

DAY 24-26

TOPIC: THE HUMAN BODY

The Respiratory System

Aim:

- Name the different parts of the respiratory system
- Explain the functions of the different parts in ensuring ventilation and respiration.

Activities :

- Study the notes below.
- Watch videos V.1-6
- Do the exercises and review questions.

2. VENTILATION AND CIRCULATION

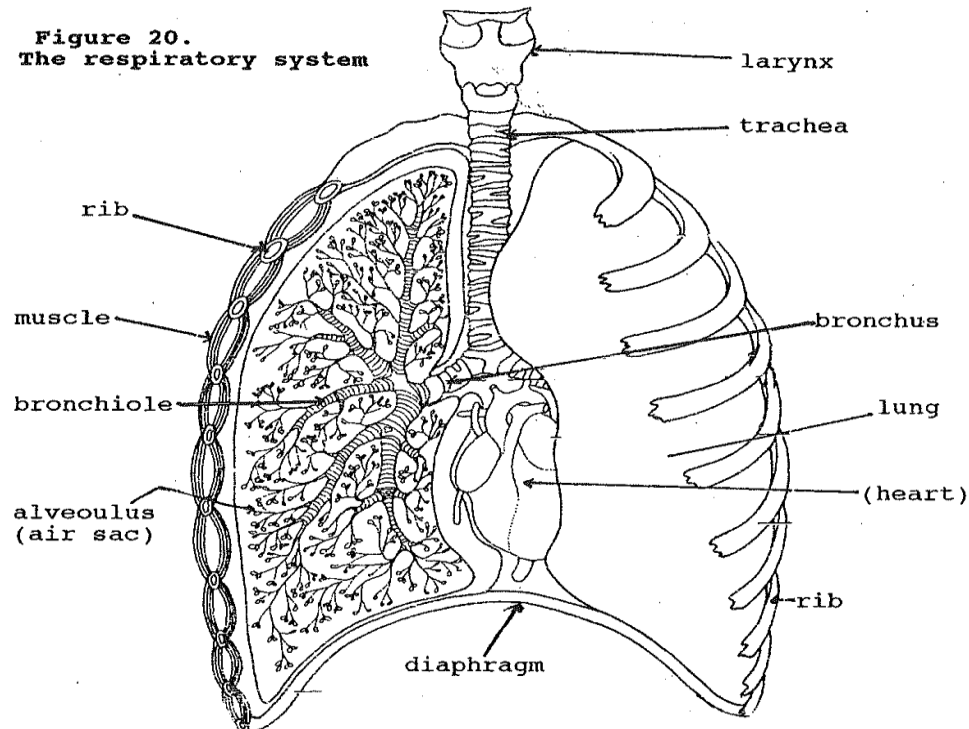
Every living cell in your body has to get a supply of oxygen for respiration and has to get rid of carbon dioxide and water produced during respiration.

How do these gases get to and from cells? The answer is in two parts. First the gases have to get into and out of your body. This happens in your lungs and is called ventilation and is carried out by the respiratory system. Then the gases have to be carried from the lungs to the cells, and then back to the lungs. This job is done by your blood in the circulatory system (circulation).

The Respiratory System

When you breathe in, you take fresh air into your lungs. The fresh air travels in through your nose and mouth, down through the large tubes called the trachea (windpipe) and bronchus into the lungs (see Fig. 20).

Figure 20.
The respiratory system



Each bronchus divides thousands of times into narrower tubes called bronchioles. Each lung contains a network of these very fine tubes. Each bronchiole has an air sac at the end of it. This is where gas exchange takes place.

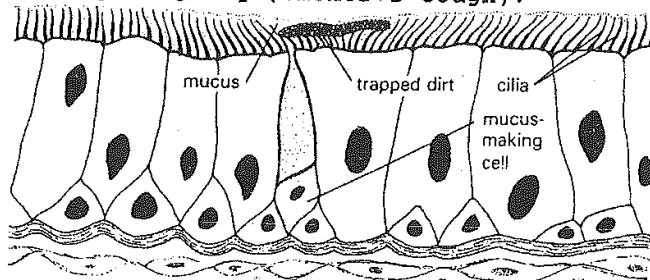
Air goes along the bronchioles into the air sacs. Oxygen from the air passes through the air sac wall into tiny capillaries around the air sac. Blood travels from the lungs to every part of the body. The oxygen goes from the blood into the cells. There it is used up in the respiration process to produce energy. The carbon dioxide and water which are also produced go from the cells and into the lungs, up through the bronchus and windpipe and out through the nose and mouth. In this way, when you breathe out, your body gets rid of carbon dioxide and water vapour.

Cleaning up inhaled air

Along the inside of your nose, and bronchi are two types of specialized cells which help to keep the lungs free of dirt. There are cells which produce a sticky liquid called mucus and other cells with moving hairs called cilia.

