

UNIQUE NOTES

BIOLOGY 10

According to New Board Pattern



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UNIT
10

Gaseous Exchange

Q.1 What is breathing? How is it different from respiration?

(Board 2014) 10410001

Ans. Breathing

The process through which animals take air in their bodies to get oxygen from it and then give out the air for getting rid of carbon dioxide.

Difference between respiration and breathing

RESPIRATION	BREATHING
(i) It involves the mechanical and the bio-chemical processes.	(i) It is only the mechanical or physical process of exchanging the gases.
(ii) It is of two types and takes place in cells (cytoplasm and mitochondria).	(ii) It occurs in two phases and takes place in respiratory system.
(iii) Energy is released.	(iii) Energy is utilized.

Q.2 Describe the process of gaseous exchange in plants.

(Board 2015) 10410002

Ans. Introduction

Plants have no organs or systems for the exchange of gases with the environment. Every cell of a plant exchanges gases with the environment by its own.

Explanation
i) Gaseous Exchange in Leaves and Young Stems /
How does the gaseous exchange occur in leaves and young stems?

(Board 2018)

The leaves and young stems have stomata in their epidermis for gaseous exchange.

The inner cells of leaves (mesophyll) and stems also have air spaces among them which help in the exchange of gases. In young stems and leaves, some gaseous exchange also occurs through cuticle which is present over their epidermis.

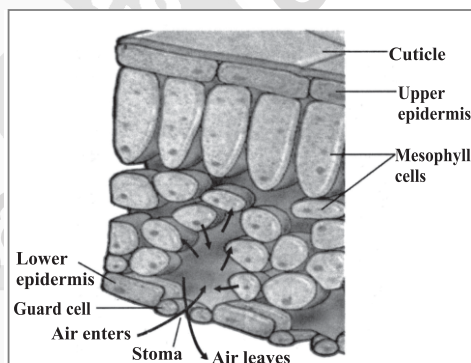
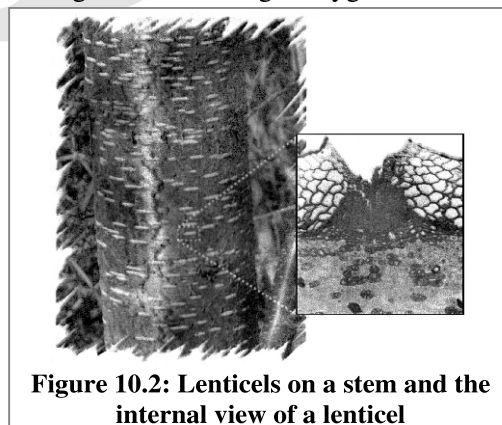
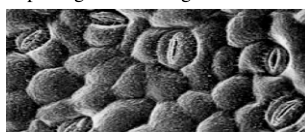
Gaseous Exchange During Day and Night Time

During the daytime mesophyll cells of leaves carry out photosynthesis and respiration side by side, the oxygen produced in photosynthesis is utilized in cellular respiration. Similarly the carbon dioxide produced during cellular respiration is utilized in photosynthesis.

However, during night when there is no photosynthesis occurring, the leaf cells get oxygen from the environment and release carbon dioxide through stomata.

ii. Gaseous Exchange in Woody Stems and Mature Roots

In woody stems and mature roots, the entire surface is covered by bark which is impervious to gases or water. However, there are certain pores in the layer of bark. These are called the lenticels. The lenticels allow air to pass through them. The lenticels are slightly more raised than the general surface of the stem.


Figure 10.1: Gaseous exchange in a leaf
Opening and Closing of a Stomata

Figure 10.2: Lenticels on a stem and the internal view of a lenticel

iii. Gaseous Exchange in Young Roots

Gases are found in the soil surrounding the roots. These gases diffuse in and out of the general surface of the young roots.

iv. Gaseous Exchange in Aquatic Plants

The aquatic plants get the oxygen dissolved in water and release carbon dioxide in the water.

Q.3 Describe the structure and functions of human respiratory system. / Describe various parts of air passageway of human respiratory system.

10410003

Ans. Introduction

In humans and other higher animals, the exchange of gases is carried out by the respiratory system.

Parts of respiratory system

We can divide respiratory system in two parts i.e.

- (1) The air Passageway (2) The Lungs

1. Air Passageway

Definition

It consists of the parts through which the outside air comes in the lungs and after the exchange of gases it goes out.

Parts of Air Passageway

This passage of air consists of the following parts:

a) Nasal Cavity and Nostrils

The nose encloses the nasal cavity. It opens to the outside through the openings called the nostrils.

Structure

The nasal cavity is divided into two portions by a wall. Each portion is lined by fine hairs and mucous.

Function

Fine hairs and mucous filter the dust particles from the air. The mucous also moistens and warms the incoming air and keeps its temperature nearly equal to that of the body.

b) Pharynx

The nasal cavity opens into the pharynx by means of two small openings called internal nostrils. It is a muscular passage and is common to both food and air.

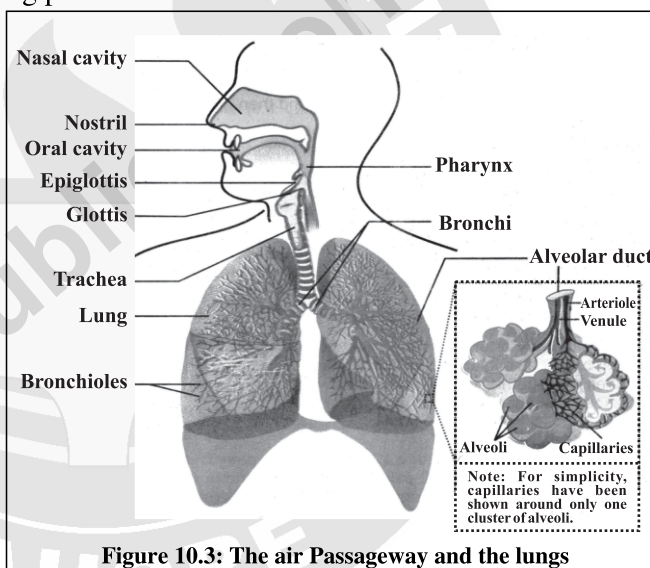


Figure 10.3: The air Passageway and the lungs

It extends to the opening of the oesophagus and the larynx.

c) Glottis and Epiglottis

Glottis is a narrow opening at the floor of pharynx which leads into larynx.

The air goes from the pharynx into the larynx. The glottis is guarded by a flap of tissue called the epiglottis.

d) Larynx or Voice box

The larynx is a box made of cartilage. It is

also called the voice box.

