Biology Grade 7

CHAPTER 2: RESPIRATION OF LIVING BEINGS

Activity 4: Respiration in an aerial medium

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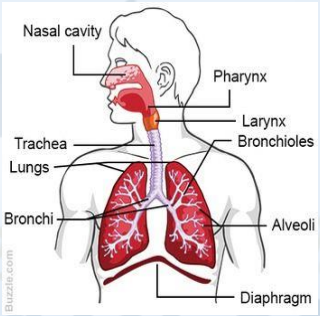
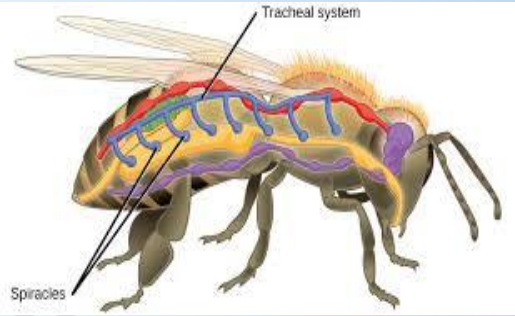
Activity 4: Respiration in an aerial medium

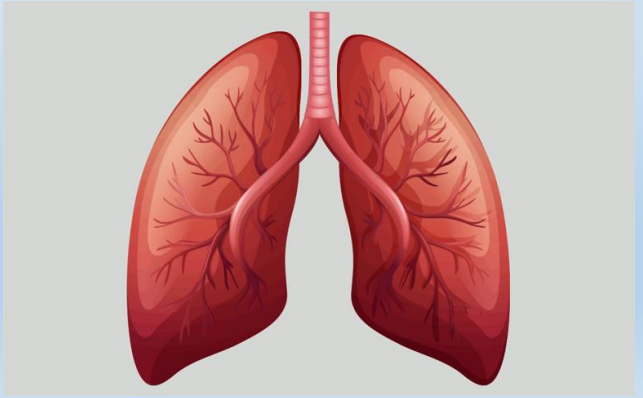
- **Terrestrial Animals:** These are animals that live on land.
  Examples: Cat, lion, grasshopper, frog, worm.

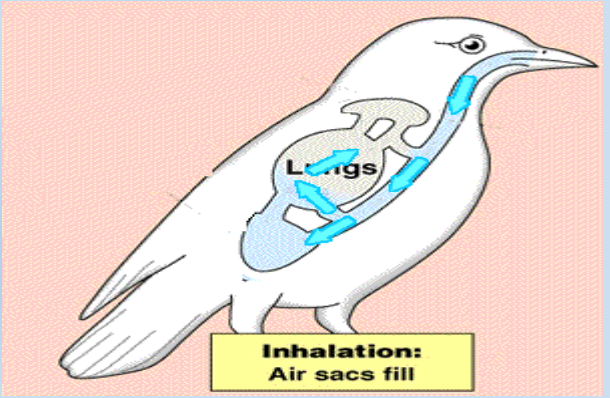
- Some animals breathe using **lungs**, such as humans and other mammals. Others use a **tracheal system**, like insects (e.g., the grasshopper). Some animals, such as the worm, breathe through their **skin.**





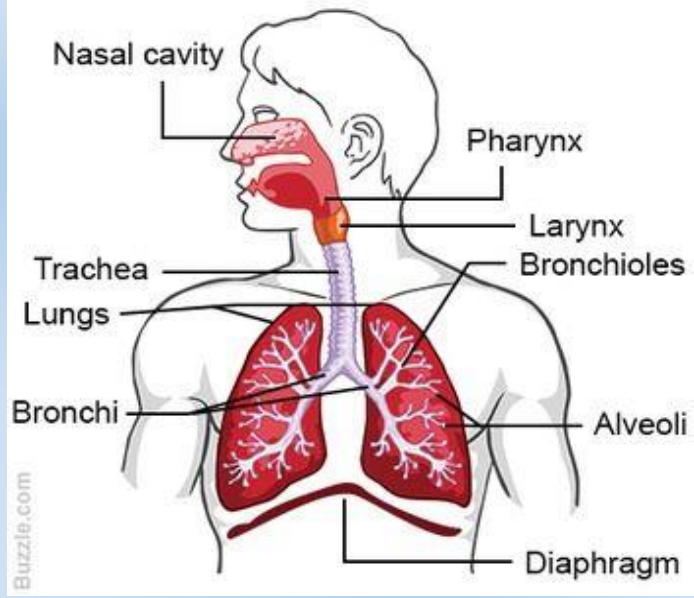
- **Pulmonary Respiration:** This is respiration that takes place through the **lungs.** Pulmonary respiration is common in humans, mammals, birds, and reptiles.