These cells help to take dirt (smoke, dust, chalk, germs) from the air you breathe in. The mucus traps the dirt. Then the cilia move the mucus along the tubes, away from the lungs. You either swallow or cough up the mucus (and dirt and germs) (see Figure 23). Smoke and tar from cigarettes stops these cells with cilia working normally by making them lose the little hair-like projections and so large amounts of mucus and dirt collect in the lungs of smokers. This mucus and dirt can only be removed by heavy coughing (smoker's cough).

Figure 23.
Cilia and mucus trap dirt and tar in the respiratory system



Gaseous Exchange

Figure 21a shows a close look at one air sac. It looks like a bunch of peanuts. The air sacs are called alveoli. The alveoli are like hollow bubbles, which provide a very large surface area for gases to get into and out of the blood. The surface area of all the alveoli put together is about the same as the area of a basketball court. Alveoli are covered with many capillaries so that there is a rich blood supply in the lungs. Oxygen passes into the capillaries from the alveoli. Alveoli have thin moist walls, so that gases can dissolve in the moisture and then pass through the alveoli wall easily into the blood.

These three features of the alveoli: large surface area, rich blood supply, and moist walls, are similar features of all regions in which gas exchange takes place.

Figure 21a. Alveoli

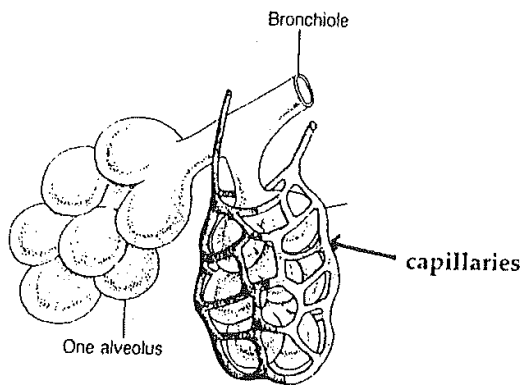


Figure 21b. Gas exchange

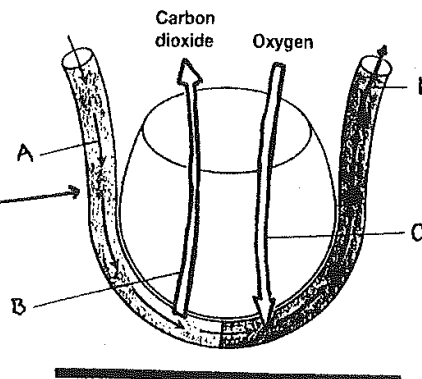


Figure 21b shows what happens in the alveoli. Blood flows to the lungs from around the body. It carries carbon dioxide produced by respiration in the cells of the body (A). Carbon dioxide passes from the blood into the alveoli. Then it is breathed out of the body (B). Oxygen is breathed into the lungs. It dissolves in the water lining the alveoli. From there it passes into the blood (C). Blood carries oxygen away from the lungs to every cell in the body, where it is used during respiration (D). This trade of oxygen and carbon dioxide is called gaseous exchange.

Exercise

Functions of Parts of Respiratory System

Using the following phrases, complete the table below identifying and explaining the functions of parts of the respiratory system. (What does each part do?)

- * provides protection for lungs & heart
- * passages/tubes for taking gases into each of the 2 lungs
- * small passages/tubes for air to travel along in the lungs
- * tiny hollow bags where gases are exchanged between the blood and lungs
- * muscle which helps bring air into and out of the lungs
- * organs for breathing
- * moves the ribs in and out during breathing
- * tube taking air from your nose and mouth into your chest

Part of body	Function
lungs trachea bronchi bronchioles alveoli diaphragm ribs intercostal muscles	

Carrying Oxygen in the blood

Red blood cells carry oxygen from the lungs to all the cells of the body. They are red in colour because to the protein haemoglobin inside them. Figure 24 shows oxygen being carried by the blood. The red cells pick up oxygen as blood is pumped through the lungs (A). The oxygen and haemoglobin join to form oxyhaemoglobin. This is bright red (B). As the blood passes around the body, the oxyhaemoglobin breaks down and releases oxygen to the body cells (C). Without oxygen blood is dull red. It is pumped back to the lungs for more oxygen (D).

The circulatory system, which transports oxygen and carbon dioxide within the body, is essential for respiration to take place.

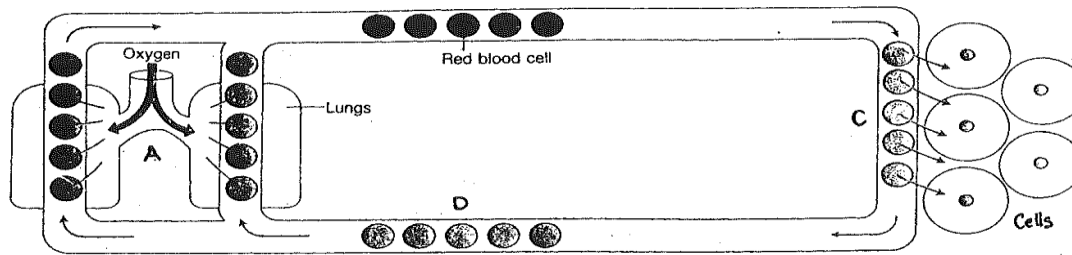


Figure 22. Oxygen being carried by the blood

Gaseous exchange therefore, happens in 2 places in the body.