Location

It is present between pharynx and trachea.

Vocal cords and Sound Production

Two pairs of fibrous bands called vocal cords are stretched across the larynx. When the air passes through them, the vocal cords vibrate. This vibration produces sounds. Movements of lips, cheeks, tongue and jaws

produce specific sounds which result in speech. Speech is an ability of only humans.

e) Trachea

Larynx continues to the trachea, which is also called the windpipe.

Length and Location

It is about 12 cm long tube which lies in front of the oesophagus.

Structure

There are C-shaped cartilaginous rings in the wall of trachea.

Function of Cartilage

The cartilages keep the trachea from collapsing even when there is no air in it.

f) Bronchi

On entering the chest cavity, the trachea divides into two smaller tubes called bronchi (singular: bronchus).

Structure

The bronchi also have cartilaginous plates in their walls.

Division of Bronchi

Each bronchus enters into the lung of its side and then divides into smaller branches.

Other functions of Trachea and Bronchi

Both trachea and the bronchi are also lined with ciliated and glandular cells.

Function of Glandular Cells

These cells secrete mucous which moistens the air and also traps any fine particles of dust or bacteria that have escaped from the nasal cavity.

Function of Cilia

2. Lungs

All the alveoli on one side constitute a lung. There is a pair of lungs in the thoracic cavity.

Chest wall formation

It is made up of 12 pairs of ribs and the rib muscles called intercostal muscles.

Diaphragm

A thick muscular structure present below the lungs is called diaphragm. It separates the chest cavity from abdominal cavity.

Lobes of lungs

The left lung is slightly smaller and has two lobes and the right lung is bigger with three lobes. They are spongy and elastic organs.

Blood vessels of lungs

The lungs also have blood vessels that are the branches of the pulmonary arteries and veins.

The cilia beat with an upward motion so that the foreign particles along the mucous are sent to the oral cavity from where it may be either swallowed or coughed out.

g) Bronchioles

The bronchi continue dividing in the lungs until they make several fine tubes called bronchioles. The bronchioles progressively lose the cartilages as they become narrower.

h) Alveolar Ducts

The bronchioles end as fine tubules called the alveolar ducts.

i) Alveoli

Each alveolar duct opens into a cluster of pouches called alveoli.

Structure

Each alveolus is a sac-like structure lined by a single layer of epithelial cells. It is bound on the outside by a network of capillaries.

j) Pulmonary Artery

The pulmonary artery from the heart containing deoxygenated blood enters the lungs and branches into arterioles and then into capillaries which surround the alveoli.

k) Pulmonary Vein

Capillaries join together to form the venules which form pulmonary vein. The pulmonary vein carries the oxygenated blood back to the heart.

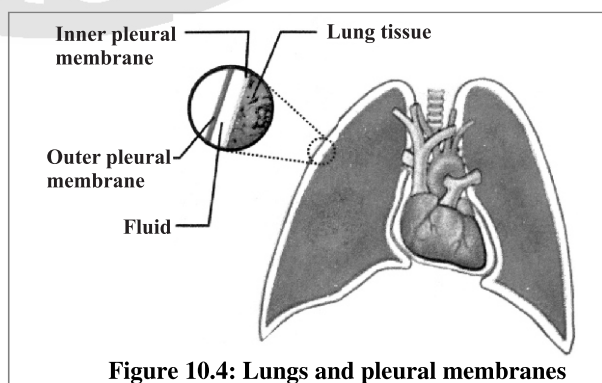


Figure 10.4: Lungs and pleural membranes

Pleural membranes

Each lung is enclosed by two membranes called the outer pleural membrane and the inner pleural membrane.

The membranes enclose a fluid which provides lubrication for the free expanding and contracting of the lungs.

Q.4 Describe the mechanism of breathing.

(Board 2014)

10410004

Ans. Introduction

The physical movements associated with the gaseous exchange are called breathing.

Explanation

The breathing movements are involuntary to a large extent. However, we can control the rate of breathing but not for a long time.

Phases of Breathing

There are two phases of breathing i.e.

1. Inhalation or inspiration

a) Contraction of Rib Muscles and Diaphragm

During inspiration the rib muscles contract and ribs are raised. At the same time the dome shaped diaphragm contracts and is lowered.

b) Effect of Contraction

These movements increase the area of the thoracic cavity which reduces the pressure on lungs. As a result, the lungs expand and the air pressure within them also decreases. The air from outside rushes into the lungs to equalize the pressure on both sides.

2. Exhalation or expiration

a) Relaxation of Rib Muscles and Diaphragm

After the gaseous exchange in the lungs, the impure air is expelled out in exhalation. The rib muscles relax bringing the ribs back to the original position. The diaphragm muscles also relax and it gets its raised dome shape.

b) Effect of Relaxation

This reduces the space in the chest cavity and increases the pressure on lungs. The lungs contract and the air is expelled out of them.

Breathing Rate of Humans

Humans breathe 16 – 20 times per minute in normal circumstances i.e. at rest.

Control of Breathing Rate

The rate of breathing is controlled by the respiratory centre in the brain. The respiratory centre is sensitive to the concentration of carbon dioxide in the blood. When we do exercise or some hard job, our muscle cells carry out cellular respiration at greater rate. It results in the production of more carbon dioxide which is released in the blood. This greater than normal concentration of carbon dioxide stimulates the respiratory centre of brain. The respiratory centre sends messages to the rib muscles and diaphragm to increase the rate of breathing so that the excess carbon dioxide present in blood can be removed out of body.

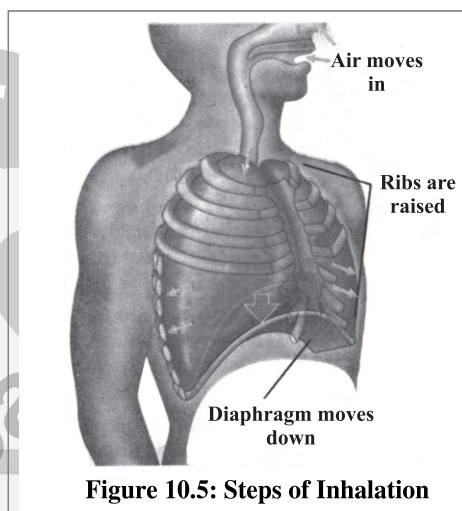


Figure 10.5: Steps of Inhalation

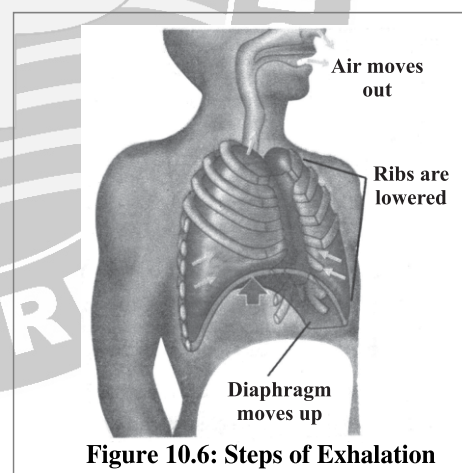


Figure 10.6: Steps of Exhalation

Breathing Rate During Exercise

During exercise or other hard physical works the breathing rate may increase up to 30–40 times per minute.