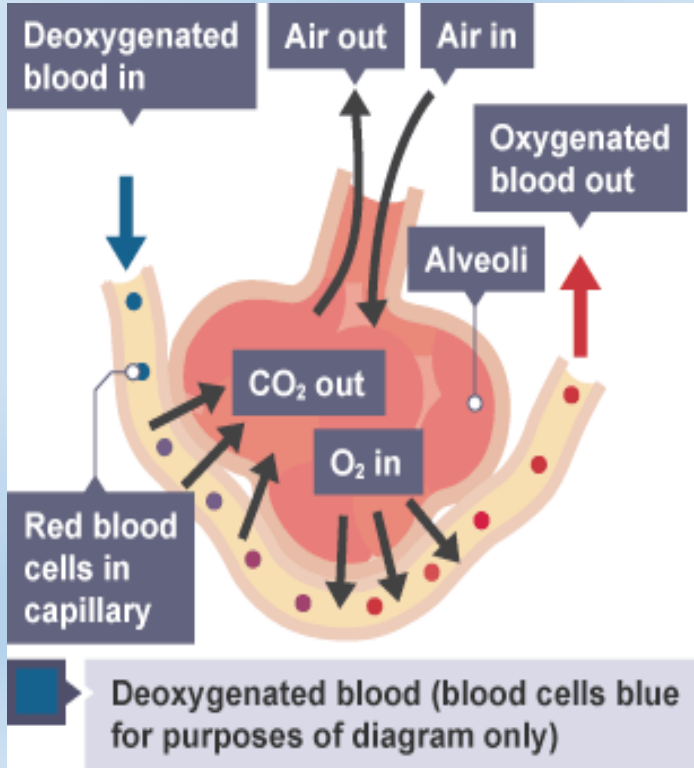
❖ Respiratory system of human:

During inhalation, air enters the respiratory system and reaches the alveoli. Then, oxygen (O_2) diffuses from the alveoli into the blood, which transports it toward the body organs. While functioning, the body organs produce carbon dioxide (CO_2), which is transported by the blood back to the alveoli. Then, CO_2 diffuses from the blood into the alveoli and is expelled from the respiratory system during exhalation.



❖ Alveoli:

The alveoli are the **structures of gaseous exchange** that allow the diffusion of O_2 and CO_2 between the blood and the air.



- **The characteristics that make alveoli well-adapted for gas exchange are:**

✓ Thin wall membrane

✓ Large surface area

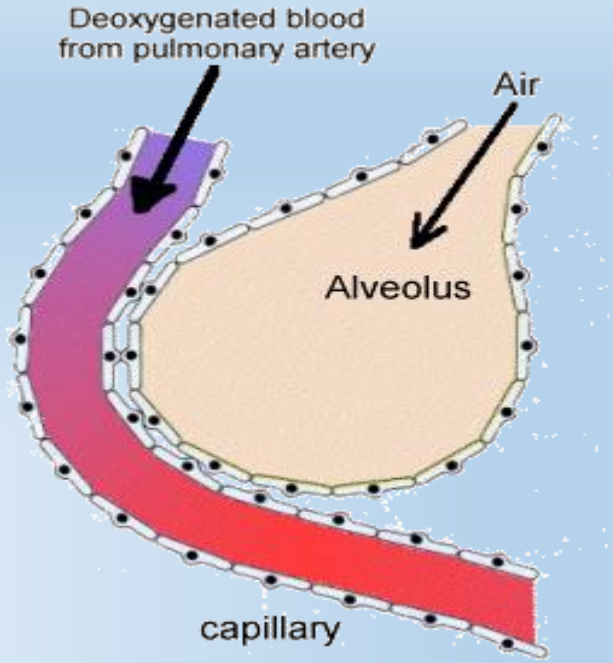
✓ Surrounded by blood vessels (highly vascularized)

❖ Diffusion:

- Diffusion is the **movement of a gas from a region of high concentration to a region of low concentration.**

