

Chapter 6- Respiration in Organisms - Textbook Exercise -(Solved)

Question 1- Why does an athlete breathe faster and deeper than usual after finishing the race?

Answer- An athlete breathes faster and deeper than usual after finishing the race due to the increased demand for oxygen in the body. During the race, the athlete's muscles work harder and require more energy. This energy is produced by the muscles through the process of respiration, which requires oxygen. Due to the intense physical activity, the muscles may not get enough oxygen and may perform anaerobic respiration, which causes a buildup of lactic acid, making the muscles feel tired and sore. Breathing faster and deeper allows more oxygen to be inhaled and transported to the muscles, and helps in removing the carbon dioxide and lactic acid buildup more efficiently, aiding in faster recovery of the muscles.

[Also Check -Rapid Revision - Class 7 Science- Chapter 10- Respiration in Organisms](#)

Question 2 - List the similarities and differences between aerobic and anaerobic respiration.

Answer-

Similarities-

- Purpose- Both aerobic and anaerobic respiration serve the fundamental purpose of producing energy required for various cellular activities.
- Involvement of Glucose- In both processes, glucose is used as a primary substrate to generate energy.

Differences-

- **Oxygen Utilisation-**
 - Aerobic Respiration- Oxygen is utilised in the process. Glucose breaks down completely in the presence of oxygen, producing carbon dioxide and water as by-products.
 - Anaerobic Respiration- Oxygen is not utilised. Glucose partially breaks down in the absence of oxygen, producing alcohol or lactic acid.
- **Energy Production-**
 - Aerobic Respiration- A significant amount of energy is produced, as glucose is completely oxidised.
 - Anaerobic Respiration- Less energy is produced in comparison to aerobic respiration, due to partial oxidation of glucose.
- **By-products-**
 - Aerobic Respiration- Carbon dioxide and water are the by-products.

- Anaerobic Respiration- Lactic acid (in muscles) or ethanol and carbon dioxide (in yeast) are produced.
- **Occurrence-**
 - Aerobic Respiration- Commonly occurs in most cells of the body where sufficient oxygen is available.
 - Anaerobic Respiration- Primarily occurs during heavy exercise or in cells where oxygen is not readily available, and in organisms like yeast.
- **Endurance-**
 - Aerobic Respiration- Supports sustained activities as it produces more energy.
 - Anaerobic Respiration- Suitable for short bursts of energy due to less energy production and the build-up of lactic acid or ethanol.

[Also Check - NCERT Exemplar Solutions- Class 7 Science Chapter 6- Respiration in Organisms.](#)

Question 3 - Why do we often sneeze when we inhale a lot of dust-laden air?

Answer- Sneezing is a protective reflex action of the body that helps to expel foreign particles, such as dust, from the nasal cavity. When a lot of dust-laden air is inhaled, the dust particles get trapped in the hair present in our nasal cavity. However, some particles may get past the hair and irritate the lining of the nasal cavity. This irritation triggers the sneezing reflex, which forcefully expels the air along with the foreign particles, ensuring that cleaner air enters the respiratory system, preventing any potential respiratory issues or infections. Sneezing, therefore, acts as a natural defence mechanism to maintain the cleanliness and health of the respiratory tract.

Question 4- Take three test-tubes. Fill $\frac{3}{4}$ th of each with water. Label them A, B and C. Keep a snail in test-tube A, a water plant in test-tube B and in C, keep snail and plant both. Which test-tube would have the highest concentration of CO₂?

Answer- Test-tube A, which contains only the snail, would have the highest concentration of CO₂. This is because the snail respire aerobically, taking in oxygen and releasing carbon dioxide (CO₂) into the water as a waste product. In this scenario, there are no plants present to absorb the CO₂ produced by the snail for photosynthesis, which would have otherwise helped in reducing the CO₂ concentration. Therefore, the CO₂ released by the snail accumulates in the water of test-tube A, leading to the highest concentration among the three test-tubes.

Question 5-

(a) In cockroaches, air enters the body through

- (i) lungs
- (ii) gills

- (iii) spiracles
- (iv) skin

Answer- (iii) spiracles

Explanation- Cockroaches, like other insects, breathe through small openings called spiracles. These spiracles are connected to a network of air tubes known as tracheae, which help in the exchange of gases, allowing oxygen to reach every cell of their body.

(b) During heavy exercise, we get cramps in the legs due to the accumulation of

- (i) carbon dioxide
- (ii) lactic acid
- (iii) alcohol
- (iv) water

Answer- (ii) lactic acid

Explanation- During heavy exercise, when the oxygen supply is not enough for muscles, anaerobic respiration takes place in our muscle cells, leading to the production and accumulation of lactic acid, which causes muscle cramps.

(c) Normal range of breathing rate per minute in an average adult person at rest is-

- (i) 9–12
- (ii) 15–18
- (iii) 21–24
- (iv) 30–33

Answer- (ii) 15–18

Explanation- An average adult at rest generally breathes about 15–18 times per minute. This breathing rate allows enough oxygen intake for cellular activities and removal of carbon dioxide.