Q.5 Give the comparison between the inspired and the expired air.

10410005

Ans.

Feature	Inspired air	Expired air
Amount of oxygen	21%	16%
Amount of carbon dioxide	0.04%	4%
Amount of nitrogen	79%	79%
Amount of water vapours	Variable	Saturated
Amount of dust particles	Variable	Almost none
Temperature	Variable	Almost equal to body temperature

Q.6 Describe different types of respiratory disorders in man.

10410006

Ans. There are a number of respiratory disorders which affect people. The high percentage of respiratory disorders in Pakistan is due to more concentration of air pollutants both in urban and rural atmosphere.

Some of the important respiratory disorders are:

1. Bronchitis

a) Introduction

- It is the inflammation of the bronchi or bronchioles.
- It results in excessive secretion of mucous into the tubes, leading to the swelling of tubular walls and narrowing of tubes.

b) Causes

It is caused by viruses, bacteria or exposure to chemical irritants (e.g. tobacco smoke).

c) Types

There are two major types of bronchitis i.e. acute and chronic.

i) Acute Bronchitis

It usually lasts about two weeks and patient recovers with no permanent damage to bronchi or bronchioles.

ii) Chronic Bronchitis

In chronic bronchitis, the bronchi develop chronic inflammation. It usually lasts for three months to two years.

d) Symptoms

Symptoms of bronchitis include:

- Cough
- Mild wheezing
- Fever
- Chills

Shortness of breath (especially when doing hard job)

e) Age limit

The majority of people diagnosed with chronic bronchitis are 45 years of age or older.

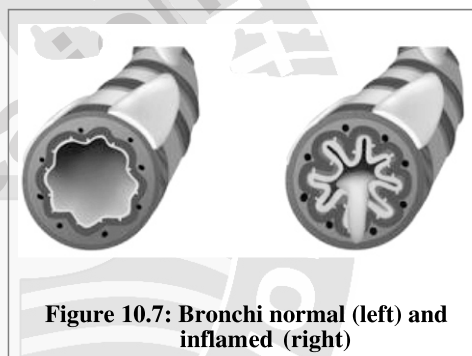


Figure 10.7: Bronchi normal (left) and inflamed (right)

2. Emphysema

Introduction

It is the destruction of the walls of the alveoli.

Explanation

It results in larger sacs but with less surface area for gaseous exchange. As lung tissue breaks down, the lungs do not come back to their original shape after exhalation so air cannot be pushed out and is trapped in the lungs.

Symptoms

It includes:

- i. Shortness of breath ii. Fatigue iii. Recurrent respiratory infections iv. Weight loss

By the time the symptoms of emphysema appear, the patient has usually lost 50% to 70% of his/her lung tissue.

Effects

The level of oxygen in blood may get so low that it causes serious complications.

3. Pneumonia / What is pneumonia? Describe its causes, symptoms and treatment.

(Board 2015,16)

Introduction

It is an infection of lungs.

Double Pneumonia

If this infection affects both lungs, it is called double pneumonia.

Causes

The most common cause of pneumonia is a bacterium, *Streptococcus pneumoniae*.

Some viral (influenza virus) and fungal infections may also lead to pneumonia.

Explanation

When the causative organisms enter the alveoli, they break the lung tissues and the area is filled with fluid and pus.

Symptoms

It includes a cold that is followed by a high fever, shivering, and a cough with sputum production. Patient may become short of breath.

Effects

The patient's skin colour may change and become dusky or purplish. It is due to poor oxygenation of blood.

Treatment

- Vaccines are available to prevent pneumonia caused by *S. pneumoniae*.
- Antibiotics are used in the treatment of this disease. Prior to the discovery of antibiotics one-third of pneumonia patients died from the infection.

4. Asthma

Introduction

It is a form of allergy, in which there is inflammation of the bronchi, more mucous production and narrowing of the airways.

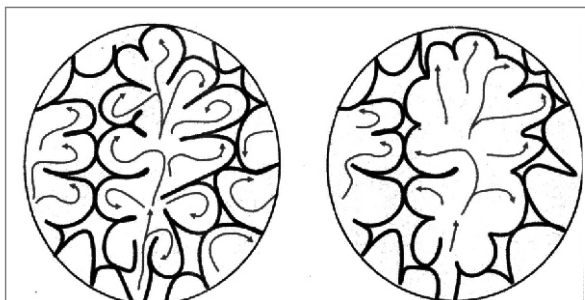


Figure 10.8: The Alveoli, normal (left) and emphysema (right)

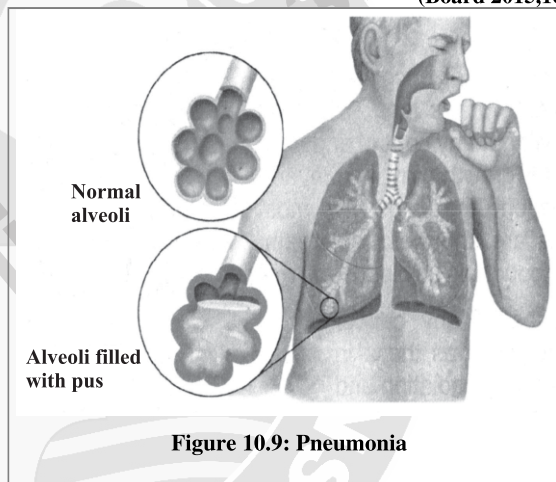


Figure 10.9: Pneumonia

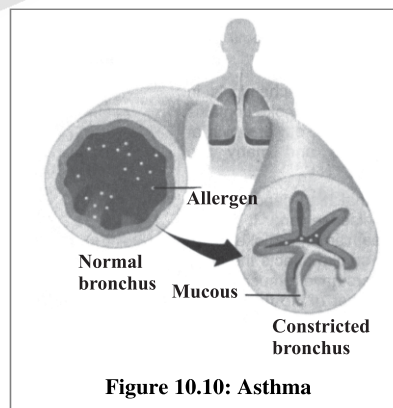


Figure 10.10: Asthma

Explanation

In asthma patients, the bronchi and bronchioles become sensitive to different allergens (allergy causing factors) e.g. dust, smoke, perfumes, pollens etc. When exposed to any of such allergens, the sensitive airways show immediate and excessive response of constriction. In this condition, the patient feels difficulty in breathing.