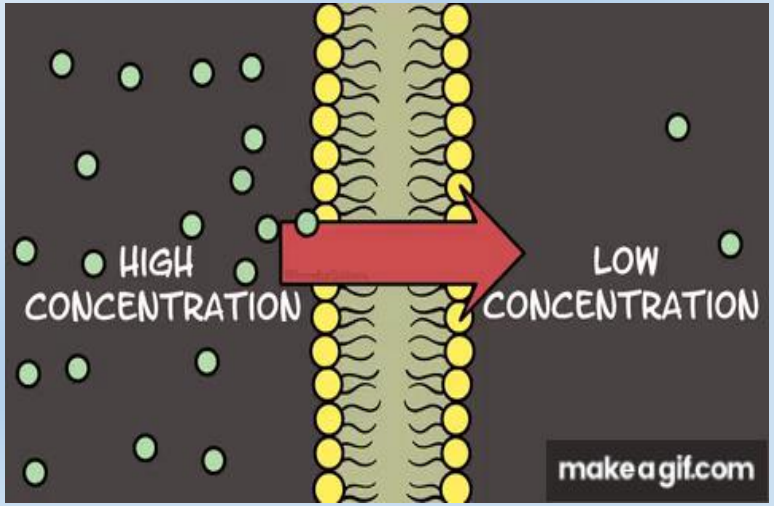
✓ O_2 diffuses from the alveoli into the blood.

✓ CO_2 diffuses from the blood into the alveoli.



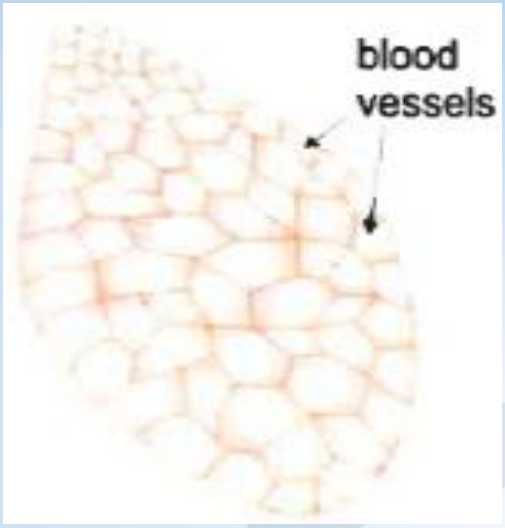
- **Note:**

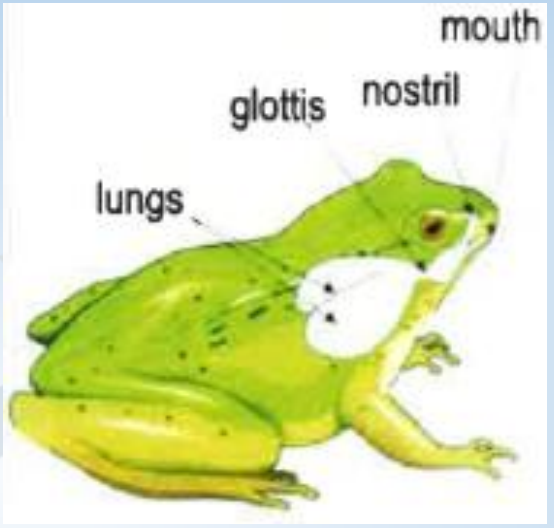
- The blood that **leaves** the lungs is **bright red** because it is **rich in O_2.**
- The blood that **enters** the lungs is **dark red** because it is **rich in CO_2** and poor in O_2.



❖ Lungs: the respiratory organ of frogs

A frog dissection shows two transparent thin sacs called lungs, which are enriched with blood vessels.





a. Name the respiratory organ of the frog.

Lungs

b.Pick out 3 characteristics of this organ.

Transparent, thin and enriched with blood vessels.

c. Indicate the pathway of the inhaled air.

Out → nostril → glottis → lungs

d. Conclude the mode of respiration.

Pulmonary respiration

Composition of the blood which enters and leaves the lungs in frog.

mL	Quantity of oxygen	Quantity of carbon dioxide
blood which **enters** into the lungs	15	53
blood which **leaves** the lungs	20	49

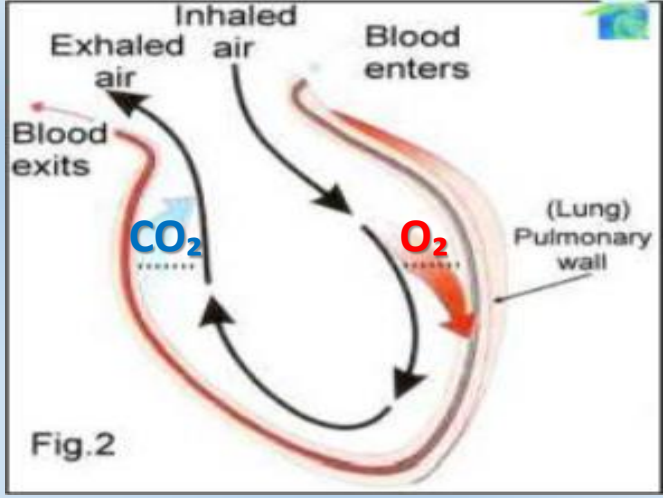


Fig.2

1. Compare the quantities of O_2 and CO_2 in the blood that enters the lungs to those in the blood that leaves the lungs.

