

LIFE PROCESSES RESPIRATION

Question 1: *Why do organisms need food?*

Answer: Organisms need food for obtaining energy to perform the vital functions.

Question 2: *How does food yield energy?*

Answer: Food is broken down with the help of various enzymes in the cells. This liberates energy.

Question 3: *What is respiration?*

Answer: Respiration is the breakdown of organic compounds into simpler compounds accompanied by the release of energy in the form of ATP.

Question 4: *What is a respiratory substrate?*

Answer: The substance used by the cell to derive energy is called a respiratory substrate.

Question 5: *Name a few respiratory substrates. Which of them is most commonly used?*

Answer: Carbohydrates, fats, proteins are some of the respiratory substrates. The most commonly used of them is glucose, a carbohydrate.

Question 6: *Give the general equation for respiration.*

Answer: $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 38ATP$

Question 7: *What are the stages of respiration?*

Answer: Respiration takes place in the following stages:

External respiration or gaseous exchange: The exchange of gases between the environment and the body is called external respiration or gaseous exchange.

Internal respiration: The bio-chemical processes involved in respiration which break down the substrate to release energy take place in the tissues within the cells of an organism. Thus, this is also called the cellular or tissue respiration.

Question 8: *What is the respiratory surface?*

Answer: The area where the gaseous exchange takes place is called the respiratory surface.

Question 9: *What are the characteristics of an ideal respiratory surface?*

Answer: The respiratory surface should have the following characteristics:

- 1) It should be permeable to the gases.
- 2) It should be thin (1mm or less) to allow effective diffusion.
- 3) It should be richly supplied with blood vessels or bodily fluids to allow maximum uptake of oxygen
- 4) It should have a large surface area to allow maximum uptake of oxygen in minimum time.

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Question 10: How does gaseous exchange take place in the lower plants?

Answer: In lower plants exchange of gases takes place through the general body surface as they are not highly modified or specialised.

Question 11: Which part of a plant is involved in the gaseous exchange?

Answer: The entire plant is involved in gaseous exchange - leaves (stomata), stem (lenticels) and general surface of the roots.

Question 12: How does gaseous exchange take place in the leaves?

Answer: The leaves have openings called the stomata which are generally on the lower surface of the leaves. It is through the stomata that the gases and water vapour diffuse in and out easily. The oxygen diffuses in through the stomata and then enters the leaf cells. Similarly, the carbon dioxide produced by the leaf cells diffuses out through the stomata.

Question 13: What are lenticels?

Answer: In woody stems, the entire surface is covered by bark which is impervious to gases or water. However, there are certain openings or pores in the layer of bark. These are called the lenticels. They are visible more raised than the general surface of the stem. At the base of the lenticels are loosely arranged cells which allow the diffused gases to pass in and out.

Question 14: What are pneumatophores?

Answer: Plants which grow in salty water show specialised roots called the pneumatophores. These are roots growing out of the surface of water with numerous pores on their surface.

Question 15: How does exchange of gases take place in fish?

Answer: Fish have specialised organs called the gills for exchange of gases.

Question 16: From where do the fish obtain their oxygen supply?

Answer: Fish utilise the oxygen dissolved in the water in which they live.

Question 17: What is operculum?

Answer: It is a plate-like cover made up of muscles and bony layers present on the outer side of the gills.

Question 18: Describe inspiration and expiration in fish.

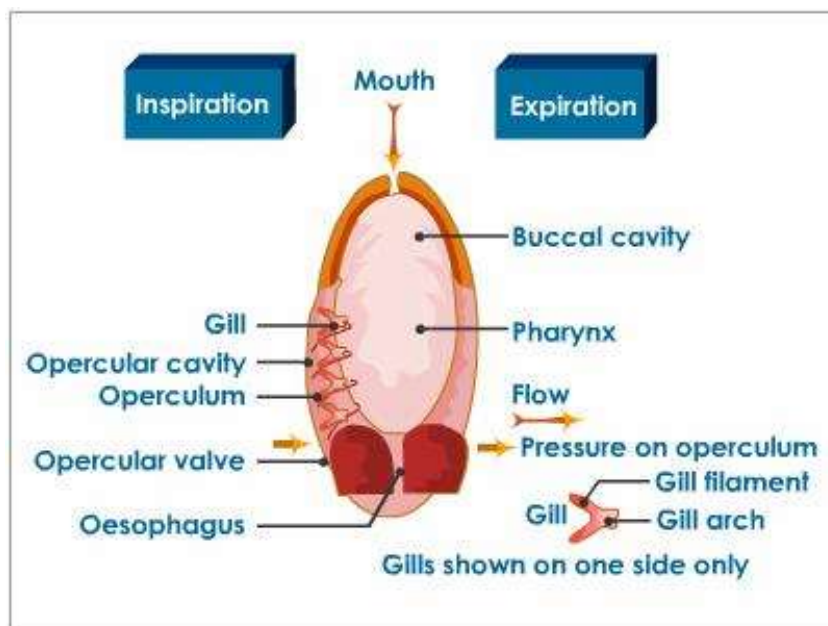
Answer: Water moves through the gills by the coordinated action of mouth and the operculum. Taking in water and thereby oxygen is called inspiration and exit of water is called expiration.