Symptoms

It varies from person to person. It includes:

- | | |
|--|---|
| <ul style="list-style-type: none"> i. Shortness of breath (especially with exertion or at night) ii. Wheezing (whistling sound when breathing out) | <ul style="list-style-type: none"> iii. Cough iv. Chest tightness |
|--|---|

Treatment

The medicine in the form of inhalers with ability to dilate the bronchi and bronchioles are used in the treatment of asthma.

5. Lung Cancer / Explain lung cancer and passive smoking.

(Board 2014)

Introduction

It is a disease of uncontrolled cell divisions in the tissues of the lung.

Explanation

In lung cancer, cells continue to divide without any control and form tumors. The cellular growth may also invade adjacent tissues beyond the lungs.

Symptoms

The most common symptoms are:

- i. Shortness of breath
- ii. Coughing (including coughing up blood)
- iii. Weight loss

Causes

(a) Main Cause

Smoking is the main cause of lung cancer.

(b) Other Causes are:

- (i) Carcinogens (such as those in cigarette smoke)
- (ii) Ionizing radiation
- (iii) Viral infection

Known Number of Carcinogens

Cigarette smoke contains over 50 known carcinogens.

Lung Cancer in Non- smokers

The risk of lung cancer is significantly lower in non-smokers.

Passive smoking (the inhalation of smoke from another's smoking) is also a cause of lung cancer.

The smoke from the burning end of a cigarette is more dangerous than the smoke from the filter end.

Prevention

- (i) Eliminating tobacco smoking is a primary goal in the prevention of lung cancer.
- (ii) The World Health Organization has called for governments to stop tobacco advertising to prevent young people from taking up smoking.
- (iii) If a person stops smoking the chance to develop cancer decreases as damage to the lungs is repaired and contaminant particles are gradually removed.

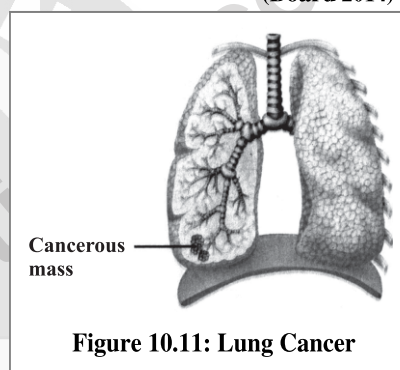


Figure 10.11: Lung Cancer

Effects

Lung cancer is the most common cause of cancer-related deaths and is responsible for more than 1.3 million deaths worldwide annually.

Q.7 Describe bad effects of smoking. Or Write two bad effects of smoking. (Board 2014) 10410007

Ans. Introduction

Smoking is harmful due to the chemicals in cigarettes and smoke.

Number of Chemicals in Cigarette Smoke

Tobacco smoke contains over 4000 different chemicals, out of which at least 50 are carcinogens and many are poisonous.

Rate of Smoking

According to the WHO, the rates of smoking have declined in the developed world. In the developing world, however, it is rising by 3.4% per year as of 2002.

Diseases Due to Smoking

Smoking not only produces lung cancer but also produces a number of life threatening diseases like:

(a) Cancers in

- | | |
|--------------|--------------------|
| (i) Kidneys | (ii) Oral cavity |
| (iii) Larynx | (iv) Breast |
| (v) Bladder | (vi) Pancreas etc. |

(b) Emphysema and Other Respiratory Disorders

Many chemicals in tobacco smoke damage the air passageway, which leads to emphysema and other respiratory disorders.

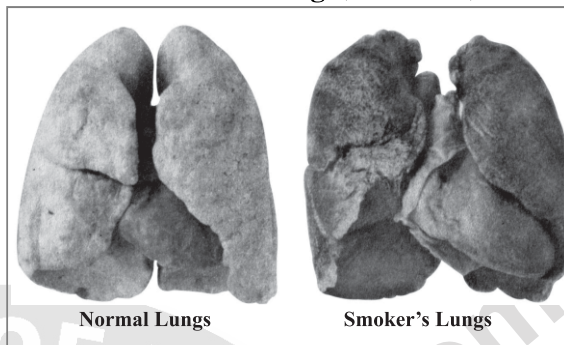
Other effects of smoking

(a) Reduction in the Oxygen Carrying Capacity

It has effects on the circulatory system. The carbon monoxide present in tobacco smoke lessens the oxygen carrying capacity of haemoglobin.

(b) Increase in the Production of Platelets

Many other chemicals in smoke increase the production of blood platelets. When platelets are more than the normal numbers, they make the blood viscous and it can lead to arteriosclerosis.



(c) Risk of Tuberculosis and Pneumonia

Smokers are at greater risk of developing infections, particularly in the lungs like risk of tuberculosis increases by two to four times, and of pneumonia by four times.

(d) Weakening and staining the teeth

Smoking is responsible for weakening and staining the teeth. Tooth loss is 2 to 3 times higher in smokers than in non-smokers.

(e) Effect on social life

Smoking also affects the social life of a person. Smokers may face social unacceptance because other people may not want to be exposed to other's smoke.

(f) Increase in the Rate of Heart Diseases and Cancer in Non-Smokers

Non-smokers who are exposed to second-hand smoke (passive smoke) at home or work increase their heart disease risk by 25-30% and their lung cancer risk by 20-30%.