The quantity of oxygen in the blood which enters into the lungs is 15 ml **less than** that in blood which leaves the lungs which is 20 ml. **While,** the quantity of carbon dioxide in the blood which enters into the lungs is 53 ml **greater than** that in blood which leaves the lungs which is 49 ml.

2. What can you conclude?

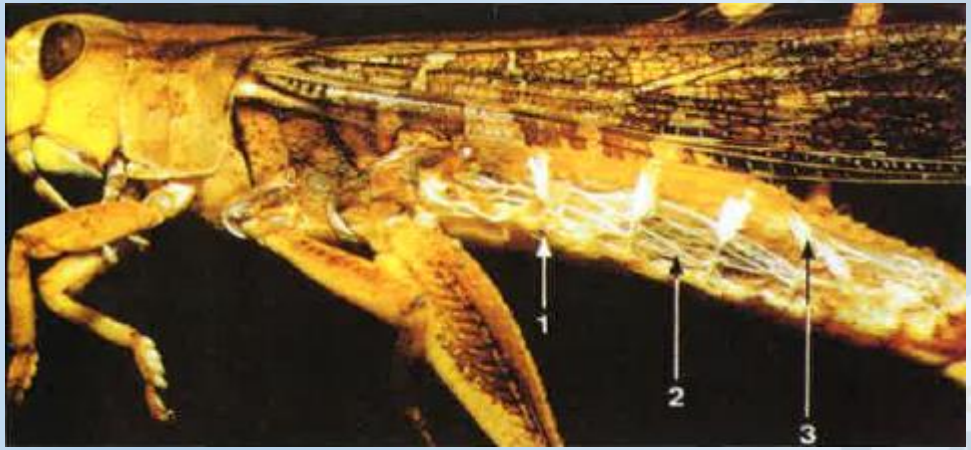
At the level of the lungs the blood is **enriched with oxygen** and **impoverished (becomes poor) with Carbon dioxide.**

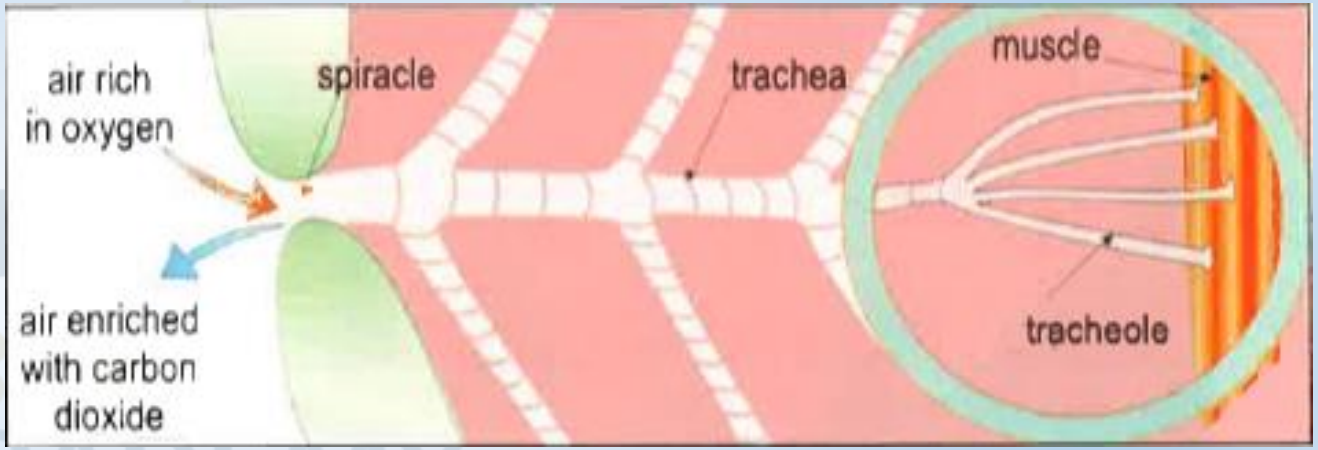
At the lungs, the blood gains oxygen and loses carbon dioxide.