(d) During exhalation, the ribs

- (i) move outwards
- (ii) move downwards
- (iii) move upwards
- (iv) do not move at all

Answer- (ii) move downwards

Explanation- During exhalation, the diaphragm and the intercostal muscles relax, causing the chest cavity to decrease in volume and the ribs to move downwards, helping to push the air out of the lungs.

Question 6- Match the items in Column I with those in Column II-

Column I	Column II
(a) Yeast	(i) Earthworm
(b) Diaphragm	(ii) Gills
(c) Skin	(iii) Alcohol
(d) Leaves	(iv) Chest cavity
(e) Fish	(v) Stomata
(f) Frog	(vi) Lungs and skin
	(vii) Tracheae

Answers-

(a) Yeast - (iii) Alcohol

Explanation- Yeasts are involved in the process of fermentation, which results in the production of alcohol as a by-product of anaerobic respiration.

(b) Diaphragm - (iv) Chest cavity

Explanation- The diaphragm is a muscular sheet that separates the chest cavity from the abdominal cavity and plays a vital role in breathing by helping in the expansion and contraction of the lungs.

(c) Skin - (i) Earthworm

Explanation- Earthworms breathe through their skin, where the exchange of gases takes place directly through the moist surface of the skin.

(d) Leaves - (v) Stomata

Explanation- Leaves have tiny pores called stomata, which are involved in the exchange of gases, including the intake of carbon dioxide and release of oxygen during photosynthesis.

(e) Fish - (ii) Gills

Explanation- Fish use gills to extract oxygen from water and remove waste carbon dioxide, which facilitates their survival in water.

(f) Frog - (vi) Lungs and skin

Explanation- Frogs have the capability to breathe through both their lungs and skin, adapting their breathing based on their environment and activity.

Question 7- Mark 'T' if the statement is true and 'F' if it is false-

(i) During heavy exercise the breathing rate of a person slows down. (T/F)

Answer- F

Explanation- During heavy exercise, the breathing rate of a person increases to supply more oxygen to the muscles.

(ii) Plants carry out photosynthesis only during the day and respiration only at night. (T/F)

Answer- F

Explanation- Plants carry out photosynthesis during the day when sunlight is available. However, respiration occurs 24 hours a day, as it is necessary for producing energy.

(iii) Frogs breathe through their skins as well as their lungs. (T/F)

Answer- T

Explanation- Frogs can breathe through both their skins and lungs. Through their skin, they can breathe in a water environment, and they use lungs when in a terrestrial environment.

(iv) The fishes have lungs for respiration. (T/F)

Answer- F

Explanation- Fishes use gills, not lungs, for respiration. Gills help them to extract oxygen from water.

(v) The size of the chest cavity increases during inhalation. (T/F)

Answer- T

Explanation- During inhalation, the diaphragm contracts and the rib cage moves upward and outward, increasing the size of the chest cavity, allowing the lungs to expand and fill with air.

Question 8 - Given below is a square of letters in which are hidden different words related to respiration in organisms. Find the words for your respiratory system using the clues provided.

(i) The air tubes of insects

Answer- Tracheae

(ii) Skeletal structures surrounding chest cavity

Answer- Ribs

(iii) Muscular floor of chest cavity

Answer- Diaphragm

(iv) Tiny pores on the surface of leaf

Answer- Stomata

(v) Small openings on the sides of the body of an insect

Answer- Spiracles

(vi) The respiratory organs of human beings

Answer- Lungs

(vii) The openings through which we inhale

Answer- Nostrils

(viii) An anaerobic organism

Answer- Yeast

(ix) An organism with tracheal system

Answer- Insect

Question 9 - The mountaineers carry oxygen with them because-

(a) At an altitude of more than 5 km there is no air.

(b) The amount of air available to a person is less than that available on the ground.

(c) The temperature of air is higher than that on the ground.

(d) The pressure of air is higher than that on the ground.

Answer- (b) The amount of air available to a person is less than that available on the ground.

Explanation-

- At higher altitudes, the concentration of oxygen in the air is less compared to the ground level. The lower availability of oxygen at high altitudes makes it difficult for mountaineers to breathe, leading them to carry supplemental oxygen. This assists them in maintaining proper oxygen levels in the body, supporting necessary cellular respiration while climbing.

Extended Learning — Activities and Projects

Question 1- Observe fish in an aquarium. You will find flap-like structures on both sides of their heads. These are flaps which cover the gills. These flaps open and close alternately. On the basis of these observations, explain the process of respiration in the fish.

Answer-

Respiration in fish occurs through their gills, which are specialised organs for exchanging gases with the surrounding water. Here is an explanation based on the observation of flap-like structures covering the gills-

- The flap-like structures observed on both sides of the fish's head are known as opercula. They play a significant role in the breathing process of the fish by protecting the delicate gills and aiding in the efficient flow of water over them.
- As the fish opens its mouth, water flows in, passing over the gills. The operculum closes, preventing water from exiting through the openings, forcing it to pass over the gill filaments where gas exchange occurs.
- Oxygen present in the water is absorbed by the blood vessels in the gills, and at the same time, carbon dioxide, a waste product of cellular respiration, is expelled from the blood into the water.
- The opercula then opens, allowing the deoxygenated water to flow out, completing the process of respiration.
- This alternate opening and closing of the operculum ensure a continuous and efficient flow of water over the gills for optimal gas exchange, allowing the fish to 'breathe' underwater.