Multiple Choice Questions

1. **The process of gaseous exchange involves:** 10410008
 (a) Breakdown of C-H bonds to yield energy
 (b) Physical movements that take air in and out of body
 (c) Getting oxygen from the air and removing carbon dioxide
 (d) Transport of oxygen by the blood to different parts of the body
2. **Most of the gaseous exchange in a leaf occurs through:** (Board 2020) 10410009
 (a) Stomata (b) General surface
 (c) Cuticle (d) Lenticels
3. **How many bronchi are there in the air passageway?** 10410010
 (a) One (b) Two
 (c) Many (d) Three
4. **Where does the gaseous exchange occur in humans?** (Board 2017,19) 10410011
 (a) Pharynx (b) Trachea
 (c) Bronchi (d) Alveoli
5. **Which structure actively helps in taking the air out of lungs?** 10410012
 (a) Nasal cavity (b) Bronchus
 (c) Bronchiole (d) Diaphragm
6. **The primary chemical stimulus for breathing is the concentration of;** 10410013
 (a) Carbon dioxide in blood
 (b) Oxygen in blood
 (c) Carbon dioxide in muscles
 (d) Oxygen in muscles
7. **Point out the FALSE statement about respiration.** 10410014
 (a) Gases can easily pass through the walls of the alveoli
 (b) Gas exchange in lungs is very efficient because lungs provide large surface area
 (c) In emphysema, the walls of alveoli break and there is more surface area
 (d) Dust particles can damage the lung by irritating the inner alveoli surface
8. **A disease involving the breakdown of air sacs of the lungs is;** 10410015
 (a) Pneumonia (b) Bronchitis
 (c) Asthma (d) Emphysema
9. **Which process does not occur in the nasal cavity?** 10410016
 (a) Trapping of large dust particles
 (b) Humidification of the inhaled air
 (c) Warming of the inhaled air
 (d) Exchange of gases
10. **What type of blood vessels surrounds the alveoli?** (Board 2022) 10410017
 (a) Artery (b) Arteriole
 (c) Capillary (d) Vein
11. **Gaseous exchange occurs through stomata in:** 10410018
 (a) Leaves and young stems
 (b) Woody stems and mature roots
 (c) Young roots
 (d) Aquatic plants
12. **In humans and other higher animals, the exchange of gases is carried out by:** 10410019
 (a) Skin
 (b) Diaphragm
 (c) Air passageway
 (d) Respiratory system
13. **The length of trachea is about:** 10410020 (Board 2022)
 (a) 10 cm (b) 12 cm
 (c) 22 cm (d) 20 cm
14. **C-shaped cartilaginous rings are present in the wall of;** 10410021
 (a) Bronchi
 (b) Bronchioles
 (c) Alveoli
 (d) Trachea
15. **Pairs of ribs present in humans are:** 10410022
 (a) 24 (b) 12
 (c) 26 (d) 36
16. **No. of lobes present in right lung are;** 10410023
 (a) 2 (b) 3
 (c) 4 (d) 5
17. **Other name of voice box is;** 10410024
 (a) Trachea (b) Larynx
 (c) Bronchi (d) Alveoli



- 18. The normal breathing rate in human being is:** (Board 2021,24) 10410025
 (a) 10-40 times per minute
 (b) 16-20 times per minute
 (c) 30-40 times per minute
 (d) 5-10 times per minute
- 19. During exercise or other hard physical works the breathing rate may increase up to:** (Board 2023) 10410026
 (a) 30 – 40 times per minute
 (b) 50 – 60 times per minute
 (c) 50 – 55 times per minute
 (d) 60 – 70 times per minute
- 20. Amount of oxygen in expired air is:** (Board 2020) 10410027
 (a) 21% (b) 16%
 (c) 0.04% (d) 4%
- 21. Amount of carbon dioxide in inspired air is:** 10410028
 (a) 16% (b) 0.04%
 (c) 4% (d) 40%
- 22. Amount of nitrogen in expired air is:** 10410029
 (a) 70% (b) 80%
 (c) 79% (d) 4%
- 23. Cough, mild wheezing, fever, chills and shortness of breath (especially when doing hard job) are symptoms of:** 10410030
 (a) Emphysema (b) Pneumonia
 (c) Bronchitis (d) Asthma
- 24. In this disease, the patient has usually lost 50% to 70% of his / her lung tissue;** 10410031
 (a) Pneumonia (b) Asthma
 (c) Emphysema (d) Bronchitis
- 25. Pneumonia is an infection of:** 10410032
 (a) Kidneys
 (b) Digestive system
 (c) Lungs
 (d) Blood
- 26. It is a form of allergy:** 10410033
 (a) Asthma
 (b) Bronchitis
 (c) Pneumonia
 (d) Lung cancer
- 27. “World No Tobacco Day” is celebrated on:** (Board 2019) 10410034
 (a) 30 June (b) 31 June
 (c) 11 January (d) 31st of May
- 28. Smoking may also lead to the cancers in:** 10410035
 (a) Kidneys and pancreas
 (b) Oral cavity and larynx
 (c) Breast and bladder
 (d) All of the above
- 29. The destruction of wall of alveoli is called:** (Board 2013, 18) 10410036
 (a) Pneumonia (b) Emphysema
 (c) Asthma (d) Bronchitis
- 30. The inflammation of bronchi or bronchioles is called:** (Board 2013) 10410037
 (a) Bronchitis (b) Emphysema
 (c) Pneumonia (d) Asthma
- 31. It remains unaffected in expired air:** 10410038
 (a) O₂ (b) CO₂
 (c) N₂ (d) Water vapours
- 32. In developing world smoking has:** 10410039
 (a) Declined (b) Risen by 5.4%
 (c) No effect (d) Risen by 3.4%
- 33. In young stems and leaves, some gaseous exchange also occurs through:** 10410040
 (a) Leaf petioles
 (b) Cuticle
 (c) Leaf petioles and cuticle
 (d) Mesophyll
- 34. Exchange of gases occurs through lenticels in;** 10410041
 (a) Woody stems
 (b) Mature roots
 (c) Woody stems and mature roots
 (d) Young stems
- 35. Gases diffuse by general surface in:** 10410042
 (a) All stems (b) Young roots
 (c) All leaves (d) Mature roots
- 36. Air passageway starts from:** 10410043
 (a) Nose (b) Pharynx
 (c) Trachea (d) Bronchi



