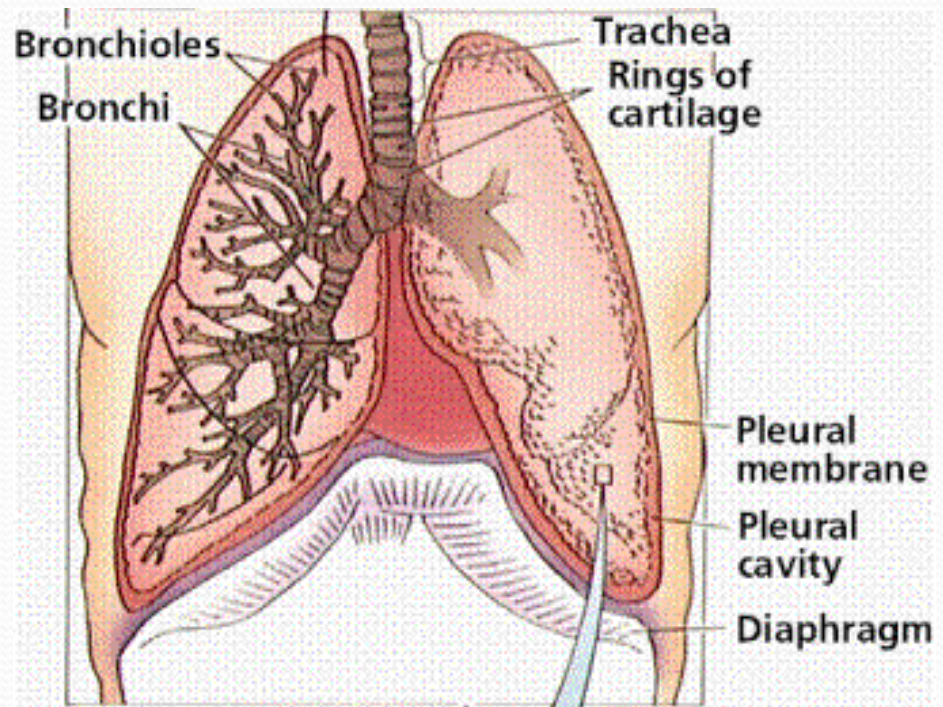
- The trachea branches off into two large tubes called **bronchi** (sing. bronchus).
- Each bronchus leads into one of our **lungs**.

**Bronchi, Bronchial Tree, and Lungs**



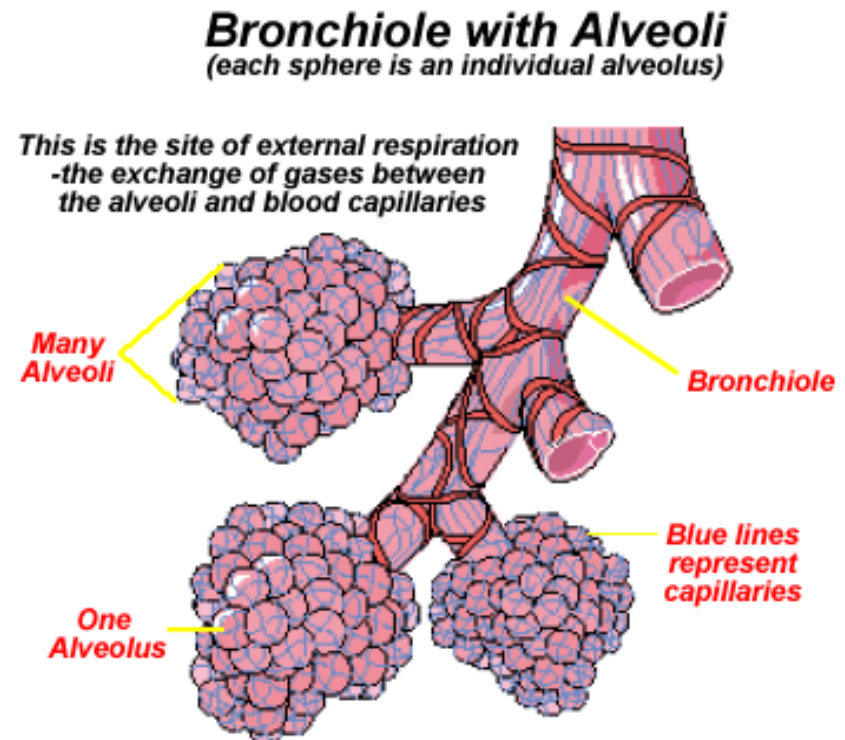
# Air Traveling to the Lungs

- The bronchi keep splitting into smaller and smaller tubes called **bronchioles**, which ensure air reaches all the corners of our lungs.



# Air Traveling to the Lungs

- At the end of the **bronchioles** are **alveoli**, which are thin walled membranes arranged in grape-like clusters.
- This is where **gas exchange** occurs as alveoli are right next to blood vessels (**capillaries**).
- Once gas exchange has occurred, the carbon dioxide is needed to be expelled from the body.



# Breathing Out

- As we breathe out, the following things occur that allow air to exit our lungs:
  - 1) Our **diaphragm** relaxes and domes upward into our thoracic cavity.
  - 2) Our **intercostal muscles** relax.
  - 3) Both these movements cause the **lungs** to **decrease their volume**. A decrease in volume **increases the pressure** of the air in the lungs and essentially creates a plenum which forces air out of the lungs into the outside environment.

# Control of Breathing Rate

- The **medulla oblongata**, a portion of our brain stem, controls our breathing rate by monitoring the level of **carbon dioxide** in our blood stream.
- When the level is too high, it sends a message to our intercostal muscles and our diaphragm to contract faster and therefore breath faster in order to get rid of the CO<sub>2</sub>.
- This is **negative feedback**.