Question 2 - Visit a local doctor. Learn about the harmful effects of smoking. You can also collect material on this topic from other sources. You can seek help from your teacher or parents. Find out the percentage of people in your area who smoke. If you have a smoker in your family, confront him with the material that you have collected.

Answer-

- **Harmful Effects of Smoking-**

- Lung Damage- Smoking damages the lungs, making it harder for the person to breathe. This is because the tar in cigarettes coats the lungs, reducing their elasticity.
- Cancer- One of the most severe risks of smoking is the development of different types of cancers, especially lung cancer. The carcinogens in tobacco smoke increase the chance of mutations in the body's DNA.
- Cardiovascular Diseases- Smoking increases the risk of cardiovascular diseases, including coronary heart disease, heart attack, and stroke.
- Respiratory Infections- Smokers are more susceptible to respiratory infections due to weakened immune responses from the continuous intake of harmful chemicals.
- Decreased Oxygen Supply- Carbon monoxide in cigarette smoke binds to haemoglobin in red blood cells, thereby reducing the amount of oxygen that reaches the body's tissues and organs.
- **Sources of Material on Harmful Effects of Smoking-**
 - Local doctor's advice and pamphlets.
 - Health websites and medical journals.
 - Anti-smoking campaigns and awareness programs.
- **Percentage of People in My Area Who Smoke-**
 - After conducting a small survey in my neighbourhood, I found that approximately 20% of the residents are active smokers. (Note- This percentage is a hypothetical number and can vary based on actual data.)
- **Confronting a Smoker in the Family-**
 - Having a conversation with a family member about the risks of smoking can be challenging but is essential for their health. It's crucial to approach the subject with empathy and understanding.
 - Present the collected materials and facts in a non-confrontational manner, expressing genuine concern for their well-being.
 - Encourage them to consider quitting and offer support in any form they might need, whether it's through counseling, nicotine replacement therapies, or simply being there for emotional support.

Question 3 - Visit a doctor. Find out about artificial respiration. Ask the doctor-

(a) When does a person need artificial respiration?

Answer- A person requires artificial respiration when they cannot breathe on their own. This can occur in various situations such as drowning, choking, suffocation, or a severe asthma attack. It might also be necessary during a medical emergency like a heart attack or respiratory failure due to an injury, illness, or infection that affects breathing.

(b) Does the person need to be kept on artificial respiration temporarily or permanently?

Answer- The need for artificial respiration can be temporary or permanent, depending on the individual's medical condition. Temporary artificial respiration may be applied during emergencies until the person can breathe independently or further medical treatment is administered. In contrast, some severe conditions, such as chronic respiratory diseases or

severe brain injury, may require a person to be on prolonged or permanent artificial respiration, typically facilitated by a mechanical ventilator.

(c) From where can the person get a supply of oxygen for artificial respiration?

Answer- Oxygen for artificial respiration can be supplied from various sources such as-

- Oxygen cylinders/tanks- Portable oxygen containers that can be used in emergencies, home care, or hospitals.
- Oxygen concentrators- Devices that extract oxygen from the ambient air, used primarily in a home-care setting.
- Mechanical ventilators- Hospital-based machines that deliver oxygen directly to the patient's lungs and can be adjusted to meet individual needs.
- Ambient Air- In emergency situations, like CPR (Cardiopulmonary Resuscitation), the rescuer may use their breath to provide oxygen to the person in need.

Each method of oxygen delivery can be used based on the urgency, location, and specific needs of the individual.

Question 4 - Measure the breathing rate of the members of your family and some of your friends. Investigate-

(c) If the breathing rate of children is different from that of adults.

Answer- Yes, the breathing rate of children is different from that of adults. Children, especially infants, have a higher breathing rate. This is because their metabolic rate is higher, and their organs are still growing and developing, requiring more oxygen. The respiratory system, including the lungs, is also smaller in size, which means they take in less air per breath, making the frequency of breaths higher.

Explanation for differences- The higher breathing rate in children helps supply adequate oxygen for their high metabolic needs and ensures the removal of carbon dioxide, a waste product of metabolism. As a person matures, their breathing rate typically decreases as their respiratory system becomes more efficient and their metabolic rate slows down.

(d) If the breathing rate of males is different from that of females.

Answer- There might be slight differences in the breathing rates of males and females, but they are generally not significant and fall within a similar range. However, factors such as physical fitness, stress levels, and overall health can influence breathing rates and cause variations among individuals, regardless of gender.

Explanation for differences- Hormones, body size, and muscle mass can also play roles in minor variations in breathing rates between males and females. For instance, in some cases, hormonal fluctuations in females due to menstrual cycles can slightly influence breathing rates. Remember that individual health status and fitness levels play a substantial role in breathing rates beyond gender differences.