37. A flap of tissue which guards glottis is: 10410044
 (a) Larynx (b) Epiglottis
 (c) Pharynx (d) Ribs
38. Temperature of expired air is: 10410045
 (a) High
 (b) Low
 (c) Equal to the body temperature
 (d) Equal to external environment
39. Cluster of pouches found in respiratory system: 10410046
 (a) Bronchi (b) Alveoli
 (c) Bronchioles (d) Trachea
40. Lungs are organs which are; 10410047
 (a) Spongy
 (b) Elastic
 (c) Spongy and elastic
 (d) Tough
41. Dusky or purplish skin colour is a symptom of: 10410048
 (a) Bronchitis (b) Emphysema
 (c) Pneumonia (d) Asthma
42. Total chemicals in tobacco smoke are: (Board 2014) 10410049
 (a) 1000 (b) 2000
 (c) 3000 (d) 4000
43. Tooth loss is _____ times higher in smokers than in non-smokers. 10410050
 (a) 2-5 times (b) 1-2 times
 (c) 2-3 times (d) 4-5 times
44. Oxygen carrying capacity of haemoglobin is lessened by; 10410051 (Board 2024)
 (a) Tar
 (b) Carbon dioxide
 (c) Nicotine
 (d) Carbon monoxide
45. A powerful poison which damages brain is: 10410052
 (a) Tar (b) Nicotine
 (c) Carcinogen (d) Carbon monoxide
46. Function of pleural membrane is to: 10410053
 (a) Enclose the lungs
 (b) Help to increase the volume of cavity during respiration
 (c) Increase volume of chest
 (d) Secrete to help the lungs
47. Deoxygenated blood towards lungs is taken by: 10410054
 (a) Pulmonary artery
 (b) Aorta
 (c) Superior vena cava
 (d) Pulmonary vein
48. Asthma is caused by: 10410055
 (a) Perfumes
 (b) Vitamin B-12 deficiency
 (c) Vitamin C deficiency
 (d) Vitamin K deficiency
49. Some viral (Influenza virus) and fungal infections may also lead to: 10410056
 (a) Asthma (b) Pneumonia
 (c) Lung cancer (d) Emphysema
50. A thick muscular structure present below the lungs is called: 10410057
 (a) Alveolus (b) Tracheoles
 (c) Diaphragm (d) Bronchioles
51. The main cause of lung cancer is: 10410058
 (a) Smoking
 (b) Viral infection
 (c) Bacterial infection
 (d) Both viral and bacterial infection
52. Passive smoking in non-smokers has increased heart disease risk by: 10410059
 (a) 20–30% (b) 25–40%
 (c) 25–30% (d) 30–40%
53. Rate of breathing depends upon concentration of; (Board 2014) 10410060
 (a) Oxygen (b) Carbon dioxide
 (c) Nitrogen (d) Hydrogen
54. Percentage of carbon dioxide in expired air during breathing is: (Board 2015) 10410061
 (a) 16% (b) 04%
 (c) 21% (d) 0.04%
55. Which disease is not related to lungs? (Board 2015) 10410062
 (a) Pneumonia (b) Myopia
 (c) Emphysema (d) Asthma
56. Identify the correctly matched pair: 10410063
 (a) Breathing, cellular respiration
 (b) Breathing, gaseous exchange
 (c) Gaseous exchange, cellular respiration
 (d) Both b & c



57. The major causative agent of pneumonia is: 10410064

- (a) *Vibrio pneumoniae*
 (b) *Streptococcus pneumoniae*
 (c) Influenza virus (d) *E. coli*

58. Stomata are frequently present on:

(Board 2016) 10410065

- (a) Upper side of leaf
 (b) Lower side of leaf
 (c) Both sides of leaf (d) Stem

59. Which structure plays an important role for pushing the air out of lungs?

(Board 2018) 10410066

- (a) Nasal cavity (b) Bronchus

- (c) Diaphragm (d) Bronchiole

60. The respiratory centre is present in:

(Board 2017) 10410067

- (a) Lungs (b) Brain
 (c) Nose (d) Muscles

61. Many other chemicals in smoke increase concentration of ___ blood cells.

- (a) Red (b) White 10410067(a)
 (c) Basophil (d) Platelets (Board 2021)

62. Which one of these muscular structure is present below the lungs?

(Board 2023) 10410067(b)

- (a) Trachea (b) Voice box
 (c) Alveoli (d) Diaphragm

Answer Key

1	c	2	a	3	b	4	d	5	d
6	a	7	c	8	d	9	d	10	c
11	a	12	d	13	b	14	d	15	b
16	b	17	b	18	b	19	a	20	b
21	b	22	c	23	c	24	c	25	c
26	a	27	d	28	d	29	b	30	a
31	c	32	d	33	b	34	c	35	b
36	a	37	b	38	c	39	b	40	c
41	c	42	d	43	c	44	d	45	b
46	a	47	a	48	a	49	b	50	c
51	a	52	c	53	b	54	b	55	b
56	b	57	b	58	b	59	c	60	b
61	d	62	d						

Short Answer Questions

Q1. Differentiate between breathing and cellular respiration.

(Board 2015,19,21,24) 10410068

Ans.

Breathing	Cellular Respiration
(i) Breathing is the process through which animals take air in bodies to get oxygen from it and then give out the air for getting rid of carbon dioxide.	(i) Cellular respiration is the process in which the C-H bonds in food are broken by oxidation reduction reactions and the energy is transformed into ATP.
(ii) It is only the mechanical or physical process for exchange of gases.	(ii) It is a mechanical and biochemical process.
(iii) It occurs at respiratory system.	(iii) It occurs at cellular level i.e mitochondria and cytoplasm.
(iv) Energy is utilized.	(iv) Energy is released.

Q2. Trace the path of air from the nasal cavity to the alveoli. 10410069

Ans. The following is the path of air:

Nasal cavity → pharynx → larynx → trachea → bronchus → bronchioles → alveolar ducts → alveoli.



Q3. How will you differentiate between stomata and lenticels? / How lenticels are different from stomata? / What is meant by stomata? Write their function. (Board 2015, 16, 20) 10410070

Ans.

Stomata (Board 2017, 18)	Lenticels
(i) The leaves and young stems have stomata in their epidermis.	(i) In woody stems and mature roots, there are certain pores in the layer of bark, called lenticels.
(ii) The gaseous exchange occurs through these stomata.	(ii) The lenticels allow air to pass through them.
(iii) Opening and closing is controlled by guard cells.	(iii) No guard cells.
(iv) Stomata are present on epidermal layer.	(iv) Lenticels are present on bark.

Q4. What are alveolar ducts?

10410071

Ans. In the lungs, the bronchioles end as fine tubules called the alveolar ducts.

Q5. Describe structure and function of alveolus. \What are alveoli? What is their function?

(Board 2015,18,22,23) 10410072

Ans. Alveolus (Pl. Alveoli) is considered as the basic functional unit of respiratory system. Each alveolus is a sac like structure. These sac like structures form clusters and ultimately the respiratory surface in human body.

Functions: The main function of alveoli is to provide surface area for the exchange of gases with surrounding capillaries.

Q6. What is asthma? Write its symptoms.

(Board 2014,15,16,23) 10410073

Ans. Asthma is a form of allergy, in which there is inflammation of the bronchi, more mucous production and narrowing of the airways. In asthma patients, the bronchi and bronchioles become sensitive to different allergens and patient feels difficulty in breathing.

The major symptoms are:

- (i) Shortness of breath
- (ii) Wheezing
- (iii) Cough and chest tightness

Q7. Define breathing. (Board 2015) 10410074

Ans. The term breathing is used for the process through which animals take air in bodies to get oxygen from it and then give out the air for getting rid of carbon dioxide. It is only the mechanical or physical process for exchange of gases.

Q8. Describe formation of bronchioles.

10410075

Ans. The bronchi continue dividing in the lungs until they make several fine tubes called bronchioles. The bronchioles progressively lose the cartilages as they become narrower.