❖ Trachea: the respiratory organ of insects

Dissection of grasshopper shows in the interior of the abdomen: opening called spiracles (1) open to a tube called trachea (2).

This trachea ramifies (branches) into many smaller tubes called tracheoles which reach air sacs (3) in which gas diffuses into muscles. This is called tracheal respiration.





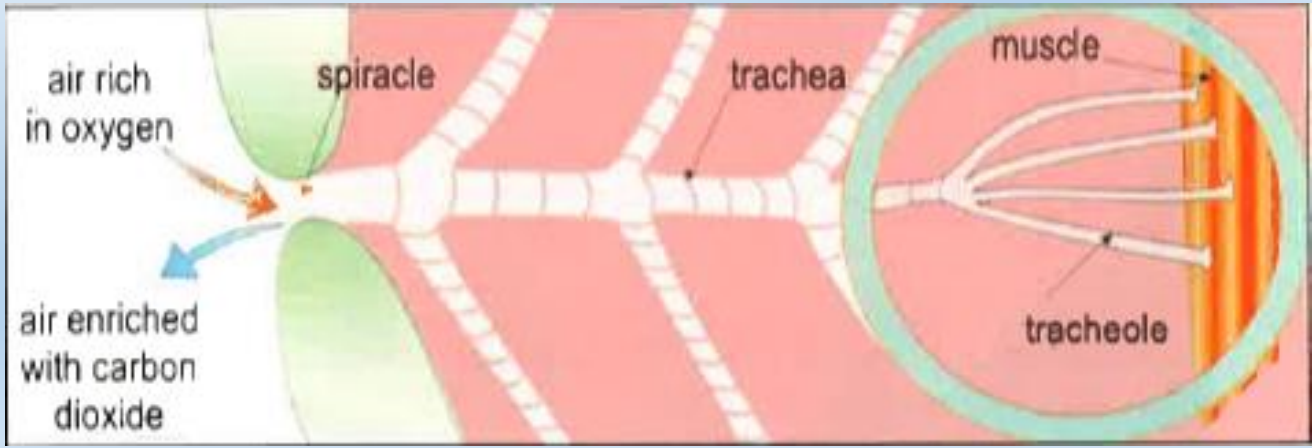
During the tracheal respiration gaseous exchange takes place directly between the tracheole and the muscle without the intervention of blood.

- The following table shows the % of different gases in the atmospheric air and in the tracheal air.

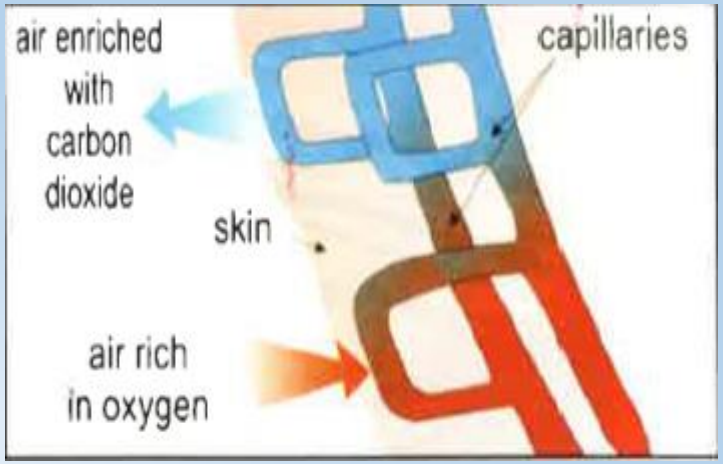
%	Atmospheric air	Tracheal air
O2	21	4
CO2	0.03	6.5

Gases diffuse from a medium of high pressure to a medium of low pressure", is this statement true? Justify using the above figure and table.

Yes, because oxygen diffused from atmospheric air with high pressure 21% to tracheal air with lower pressure 4% same for CO2, diffused from Tracheal air with high pressure 6.5% to atmospheric air with lower pressure 0.03%.



❖ Skin: the respiratory organ of earthworms



The skin of the earthworm is thin, transparent and always humid. This allows the exchange of gases between the internal blood capillaries and the atmospheric air.

1. Pick out:

1.1. The respiratory organ.

Skin

1.2. The 3 characteristics of this organ that favor gas exchange.

Thin, transparent and always humid.

2. Conclude the mode of respiration

Cutaneous mode.

3. Predict the consequences of drying up the earthworm's skin. Justify.

Dies, because oxygen can't diffuse through a dry skin.