INSPIRATION: When the mouth is open, the space inside buccal cavity increases which reduces the pressure inside. This makes the water enter the buccal cavity. At the same time, the water pressure outside presses the posterior end of the operculum against the body preventing the entry of water into the gills from this end.

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The opercular cavity is enlarged by the contraction of the muscles in the operculum. This decreases the pressure in the opercular cavity and draws water from the buccal cavity into the opercular cavity.

This water flows over the gill filaments during which the exchange of gases between the capillaries and the water take place

**EXPIRATION:**

The mouth and the entrance to the oesophagus close and the floor of the buccal cavity rises. This pushes the water out into the opercular cavity. This water which is under high pressure forces open the operculum at the posterior end and moves out into the surrounding.

Question 19: Which are the respiratory organs in man?

Answer: The respiratory organs in man are the lungs.

Question 20: Where are the lungs in man situated?

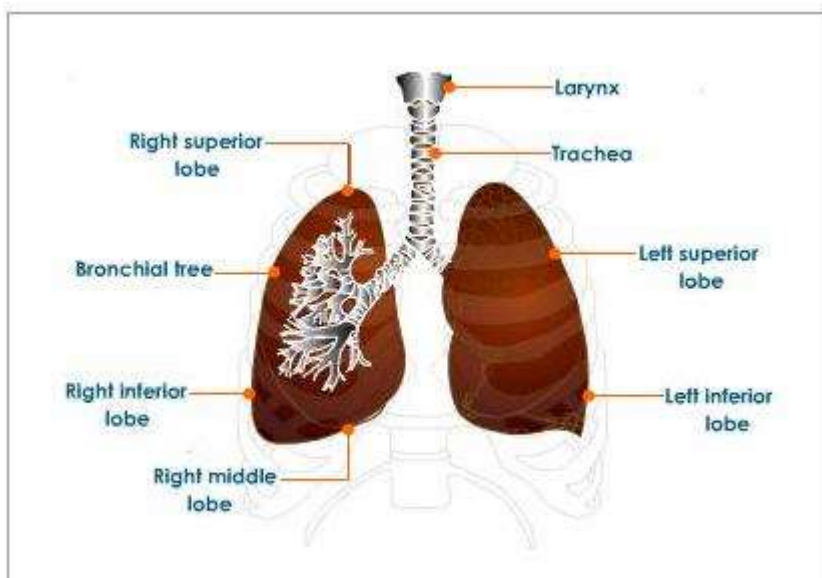
Answer: In man, there are a pair of lungs present in the thoracic cavity. They are found next to the heart. Towards the front they are protected by the chest wall that is formed by the rib cage and the muscles associated with the ribs. There are 12 pairs of ribs and two sets of muscles called the outer and inner intercostal muscles in the chest wall. Posteriorly, lungs are bound by a muscular diaphragm that separates the thoracic cavity from the abdomen.

Question 21: Describe the structure of the lungs.

Answer: Lungs are spongy, lobed and elastic organs that are broad at the bottom and tapering towards the top. They consist of air sacs, the alveolar ducts, bronchioles (which connect them to the respiratory tract) and the blood vessels.

Each lung is enclosed by two membranes called the outer and the inner pleural membrane. The membranes enclose a space called the pleural cavity that contains a fluid. The lungs are capable of expanding and contracting as they are elastic organs. Lubrication for their free movement is provided by the fluid in the pleural cavity.

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Question 22: Name the various parts of the respiratory tract.

Answer: The various parts of the respiratory tract are nose, pharynx, glottis, larynx, trachea, bronchus, bronchioles, alveolar ducts and alveoli.

Question 23: Write a brief note about the nasal cavity.

Answer: The nasal cavity opens to the outside through the openings called the nostrils. The nasal cavity is lined by fine hairs that filter the dust particles from the air. It is separated from the mouth by hard and soft palate that form its floor. It opens into the region called the pharynx.

Question 24: What are the functions of the pharynx?

Answer: Pharynx is the region of the respiratory tract that connects the nasal cavity to the larynx. It is a region which is common to the passage of food and air. It has two functions:

- 1) Taking in of extra air when required. For example, during heavy exercise.
- 2) Allowing passage of air when the nose is blocked.

Question 25: What is the significance of respiration?

Answer: Respiration is an important process in nature. It is the process by which the organic compounds are broken down to release energy in the form of ATP molecules. Respiration makes use of oxygen and releases carbon dioxide, which is then used by plants during photosynthesis that releases oxygen. Thus, respiration has an important role to play in maintaining the delicate oxygen-carbon dioxide balance in nature.

Question 26: Write short notes on trachea.

Answer: Trachea is also called the windpipe. The trachea are held open with the help of C-shaped cartilagenous rings. The open ends of the rings are towards oesophagus - the foodpipe.

Trachea is situated in front of the oesophagus. The cartilages keep the larynx and trachea from collapsing even when there is no air in them. The trachea then branch into two main branches called bronchi.