Q9. What is bronchitis? Write the name of its two types. (Board 2013,14,16,20) 10410076

Ans. Bronchitis is an inflammation of the bronchi or bronchioles. It results in excessive secretion of mucous into the tubes leading to the swelling of tubular walls and narrowing of tubes. It is caused by viruses, bacteria or exposure to chemical irritants e.g. tobacco smoke. There are two major types of bronchitis.

- i) Acute bronchitis
- ii) Chronic bronchitis

Q10. What are pleural membranes?

write their function. (Board 2024) 10410077

Ans. Each lung is enclosed by two membranes called the outer pleural membrane and the inner pleural membrane. The membranes enclose a fluid which provides lubrication for the free expanding and contracting of the lungs.

Q11. Define diaphragm. (Board 2013,14) 10410078

Ans. A thick muscular sheet present below the lungs is called diaphragm. It divides the body cavity into chest cavity and abdominal cavity. It also aids in the process of inhalation and exhalation.

Q12. Briefly explain emphysema. 10410079

Ans. Emphysema is the destruction of the wall of the alveoli. It results in larger sacs but with less surface area for gaseous exchange. As lung tissue breaks down, the lungs do not come back to their original shape after exhalation. So air cannot be pushed out and is trapped in the lungs. Symptoms include:



- (i) Shortness of breath (ii) Weight loss
(iii) Recurrent respiratory infections (iv) Fatigue

Q13. What is exhalation? / Describe the changes which take place during expiration or exhalation in the chest cavity?

(Board 2013,14,23) 10410080

Ans. It takes place in the following way:

Relaxation of rib muscles and diaphragm

After the gaseous exchange in the lungs, the impure air is expelled out in exhalation. The ribs come back to the original position, the diaphragm muscles also relax and it gets its raised dome shape.

Effect of relaxation

This reduces the space in the chest cavity and increases the pressure on lungs. The lungs contract and the air is expelled out of them.

Q14. What is gaseous exchange?

(Board 2015) 10410081

Ans. Taking in oxygen and giving out of carbon dioxide is termed as gaseous exchange.

Q15. What is inhalation? / Define inspiration.

(Board 2013,14,22,23) 10410082

Ans. It takes place in the following way:

Contraction of rib muscles and diaphragm

During inhalation the rib muscles contract and ribs are raised. At the same time the dome – shaped diaphragm contracts and is lowered.

Effect of contraction

These movements increase the area of the thoracic cavity, which reduces the pressure on lungs. As a result, the lungs expand and the air pressure within them also decreases. The air from outside rushes into the lungs to equalize the pressure on both sides.

Q16. Define larynx.

10410083

Ans. The larynx is a box made up of cartilage. It is present between pharynx and trachea. It is also called voice box.

Q17. Define lenticels. / What are lenticels?

Write their function. (Board 2014,15, 17) 10410084

Ans. In woody stems and mature roots, there are certain pores in the layer of bark. They are slightly more raised than the general

surface of the stem. The lenticels allow air to pass through them.

Q18. What is nasal cavity? (Board 2016) 10410085

Ans. The nose encloses the nasal cavity. The nasal cavity is divided into two portions by a wall. Each portion is lined by fine hairs and mucous which filter the dust particles from the air. The mucous also moistens and warms the incoming air and keeps its temperature usually equal to that of the body.

Q19. Define nostrils.

10410086

Ans. Nasal cavity opens to the outside through the openings called the nostrils.

Q20. Define pneumonia. / What is difference between pneumonia and double pneumonia. Write names of microorganisms causing pneumonia.

(Board 2014,19,21) 10410087

Ans. Pneumonia is an infection of lungs.

Double Pneumonia

If this infection affects both lungs it is called double pneumonia.

Cause

The most common cause of pneumonia is bacterium *Streptococcus pneumoniae*. Some viral and fungal infections may also lead to pneumonia.

Q21. Explain the structure of trachea.

10410088

Ans. Larynx continues to the trachea, which is also called the windpipe. It is about 12 cm long tube which lies in front of the oesophagus. There are C-shaped cartilagenous rings in the wall of trachea. The cartilage keep the trachea from collapsing even when there is no air in it.

Q22. Define vocal cords. (Board 2016) 10410089

Ans. Two pairs of fibrous bands called vocal cords are stretched across the larynx. The vocal cords vibrate when the air passes through them. This vibration produces sounds.

Q23. Define epiglottis. Write its function.

(Board 2014,21) 10410090

Ans. In the air passageway of man, the glottis is guarded by a flap of tissue called epiglottis. Epiglottis closes the opening of



glottis while swallowing in order to prevent entry of any food particle into it.

Q24. What are the symptoms of bronchitis? (Board 2014) 10410091

Ans. Symptoms of bronchitis includes:

- (a) Cough (b) Mild wheezing
- (c) Fever (d) Chills
- (e) Shortness of breath (Especially when doing hard job)

Q25. Describe structure of larynx? Write its function. / How is sound produced in larynx? / How sound is produced by voice box in human? (Board 2014,10,21) 10410092

Ans. The larynx is a box made of cartilage. It is also called the voice box. It is present between pharynx and trachea.

Function: Two Pairs of fibrous bands called vocal cords are stretched across the larynx. When the air passes through them, the vocal cords vibrate. This vibration produces sounds. Movements of lips, cheeks, tongue and jaws produce specific sounds which results in speech. Speech is an ability of only humans.

Q26. Name the membranes surrounding lungs. What is their function? / How do pleural membranes protect lungs? (Board 2014,23) 10410093

Ans. Each lung is surrounded by two membranes called outer pleural membrane and inner pleural membrane. The membranes enclose a fluid which provides lubrication for free expanding and contracting of the lungs.

Q27. What is the role of fine hairs and mucous present in nasal cavity?/What is the function of hairs and mucous in the nose?

Ans. Both the portions of nasal cavity are lined by fine hairs and mucous which filter the dust particles from the air. The mucous also moistens and warms the incoming air and keeps its temperature nearly equal to that of the body. (Board 2014,19) 10410094

Q28. What is meant by passive smoking and how is it harmful? (Board 2014, 20) 10410095

Ans. Passive smoking is the inhalation of smoke from another's smoking. Passive smoking is also a cause of lung cancer. The smoke from the burning end of a cigarette is

more dangerous than the smoke from the filter end.

Q29. Why does blood become thick due to smoking? (Board 2015,16) 10410096

Ans. Different chemicals in smoke increase the production of blood platelets. When platelets are more than the normal numbers, they make blood viscous and it can lead to arteriosclerosis.

Q30. What is glottis?

(Board 2022) 10410097

Ans. Glottis is a narrow opening at the floor of pharynx which leads into larynx.