(1) In the lungs: capillaries surrounding the alveoli release carbon dioxide and absorb oxygen.

(2) In the cells: (where respiration takes place) capillaries release oxygen to the cells and absorb carbon dioxide.

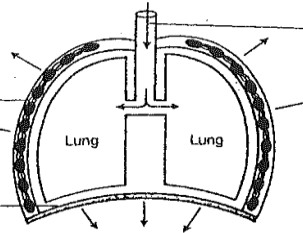
How Breathing Happens

Two sets of muscles control your breathing. They are the diaphragm and the intercostal muscles (the muscles joined to the ribs). They can be seen in Figure 20 on the next page. The two sets of muscles make air go into and out of your lungs by making your chest cavity bigger or smaller. These processes are shown and explained in Figure 24.

When you breathe in

1 The intercostal muscles contract. These pull the rib cage upwards. So the chest increases in volume.

2 The diaphragm contracts. This makes it flatten out, so the chest gets even larger.

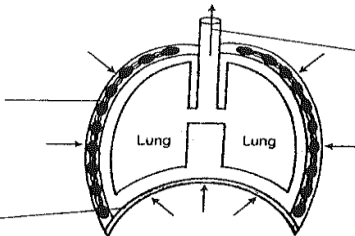


3 As the chest gets larger, air is sucked down the wind-pipe and into the lungs.

When you breathe out

1 The intercostal muscles relax, which lowers the rib cage. The chest decreases in volume.

2 The diaphragm relaxes, and bulges upwards. This decreases the volume of the chest even more.



3 Because the chest has got smaller, air is forced out of the lungs.

Figure 24. Breathing in and out

Put your hands on your sides and take a deep breath. You can feel your chest getting larger (volume increasing). Breathe out and you feel the volume decreasing. Next time you run or play hard, notice how you sometimes put your hands on your sides to help you get your wind back. This helps the rib cage to be able to move out as much as possible so you can take in plenty of air.

Practical Exercise 14: Effect of Exercise on Breathing

1. Select a volunteer. Observe him/her breathing as naturally as possible. Count how many breaths are taken in one minute.
2. Send the volunteer on a quick run around the school oval. When he/she returns observe any changes in their breathing pattern.
3. Can you explain these changes?

There are three major effects of increased physical activity on your body.

- (1) breathing becomes faster and deeper
- (2) heart pumps faster and stronger
- (3) get more hungry (lose weight)

These effects all occur because of the bodies need for more energy when you are working hard. This energy is released by respiration. When you are exercising hard the extra energy needed is supplied by burning up more food in the cells during respiration. Respiration needs food and oxygen. Therefore you must breathe faster and deeper to get more oxygen to burn up this food (and get rid of carbon dioxide). Your digestive system needs more food to digest to supply food ready for respiration. Lastly your heart pumps faster and stronger to move the food and oxygen quickly around to the respiring cells of your body.

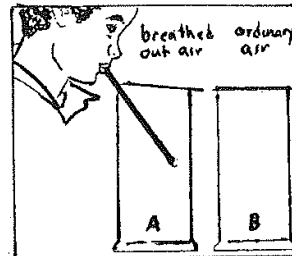
A person who is unfit breathes faster. This is because they are not able to change over enough air in one breath, because the muscles in their chest are unfit. They have to breathe faster to get the extra oxygen they need.

People whose lungs are not working properly breathe faster. Many people have difficulty breathing because they are suffering from lung diseases. Lots of other people have difficulty breathing because they have damaged their lungs by smoking.

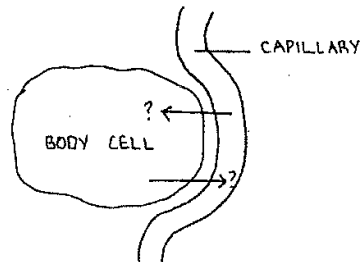
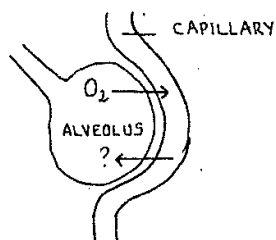
Review Questions

1. What does a cell need to produce energy?
2. Why is there more water vapour in exhaled air than in inhaled air?
3. How does the air in your classroom change during a lesson? Explain why.
4. How does your body use the energy from food?
5. Which of the jars A or B
 - (a) let a splint burn longer
 - (b) turn lime water milky

Explain your answers.



6. What 2 major body processes are essential for respiration to take place?
7. Explain what happens to intercostal muscles and the diaphragm as you breathe in.
8. TRUE OR FALSE? When you breathe out, your chest cavity is made smaller because your intercostal and diaphragm muscles relax.
9. Why must alveoli have thin moist walls?
10. Copy the following diagrams. Complete them by showing the direction that oxygen and carbon dioxide flow at these gas exchange surfaces.



12. What are mucus and cilia? How do they help to clean up the air you breathe in?
13. Explain how your body gets extra (a) energy (b) oxygen when you exercise.