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Question 27: *How do the trachea and bronchi keep the respiratory tract healthy?*

Answer: The trachea and the bronchi are lined with ciliated epithelial cells and secretory cells (goblet cells). The secretory cells secrete mucus which moistens the air as it passes through the respiratory tract and also traps any fine particles of dust or bacteria that have escaped the hairs of the nasal cavity.

The cilia beat with an upward motion so that the foreign particles along with the mucus is sent to the base of the buccal cavity from where it may be either swallowed or coughed out.

Question 28: *How does exchange of gases take place in the alveoli?*

Answer: The capillaries lining the alveoli have impure blood which has low concentration of oxygen. So, the oxygen from the air easily diffuses into the blood through the thin barrier of the alveolus wall. Similarly when the concentration of carbon dioxide is quite high in the blood, the gas easily diffuses out into the alveolar space. From here, the air which has comparatively more concentration of carbon dioxide than the air that entered it, leaves the lungs.

Question 29: *What is oxyhaemoglobin and how is it formed?*

Answer: Oxyhaemoglobin is the compound formed by the combination of haemoglobin and oxygen. The haemoglobin pigment (Hb) has an affinity for oxygen. In the lungs, it combines with oxygen and forms HbO₂, oxyhaemoglobin.



Question 30: *How does carbon dioxide get transported in the blood?*

Answer: Carbon dioxide is transported in the blood as bicarbonate ions in the plasma region of the blood.

Question 31: *What is inspiration?*

Answer: During inspiration, the outer intercostal muscles contract which raises the chest cavity or the ribs. This is accompanied by the lowering of the diaphragm. Together these movements serve to increase the area of the thoracic cavity which reduces the pressure. The air from outside rushes into the lungs.

Question 32: *What is expiration?*

Answer: During expiration or exhalation the inner intercostal muscles contract bringing the ribs back to the original position and the diaphragm is also raised back. This reduces the space in the chest cavity and increases the pressure. This expels the air out of the lungs.

Question 33: *Define the terms (a) Lung capacity (b) Vital capacity*

Answer: (a) Lung capacity: The maximum air that can be held in the two lungs at any time is called the lung capacity. It is about 6000 mL.

(b) Vital capacity: The maximum volume of air that can be exchanged in one breath in and out is called the vital capacity. It is about 5000mL.

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Question 34: Define the terms:

a) *Inspiratory reserve volume*

b) *Expiratory reserve volume*

Answer: a) Inspiratory reserve volume

The volume of air that can be drawn in after normal inspiration is about 1500 mL and is called the inspiratory reserve volume (complemental air).

b) Expiratory reserve volume

The volume of air that can be expelled out after a normal expiration is about 1500 mL and is called the expiratory reserve volume (supplemental air).

Question 35: *What is breathing?*

Answer: The mechanism of taking in oxygen and giving out carbon dioxide is called breathing.

Question 36: *Breathing and respiration are not synonymous. Why?*

Answer: Respiration involves both the mechanical and the bio-chemical processes whereas breathing is only the mechanical or physical process of exchange of gases.

Question 37: *What is cellular respiration?*

Answer: In the cells, the substrate, often glucose, is broken down into carbon dioxide and water in the presence of oxygen. This process releases energy and involves a series of bio-chemical reactions. This is called cellular respiration.

Question 38: *What are the major steps of cellular respiration?*

Answer: The major steps of cellular respiration are:

- 1) Glycolysis
- 2) Krebs's cycle
- 3) Electron Transport Chain

Question 39: *What is anaerobic respiration?*

Answer: Respiration or breakdown of food in the complete absence of free oxygen is called anaerobic respiration.

Question 40: *Name two anaerobes.*

Answer: *E.coli* and *Clostridium tetani* are two anaerobes.

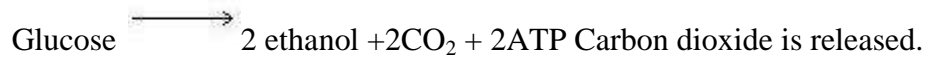
Question 41: *Where do you find anaerobic respiration in animals?*

Answer: In animals, anaerobic respiration can be seen in certain skeletal muscle cells when they are short of oxygen. For example, during the period of heavy exercise.

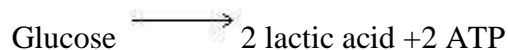
Question 42: *What are the types of anaerobic respiration?*

Answer: Anaerobic respiration is of two types based on the products formed.

a. Alcoholic Fermentation: It occurs in plants like the yeast (a fungus). It can be represented as follows:



b. Lactic acid Fermentation: It occurs in animal cells. It can be represented as follows:



During this process, no carbon dioxide is released.

Question 43: *Which type of respiration is more efficient - aerobic or anaerobic? Why?*

Answer: Aerobic respiration is more efficient as it produces 38 ATP molecules for every molecule of glucose used up. Whereas anaerobic respiration yields only 2 ATP molecules for each molecule of glucose.

Question 44: *What are the uses of fermentation?*

Answer: Fermentation is a commercially important process. It is used in the following processes:

- 1) Manufacture of alcohol
- 2) Curing of tea leaves, tobacco, etc.
- 3) Formation of curd from milk
- 4) Manufacture of vinegar, an industrially important compound.