Q31. Give two bad effects of smoking. / Enlist how smoking affect the circulatory system. / Describe two harmful effects of smoking on human health. 10410098

Ans. (Board 2015,19,21,23,24)

1. Smoking effects on circulatory system. The carbon monoxide present in tobacco smoke lessens the oxygen carrying capacity of haemoglobin.
2. Smoking is responsible for weakening and staining the teeth.

Q.32 Define cellular respiration.

(Board 2023) 10410099

Ans. Cellular respiration is the process in which the C-H bonds in food are broken by oxidation reduction reactions and energy is transformed into ATP. Organisms need energy in the form of ATP for their activities.

Q.33 Explain aerobic respiration.

(Board 2022) 10410100

Ans. In aerobic respiration, oxygen is used and there is complete oxidation of the food material. Carbon dioxide and water are also produced in this process.

Q.34 Define gaseous exchange. Why is oxygen needed? (Board 2014) 10410101

Ans. Definition: Taking in oxygen and giving out of carbon dioxide is termed as gaseous exchange.

Need of Oxygen

Organisms get the oxygen needed for cellular respiration from their environment and provide it to their cells. The carbon dioxide which produces during cellular respiration is taken out of the cells and ultimately from the body.



Q35. What do you know about Nicotine? / What is nicotine? How does it affect the human body? (Board 2017) 10410102

Ans. Nicotine is a powerful poison and was widely used as an insecticide in the past. When inhaled through tobacco smoking, it reaches our circulatory system and not only hardens the walls of the arteries but also damages the brain tissues.

Q36. When the “World No Tobacco Day” is celebrated? 10410103

Ans. It is celebrated on the 31st of May every year.

Q37. Describe the role of air spaces found among inner cells of leaves and stems.

Ans. The inner cells of leaves (mesophyll) and stems have air spaces among them, which help in the exchange of gases through diffusion. These air spaces also help in transpiration through plant surface.

Q38. How cellular respiration and photosynthesis help to maintain O₂ and CO₂ concentrations during daytime? 10410105

Ans. During daytime when the mesophyll cells of leaves are carrying out photosynthesis and respiration side by side, the oxygen produced in photosynthesis is utilized in cellular respiration. Similarly, CO₂ produced during cellular respiration is utilized in photosynthesis. Thus both the processes help out leaf cells in compensating the O₂ and CO₂ concentrations.

Q39. Which unique ability related to voice box make humans superior to all organisms? 10410106

Ans. Speech is an ability that only humans are gifted with and this is one of the

Q.44 Give the major differences between emphysema and bronchitis. / Write causes and symptoms of emphysema. (Board 2020) 10410111

Emphysema	Bronchitis
<ul style="list-style-type: none"> It is the destruction of the walls of alveoli It results in larger sacs but with less surface area for gaseous exchange. 	<ul style="list-style-type: none"> It is the inflammation of bronchi and bronchioles. It results in excessive secretions of mucous into the tubes, leading to swelling of tubular walls and narrowing of tube.
Symptoms: <ul style="list-style-type: none"> Shortness of breath 	Symptoms: <ul style="list-style-type: none"> Cough

characteristics which has put human beings superior to all.

Q40. What are carcinogens? How many carcinogens are found in cigarette smoke?

Ans. Cancer causing agents are known as carcinogens. Cigarette smoke contains over 4,000 different chemicals, out of which at least 50 are carcinogens.

Q41. Write two effects of carbon monoxide on our circulatory system. (Board 2021) 10410108

Ans.

- Carbon monoxide lessens the oxygen carrying capacity of hemoglobin in blood.
- It also decreases the venous and tissue oxygen tension leading to the development of cardiovascular diseases such as arteriosclerosis.

Q42. Differentiate between acute bronchitis and chronic bronchitis.

Ans. The acute bronchitis lasts about two weeks and patient recovers with no permanent damage to the bronchi or bronchioles while, in chronic bronchitis, the bronchi develop chronic inflammation. It usually lasts for three months to two years. It is diagnosed mostly in people 45 years of age or older.

Q43. Name the causative agents of pneumonia. 10410110

Ans. The most common cause of pneumonia is a bacterium, *Streptococcus pneumoniae*. Some viral and fungal infections may also lead to pneumonia.

<ul style="list-style-type: none"> • Fatigue • Recurrent respiratory infections • Low oxygen level in blood 	<ul style="list-style-type: none"> • Weight loss • Mild wheezing • Chills 	<ul style="list-style-type: none"> • Fever • Shortness of breath
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Q45. Enlist factors on which breathing depends.

10410112

Ans. It depends on several factors:

- Altitude
- Lung capacity
- Health
- Level of activity (rest or exercise)

Q46. Define bronchitis.

10410113
(Board 2022)

Ans. It is the inflammation of bronchi and bronchioles. It results in excessive secretions of mucous into the tubes, leading to swelling tubular walls and narrowing of tube.

Symptoms

Cough, mild wheezing, fever, chills, shortness of breath.

Q47. The breathing becomes rapid and deep after exercise. Why?

10410114

Ans. The rapid and deep breathing continues for sometimes after the exercise has been stopped. This is done for paying off the oxygen debt the muscles has incurred during prolonged continuous exercise.

Q51. Differentiate between glottis and epiglottis.

Ans.

10410118
(Board 2018,22)

Glottis	Epiglottis
Glottis is a narrow opening at the floor of pharynx which leads into larynx.	The glottis is guarded by a flap of tissue called the epiglottis.

Q52. What are intercostal muscles?

(Board 2020)

10410119

Ans. Several groups of muscles that run between the ribs and help to move the chest wall are called intercostal muscles. These muscles are involved in the process of breathing.

Q53. Differentiate between bronchi and bronchioles.

(Board 2024)

10410120

Ans.

Bronchi	Bronchioles
On entering the chest cavity, the trachea divides into two smaller tubes called bronchi (singular: bronchus).	The bronchi continue dividing in the lungs until they make several fine tubes called bronchioles. The bronchioles progressively lose the cartilages as they become narrower.

Q54. How respiratory center controls breathing rate?

(Board 2024)

10410121

Ans.

The rate of breathing is controlled by the respiratory centre in the brain. The respiratory centre is sensitive to the concentration of carbon dioxide in the blood. When we do exercise or some hard job, our muscle cells carry out cellular respiration at greater rate. It results in the production of more carbon dioxide which is released in the blood. This greater than normal concentration of carbon dioxide stimulates the respiratory centre of brain. The respiratory centre sends messages to the rib muscles and diaphragm to increase the rate of breathing so that the excess carbon dioxide present in blood can be removed out of body.